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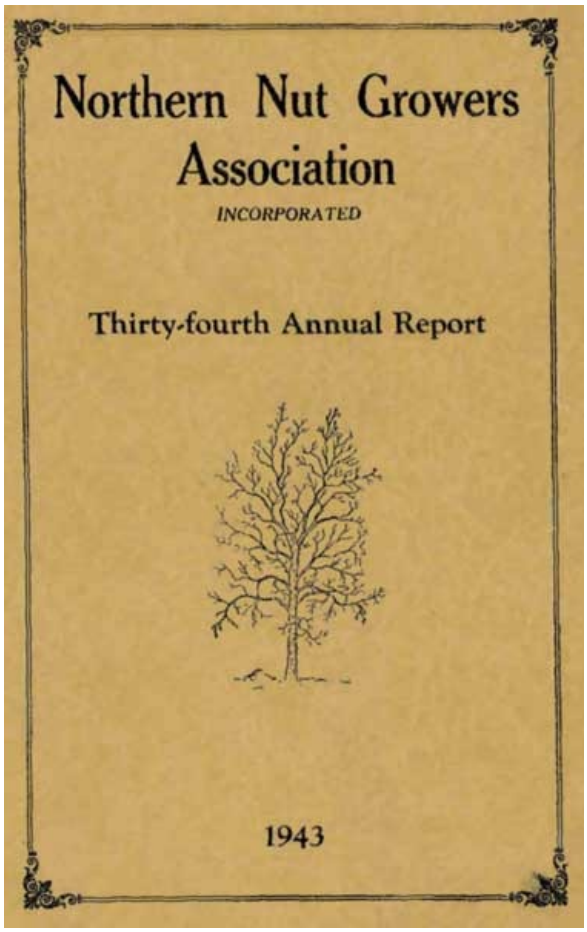

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NUT GROWERS ASSOCIATION

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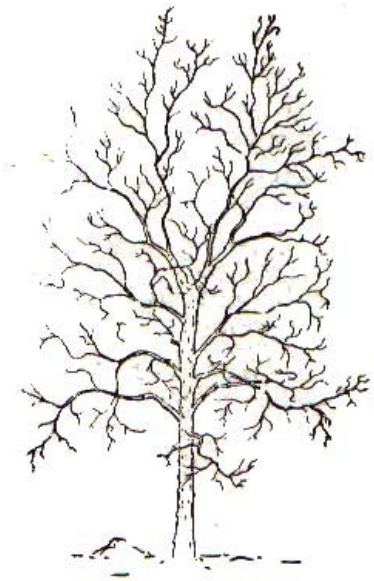
Thirty-fourth Annual Report
1943



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Transcriber's note:

The illustrations are not as good as hoped, but have been placed.

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Rebillard, Frederick, 164 Lark St., Albany
Salzer, George, 169 Garford Rd., Rochester
Schlegel, Charles P., 990 South Ave., Rochester
Schmidt, Carl W., 180 Linwood Ave., Buffalo
Schwartz, Mortimer L., 1243 Boynton Ave., Bronx, New York
Slate, Prof. George L., State Agricultural Experiment Sta., Geneva
Smith, Gilbert L., State School, Wassaic
Smith, Jay L., Chester
Steiger, Harwood, Red Hook
Stern-Montegny, Hubert, Erbonia Farm, Gardiner
Sucsy, Emil J., West Nyack
Warren, Herbert E., P. O. Box 109, Norwich
Wilson, Mrs. Ida J., Candor, New York
Windisch, Richard P., W. E. Burnet & Co., 11 Wall St., New York
*Wissman, Mrs. F. de R., 9 W. 54th St., New York

NORTH CAROLINA
Dunstan, R. T., Greenboro College, Greenboro
Malcolm, Van R., Celo P. O., Yancey County
Parks, C. H., R. No. 2, Asheville

OKLAHOMA
Billups, Richard A., Hales Bldg., Oklahoma City
Clifton, Edward C., 1325 East 66th St., R. No. 2, Tulsa
Hirschi's Nursery, 414 N. Robinson, Oklahoma City
Hughes, C. V., 5600 N. W. 16, R. No. 5, Oklahoma City
Jarrett, C. F., 2208 W. 40th St., Tulsa
Meek, E. B., R. No. 2, Wynnewood
Swan, Oscar E., Jr., 1431 E. 35th St., Tulsa

OHIO
Bungart, A. A., Avon
Cinadr, Mrs. Katherine, 13514 Coath Ave., Cleveland, 20
Cole, Mrs. J. R., 163 Woodland Ave., Columbus
Cook, H. C., R. No. 1, Box 125, Leetonia
Cranz, Eugene F., Mount Tom Farm, Ira
Crooks, John L., 4600 Chester, Cleveland
Davidson, John, 234 E. 2nd St., Xenia
Diller, Oliver D., Dept. of Forestry, Experiment Sta., Wooster
Dubois, Wilber, & Son, Madisonville, Cincinnati, 27
Emeh, Frank, Genoa
Fickes, W. R., R. No. 1, Wooster
Franks, M. L., R. No. 1, Montpelier
Garden Center of Greater Cleveland, 1190 East Blvd., Cleveland
Gauly, Dr. Edward, 1110 Euclid Ave., Cleveland
Gerber, E. P., Kidron
Gerhardt, Gustave A., 13125 Jefferson Ave., Cincinnati
Gerstenmafer, John A., 18 Pond S. W., Massillon
Hoch, Gordon F., 6292 Glade Ave., Cincinnati
Hill, Dr. Albert A., 4187 Pearl Rd., Cleveland
Irish, Charles F., 418 105th St., Cleveland
Jacobs, Homer L., c/o Davey Tree Expert Co., Kent
Jacobs, Mason, 3003 Jacobs Rd., Youngstown
Kappel, Owen, Bolivar
Kintzel, Frank M., 2506 Briarcliffe Ave., Cincinnati, 13
Kirby, R. L., Box 131, R. No. 1, Sharonville
Kratzer, George, Kidron
Lacknett, G. S., 510 E. Main St., Newark
Lehmann, Carl, Union Trust Bldg., Cincinnati
Madison, Arthur E., 13608 5th Ave. E., Cleveland
McBride, William B., 2398 Brandon Rd., Columbus, 8
Meikle, William J., 730 Thornhill Dr., Cleveland
Metzger, A. J., 724 Euclid Ave., Toledo
Ochs, C. T., Box 291, Salem
Ochs, Norman M., R. No. 2, Brunswick
Osborn, Frank C., 4040 W. 160th St., Cleveland
Ransbottom, Earl A., 1057 W. Market St., Lima

Scarff's Sons, W. N., New Carlisle
Shelton, E. M., 1468 W. Clifton Blvd., Lakewood, 7
Shessler, Sylvester M., Genoa
Silvis, Raymond E., 1725 Lindberg Ave. N. E., Massillon
Smith, Sterling A., 630 W. South St., Vermillion
Spring Hill Nurseries Co., Tipp City
Toops, Herbert A., 1430 Cambridge Blvd., Columbus
Van Voorhis, J. F., 215 Hudson Ave., Apt. B-1, Newark
Walker, Carl F., 2351 E. Overlook Rd., Cleveland
*Weber, Harry R., 123 East 6th St., Cincinnati

Weber, Martha R., R. No. 1, Morgan Rd., Cloves
Willett, Dr. G. P., Elmore
Wischhusen, J. F., 15031 Shore Acres Dr. N. E., Cleveland

OREGON
Carlton Nursery Co., Carlton
Doharian, S. H., P. O. Box 346, Eugene
Flanagan, George C., 909 Terminal Sales Bldg., Portland
Miller, John E., R. No. 1, Box 312-A, Oswego
Russ, E., R. No. 1, Halsey
Schuster, C. E., Horticulturist, Corvallis

PENNSYLVANIA
Allaman, R. P., R. No. 1, Harrisburg
Allen, Lt. Col. Thomas H., St. Thomas
Banks, H. C., R. No. 1, Hollortown
Barnhart, Emmert M., R. No. 4, Waynesboro
Baum, Dr. F. L., Boyertown
Beard, H. K., R. No. 1, Sheridan
Blair, Dr. G. D., 702 N. Homewood Ave., Pittsburgh
Bowen, John C., R. No. 1, Macungie
Brenneman, John E., R. No. 6, Lancaster
Brown, Morrison, Carson Long Military Academy, New Bloomfleld
Creasy, Luther P., Catawissa
Dewey, Richard, Box 41, Peckville
Driver, Warren M., R. No. 4, Bethlehem
Diefenderfer, C. E., 918 3rd St., Fullerton
Duckham, William C., R. No. 2, Allison Park
Ebling, Aaron L., R. No. 2, Reading

Ellenberger, Herman A., 333 S. Burrows St., State College
Etter, Fayette, P. O. Box 57, Lemasters
Gebhardt, F. C., 140 East 29th St., Erie
Heckler, George Snyder, Hatfield
Heilman, R. H., 2303 Beechwood Blvd., Pittsburgh
Hershey, John W., Nut Tree Nurseries, Downingtown
High Tor Nursery, R. No. 6, Pittsburgh
Hostetter, C. F., Bird-In-Hand
Hostetter, L. K., R. No. 3, Lancaster
Jackson, Schuyler, New Hope
Johnson, Robert F., R. No. 5, Box 56, Crafton
Jones, Dr. Truman W., Coatesville
Jones, Miss Mildred, P. O. Box 356, Lancaster
Kaufman, M. M., Clarion
Kirk, DeNard B., Forest Grove
Kline, Dr. Florence M., 909 Arlington Apts., Corner Acken and Center Aves., Pittsburgh
Leach, Will, Court House, Scranton
Long, Carleton C., 141 Walnut St., Beaver
Losch, Walter, 133 E. High St., Topston
Lutz, Stanley W., Egypt
Mattoon, H. Gleason, 1008 Commercial Trust Bldg., Philadelphia
McCartney, T. Lupton, Room 1, Horticultural Bldg., State College
Miller, Robert O., 3rd and Ridge St., Emmaus
Moyer, Philip S., Union Trust Bldg., Harrisburg
Owens, G. F., 700 E. Line Ave., Ellwood City

Reidler, Paul G., Ashland
Rial, John, 528 Harrison Ave., Greensburg

*Rick, John, 439 Pennsylvania Sq., Reading
Ruch, George, Huntingdon Valley
Rupp, Edward E., Jr., 57 W. Pomfret St., Carlisle
Sameth, Sigmund, Grandeval Farm, R. No. 3, Kutztown
Schaible, Percy, Upper Black Eddy
Schmidt, Albert J., 534 Smithfield St., Pittsburgh
Siebley, J. W., Star Route, Landisburg
Shelly, David B., R. No. 2, Elizabethtown
Silin, I. J., Echo Mountain, Fairview
Smith, Dr. J. Russell, 550 Elm Ave., Swarthmore
Southampton Nurseries, Southampton
Stoebener, Harry W., 6227 Penn. Ave., Pittsburgh
Theiss, Dr. Lewis E., Bucknell University, Lewisburg
Waggoner, Charles W., 432 Harmony Ave., Rochester
*Wister, John C., Clarkson Ave. and Wister St., Germantown
Wood, Wayne, R. No. 1, Newville
Wright, Ross Pier, 235 West 6th St., Eric

RHODE ISLAND
**Allen, Philip, 178 Dorance St., Providence
R. I. State College, Library Dept., Green Hall, Kingston

SOUTH AMERICA
Pereda, Celedonia V., Arroyo 1142, Buenos Aires, Argentina

SOUTH CAROLINA
Bregger, John T., Clemson

SOUTH DAKOTA
Bradley, Homer L., Lacreek National Wildlife Refuge, Martin

TENNESSEE
Chase, Capt. Spencer B., Hqs. Det. Sta. Camp, Camp Tyson
Kirk, Charles H., Oak Ridge
Howell Nurseries, Sweetwater
McDaniel, J. C., P. O. Box 331, Brownsville
Rhodes, G. B., R. 2, Covington
Zarger, Thomas G., Norris

TEXAS
Carroll, Y. D., 2093 McFadden St., Beaumont
Florida, Kaufman, Box 154, Rotan
Price, W. S., Jr., Gustine

UTAH
Oleson, Granville, 1210 Laird Ave., Salt Lake City, 5
Petterson, Harlan D., 2164 Jefferson Ave., Ogden

VERMONT
Aldrich, A. W., R. No. 3, Springfield
*Ellis, Zenas H., Fair Haven
Foster, Forest K., West Topsham

VIRGINIA
Acker, E. D., Co., Broadway
Brewster, Stanley II., "Cerro Cordo," Gainesville
Burton, Geo. L., 728 College St., Bedford
Carey, Graham, Fair Haven
Dickerson, T. C., 316 56th St., Newport News
Gibbs, H. R., McLean
Johnson, Dr. Walt R., 2602 B. Monument Ave., Richmond
Landess, S. S., 2103 N. Quantico St., Arlington
Lewis, Pvt. Hewlett W., H. & H. Co., 938 Engr. Avn. Cam. Bn., A. A. B., Richmond
Morse, Chandler, Valross, R. No. 5, Alexandria
Nix, Robert W., Jr., Lucketts
Peters, John Rogers, P. O. Box 37, McLean
Pertzoff, Dr. V. A., Carter's Bridge

Stoke, H. F., 1420 Watts Ave., Roanoke
Stoke, Dr. John H., 408-10 Boxley Bldg., Roanoke
Varcity Products Co., 5 Middlebrook Ave., Staunton
Webb, John, Hillsville
Zimmerman, Ruth, Bridgewater

WASHINGTON
Altman, Mrs. H. E., Cedarbrook Nut Farm, Nooksack
Barth, J. H., Box 1827, R. No. 3, Spokane
Carey, Joseph E., 4219 Letona Ave., Seattle
Clark, R. W., 4221 Phinney Ave., Seattle
Denman, George L., 1319 East Nina Ave., Spokane
Ferris, Major Hiram B., P. O. Box 74, Spokane
Kling, William L., R. No. 2, Box 230, Clarkston
Linkletter, F. D., 8034 35th Ave. N. E., Seattle
Lynn Tuttle Nursery, The Heights, Clarkston
Martin, Fred A., Star Route, Chelan
Naderman, G. W., R. No. 1, Box 370, Olympia
Shane Bros., Vashon
Wilson, John A., East 1517 16th Ave., Spokane

WEST VIRGINIA
Cannaday, Dr. John E., Charleston General Hospital, Charleston
Hoover, Wendell W., Webster Springs
Slotkin, Meyer S., 1671 6th Ave., Huntington, 1

WISCONSIN
Aoppler, C W., Box 239, Oconomowoc
Bassett, W. S., 1522 Main St., La Crosse
Dopkins, Marvin, R. No. 1, River Falls
Downs, M. L., 1024 N. Leminwah St., Appleton
Koelsch, Norman, Jackson
Zinn, Walter G., P. O. Box 747, Milwaukee

***Life Member**
****Contributing Member**

CONSTITUTION

ARTICLE I

Name—This Society shall be known as the NORTHERN NUT GROWERS ASSOCIATION, INCORPORATED.

ARTICLE II

Object—Its object shall be the promotion of interest in nut-bearing plants, their products and their culture.

ARTICLE III

Membership—Membership in this society shall be open to all persons who desire to further nut culture, without reference to place of residence or nationality, subject to the rules and regulations of the committee on membership.

ARTICLE IV

Officers—There shall be a president, a vice-president, a secretary and a treasurer, who shall be elected by ballot at the annual meeting; and a board of directors consisting of six persons, of which the president, the two last retiring presidents, the vice-president, the secretary and the treasurer shall be members. There shall be a state vice-president from each state, dependency, or country represented in the membership of the association, who shall be appointed by the president.

ARTICLE V

Election of Officers—A committee of five members shall be elected at the annual

meeting for the purpose of nominating officers for the following year.

Article VI

Meetings—The place and time of the annual meeting shall be selected by the membership in session or, in the event of no selection being made at this time, the board of directors shall choose the place and time for the holding of the annual convention. Such other meetings as may seem desirable may be called by the president and board of directors.

Article VII

Quorum—Ten members of the Association shall constitute a quorum but must include two of the four elected officers.

Article VIII

Amendments—This constitution may be amended by a two-thirds vote of the members present at any annual meeting, notice of such amendment having been read at the previous annual meeting, or copy of the proposed amendment having been mailed by any member to each member thirty days before the date of the annual meeting. [Pg 19]

BY-LAWS

Article I

Committees—The Association shall appoint standing committees as follows: On membership, on finance, on programme, on press and publication, on exhibits, on varieties and contests, on survey, and an auditing committee. The committee on membership may make recommendations to the Association as to the discipline or expulsion of any member.

Article II

Fees—Annual members shall pay two dollars annually. Contributing members shall pay ten dollars annually. Life members shall make one payment of fifty dollars and shall be exempt from further dues and shall be entitled to the same benefits as annual members. Honorary members shall be exempt from dues. "Perpetual" membership is eligible to any one who leaves at least five hundred dollars to the Association and such membership on payment of said sum to the Association shall entitle the name of the deceased to be forever enrolled in the list of members as "Perpetual" with the words "In Memoriam" added thereto. Funds received therefor shall be invested by the Treasurer in interest bearing securities legal for trust funds in the District of Columbia. Only the interest shall be expended by the Association. When such funds are in the treasury the Treasurer shall be bonded. Provided that in the event the Association becomes defunct or dissolves then, in that event, the Treasurer shall turn over any funds held in his hands for this purpose for such uses, individuals or companies that the donor may designate at the time he makes the bequest or the donation.

Article III

Membership—All annual memberships shall begin October 1st. Annual dues received from new members after April first shall entitle the new member to full membership until October first of that year and a credit of one-half annual dues for the following year.

Article IV

Amendments—By-laws may be amended by a two-thirds vote of members present at any meeting.

Article V

Members shall be sent a notification of annual dues at the time they are due and, if not paid within two months, they shall be sent a second notice, telling them that they are not in good standing on account of non-payment of dues and are not entitled to receive the annual report.

At the end of thirty days from the sending of the second notice, a third notice shall be sent notifying such members that, unless dues are paid within ten days from the receipt

of this notice, their names will be dropped from the rolls for non-payment of dues. [Pg 20]

ANNUAL REPORT OF THE NORTHERN NUT GROWERS ASSOCIATION INCORPORATED

For the third time in the forty-four years of our existence our annual convention has been omitted. Each time this has been due to war conditions. The first was in 1918, the others in 1942 and 1943. No report was issued for 1918 but one was compiled for last year, and this present little volume will show that your members and officers are still functioning. We have great hope for the future.

An important part of this report is the result of the work of the Chairman of the Survey Committee, Mr. John Davidson, a good job well done. Considering the still elementary state of nut growing it is remarkable—a really immense undertaking. The responses to this survey show enthusiasm that is encouraging. The war and its emphasis on food seems to have increased interest in nut culture.

W. C. Deming.

REPORT OF THE SECRETARY FOR 1942-43

The Association has had a successful year in spite of the war and the cessation of our annual meetings because of the restrictions on wartime travel. Interest in the Association and nut culture appears to be well-maintained. The program committee assembled a report for 1942 and is already working on one for 1943.

During the past year the membership increased from 400 as of August 10, 1942 to 466 as of July 1, 1943. If this rate of increase continues, we shall pass the 500 mark before the end of 1944. In the 1932 report 134 members were listed and each year since then has shown a substantial increase.

Accompanying this letter is a questionnaire from the survey committee which is designed to extract as much information as possible from the members. The secretary is especially interested in the section on personal information as it should give some idea as to the interests of the members and indicate how they may best be served by the officers and committees. The program committee can also use this information in preparing programs.

President Weschcke announces that the committees and state vice-presidents for 1942 will continue for another year.

The membership circulars which contain the list of nut nurseries and a list of publications on nut culture may be had from the secretary by all who wish to distribute it.

The sets of reports as now sold lack the report for 1935. The few remaining copies are being reserved for agricultural libraries. If members have copies of this report for which they no longer have any use their return to the secretary's office will be appreciated as it may make possible the supplying of complete sets to libraries. [Pg 21]

Treasurer's Report

REPORT OF THE TREASURER—AUG. 15, 1942 to SEPT. 1, 1943

Receipts:		
Memberships	$774.15	
(Philip Allen $10.00)		
(Exchange .15)		
Sale of Reports	102.85	
Sale of Index	.75	
Sale of Advertising (1941 Report)	5.00	
Carl Weschcke Contribution	50.00	
	———	
	$932.75	$932.75
Disbursements:		
Fruit Grower Subscriptions	71.20	
Printing and Mailing 1942 Report	328.37	
Reporting 1941 Convention	32.50	

Expense of President	None	
Expense of Secretary	74.02	
Expense of Treasurer	26.38	
Supplies and Miscellaneous	26.71	
	$559.18	$559.18
Excess of Receipts over Expenditures		373.57
Balance on Hand Aug. 15, 1942		216.05
Balance on Hand Sept. 1, 1943 in North Linn Savings Bank		$589.62

D. C. Snyder, Treasurer [Pg 22]

The Status of Nut Growing in 1943

SURVEY REPORT

John Davidson, *Chairman of Committee*

This survey of nut tree growing in the United States and Canada is a cross section of the industry and has been conducted through the membership of our Association. Questionnaires were submitted to all members, of whom a very satisfactory percentage responded with reports which usually were as complete as the age of the planted trees made possible. Our thanks are due to all who had the patience to reply to so searching a questionnaire. Their reward, we hope, will be increased by nuggets of information from others. The survey committee is indebted to the officers of the Association, to Mr. Slate particularly, who took care of the multigraphing and mailing drudgery, and to the experienced men who lent invaluable aid in formulating and revising the exhaustive and detailed questions.

The results are here set forth in three sections: Northern United States, Southern United States and Canadian. It is evident that trees which do well in the south may act very differently in the north; yet, to a certain and very important extent, the experience of the south has a bearing upon conditions in the north. For example, the pawpaw, though not a nut tree, has seemed to edge itself into the affections and interest of many nut tree men. It is in reality a tropical fruit which has adapted itself to northern latitudes. The pecan seems to be trying to do the same thing. Both illustrate a way of working that nature practices more or less with all species. By cross pollination and selection, human hands are having a part in speeding up this process of adaptation in pecans, Persian walnuts and other tender species. In fact, this is one of the jobs to which the Association is dedicated.

We wish here to pay tribute to the nurserymen of this Association. Most nurserymen are intelligent and honest but sometimes they have a tough time of it. Their worst competitor is a nurseryman who sells seedlings for named varieties, who advertises widely and prospers upon the work of others. When we think of the painstaking care of the honest nurseryman, of his days of drudgery, of the thousands of failed experimental trees and plants that he destroys, of the service he renders his fellows, we know that we should make slow progress without his help.

The conscientious worker in the experiment stations is in the same category. He does his best work largely for love of it.

In addition to many letters and other valuable sources of information this survey covers reports from more than 150 planters of named varieties of nut trees. Many are also planters of seedlings from selected and named varieties with which they are experimenting and from which they are making selections for future tests. Some are experimenting with cross pollination. As one example of careful work, we have now on file blue prints from the New Jersey Department of Conservation and Development, from Gerald A. Miller, of Trenton, showing exact locations by name and number of one of the largest variety collections of hybrid walnut trees in the world. From the Brooklyn Botanic Gardens, Arthur H. Graves, Curator, we have valuable records of the [Pg 23] breeding of chestnut trees, with selections made primarily for tree growth and timber production. There is also hope for some good nuts from the trees. The timber, in money value, is of course more important than the nuts. If successful, we shall again have both.

It is difficult to interest "hurry-up" Americans in planting trees for future generations. They want results now. But the sooner we develop reliable and adaptable fruiting trees for general planting, the sooner will thousands of people begin to plant trees. The late rapid growth of membership in this Association shows an awakened interest that could be swollen into a mighty flood of tree planters if good trees were available. If there were more agencies like the Tennessee Valley Authority, more trees of the better sort would be developed. Its tree crop activities have now been transferred to a "Forest Resources Division" under the supervision of Mr. W. H. Cummings, and its testing and selection work is going ahead steadily. Thomas G. Zarger, Jr., Botanist, is handling the black walnut work in connection with other investigations of "Minor Forest

Products." The headquarters is at Norris, Tennessee. Charles V. Kline, now Assistant Chief of the Watershed Protection Division, still keeps his old interest in the black walnut and tree crop program. Definite and important results are bound to follow from so sustained and well organized a project. Most state agencies complain of lack of appropriations and help. The real trouble lies in lack of vision and knowledge upon the part of legislators. The President has proposed an immense program of communications and highway development as a post-war project. We suggest that fruitful land is still more important, and that highways through desert countries are almost unknown except as means for getting from one fruitful land to another. Perhaps this Association could do more than it has done toward spreading the gospel among legislatures.

The largest source of contribution to the survey is, of course, from the Northern United States. For purposes of tabulation, we have included everything north of Central Tennessee in this class. Nearly one hundred planters of nut trees contribute their experiences in this section. Of the lot, only fourteen of them plant trees for sale as nurserymen. Today we could keep more of them with stocks sold out. Seventy-six are interested in planting primarily for the production of nuts; fifty-seven, in grafting and budding trees from named varieties; forty-five in planting seed from the better varieties, either for production of stocks upon which to graft or, in large quantities, for observation and selection. As many as twenty-six are doing important work in hybridizing. Fifty-one are top-working young trees to better varieties. Only twenty-one count upon the growth of timber for a part of their profit. But certainly the growth of timber, especially black walnut, is not an item to be left out of consideration. Much, here, depends upon the manner of planting, whether in orchard or forest formation. However, even in orchard plantings, the stumps alone are valuable for beautifully patterned veneers.

Fifty-seven correspondents tell us that they are testing standard varieties, while forty-two are interested in discovering and developing new varieties, certainly an index to the pioneering and creative urge which dominates many of our members. As is to be expected, most of our newer members are thus far feeling their way by growing a few of the better varieties for home use. [Pg 24] Only nine of the whole number say that they are working with nut trees at an experiment station.

As to the species of trees being planted, black walnut heads the list with eighty-nine planters. Persian walnuts are next with seventy-three, including five who specify Carpathians or Circassians. Sixty-eight are planting Chinese chestnuts, and sixty-four hickories. Filberts and pecans are tied with fifty planters each; forty-eight say they are planting hazels; forty-three heartnuts; and forty-two persimmons—if we may include these trees for the time being among the nuts. Thirty-eight are planting butternuts; thirty-two, Japanese Walnuts; twenty-eight, pawpaws; twenty-seven, mulberries; twenty-four, Japanese chestnuts. After these, in order, come almonds along the southern borders, beech toward the north, hicans, tree hazels, oaks, Japanese persimmons, honey-locust, jujube, black locust (the correspondent explains, "for bees and chickens"), Manchurian walnuts, and finally, coral and service berries.

As an indication of the adaptation of species and varieties to the climates in which these men, and several women, are working, they listed at out request the following native trees found most plentifully in their sections. Black walnuts and hickories stand at the head of the list, as reported by seventy-five correspondents each. Then follow in order, butternuts, hazel, beech, oaks (probably overlooked by many), pecans and chestnuts.

Of nut trees found sparingly in these sections, butternut trees, surprisingly, take first place, indicating broad adaptation but a certain weakness, perhaps a slow susceptibility to blight or fungi, which prevents this tree from being found plentifully. It is significant that it is found most plentifully in the more rigorous areas of New England where fungous ravages are discouraged by cold. Add chinquapins to the number of scarce trees, and the list is complete.

As a further gauge of climatic conditions, fifty reported that peaches are reliably hardy in their sections, while fifty said they are not. This, according to the late Thomas P. Littlepage, is a fairly reliable index to the climatic adaptability of present varieties of northern grown pecans. Ninety-two planters reported that their seasons are long enough to mature Concord grapes. Only four said "no." For Catawba grapes? "Yes," said forty-two; "No," fourteen. For field corn? "Yes," ninety-three; "No," four. This question was improperly asked. Field corn varies too widely in length of maturity for accuracy in this respect.

Lowest temperatures expected range from 8°F above to 30°F below zero, with the usual lower range in the greater portion of the northern states, from zero to 12° below. Lowest known temperatures range all the way from 10° to 52° below, but in most portions from 15° to 35° below.

Returns indicate that winter injury is not always, nor even usually, the result of low temperatures but, rather, to the condition in which the trees enter the winter. If late excessive growth leaves them with wood not wholly dormant, they suffer. If not, they will stand extraordinary low temperatures with little or no damage. One way to guard against this damage is by preventing late growth. A means of doing this will be found in an important contribution by Mr. H. P. Burgart, of Union City, Michigan. Mr. Burgart says: [Pg 25]

"After 21 years of experience with growing, selling and planting nut trees, I have had to have a neighbor show me the best way to care successfully for them. I have studied and practiced Mr. Baad's methods, and in comparing them with my former practice, and with the practice of others who have failed with their trees, I will suggest the following cultural procedure to be given all plantings when possible, and to be continued for at least three years, or even longer for best nut

production.

"Nut trees should be given clean cultivation right after being planted (in the spring) and until August 1st. This encourages root growth and conserves moisture. Then sow a cover crop of rye, cow peas or soy beans to take up moisture, slow up growth and prevent the late sappy condition that is often responsible for winter injury. Leave the cover crop over winter and turn it under in the spring for humus. Before turning under, a light application of some kind of manure, along with some superphosphate and potash, should be sprinkled around each tree. Then thorough cultivation again until August, and repeat.

"Soil for nut trees should be tested for acidity, nitrogen, phosphate and potash. It has been determined that most nut trees prefer a pH range of 6.0 to 8.0; but I have frequently found people planting trees on soils of 4.0 and 5.0, where nothing but sickly growth could be expected.

"Where it is not possible to work all of the ground between nut trees, cultivation should begin with a three or four foot circle around each tree, annually increasing this space with the growth of the branches. Cultivation, with attention to humus and fertility, are necessary to proper tree growth and nut production. Sod culture will never do."

Mr. Burgart's method has the advantage not only of guarding the trees from excessive winter injury but at the same time adds an almost immediately available source of humus and nutrients to the soil for spring growth. If followed, it should greatly reduce the number of reports of winter injury, failure to start, and of weak growth afterward.

Excessive summer heat is not so great a problem in most portions of the northern states. The highest expected temperatures range, in our reports, from 86° to 110°; mostly from 90° to 100°. The highest known are reported to be all the way from 95° to 120°, but mostly from 100° to 110°. A method of guarding against heat damage will be found in a communication from Mr. H. F. Stoke, of Roanoke, Va., which appears later in this report.

Drouth and hot, dry winds are more dangerous enemies than either cold or heat. It is somewhat ominous that, out of eighty-three reports, forty-two, originating all the way from Maine to Oregon and from Canada to Tennessee, report the occurrence today of frequent drouths, while forty report hot, dry winds. Surely the need for tree planting is immediate and urgent. Mulching, and the protection of recently planted trees by wrapping their trunks, are preventives of some damage, but can not stand up forever against the longer and longer periods of drouth now being reported, during which the water table is gradually being lowered beyond the reach of tree roots.

The length of the frost-free season has an important bearing upon the production of nuts after the trees are matured. This is true in the south as well as in the north. One of the most frequently reported causes of loss of nut production in southern sections is an early spring, inducing growth [Pg 26] of buds and blossoms, followed by a frost. No protection seems to have been found against this damage except by use of heavy smudges. Large orchardists protect themselves, but planters of small groves rarely do so. This explains the autumn scramble, reported by many members, in search of early fallen nuts. We should continue our search for trees which produce nuts of early maturity. Thus far the search has not been too successful among most species, but some progress has been made and the future is more encouraging in this respect than it was a decade or two ago. Some early maturing nuts have been found and pollen from the trees is being used for cross-pollination with better known nut producers. In the northern states, dates of the latest spring frosts range from April 1 to June 1, with the average around May 15. The earliest fall frosts come from Sept. 5 to Oct. 15, with the average about Sept. 15 to 20. Where the frosts fall much outside these limits—too late in the spring or too early in the fall—protective measures will help but will not always prevent damage.

Soil Conditions. There is a slight preponderance of clay soils over loam among the returns from planters. Loams and sandy loams are tied for second place. A smaller number report that these top soils lie shallow over hard-pan or rock. Fewer still report a soil underlaid with sand or gravel.

By far the best growth for most kinds of nut trees, as well as the best production of nuts, is to be found where trees are planted in deep loam. Next come the trees in clay loam; then come trees in sandy loam and in clay over sand or gravel. Numerous complaints of poor growth come from members who have trees set in a soil which is shallow over rock or hard-pan. Some of the hazels and butternuts are reported as able, for a time at least, to establish themselves in such soils, but their fight for survival seems precarious and is apparently short-lived. Black walnuts, particularly, require deep, rich soils into which their long taproots can easily penetrate. This is one of the few nut tree facts so definitely established that there can no longer be any doubt about it. The reports show that the planting of black walnuts in any but good deep soil should be discouraged. It leads only to disappointment and often to loss of interest.

A somewhat sandy soil, particularly if loamy, seems adapted to the planting of chestnuts and to such trees as do well on ground that will successfully grow peach trees. If such soil is found upon a hillside or hill top, so much the better. All such soils, of course, require more attention to fertility maintenance, for they leach out more quickly than soils with more of a clay constituent.

Do any of the nut tree species prefer an acid to an alkaline soil? This is a question our questionnaire does not answer. Thirty correspondents say their trees are set in a lime soil, fourteen in an alkaline soil (which may or may not, in the commonly accepted usage of that term, have lime as a source of alkalinity). Sixty-one report an acid soil. Only eight of this group report the use of lime, two the use of bone meal, and one of wood ash as acid correctives. Unfortunately,

we did not ask definitely about the reaction of trees to the use or non-use of lime. Puzzled by this comparative neglect of lime as a corrective on acid soils, we asked Mr. H. F. Stoke, of Roanoke, Va., a very accurate and acute observer, who had reported plantings in both kinds of soils, what his experience had been. Also we asked Miss Mildred Jones, whose experience with nut trees is [Pg 27] second to none, the same question. Their replies follow:

Mr. Stoke says: "In response to your inquiry, 'What nut trees, if any, do best in acid soils?' I should reply that the chestnut leads the list, followed closely by the mockernut hickory.

"Throughout its native habitat the heaviest stands of the native chestnuts are to be found on acid soils over granitic and sandstone formations, rather than on limestone ridges. The best stands are on granite ridges, partly due, no doubt, to the poverty of sandstone soils.

"The mockernut hickory occurs about anywhere on the poor, acid, clay soils of the south, its vigor depending on fertility. Shagbark does not occur on the acid (granitic) Blue Ridge mountains, but is found on the limestone Alleghanies running parallel only a few miles away. I have never seen a shagbark hickory between Roanoke and the coast, more than 200 miles away, but it occurs freely to within two or three miles on the west. The difference is not in elevation or rainfall, but in the soil.

"On the other hand, black walnut occurs on both acid and limestone soils, but seems to prefer the latter. Part of its preference may be due to the generally greater fertility and better drainage to be found in limestone soil. Persian walnut, I believe, when on its own roots, is more or less allergic to acid soil. Wild hazels grow here on both limestone and granite soils.

"Frankly, I believe the matter of soil acidity, as such, is rather over-emphasized. There are other factors entering into the problem that are of as great or greater importance. I doubt if there was actually any really alkaline soil, in its native state, in the humid region lying east of the Mississippi River. In the glaciated region lying to the north, the soil seems to have been more nearly neutral (pH 7). Such was the case in Iowa and in Minnesota where I homesteaded many years ago.

"Throughout the south the soil averages much more acid, even much limestone soil being greatly benefitted by liming. North or south, soil acidity is greatly affected by drainage and by the resulting native vegetation.

"Peat or muck soils are notably acid; also they are notably deficient in potash. The addition of wood ashes greatly benefits such soils in two ways. On the other hand, the addition of wood ashes to a soil already alkaline might be harmful even though in need of potash.

"In the last several years I have been making some soil experiments that I may write up when I am sure I know what I am talking about. In general, I may say I should prefer a soil slightly on the acid side for any and all tree and farm crops if I had an eye to future fertility. Lime breaks down vegetable matter and makes its constituent plant foods quickly available, but prevents a build-up of humus in the soil. The effect is very pronounced in times of drought, the alkaline soil crops drying up much more quickly than do those on acid soil. On the other hand, such soil elements as phosphorus seem to require the lime as a flux to prevent the phosphates from becoming fixed and unavailable to crops.

"In regard to peat moss, it is undoubtedly acid, but it is beneficial in its water-holding properties and in the comparatively slow release of its nutritive elements. Lime added to the peat will break it down rapidly and make it more available as a fertilizer, but until the decomposition reaches a [Pg 28] certain point; its effect is to impoverish rather than to enrich the mixture. This seeming paradox can perhaps best be explained by some experiments I have been making with sawdust. A number of plots were prepared and given various treatments, including mixing one surface-inch of sawdust with the soil, and wheat was sown on the area.

"Wheat sown on the test plot without any treatment or fertilizer was normal for the poor clay soil on which the experiments were made. Where sawdust, only, was added, the wheat came up but sickened and produced no filled heads. The same was true where lime was added to the sawdust. Where heavy applications of nitrate of soda were added to the sawdust treated plots, both with and without lime, the 'sickness' disappeared and wheat was matured.

"My analysis of this, coupled with experiments in composting, leads to the following conclusion: During the period of decomposition of the sawdust (hastened, no doubt, by the lime), the bacteria of decomposition fed so heavily on the nitrates in the soil that the plants were starved. When the material had reached the condition of humus, the bacterial activity decreased to the point where fertility was restored.

"The above analysis accounts for the fact that coarse vegetable material, injures crops, when plowed under, for the current season. Fresh succulent material decays so quickly that it becomes almost immediately available, releasing its constituent plant food.

"With proper conditions of moisture and aeration, sawdust, when mixed with quickly decaying material like kitchen garbage, can be reduced to an excellent, usable humus in three summer months. In fact, it is then better material than if permitted to lie out in the weather for fifteen years.

"There is another factor I think important in tree growth, especially where summers are hot, and that is soil temperature.

"For any of our nut trees I should say that an acidity test of pH 6 to 7 would be entirely satisfactory. If the soil is infertile, some form of humus should be worked in at the time of planting. If much such material is used, some lime may be added. Better yet, wood ashes and bone meal will furnish potash, phosphorus, and the lime necessary to correct acidity and maintain the phosphorus in an available condition. Add to this, proper drainage and cool soil achieved by, first, cultivation, and later by heavy mulching, artificial shading, or shrubby undergrowth extended outside the root area, and your tree should 'go to town.' When the tree is large enough to shade its own root area it will take care of its own soil refrigeration. Nature knew what she was about when she planted trees in forests. Trees require warm heads (sunshine) and cool feet (shade), just the opposite from us humans."

Mr. Stoke's letter recalls a very ancient Arabian proverb connected with the date palm. "The date palm tree must have his head in hell and his feet in water." We are indebted both to Mr. Stoke and to the Arab scientists for many things.

Miss Mildred Jones' reply, fortunately, goes into other and equally important phases of the same subject. She says: "Anyone who is going to lime and fertilize nut trees should take at least a five year period for his work, using lime and fertilizer each year, and not dump it all in one year, then wait for results. He should study the return on a five year basis. One year is too short a term. [Pg 29] Weather conditions can upset a program to the extent that both lime and fertilizer may not have their effect until the following year. Let those who really want to know, make graphs of growth in young trees and of nut production from older trees, in pounds, for five years, as against five of the same years during which trees similarly situated received no fertilizer or lime.

"I shouldn't be at all surprised if those who state in reports to you that they have an acid soil, merely have a top acid soil. They may be growing their trees in basic limestone soils. Walnut trees grow in this environment very well, because they are found growing wild in woods where laurel and other types of plants loving an acid condition grow. This is true here in our county, but these soils are not seriously acid. They grow good garden crops.

"Ground, or pulverized, limestone is the safest type of lime to apply to trees or crops, in my estimation. Some of it is ground so fine that it looks like hydrated lime and is used for medicinal purposes. I am inclined to think that any reports you received that noted injury from the use of lime may have been due to the use of burned lime (calcium oxide) which is caustic when wet. This type of lime may be used in winter, but during the growing season, or too close to the growing season, may injure trees. I believe such injury depends entirely upon weather conditions, but it is a good thing to be on the safe side and use a lime which will not have the hot reaction that burned lime has.

"Your reports will serve an excellent purpose if they lead to getting a yearly record by planters on bearing and tree growth of their varieties. Few people know enough to go into the matter of soils and treatments intelligently. One can hardly blame them. It is a baffling subject. An unbalance in one element will lock up another element until one has quite a time unlocking them again. It seems that a conservative middle course is about the best to advise."

Upon reflection, it seems likely that if our questionnaire had asked specifically about the use of lime, many more reports would have been received of its use.

In response to an inquiry as to how weed competition near young trees is controlled, the replies are encouraging. Forty-seven practiced mulching; forty-five, mowing; thirty-four, occasional cultivation; twenty, regular cultivation, and a few others, slag or cinders around the trees. As is evident, some used several of the above methods. A few used none and suffered losses. Their honesty is admired, and their experience, disappointing as it is, is useful information.

As to fertilizing, forty-three reported the use of manure in some form as the principal material; twenty-eight used nitrogenous fertilizer; twenty-one, a complete fertilizer. Other materials were, in order, lime, compost, bone meal, ammonium sulphate, wood ash, tankage. One used a mixture of muck and manure and got results in excellent growth where the use of muck alone produced unsatisfactory growth. Several reported injury from too much fertilizer or from too late an application. Tree growth was thus pushed on into late fall; the trees were too sappy to stand the winter freezes and suffered from winter killing. The same result was reported from "over-cultivation." In this connection, we refer back to the letter from Mr. H. P. Burgart, of Michigan, [Pg 30] whose suggestions on cultivation and fertilizing are well worth careful study and practice by all who have had this trouble. It is possible that some planters, especially those whose trees are set on hillsides, where erosion is a robber of fertility, would modify Mr. Burgart's practice of turning under the green crop in the spring. They might prefer, as indeed might others who would like to see their green manure nearer the top of the soil, to disk in the green crop rather than bury it deeply with mouldboard plows. They would of course follow it up with repeated diskings until the time came for sowing another cover crop. This is, however, entirely in line with Mr. Burgart's recommendations.

Pursuing this subject to its conclusion, we next asked: "*When young trees failed to grow with you, what percentage of these failures was due to* ..." (various causes enumerated below)? The question was misunderstood. Many evidently gave percentages of all trees planted. Others, correctly, gave percentages merely of the trees which failed to grow. As nearly as could be arrived at, about 30 percent of losses were among trees that failed even to start; 40 percent failed from weak growth the first year or two; 10 percent from failure to maintain later growth; 16 percent were winter killed, and 3 or 4 percent died from rodent or similar (mole, gopher, deer,

bear) injury. It is evident that by far the greatest losses were suffered within the first two years—not less than seventy percent. Probably more. It would seem that two years of intensive care should not be too burdensome a stint for a reward which lasts a lifetime.

Rodent and similar injuries were no doubt kept low because of extra protective care. Hardware cloth (galvanized wire ¼" mesh, 24" high, preferred) around each tree proved the most common and effective preventive. Following this, in order of use, were: wrapping the trunks (including wrappings of tar paper); mounding with earth or ashes; poison bait, dogs and cats, clean cultivation; resinous paint; spray (with Purdue formula mentioned); and, finally, hogs, against mice.

Anti-rodent treatments which proved injurious to trees were reported to be; tar paper wrappings; coal tar washes; close-set creosoted posts; oil sprays; "any paint"; any chemical to smear on trunks; rooting cement. For those who are located in regions where deer are a source of injury, Mr. J. U. Gellatly, of West Bank, B. C., reports the successful use of an old and heroic Russian formula. Spray or paint all branches with manure water, using hog or human offal. Deer will stay away. Naturally.

Next come answers to some personal questions as to experiences from which the reader may glean a wide variety of suggestions. The first of these questions is:

"*What is your ONE greatest source of success?*" The answers seem to show many royal roads, each of which was the one road for someone. The answers: Mulching young trees; watering care; planting seeds; planting one-year seedlings; wrapping-with paper; 50% moist peat mixed with earth in transplanting; manure; sod in bottom of planting hole and use of nitrogen later; setting trees at bottom of slopes; clean cultivation until August then sowing rye, soy beans or cow peas as cover crops to turn under in spring; topworking hickories; grafting in cool, moist spring weather; pigs in orchard; chickens in orchard; planting 12-14-foot trees severely cut back, burlap wrapped, heavily mulched. [Pg 31]

It seems a pity that limitations of space do not permit the telling of the various stories connected with the above glimpses of successful solutions. Each represents a little or a big success story connected with an individual problem. It is sufficient, perhaps, to know that someone somewhere found that each was the answer to his own difficulties.

The next question brings out the reverse side of the planters' work: "*What is your chief source of failure?*" The answer most often given was the honest one, lack of attention. We can all convict ourselves here, either involuntarily or otherwise. Especially during this period of warfare, when so many have been taken away from their plantings and have been unable to get help, there is no question but that our trees have suffered. The next in frequency is "unsuitable soil." Following this come: lack of water; poor planting; planting too big a tree; spring planting of nut trees; buying 5 to 7 year-old trees; climate; transplanting failures; grafting; grafting in dry, hot, springs; top-working old trees; stink bugs on filberts (nuts); lack of drainage; forcing with nitrogenous fertilizer; fertilizing young trees too much; birds breaking off top growth. It had been the intention to confine this question to young trees, but it was not so phrased, so we shall let the answers stand as they are. It is a bit ironical that some found their chief source of failure exactly where others had made their best success. The explanation must lie in differences in technique, in soil or in some other local condition. Skill, knowledge, and persistence must always play a great part in any success.

We next asked, "*What have been your chief difficulties with established, bearing trees?*" The difficulties here shift from matters of soil, rodent protection and the like to other types; caterpillars, neglect, winter injury, limited crops, failure of nuts to fill, disappointing quality of nuts, bag and tent worms, blight, "blight" due to drought, too early leaf fall, insects in early spring, trees drowned out in flooded bottom lands. It is probable that this last disaster happened to younger trees.

As to the species of trees chiefly damaged by these causes, black walnut comes first (possibly because more of these trees have been planted), then hickories, Persian walnuts, chestnuts (blight), heartnuts, pecans, filberts, butternuts, and finally butternuts in the south areas from fungus troubles.

Trees reported to have been least damaged were, first, butternuts, then hazels and filberts, black walnuts, hickories, Manchurian walnuts, Jap. walnuts, heartnuts, chestnuts, pecans, Persian walnuts.

In response to the specific question, "*What insects damaged the trees?*", we found that walnut caterpillars were more common than any others, followed closely by web or "tent" worms. The Japanese beetle is a close second and is broadening its entrenched positions steadily. Others are flat-headed apple borers, lace-wing fly, aphis, leaf hoppers. To this list two reporters added sapsuckers among the insects. These birds would almost girdle some of the branches with punctures.

Insect damage was reported as serious by eight reporters, as slight or occasional by six, and of yearly occurrence by nearly all. Others reported damage as serious if not controlled.

"*What do you do to control the insects?*" was then asked. Most of the answers referred to clustering types of insects and involved removal of the clusters by burning, by cutting off the infested twigs, or by scraping off the clusters from the trunks in the early morning or late [Pg 32]

evening. Others sprayed with lead arsenate, "sprayed in late summer with lead arsenate", sprayed with nicotine sulphate for aphis and lice. Other methods mentioned were early cultivation, shaking the tree with a pole early and often, and chickens in the grove. Some of these means are adapted manifestly, to small plantings and others to larger groves. None mentioned the attracting of birds by plantings of trees or shrubs that bear berries or small seeds. When trees are tall enough to be beyond reach of poles or sprays, the birds become more essential as insect destroyers.

"*What insects damage the nuts?*" Weevil, by long odds. Next come husk maggots or "shock worms", codling moth larvae, borers, stink bugs on filberts, butternut curculio. No cure is given for this trouble except the very valuable one of keeping chickens, or, better still, turkeys running freely in the plantation. Clean cultivation will, of course, destroy many larvae that hibernate under trash.

"*What species are most injured by disease?*" None are immune, apparently, though three reporters in favored regions answer "none" are injured. Black walnuts suffer from leaf-spot, blight, or canker, especially in seasons when the trees have been weakened by drought. Hazels and filberts are next, then Persian walnuts, butternuts, native chestnuts, Chinese chestnuts, pecans.

Blight in chestnuts, nectria canker and blight in black walnuts, blight in filberts (Cryptosporella), scab in pecans, and die-back Melanconium oblongum in butternuts. These are the kinds of diseases most to be feared among nut trees. Sprays, chiefly with Bordeaux mixture and copper base solutions, are recommended. If nut orchards were generally as well sprayed as apple and peach orchards, we should hear less of disease among nut trees. As it is, nut trees are in general far more resistant by nature to disease than fruit trees, but it will not do to take unlimited resistance for granted. As progress is gradually made in the selection of varieties for better nut production, it is very likely that there will be a weakening of this resistance to disease. Better cultural methods, resulting in more robust growth, will build up resistance. Better sprays and more spraying will act as a barrier not only to disease but to most insect enemies as well.

"*What disease, if any, affects the nuts?*" Fortunately, very few diseases are reported. "None," say most of our reporters. A scab is reported for the first time this year in some sections on pecans. "Galls" are reported on some hickories. A husk blight appears to affect Persian walnuts in some places, and nut production is very seriously affected among black walnuts by defoliation prematurely, either because of drought or leaf-spot. The cure is undoubtedly the same as for disease affecting the trees, namely spraying.

"*What proportion of nuts are taken by the squirrels?*" The answers to this question range all the way from "all if allowed" to "none if prevented." If the nut trees are located near a forest, the proportion will be large; if not, much smaller. Most correspondents say that the proportion is very small, but nearly a third of those who make any report on this at all, say such losses are rather heavy. In the extreme north, there seem to be no squirrels to bother. Several report thefts, particularly of filberts, by chipmunks, while one complains about both mice and jaybirds as filbert lovers. [Pg 33]

The most effective squirrel control is the rifle or shotgun. Rat traps, using black walnuts as bait, are second choice and said to be effective. The banding of isolated trees with tin (one says cotton batting) will prevent squirrels from climbing. A good cat or several of them will be useful, say several reporters. One judicious correspondent says that, in general, there are two popular ways of handling the situation; one by shooting, the other by cussing—most practiced, least effective. One grower, not to be outdone by the patient Chinaman or Japanese, in September ties up each chestnut burr in a cloth sack. Take your choice; but it will be well, if you wish to remain in good standing with the law, either to do your shooting during the open hunting season or, if at other times, catch your thief in the act and, wastefully, let him lie where he falls when shot. So says the law, at least in some states. On the other hand, there are many who will say, with one reporter: "I do nothing about it. I like squirrels." [This note by chairman—not W. C. D.!]

The Marketing of Nuts! The purpose of this section was not to inquire into methods of marketing but merely to determine, if possible, what marketing of nuts is now being done. It is little enough. Chestnut lovers have all but forgotten the taste of good chestnuts. Black walnut buyers, confectioners, bakers, report that it is next to impossible, at least for the duration of the war, to get deliveries of nuts, especially shelled nuts. The market for a good product is best only when the product is easily and plentifully obtainable.

Forty-one growers reported that they sell nuts commercially. The others do not because they have no surplus to sell. Only six sell kernels. The others sell whole nuts.

Owing to a misreading of the question, few reported on profitable varieties. Those who did, reported Thomas as first, then Stabler and Ohio. Of pecans, Major first, then Greenriver, Busseron, Indiana, Niblack. Of chestnuts, Hobson is the only one mentioned, and of filberts only the Jones hybrid. Most growers reported on species instead of varieties. Of these, black walnuts stand first, then pecans, chestnuts and filberts. In the far northwest, filberts stand first. Most growers have the feeling that the hybrid chestnut, *mollissima x dentata*, is coming fast and offers one of the best chances for profitable commercial planting. At present only three reporters who specifically commit themselves on the subject say they count upon the sale of nuts as an important item in their income. Fifty-one do not. Fifteen definitely expect, and sixteen others have hopes, that nuts may some day become, at least to an extent, good income producers for

them. Practically all express themselves as willing to sell or exchange either nuts or cions for propagation purposes.

Discovery of Promising Nut Trees. Some thirty-odd "wild" trees which bear nuts of unusual promise have been reported by discoverers in their answers to this survey. It is more than likely that some of them have been previously reported. The committee has no means of knowing. However, it is hoped that, out of the lot, one or two may be good enough for propagating or for contributions of pollen for cross-pollination. The names and locations of the owners of these trees have been turned over to Mr. C. A. Reed, Associate Pomologist, U. S. D. A., Beltsville, Md., for [Pg 34] further investigation. It has been found that such information should not be prematurely published, since it leads to trouble for the owners and to possible undue valuations being placed upon the trees in question.

RATING OF VARIETIES. First, it will be best to state how the committee arrived at a rating. Certain well-known varieties were printed by name, and blanks were left to be filled, if desired, with names of special favorites of the reporter. Those listed by name were not all good, but were widely planted. We wished to know exactly what the planters' experience had been not only with the better varieties but with other old stand-bys which were suspected of being below standard.

We asked reporters to mark their sheets with the following scale symbols: XXXX for best; XXX, very good; XX, good; X, average. O, poor; OO, failure. In tabulating final summaries, the committee valued the XXXX symbol at 100%; XXX, 75%; XX, 50%; X, 25%; O, O%; OO, minus 20%. Twenty percent was arbitrarily deducted from any 100% rating, and 10% from any lesser rating, in case no other reports on the same tree were received from other reporters.

Qualities upon which ratings were made were hardiness, average yield (rating), yield in pounds per tree or acre, age of oldest trees, age at first crop, percentage filled nuts, husking quality, cracking quality, size of nuts, weight of kernels, quality of kernel.

Naturally, not all reporters were able to evaluate all of these qualities, so many spaces were left blank. For instance, hardiness could be rated for a very young tree, but not yield. In any future survey, we should advocate including a rating on early maturity of nuts, since this is a quality essential in trees planted farthest north.

Black Walnuts. Six names of well-known varieties were printed upon our sheets and, of course, most of the reports are centered around these trees. Twenty-four varieties were voluntarily written in and reported on by correspondents. No doubt some of these varieties will in time replace some of the older ones. Reports on them are now too scattered and too much uncorroborated to enable us to do them justice here. For the present we shall have to content ourselves with those which have sufficient evidence.

Of the printed list, Thomas takes first place with rating of 80.1%, which is a cumulative percentage of all percentages earned on the most desirable black walnut qualities. The method of obtaining this Thomas overall percentage is as follows: Add all the Thomas percentages in the paragraph below. Their average will be found to be 78%. Reports from Canada and the southern area bring this average up to 80.1%, as stated. Stambaugh is second with a rating of 72%. Rohwer rates 76%; Ohio, 57%; Stabler, 49%, and Ten Eycke, 45%. The last three seem to stand in jeopardy of replacement by other varieties.

Breaking these percentages down according to their qualities, the trees in the northern U. S. area were rated as follows, using the valuations noted in the second paragraph at this section entitled *Rating of Varieties*: In hardiness Thomas rates 80; Stambaugh, 70; Rohwer, 75; Ohio, 70; Stabler, 60; Ten Eycke, 65. In yield, Thomas rates 61%; Stambaugh, 39; Ten Eycke, 38; Rohwer, 37; Ohio, 36; Stabler, 13. Yield per tree or per acre was not well enough reported to warrant reliable ratings. In percentage of filled nuts, Thomas rated 82%; Stambaugh, 88; Rohwer, 91; [Pg 35] Ohio, 87; Stabler, 67; Ten Eycke, 68. In husking quality, Thomas, 71%; Stambaugh, 67; Rohwer, 66; Ohio, 7; Stabler, 21; Ten Eycke, 13. In cracking quality, Thomas rated 81%; Stambaugh, 79; Rohwer, 57; Ohio, 57; Stabler, 61; Ten Eycke, 50. In size of nuts, Thomas rated 92%; Stambaugh rated 57%; Rohwer, 58; Ohio, 55; Stabler, 39; Ten Eycke, 42%. In weight of kernels, Thomas rated 79%; Stambaugh, 87; Rohwer, 62; Ohio, 55; Stabler, 50; Ten Eycke, 31. In quality of kernels, Thomas rated 77%; Stambaugh, 58; Rohwer, 60; Ohio, 68; Stabler, 44; Ten Eyck, 47.

It would have been more accurate, of course, to have again divided these returns according to the warmer and cooler regions from which they came, but the report has certain limits which can not be over-stepped. All these varieties are represented by some trees twenty years old or older. Thomas was reported to be the youngest to bear. Its average age at first crop was exactly five years; Stambaugh, 6 years; Rohwer, 5.57 years; Ohio, 5.17; Stabler, 5.7; and Ten Eyck, 5.17 years.

Other varieties, the names of which were written in, are each sponsored by one or more correspondents who were attracted by their outstanding excellence with respect to the following qualities:

Hardiness: Creitz, Homeland, Mintle, Elmer Myers, Tasteright, Pinecrest, Patterson, Horton, Vandersloot, Lamb, Deming Purple, Brown, Tritton, Cole, Sifford and Korn.

Yield: Creitz, Homeland, Mintle, Cozad, Vandersloot, Brown.

Filled Nuts: Homeland, Mintle, Cornell, Niederhauser, Cozad, Vandersloot, Brown, Tritton, Cole,

Sifford.

Husking Quality: Creitz, Homeland, Mintle, Patterson, Todd, Snyder, Cozad, Horton, Vandersloot, Lamb, Deming Purple, Brown, Tritton, Cole, Sifford.

Cracking Quality: Eureka, Snyder, Mintle, Patterson, Brown, Tritton.

Size of Nuts: Homeland, Todd.

Weight of Kernels: Mintle, Todd, Snyder, Cornell, Niederhauser.

Kernel Quality: Creitz, Homeland, Mintle, Korn, Snyder, Cornell.

This, of course, cannot be a complete list, but we give it as reported to us. It will be well to keep an eye on several of them.

Mr. L. K. Hostetter, Lancaster, Pa., sends us the only report which gives a year-by-year record of nut production from black walnut trees. He says:

"I am especially interested in persimmons, service-berries, wild cherry, mulberry and elderberry. Of about 15 varieties of persimmon here I consider Early Golden and Josephine the best. Of 20 or more varieties of mulberries I consider Downing and Paradise the best. Paradise is a large purple mulberry I found near here. It has an exceptionally good flavor.

"Following is a record of my crops of black walnuts, grafted varieties: 1931, 2 bu.; 1932, 3 bu.; 1933, 4 bu.; 1934, 8 bu.; 1935, 12 bu.; 1936, 18 bu.; 1937, 37 bu.; 1938, 54 bu.; 1939, 52 bu.; 1940, 300 bu.; 1941, 20 bu.; 1942, 125 bu.; 1943, 70 bu." [Pg 36]

Mr. Hostetter sells his nuts both as kernels and in the shell. He says that he can now count upon this crop for a substantial contribution to his annual income.

Seedling Chestnuts. None but Chinese and Japanese varieties were reported on. More of the Chinese seedlings have been planted than of the Japs. The latter excel in hardiness, yield, size of nuts, but the Chinese have a better percentage of filled nuts, have better husking quality and much better quality of kernel, according to growers. Of course, being seedlings, neither is entirely dependable in any of these qualities. The best that can be said is that the planter of a Chinese seedling has a better chance than the planter of a Jap seedling if he is after nut quality.

Named Chestnuts. Outside of the report on hardiness, the returns on these varieties are too meagre to enable one to arrive at a corroborated conclusion. In hardiness, the Hobson stands first with a rating of 95%. Zimmerman and Carr are tied at 60%; Yankee rates 50%. Reliable seems to be little planted but also seems to rate well in hardiness. Hobson again stands first in yield, with Carr and Zimmerman second. The ratings are 80% and 60% respectively. Reliable comes next, then Yankee. In early bearing, Hobson stands first, Carr next. All seem to fill well, also have good husking quality. Carr is said to bear the largest nut, with Hobson and Zimmerman next. In quality of kernel, Hobson and Reliable stand out from the others. Hobson, on the returns, has much the best of it in general excellence. However, the last word has by no means been said in connection with hybrid chestnuts. In no field of nut culture is so much hybridizing being done. We expect to see many contenders for preeminence in this most promising branch of the industry.

Pecans. The returns on pecans are also very incomplete after we go beyond the young tree age. Perhaps one reason for this is that young orchards of pecans require a longer time for growth than many other species before they begin to bear. The reports confirm this view. Records of crops from present plantings are none too numerous.

In the reports on hardiness among the pecans, Major stands first with a percentage score of 85; Greenriver 83; Busseron, Indiana and Giles are tied at 80; Posey 75; Butterick 40.

Records of yields are not numerous enough to be conclusive, but Major, Busseron and Butterick lead. This is in the absence of reports on Greenriver, Posey, Niblack, and other important varieties.

Hybrid Pecans. The records for hardiness here, as with other pecans, are marred by lack of good reporting. So far as the record shows, Pleas—Hican var. (hickory x pecan) is the outstanding variety for hardiness in regions north of its origin. It scores 85%; Norton and Rockville, 80% each; Gerardi, 75; Burlington, 60; Bixby, Des Moines and McCallister, 50% each.

Records of yields are not forthcoming. Such records as we have of filled nuts show them to be in general, unsatisfactory. In fact, however, no reliable conclusion can be reached from a study of the pecan reports unless it should be—a sad one—that the questionnaire or the questionees fell down here.

Filberts. The story brightens. Many are working with filberts. In the northwest, the growing of filberts is developing into a commercial enterprise of good proportions. Our records are correspondingly more complete though they show that there is plenty of room for improvement in the development of varieties of desirable quality. [Pg 37]

In hardiness, Winkler leads in the reports with a score of 71.46%, with Jones hybrid a very close second at 71.15%. Bixby is next, then Buchanan. Of the "written-in" varieties, excellent hardiness is reported for Cosford, Hazelbert, Kentish Cob, Early Globe, Burkhardt's Zeller, Comet, Gellatly

No. 1, Chinese Corylus, Brixnut and Longfellow.

Yields rule best with Rush and Jones hybrid. Winkler, Bixby and Buchanan follow closely. Failures in this respect are noted for Barcelona, DuChilly, Italian Red and White Aveline. Cosford has a good report.

Rush and Jones hybrid fill well, as do Cosford, Hazelbert, Buchanan and, usually, Winkler. Husking qualities are quite good for all varieties named except Winkler and, in some places, Rush. Cracking qualities are fairly uniform in all varieties reported.

In size of nuts, Jones hybrid and Winkler have a more uniformly good record, with Hazelbert, DuChilly, White Aveline, Barcelona, Brixnut and Longfellow following closely. In kernel quality, Rush, Winkler, Cosford, DuChilly, Bixby, Buchanan and Longfellow are named as among the best.

Butternuts. The record is very scant. Weschcke, Sherwood and Buckley, according to these reports, are hardy. Weschcke and Craxezy yield well. Sherwood is the most precocious in early bearing with Weschcke close up. Sherwood, Craxezy and Weschcke fill well and the latter two crack well. Buckley leads in size of nuts, with Sherwood close, and all have good kernel quality. We have no reports on Aiken, Deming or Devon.

Persian Walnuts. In most portions of the north, the reports show that Franquette, Mayette, Pomeroy and Rush are not adapted to our climate—too tender. Broadview has the best record for hardiness, followed by one or two of the Crath Carpathian numbers, and with Breslau, Lancaster and Bedford showing up well.

In yields, Broadview and Payne have the best reports, followed by Breslau, Lancaster and Bedford. In size of nuts, Breslau, Lancaster and Franquette are first; Broadview and Payne next. In quality of kernel, Bedford, Franquette, Lancaster and Payne, in that order, are claimed as best, with Mayette, Breslau, Crath, Pomeroy and Broadview following. Since kernel quality is a matter of taste, it seems unlikely that any rating on it will prove satisfactory to everybody.

Hickories. Returns are numerous and well distributed. In hardiness, Stratford leads with a rating of 84%; Glover rates 83; Fairbanks, 79; Romig, 75; Weiker, 71; Kentucky, 65. Others, written in, with best ratings by their growers, are, in the following order; Beaver, Hales, Barnes, Clark, Caldwell, Taylor, Weschcke, Beemen, Bridgewater. Schinnerling, Hagen and Abscota are close up.

Best yields are reporting for Stratford and Fairbanks. Close up are Barnes, Glover and Schinnerling.

Weschcke, Glover, Weiker, Beeman and Bridgewater are most precocious in early bearing. Best filled nuts are reported, in order of precedence, for Stratford, Fairbanks, Walters, Beaver, Hagen, Weschcke, Beeman and Bridgewater. [Pg 38]

Husking quality: Reports were inadequate. Cracking quality, in order or rank, Glover, Stratford, Hagen, Beeman, Weschcke, Schinnerling, Kirtland, Weiker, Bridgewater.

Size of nuts: In order of rating, Weiker, Bridgewatar, Fairbanks, Weschcke, Stratford, Beeman, Schinnerling, Hagen. In weight of kernel: first, Abscota, then Barnes, Glover, Fairbanks, Kentucky, Kirtland.

Quality of kernel: In order of preference, Kirtland, Glover, Weschcke, Hagen, Stratford, Bridgewater, Weiker, Abscota, Schinnerling, Kentucky, Beeman, Stratford, Beaver.

Too much dependence should not be placed upon the order of precedence in the above lists after the first two or three, since, in many instances, there is not sufficient corroboration from separate sources to warrant more than a tentative position, especially for some of the varieties listed at the ends of the classes.

Heartnuts. The hardiest, in the order reported, are Walters, Fodermaier, Gellatly, Faust, Bates. Lancaster, does not bear well and is not hardy in the northern areas. Best yields reported are from Walters and Bates. Other reports are inadequate or absent. Most precocious, Bates and Gellatly.

Best filled heartnuts, with best husking and cracking qualities as well as best quality of kernels; returns are about equally divided between Gellatly, Walters and Bates, with Walters and Gellatly somewhat larger in size.

It is to be regretted that reports are incomplete or absent in connection with many varieties of nuts. We feel, however, that, in the main, the above ratings, especially when arrived at from cumulative evidence, reflect with fair accuracy, the present status of nut tree conditions in northern United States.

CANADA. In all its chief characteristics, the Canadian nut growing experience follows the pattern of northern United States. The reports received from Canada numbered about one-tenth those received from the northern states—upon the whole, a satisfactory cross section.

In summarizing these reports it will be necessary only to call attention to such practices and experiences in Canada as are at variance with those already reported from the northern states. For example, in response to the question, "What species are you planting experimentally or commercially?" we find, surprisingly, that Persian walnuts displace black walnuts from first

place, at least in these reports, and that filberts and heartnuts come next. Then come black walnuts, butternuts, hickories, hazels, Chinese chestnuts, persimmons, Jap walnuts, almonds and a scattering of other species. Leading native wild trees are, first hazels, then black walnuts, hickories and butternuts.

Winter climate is widely varied, being temperate along Puget Sound and close to the southern tier of the Great Lakes, but subject to great extremes in the prairie provinces. Lower winter temperatures in these provinces average from zero to 45° below, while the lowest recorded is reported to have been 62° below. It is evident that Canadians have widely variable problems, in spite of which three Canadians, exactly the number reported from the northern states, tell us that the sale of nuts is an important item in their annual incomes. It looks as though, in comparison, [Pg 39] northern U. S. growers could do better. With an average frost-free season of less than five months (from May 7 to Oct. 2), Canadians do this. The normal dates of latest spring frosts average from April 20 to May 24, and of earliest fall frosts, from Sept. 10 to Oct. 12. Extremes at either end often shorten the season somewhat.

Soil conditions are generally good, with plenty of loam and sandy-loam, half lime, half acid; but drought is serious in places, necessitating irrigation. One wonders whether, if more of us were pushed to it, we might not find irrigation so profitable that we would never again be without it. Cultural and soil corrective practices are, in general, similar to those previously reported. Less trouble is experienced from rodents—mice, rabbits, squirrels—but more from deer. Wrapping the trunks of young trees is more generally practiced than with us of more southern latitudes, and disk cultivation is more generally favored.

In reply to the question, "What was your one greatest source of success?", the answers include, pollination by hand, the use of good trees, disking, planting hardy seed, and budding Persians on black walnut stocks. Failures were due mostly to the inevitable causes, cold, drought, weak growth. Alkaline soil is mentioned in one report as a chief difficulty. Bud worms, June beetle, leaf hoppers and walnut caterpillars are also enemies, but Canada seems free from some of the other pests that have invaded the United States.

The most profitable species reported by Canadians are filberts, black walnuts, with "soft-shelled" walnuts mentioned by Mr. Gellatly, of West Bank, B. C. From Ontario, Mr. A. S. Wagner, of Delhi, writes, "We are collecting (nuts) now to make tests of various types of black walnuts this winter. There are one or two plantations of 1000 trees which will soon be bearing, and the future looks interesting."

Black Walnuts. Four varieties appear in Canadian reports which have not been mentioned previously: Impit, Troup, Gifford and Neilson. Gifford and Neilson are said by Mr. Corsan, of Ontario, to be heavy croppers in Canada, Neilson "Very heavy." Impit is a splendid, upright-growing tree which should do well for timber production as well as for nuts. All trees printed in the questionnaire, Ohio, Rohwer, Stabler, Stambaugh, Ten Eyck and Thomas, are given "good" ratings for hardiness except Thomas which is fair. Gibson bears large nuts of good cracking quality.

Neither Japanese chestnuts nor pecans are reported on from Canada. Chinese chestnuts and hybrid chestnuts are reported as planted and hardy, thus far, but have yet to bear.

Filberts. Holden, Craig, Firstola, Comet and Brag show up as hardy and bear good crops of nuts of good quality. Other promising varieties are Petoka (new variety, small, thin shell,) Daviana, Churchvelt—significant name! Barcelona, DuChilly, Italian Red, Rush, White Aveline and Bixby are reported to be not hardy. Winkler is hardy. Mr. J. U. Gellatly, of West Bank, is working with a number of tree hazels, Chinese, Indian, Turkish and a cork-barked variety. All are rated by him as hardy in his area. They are young trees, not yet reported in bearing.

Butternuts. In addition to previously named varieties, Edge is added and is given a foremost rating in all departments, The rating on others is not conclusive. [Pg 40]

Persian Walnuts. No new light is thrown on the performance of varieties already listed. Broadview is one of the hardiest, a good producer of fair nuts. Watt produces a large nut of finest flavor. Geloka is a good nut, and Corsan is hardy but bears a smaller nut of lesser kernel quality.

Hickories do not seem to interest Canadians. Stratford, first, and Weiker, second, are leaders. Stratford bears heavily but its quality in Canada is not up to par.

Heartnuts are a Canadian specialty. Gellatly, of all varieties in the printed list, is reported as best in all departments. Of the twelve varieties written in by reporters as worthy of special mention, it is difficult to make a just appraisal. Okanda, O. K., and Crofter are reported perfectly hardy through minus 20° of cold. Others, hardy and good in all departments, are, Mackenzie, Canoka, Walters, Rover, Calendar and Smyth. Stranger seems not quite so hardy, but Mr. Corsan calls it "the best heartnut grown", splendid in flavor, thin shelled, a little small but with a better than usual percentage of kernel.

If heartnuts have a future, which seems almost inevitable, it looks as though Canada, if it continues as it has started, will be one of the main sources of supply for varieties. The Canadians are doing a creative job.

THE SOUTHERN AREA. There are no nurserymen who report from the southern area. Practically all are interested in the production of nuts, but they are more alive than their northern neighbors

to the value of timber, and more of them count upon it for a part of their profit from the planting of nut trees.

Interest is about equally divided between methods of propagation, grafting, budding, top-working, planting seed of better varieties, artificial cross-pollination, and searching their neighborhoods for wild trees that show promise of superiority.

The species being planted experimentally or commercially are, in order of precedence, black walnut, persimmon, pecan, Persian walnut, Chinese chestnut, hickories, filberts, hazels, heartnuts, Jap chestnuts, almonds, mulberry, native chestnuts, Jap walnuts, pawpaws and beech. Species of wild trees found locally follow closely the pattern of planting mentioned above, which is as it should be.

Climatic conditions are, in-general, favorable. Peaches are in most places reliably hardy. Lowest temperatures normally expected range from 22° above to 20° below zero; and the highest normal summer temperatures range from 90° to 115°. Dates of normal late spring frosts have a very wide spread, being all the way from March 1 to May 12. Normal early frost expectancy is from Oct. 10 to Nov. 15. All long-season crops mature well. The chief climatic enemies are drought and hot, dry winds.

As to growth conditions, clay soils predominate, but with plenty of loamy bottom land for nut planting. Acid soils predominate somewhat over lime soils, growing more unfavorably alkaline in the south-west.

Cultural practices are generally the same as in the north, but with a greater proportionate use of mowing and mulching, no doubt induced by the need for protection against greater heat, as well as for conservative of moisture. A greater proportionate failure of young trees to start first year's growth is also probably due to heat injury in the spring and summer following planting. Tree wrapping seems to be the corrective chiefly indicated. [Pg 41]

The difficulties principally mentioned with matured trees are again mostly climatic; drought, sun-scald, early advent of spring followed by late frosts, delayed dormancy in the fall, poor filling in dry seasons, and biennial fruiting.

Insect enemies which damage both trees and nuts are practically the same as in the north only there are more of them. Rodent damage and squirrel theft seem less troublesome there owing, perhaps, to protective measures and to the well developed hunting instinct among southern farm boys.

A larger proportion of growers than are reported in the north sell nuts commercially, with pecans, walnuts, and chestnuts listed as the most profitable species. The practice is still limited as an important source of income, but a much greater proportion of planters look confidently forward toward profitable operations in the future.

Black Walnuts. It is evident that in some of the warmer parts of the United States, California, for instance, the word "hardiness" takes on a certain connotation that we should understand better in the north. Its meaning there is "resistance to delayed dormancy", as one California report states it. As a matter of fact, it might be advisable for us all everywhere to think of hardiness in these terms. Delayed dormancy is hazardous in any tree, whether natural to it or induced artificially by late summer or early fall cultivation and fertilizing, and whether the tree is located in the north or in the south. When a tree goes into the winter with sappy wood, it is injured, and we say it is not hardy.

That this is true in the south as well as in the north is well attested by the returns on black walnut trees of the south. There, the tree gives us a picture surprisingly similar to that of the north. In the south, if the tree's dormancy is delayed, it does not get its proper rest between crops and it dies or is stunted, in one way or another, for some time thereafter. In the north, if the following winter is severe, it simply dies. Perhaps the winter killed it. Or perhaps we killed it with unseasonable pampering.

Reports show that in the south, Rohwer, Stambaugh, and Ten Eyck lead in hardiness in the printed list of black walnuts, with a score of 80% each. Ohio, Stabler and Thomas each average 75%. Of the written-in names, Sifford and Beck are reported hardy, followed by Creitz. Elmer Myers has only one report, which is rather unfavorable in this respect.

In yield, Creitz has the best rating, then Thomas, Stambaugh, Sifford, Stabler and Beck, in that order.

Thomas is the most precocious in early bearing. One report has it that Thomas kills itself, sometimes, by overdoing it in this respect. Stabler, Sifford, Creitz and Beck come next. All of these varieties are reported as having well filled nuts, with Stabler in the lead, which may come as a surprise to many. Other qualities, such as husking and cracking, size, and quality of kernel, are reported to be the same as in the north except that Stabler leads in cracking quality, with Thomas a rather poor second, owing, perhaps, to a shell too well filled for cracking without shattering the kernels. [Pg 42]

Seedling Chestnuts. More Chinese chestnuts are planted than Japs. They are hardier, yield better crops, are more precocious, and have a far better quality of kernel. The Japs excel only in size.

Named Chestnuts. Hobson is hardy and an extremely precocious bearer of finest quality. Carr

follows. Reports on these varieties, however, are not numerous enough to enable one to reach a satisfactory appraisal. Two Marron strains are mentioned as producers of very large nuts; otherwise this variety's record is not impressive.

Pecans. Posey and Greenriver are given top mention for hardiness, with Busseron, Major, and Niblack next. In the more southern areas, of course, the more tender varieties are favored, such as Mahan, Success, Burchett, Schley and Stuart. Mahan seems to be the one most favored for general excellence in yield, flavor, and cracking qualities. It must be said, however, that, in flavor, these larger pecans are inferior to the best pecans of the indigenous northern varieties which are now being propagated. But because of their size, beauty, and productiveness, they will probably maintain their present leadership commercially.

Hybrid Pecans, Filberts, Butternuts. Reports from the south are inadequate for appraisal. The inference one must draw is that they are not being planted extensively there.

Persian Walnuts. The object of the inquiry, of course, was primarily to get information about varieties which might be capable of expanding their range toward the north. In this, so far as the southern reports are concerned, we have not been successful. Placentia and Eureka are mentioned in one report but their records, as reported, are not particularly good. Corroborative evidence is needed. Upon the whole, the south, strangely enough, seems not to be the place to look for Persian walnuts for the north. In California, the varieties of Persians, Juglans regia L., are well rooted to the ground. They object to more northern locations. This may not be entirely true of another species, J. hindsii, which in the past has shown a tendency to cross with other members of the juglans tribe. Crossed with the native black walnut, the hybrid known as "Royal" was developed, a robust grower which bears little. Crossed with the Persian, "Paradox" was produced. We are indebted to Mr. Harry S. Welby, of Taft, Calif., for some interesting J. hindsii varieties of good size and rather large, well filled kernel capacity. Upon their exterior, the nuts resemble the Persians, and the kernel has the Persian flavor. Inside the shell, the structure is that of the American black, with a substantial woody cross-brace, and the shell itself calls for a hammer for cracking. Neither Paradox nor Royal have proved of value except for stocks upon which the growers graft or bud their commercial cions. Much experimenting has been done in hybridizing J. hindsii, thus far without producing more than comparatively sterile "mules", but, the tendency to cross having been demonstrated, this work should be continued. Mr. Welby's samples have been sent to Mr. C. A. Reed, at the Beltsville Experiment Station, for evaluation. "Perhaps someone will know," says Mr. Welby, "the limit of cold J. hindsii will stand."

Mr. Welby's comments accompanying his report are too interesting to omit. He says: "On the grounds of an oilfield camp, I have carried on collaboration with the U. S. D. A. Bureau of Plant Introduction for twenty years. The importation of graftwood of eastern soft shell black walnuts [Pg 43] has been "on my own." Of black walnuts we have bearing trees among ornamental plantings. There has been a marked change of attitude from the early days when I was more or less looked upon as a freak for working with them. The nuts are valued today. The original objective has been attained.

"In the meantime, I have purchased, 450 miles north of here, a twenty; have fenced and planted it to a brand of permanent pasture grasses known as "Evergreen", furnished by a grass specialist, Dale Butler, of Fresno. Prior to the grass, black walnuts, grafted and ungrafted had gone in. A strip bordering the highway was reserved for trees, we hope pistachio. There are now thirty of that variety, bearing, in an interior block.

"We have for years purchased black walnut meats in the Chico area. That would be a paradise for a black walnut man. And years ago I visited Teharna, a deserted village from the storybook, a former pony express station—wonderful black walnuts! Upon placing my camera upon a stump of a tree that grew in the street-parking, which had been logged, I braced the camera with a chip of this four-foot stump and discovered that the tree had been a curly walnut. The trees there are not *J. hindsii*, but Missouri blacks planted by forty-niners.

"Concerning pistachio: I doubt, considering the percentage of members who would be interested, whether I should bring this up, but there is need for just such an organization as the N. N. G. A. behind this tree. It does not lend itself to common nursery practice. It should be raised from seed, potted or in cans, reared without babying for several years, a horticulturist brought in, and your pistachio vera male and female blossoms worked to *P. atlantica* or *chinensis*. Lots of work but it is worth the trouble. It is deciduous with a hickory-like foliage; clusters of nuts clothed in pink-cheeked hulls. Bailey reports best nuts come from Sicily. Perhaps knowledge of them will be more widely disseminated when the boys return."

Hickories. This species seems not to be of great interest to the south. The old varieties are not mentioned in the reports. Nugget is mentioned by Mr. W. D. Dockery, of Steele, Ala., as one of the best. It grows well, yields well, its kernels have a good size and their quality is unusually good.

Of *heartnuts*, only one is mentioned, the Lancaster, which leaves much to be desired in performance in the south.

Suggestions and Requests. In response to the questions, "Is there any service that N. N. G. A. could render you not now being met?" and "Have you any suggestions for future work?", a number of responses were received which are worth noting.

Dr. O. D. Diller, State Exper. Sta., Wooster, O., "We are thinking in terms of another state wide

nut contest in the fall of 1944." It will be remembered that the last Ohio contest brought the Brown and Tritton trees to light. Both are making friends by good production of good nuts. This is a suggestion for promotion in other states.

Sylvester Shessler, Genoa, O.: "Planted 10 nuts from Tritton parent tree in 1935. One seedling bore a larger nut than the parent tree. Several others bore very small nuts but all well filled." [Pg 44]

J. Russell Smith, Swarthmore, Pa., "Urge the members to run local contests for good nuts. It may bring members if not nuts, and you may find some good new neighbors you didn't know about." (One easily worked plan is to see the secretary of your county fair board, offer to pay half or all prize money for best nuts from a single tree in your own and surrounding counties. See that judging is done by someone who knows how or do it yourself.)

Alfred J. Frueh, W. Cornwall, Conn., "Have had quite a lot of winter injury on the south-west side of black walnut trunks grafted near the ground. Note that seedling walnuts have a ridged, corky bark on the trunk already the second year, whereas a grafted trunk maintains its smooth bark for 6 to 8 years. Am now grafting on seedling stock 5 to 6 feet above the ground and much of the winter injury is thus eliminated."

A. B. Anthony, Sterling, Ill., "If they can be had disease free, promote the planting of a few of the most choice chestnuts in widely scattered regions where no one grows such trees. Possibly our children can get back to chestnut growing."

Seward Berhow, Huxley, Ia., "In a separate (pamphlet) or included in an early report, give a complete list of all named varieties, especially black walnuts, name of nut, name and address of originator, location of original tree, north latitude, year discovered, nuts per pound, score for cracking, kernel, prizes won. This would be very valuable for quick reference." The T. V. A. has issued a pamphlet giving much of this information. Also, we believe, Mr. C. A. Reed is at work on a book which will be worth waiting for.

J. U. Gellatly, Westbank, B. C.: "Could not the Association supply samples of recommended nuts or perhaps give lists of those who would sell small (3 or 4) nut samples. I have sent out such samples of 2 or 3 each of varieties I have on hand up to 9 or 12 kinds, at 50 cents per package, post paid. This is not enough to pay for the time consumed but is a good advertising practice."

Harry S. Welby, Taft, Calif.: "The ground squirrel is a pest here. Black walnut as bait will attract them in winter when fruits are scarce. At that time I have had some success with a box trap treadled by an electric contrivance instead of figure 4. Can anyone tell me any experience with scent baits which I believe Biological Survey trappers sometimes use? It may be a delicate question, but I should be interested in knowing more if the information is available."

R. T. Dunstan, Greensboro College, Greensboro, N. C.: "I would be happy if this survey brings to light information on the behavior of the best and more recently discovered hickories. (If not,) I believe an article on performance of such varieties as Whitney, Grainger, Bergor, Davis, Wilcox, Schinnerling, etc., perhaps similar to that by Reed in 1938 Proceedings, would be highly valuable and welcome. Perhaps a report on T. V. A.'s nut tree work in recent years would also be worth while."

C. H. Parks, Asheville, N. C.: "Would be interested in a chestnut that will grow in southern Appalachian regions." (See Mr. H. F. Stoke's report above. Chairman.) [Pg 45]

Harold G. Williams, Ramsey, N. J.: "I believe that most useful trees, both fruit and nut, that are now commercially important, were developed from selected seedlings grown in the area in which they are being used. I have a suggestion. How about a concerted breeding program for nut trees with full membership participation? The best parent trees should be selected from present plantings of grafted, named varieties. Ship these seeds, or one or two year old seedlings from them, to each member on a subscription basis. Let each member make a trial planting of as many trees as he can. When these trees come into bearing there will be a better chance of finding superior strains that are adapted to their environment. Hybridizing by cross pollination requires more time and skill than many of our members possess. There are, however, members who now own orchards containing some of the best varieties, such, for instance (among the black walnuts) as Thomas, Stabler, Stambaugh, and perhaps Elmer Myers, planted in such close proximity as to allow for cross pollination. Seed could be purchased from them and resold to members for their planting; costs to be kept fairly low, with annual reports required as to care, cultivation, fertilizing and growth.

"An alternate plan would be to turn over such seed to Hershey, Smith, and other member nurserymen to plant, grow the young seedlings under best conditions, and furnish to member cooperators whose pledged subscriptions are to take care of the cost. This would give the cooperating nurseries a piece of business that could be depended upon (of a kind that would take comparatively little time as compared with that required for grafted trees), in return for their support. These trees could be planted fairly close, since most of them would prove to be useless as nut producers. If an outstanding variety is found, everything around it should be chopped down to give it room for development. I personally would raise and report upon some two dozen trees of this kind, and if a large group joined in the work, hundreds of tree could be tested."

Comment: That the chairman of this committee thinks the above suggestion a good one, and the project a good gamble, is evidenced by the fact that he has about a thousand of such trees now growing. Seed was bought from Mr. Harry Weber's, Rockport, Ind., and Mr. C. F. Hostetter's

Bird-in-Hand, Pa., plantations in the fall of 1937 and planted at once. Most of the seed was from Thomas trees which had been flanked in the plantations with Stablers and other named trees, and from Stablers similarly flanked. The trees have now had six years' growth. He hopes for first nuts in 1944 *from seedlings planted in deep loam only*. Growth elsewhere has been negligible. If no outstanding nut producers are found, there will at least be some splendid timber, already assured.

It should be stated at once, however, that those whose object is the assured production of nuts, rather than the discovery or development of a new variety, should never plant anything but the best grafted trees bought from reliable nurserymen. Your decision should be governed by your interest. If you wish to be sure of nuts of a certain quality for home use, buy grafted trees of that quality. If, on the other hand, you have the urge to probe into the unknown and possibly create a new type, the above project will appeal to you, especially if you should lack training and time for more painstaking work. The following account is an example of the latter kind. [Pg 46]

Arthur H. Graves, Curator, Brooklyn Botanic Garden, says: "We are breeding chestnuts for the purpose of obtaining a disease-resistant timber tree stock similar to the old chestnut tree which has now nearly disappeared on account of the blight. We started breeding chestnuts here at the Botanic Garden in 1930, and now after thirteen years of work, have on our plantation at Hamden, Conn., Litchfield, Conn., where the White Memorial Foundation is cooperating with us, and Redding Ridge, Conn., where Mr. Archer M. Huntington and the Connecticut Agr. Exp't Station are cooperating, about 1000 hybrids, a large number of combinations of Chinese, Japanese and American chestnuts, many of them now in the third generation from the beginning of the breeding period in 1930.

"We are carrying out our breeding program in the following way:

"We have selected the Chinese and Japanese species to cross with the American because the Asiatic species are disease-resistant, and we hope to incorporate this quality of disease-resistance with the tall timber growth of the American. We find that the Chinese are in general more disease-resistant than the Japanese. Other stocks which have been incorporated in our hybrids are the European *C. sativa*, the southern chinquapins *C. pumilia*, *C. ozarkensis*, *C. floridana*, and Dr. Van Fleet's old hybrid, presumably of *C. crenata* and *C. pumila*, which goes under the name of S8, and *C. seguinii*. After the hybrids become old enough, we inoculate the tallest of them with the blight fungus in order to get an index of their disease resistance. The most disease-resistant are bred together and of their offspring the tallest are selected, inoculated, and the most disease-resistant are bred together again. For example, this year we had 350 hybrids from last year's breeding experiments set out in a special nursery at Hamden and carefully tended during the season. Of these 350 we have selected 50 which are the tallest and straightest, that is, 20 inches and over. The others were sent to Washington, D. C., where the Division of Forest Pathology, Department of Agriculture, is working along a similar line, but with more attention to the nut phase of the problem.

"Our ultimate aim, of course, is to establish a race of chestnut trees which shall replace our now practically extinct American chestnut. The loss in money value from this timber tree has amounted to millions of dollars in comparison with which the value of its nut crops is very small indeed.

"However, we are interested in the nut problem, and whenever any particularly fine nuts appear we note the fact. We have now a strain of Chinese chestnut which has not yet come into bearing which we believe will have nuts as sweet as the old American chestnut, but much larger."

With this forward-looking note we close our report. We have a foundation upon which to build that is substantial and tried. The pioneering work of a patient, far-sighted, and distinguished group of workers has shown us much of what to do and what not to do. It is now up to us, the farmers, the planters, to multiply their work and continue it. [Pg 47]

Side-lights on the 1943-4 Survey

Very many interesting bits of information have been included in the survey reports; so many that the committee has regretfully omitted some that hardly seemed properly to belong with the material of a survey, which after all must have some limits. One such item is from J. C. McDaniel, of Haines City, Fla., and has a special interest for members of this Association. He says:

"Perhaps you will be interested in data on one of America's largest Chinese chestnut trees, even if it does grow in Florida, at Monticello. It stands adjacent to a lot in which the late J. F. Jones had a nursery for a short time in the early years of this century, and apparently was planted at that time, around forty years ago. The trunk is now more than 25 inches in diameter below where it divides 6 feet above the ground. From this level, the tree branches profusely and has a symmetrical, rounded crown. It is healthy, not having a sign of the bark disease, although a native chinkapin 100 feet away is badly infested. It has abundant bloom and sets heavy crops of burrs but, lacking another variety for pollination, the number of nuts matured is small. Nuts are about average size for the species, of typical sweet flavor, and separate readily from the pellicle. Many of them become infested, before ripening, with a fungus which rots the kernel, apparently

the same one which infests chestnuts and chinkapins at Savannah and Albany, Georgia. Mr. Paul Goldberg, of Monticello, the present owner, states that the tree has been bearing annually during the twenty years his family has owned it."

This nut-rot among the oriental chestnuts is one of the diseases that have become troublesome elsewhere. It is being studied and efforts are being made to combat it. Thus far, so far as we know, no effective cure has been found. A report upon present progress would be worth while.

Oscar E. Swan, Jr., Tulsa, Okla., reports an enviable situation. He says: "My nut trees are growing on a farm where more than 30 years of cultivation have failed to kill the native pecan sprouts. They come up year after year from the top roots. Since acquiring the place in 1936, I have allowed the pecan sprouts and the few native walnuts to grow unchecked except where necessary to cut them out to avoid crowding. The growth of these sprouts is quite vigorous, and they are ideal for top-working. I have top-worked a few trees every spring and now have about 300 grafted trees all the way from 6 to 30 feet tall. Many are too close together for full grown trees and I plan to thin them. My problems, so far, are the mechanical ones of top-working. I have settled upon a modification of the Biederman bark graft, which gives very good results. After the grafts are well established, the trees get very little attention except for cutting out the crowding trees. They are literally growing 'wild', yet the growth has been better than transplanted trees would have made with the best of care, because the root systems are well established in a situation which suits them.

"This system of neglect probably explains why I have failed with some species and varieties such as the butternut and some of the hickories. Occasionally I am pleasantly surprised, as in the case of some seedling Carpathian walnuts which, grafted upon some established black walnut sprouts, came through the severe 1943 drouth in fine shape without benefit of mulch, cultivation, [Pg 48] fertilizer, or watering. The same applies to the Helmick hybrid. (A two year old tree, a hybrid walnut, grafted and growing well on black walnut stock, and which Mr. Swan says will bloom next year.) I have pampered my Chinese chestnut trees with cultivation, mulch and manure, as they are located in poorer, drier soil. They were badly hit by the drouth. Some died in spite of the attention.

"As to varieties, I am far enough south to grow all the standard southern pecan varieties, although several do not have a long enough season to mature their nuts. I am trying the northern varieties and, so far, am well pleased with their growth as compared with the southern kinds. It will be a few years before I can report on the size and quality of their nuts."

J. C. McDaniel again: "Source and variety of seed in Chinese chestnuts have a great influence on the performance of seedlings. Numerous seedlings from the original Hobson tree began fruiting in their second season of growth, and half of the ones I have are fruiting during their fourth season. On the other hand, I have a tree from imported seed which grew nine seasons before setting and ripening its first burr. The above data refer to my planting near Hartselle, Morgan County, Ala., and that vicinity. I have several black walnut trees under observation, native trees, on which data are not yet complete enough for evaluation."

If any man deserves a bright N. N. G. A. medal, it is A. L. Young, of Brooks, Alberta. Lowest temperature expected in winter, 45° below; lowest known, 62° below. Highest expected in summer, 101°. Frequent drouths? Yes. Hot, dry winds? Yes. Native nuts found plentifully? None. Sparingly? None. Yet Mr. Young plants nut trees. It is men like that who have made Canada what it is. It takes more than mere weather to stop them. The never-say-die spirit of pioneers speaks throughout his report:

"Black walnuts, butternuts, some oaks, hazels and American chestnuts (Ohio buckeyes) all came through last winter well. However, late frosts reduced the nut crop. Of these species, filberts are not getting anywhere. Winkler, I believe, will eventually make a go of it. Heartnuts got a rough deal last winter, and European buckeye chestnuts were hurt a little by late spring frosts. Some Manchurian walnuts also got a setback with spring frosts, and some did not. Carpathian walnuts killed back quite a lot, so did most of my hybrid walnuts. Hybrid hazels seem perfectly hardy. Pecans, beechnuts and sweet chestnuts almost passed out of the picture last winter. Giant hickory from Ontario seems hardy but particular about the kind of soil and conditions. When irrigated, too much water will kill them. And this is true also of walnut and butternut seedlings. I have no acreage of nut trees. I grow seedlings and plant them wherever I find a place protected from the stock and within reach of moisture from the irrigation ditch, as this is a desert, cactus country.

"I always have a stock of seedling trees on hand, and whenever visitors show any interest, I give or send them fruit or nut trees and a few perennial flowers. So there are sure to be a few nut trees, some day, growing successfully throughout Alberta.

"There is more benefit from this northern seed, especially as I am using a commercial pollen with the hope of getting a hardy white walnut with possibly a coarse bark like the black to ward off sun-scald in this climate. They are on their way. I don't know when we'll be eating these [Pg 49] imaginary nuts. However, it is not so long ago that fruit growing on the cattle range was a dream. I grew the first pears in Alberta, so far as we know. Now we are insulted if there is not a crop of fruit every year. I have many seedlings of standard apples, unnamed, that are really choice fruit, and, of course, a few named varieties that are doing fairly well. Minnesota has done great work in apple and plum breeding for the north. We are enjoying some of them right here.

"I am sorry that I have no data on husking, cracking, etc. Really even the hardiest, best trees bear nuts that, while of fair size, do not have fleshy kernels, and some have three sections instead of two. Butternuts are very sweet with fair size kernels. I was surprised, after a long hard winter, to find the Ginkgo trees still alive and gaining growth. Credit some or all this result to J. U. Gellatly and Paul Crath for supplying me with seed, seedlings, and pollen to carry on with. I am greatly obliged to them and also to George Corsan of Echo Valley, Islington, who has a wealth of nut interest.

"We have had a mighty dry year here, so, between irrigating and tending the largest herd of Ayrshire cattle in the prairie provinces, I have been busy. The town of Brooks is probably the only town in Canada on straight Ayrshire milk; and the change in Brooks from a box-car on a siding years ago to the Brooks of today, with its hundreds of healthy children now on the streets, is the marvel of a man's lifetime."

George H. Corsan, Echo Valley, Islington, Ont.: "Last winter, 1942-43, was by far the coldest ever recorded. No damage to filberts. A few inches of twigs were hurt on certain English walnuts. The Stranger heartnut, a tender variety, passed through unscathed. Persimmons and pawpaws passed without a bud killed. These are perfectly hardy varieties. Jujubes passed O. K., but that may be due to the very deep snows."

Dr. Oliver D. Diller, Associate Forester, Ohio Experiment Sta., Wooster, Ohio: "You will be glad to know that the experiment station has set aside some land for improved varieties of nut trees. If you find some promising walnuts which might be tested in this part of the state, we should be glad to have you keep us in mind." This is indeed welcome news and will be appreciated by all growers in this area.

J. G. Duis, Shattuc, Ill.: "A chicken yard is one of the best places to grow nut trees."

J. U. Gellatly: "I do not believe in selling nuts for seed purposes except on a very large scale."

J. C. McDaniel: "A neighbor lost some 5 year old Chinese chestnut trees following a summer drouth on silty loam soil, rather shallow to hard-pan. It is my observation that deeper, sandier soils (not too extremely sandy) are best for chestnuts in the coastal plain and other regions subject to summer drouths. In the mountains where summer rainfall is more uniform, they thrive also in clay soils."

G. H. Corsan: "Best success in grafting (hickories) has been in juicy, wet springs. Heartnuts must not be budded until late August (in Islington, Ontario). Heartnuts must not be pruned." [Pg 50]

A. L. Young, Alberta: "There is a demand for young walnuts for pickling." (Does anyone know the details—when to pick, how to pickle?) (Note by Ed. Several recipes and methods in Am. Nut Journal now out of print but indexed by Ed. Copies of this index in his hands and those of Mr. C. A. Reed at Washington. Also recipes in 33rd Ann. Report p. 95).

Sterling A. Smith, Vermillon, O.: "With me, summer budding is the most successful means of propagating black walnuts."

J. Russell Smith: "Chinese chestnuts will blight some if under-nourished." Which includes the wrong kinds of soil, if uncorrected.

"Does anyone know for sure how to get pawpaw seed to germinate?" Several have asked this question. The chairman has had the same trouble, so can not answer. (Note by Ed. See "Nut Puttering in an Offyear" in this report.)

So far as the correspondence shows, no state or federal department buys seed on a large scale (with the exception, now, of chestnut seed) from trees of the better named varieties with which to grow seedlings for distribution by state nurseries for forest planting. All nut seed seems to be gathered haphazardly.

W. G. Tatum, Lebanon, Ky.: "A nut tree with plenty of root, top cut back one third, promptly set, roots protected, stem wrapped, 4 inches, mulch applied, set either spring or fall, grows for me 99% of the time. Failures are not worth mentioning if the above conditions are met."

Carl Weschcke, St. Paul, has a dozen or so extra hardy Persian walnuts by selection from some 12,000 seedlings. Also is introducing the hardy "Hazelbert," result of crosses between wild varieties and filberts.

"Dip wire screen guards in red lead and they will be good for twenty years."

Thomas and Stambaugh, among the black walnuts, are, with justice, entrenched leaders, but it will be well to watch Patterson, Mintle, Elmer Myers, Eureka, Creitz, Todd, and other promising new ones less well known. Thomas is more prolific in the south (generally) than in the north, which indicates that its bloom may possibly be out nearly enough to suffer in the north from late frosts.

Among chestnuts, the weight of evidence favors Hobson, Carr and Reliable, though J. Russell Smith says he has something he likes better than the first two.

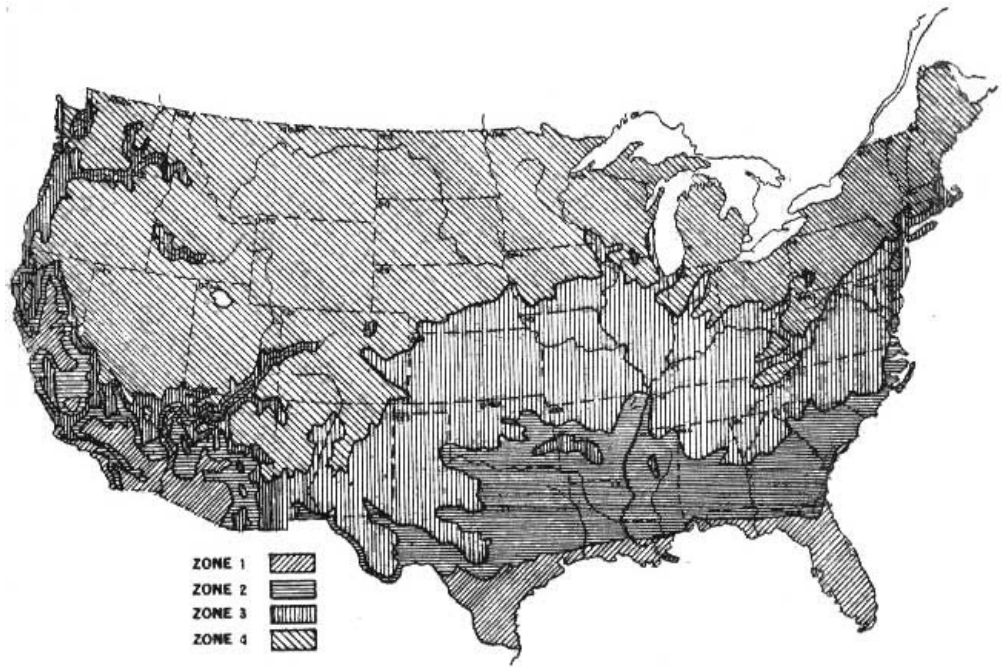
Among pecans, Major, Greenriver, Pleas; among filberts and hazels, Winkler, Jones hybrid, Cosford, Gellatly, Brixnut; among Persian walnuts, Broadview, one or two Crath varieties, Payne, Breslau; among hickories, Stratford, Fairbanks, Barnes, Glover, Weschcke. These seem, so far as

the returns show, to have outstanding points of superiority. In any such survey, injustice is bound to be done to some not fully reported.

Outside of filberts in the northwest, no northern grown nut can yet be said to have reached the status of a profitable commercial crop. (Exception: The narrow pecan belt along the southern terminus of the Ohio river valley; mostly wild trees.) Dr. A. S. Colby, University of Illinois says, "The report from the State Statistician at Springfield indicated a crop of 575,000 pounds of pecans for Illinois in 1943. I don't know just where they came from." Short crops were reported in Calhoun and Gallatin, leading nut producing counties. No reports have been received as to the size of pecan crops in the Kentucky and southern Indiana portions of the same belt. [Pg 51]

The search for better varieties must continue, but it is also altogether likely that with an orchardist's attention, with cultivation, mulching, fertilizing, spraying one to three times yearly with Bordeaux and lead sprays, we might approach the commercial goal more closely with what we have today. Is anyone treating a bearing nut orchard as well as he would treat an apple orchard? That's the test.

S. H. Graham of Ithaca, N. Y. says: "The Ohio is commonly regarded as hard to hull. With a chained tire husker it hulls as well as any." He rates it for hardiness and a percentage of 90 to 100 for filled nuts, while Thomas yields only 0 to 90%.



Seasonal Zones Compiled from the U.S. Department of Agriculture Records, Based on the Average Date of the Last Killing Frost in Spring

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Juglone—The Active Agent in Walnut Toxicity

By* George A. Gries, *Connecticut Agricultural Experiment Station

The problem of walnut toxicity dates back at least to the writings of Pliny. In his "Natural History," this Roman philosopher stated that "the shadow of walnut trees is poison to all plants within its compass" and that it kills whatever it touches.

The first rebuttal to the existence of such a toxicity was forwarded by Evelyn in the 17th century. This author discussed the high regard in which walnuts were held in Burgundy as field trees. The roots of these trees were below the plow sole and thus did not affect either cultivation nor the growth, of grasses and cereals beneath them.

The pros and cons of the problem have been reviewed several times in the recent proceedings of the Northern Nut Growers Association. (Greene, 1930; MacDaniels and Muenscher, 1942; Brown, 1943.) That the roots of walnut trees are toxic to the roots of certain crop plants in direct contact with them is widely accepted. In nature this toxicity seems to be limited to plants with tap root systems such as tomato and alfalfa (Davis, 1923) and those with other types of deep root systems such as apple trees (Schneiderhan, 1927), rhododendrons (Pirone, 1938), and privet. This toxicity is exhibited only when there is a direct contact between the roots of the two plants involved. (Jones, 1903; Massey, 1925). That the wilting observed under walnuts is due to a toxic product from the bark of the walnut, and does not result from a lack of water, is substantiated by the fact that the vascular or water conducting system is discolored for several inches above the point of contact with the walnut root. This symptom is very similar to that produced by vascular disease fungi. No such discoloration results from wilting due to competition for water. This symptom of toxicity has been overlooked by many workers in the field.

Massey (1925) suggested that the toxic component of walnuts might be juglone. This idea was further supported by Davis (1928). Today this concept is widely held. Chemically this substance is known as 5, hydroxy-1, 4, naphtho-quinone and belongs to a group of strong oxidizing agents with commercial uses, including tanning agents, medicinals, poisons, etc.

A knowledge of the physiology of juglone in the walnut is essential to an understanding of the divergent results obtained by various experimenters. Juglone, as such, occurs probably only in minute quantities in the inner root bark, and in the green husks of the nuts. These regions are, however, rich in a substance known as hydrojuglone. This compound, the colorless, non-toxic, reduced form of juglone is immediately oxidized to its toxic form upon exposure to the air or some oxidizing substance from the roots of other plants. Upon standing in the air juglone again disappears, being either changed back to hydrojuglone or broken down into other non-toxic substances.

This sequence of events may be noted in a fresh green husk of a black walnut. When the fresh husk is cut, the interior is white but immediately turns yellow as the colorless hydrojuglone is transformed into the yellow juglone. Upon standing or drying the husk becomes black as further chemical changes occur. It is impossible to extract juglone from these dried husks without first reoxidizing them. [Pg 53]

It now becomes possible for us to understand some of the discrepancies in the studies on walnut toxicity. If walnut bark or other plant parts are allowed to become desiccated, no toxicity may be found. If the roots of plants do not contact plant parts containing juglone or hydrojuglone, their oxidizing ability can not produce the toxin. Further the relative amounts of juglone in various species of *Juglans* has not been completely investigated. It does occur definitely in *J. nigra* and *J. cinerea* and has been reported as being in *J. regia*. Other species need investigation before being included as sources of juglone.

It is known that many plants are not adversely affected when grown under or near walnut trees. Some of these have root systems too shallow to contact the roots of the walnuts, especially in plowed ground. Some plants may send out sufficient surface roots to keep the plant alive in spite of injury to the deeper roots. The possibility that the roots of some plants are capable of withstanding the oxidizing power of the juglone is currently under study.

In early American folklore, the inner bark and the husks of the nuts were used as a source of a yellow dye for cloth. This yellow dye is juglone. The ancients also used this method of dying both cloth and hair.

Another property of juglone is its toxicity to fish. A few years ago it was a common practice in the South to cut the husks from young nuts and throw them immediately into a still pond of water. The fish, stunned by the juglone, would rise to the surface and were collected and eaten. No one seemed to worry about the effects of such poisoned food on the consumers.

Juglone is toxic to fungi and bacteria. Of all the medicinal powers attributed to walnuts by the Greeks and Romans, its use in curing certain skin diseases including ringworm has held up through the ages until many today can recall the use of the green husks for control of ringworms. Brissemoret and Michaud (1917) reported the use of juglone in clinical cases for the cure of eczema, psoriasis, impetigo and other skin diseases and concluded that juglone deserves extensive use in dermatology. To our knowledge the medical profession has not followed up the possibilities which this substance offers. The author is familiar with one case in which pure juglone was applied to a persistent ringworm infection. The infection disappeared within a month after treatment was begun. Though conclusions can not be drawn on a single case, certainly this observation lends credence to the medicinal lore of the ancients and the American pioneers.

During the fall and winter of 1942-43, investigations on juglone were started at the Connecticut Agricultural Experiment Station in conjunction with studies of the effect of other plant toxins on the roots of higher plants. When the toxicity of this oxidizing compound was established, it was produced in some quantity both by extraction from walnuts after the method of Combes (1907) and by synthesis after the method of Bernthsen and Semper (1887). Working on the assumption that the killing of germinating fungus spores and root hairs are similar phenomena, juglone was subjected to standardized laboratory tests for fungicidal value. In a series of experiments, this compound proved to be equally toxic with the copper in Bordeaux mixture. Such a high degree of toxicity was deemed worth further investigation, so juglone was tested as a seed protectant and as a spray in field trials for the control of black spot of roses. [Pg 54]

As a seed protectant, juglone failed miserably. It's toxicity to the noncutinized surfaces of root tissues was so great that germination was abnormal and greatly impaired. The injury noted here was apparently the same as that discussed by Brown (1943) and that which occurs normally in the field.

In field tests on the control of black spot of roses juglone stood up well. No phytotoxic activity could be noted on the cutinized stem and leaf surfaces. On the variety George Ahrens, juglone gave equal control with 2½ times as much 325 mesh sulfur, the standard control for this disease.

SUMMARY

1. Under certain conditions walnut trees exhibit toxicity to those plants whose roots are in intimate contact with the roots of the walnut.

2. This toxicity is due to the action of juglone, the oxidized form of hydrojuglone, a non-toxic substance occurring in the inner bark and green husk of walnuts.

3. Juglone has been used in dermatology to cure various skin disorders including both bacterial and fungus diseases.

4. As a seed protectant, juglone is unsuitable because of its inherent toxicity to the non-cutinzed root surfaces.

5. Laboratory and field tests have shown juglone to be an excellent fungicide

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Possible Black Walnut Toxicity on Tomato and Cabbage

***By* Otto A. Reinking**

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The toxicity or antagonism of black walnut roots and those of certain other plants has been a controversial question. L. H. MacDaniels and W. C. Muenscher in a report on page 172 of the Thirty-first Annual Meeting of the Nut Growers' Association held in 1940 cited evidence pro and con relative to the toxic effect of black walnut on various crops. They concluded that because of conflicting evidence, the problem of walnut toxicity was still unsolved and needed further investigation. In 1942, Babette I. Brown reported on page 97 of the Thirty-third Annual Report of the Northern Nut Growers' Association, on the injurious influence of bark of black walnut roots on seedlings of tomato and alfalfa. It was concluded, from carefully conducted tests, that walnut roots produce a substance that may be injurious to certain other plants. Experimentation showed that the walnut root bark produces a substance that is injurious to alfalfa and tomato seedlings.

During the past years, a number of instances of stunting and wilting of tomato plants in the vicinity of black walnut trees has been observed. In 1942, a very definite case of wilting and stunting was noted in cabbage plants growing in the vicinity of a black walnut tree.

Severely wilted tomato plants were observed on July 30, 1943, in a field of tomatoes near Egypt, New York. This case was typical of others observed in tomato fields in recent years. The wilting and stunting were all located in one corner of the field, on both sides of which large black walnut

trees were growing, and extended out in the field for a distance somewhat greater than the height of the trees. The rest of the field planted with the same stock of tomatoes was entirely healthy. The field had been planted to beans in 1942 and prior to that had been in grass for at least 7 years. The vascular bundles of affected plants were browned as in Verticillium or Fusarium wilt and in some bacterial diseases. No cankers or discolorations were observed on the external parts of the plants. In order to determine whether or not the wilting was caused by a fungus or bacterium, plants were collected for microscopic examination and for culturing to show possible presence of pathogens. The microscopic examinations showed the absence of fungi or bacteria in the vascular system or other plant tissues. The browning in the vascular bundles appeared to be confined to the phloem tissue. All attempts to culture a pathogenic fungus or bacterium from affected tissue was negative. Portions of diseased plants with discolored vascular bundles were placed in a damp chamber and no fungus or bacterial growth developed from the vascular system. From these field and laboratory studies, it was concluded that the wilting and stunting were not produced by a plant pathogen. Since the affected plants in the field were all confined to the area adjacent to black walnut trees, and the fact that it had been shown that the bark of this tree does produce a substance that is toxic to certain plants, it was concluded by circumstantial evidence alone that the wilting possibly was due to black walnut toxicity or antagonism of some sort. [Pg 57]

In August of 1942, studies were made on wilted and stunted cabbage plants growing in a semicircle on one side of a field adjacent to a walnut tree (Fig. 1). The field was located near Hall, New York, in a region known to be infested with cabbage yellows. From a distance, the affected plants appeared to have yellows, but upon close study, it was found that they were merely wilted and stunted and did not show the other typical symptoms of the yellows disease. The root systems of wilted plants did not show the presence of club root or black rot infection. The plants in the field were all of one variety and came from the same seed bed. Microscopic studies and attempts to culture a fungus from the vascular bundles of affected plants showed the absence of any fungus that might have caused, the disease. Since the affected plants showed no [Pg 58] symptoms of known cabbage diseases and as they were growing in a semicircle adjacent to a walnut tree, it was concluded that the presence of the root system of this tree might have been the cause of the trouble.

Fig. 1. Wilted and stunted cabbage plants growing in a semicircle adjacent to a black walnut tree. Note large, healthy plants in foreground, side and background about a semicircle of smaller, wilted plants, growing in an area affected by the root system of the black walnut tree.

These two instances of wilting and stunting of plants in the vicinity of walnut trees give further circumstantial evidence that the trouble might have been caused by the toxicity or antagonism of black walnut roots. Detailed experiments with the plants in question would have to be run to prove this assumption.

Preliminary Studies on Catkin Forcing and Pollen Storage of Corylus and Juglans

L. G. Cox, *Cornell University*

Methods of collecting and storing pollen are of great interest to those engaged in plant breeding. Very little reliable information is available for the various nut species compared with many other horticultural plants. The following preliminary experiments were conducted to obtain data on germination media, forcing methods, and storage conditions for Corylus and Juglans Sieboldiana pollen. The former was mostly from hybrid plants produced by crossing the Rush filbert (Corylus americana) with European varieties.

The optimum temperature and sugar concentration for germination of Corylus pollen.

The cut ends of Corylus branches with mature catkins collected March 1, 1942 were immersed in water and forced into shedding pollen in a room at a temperature of approximately 20° centigrade. The collected pollen was sifted upon the surface of a thin layer of sugar-agar in petri dishes.

Commercial cane sugar was used in preference to purified sucrose, because other studies have shown it to contain impurities which stimulate pollen germination. A range in sugar concentration from 5% to 55% by weight in 5% intervals was made up in distilled water containing 1.5% agar, heated to boiling and poured into the petri dishes.

The pollen was incubated at 10° C. and at 25° C. on the agar medium for 48 and 24 hours respectively prior to making the germination counts. Pollen was assumed to have germinated if the length of the pollen tube exceeded the diameter of the pollen grain.

At 25° C. germination was prompt and uniform with a maximum of 19.5% at 25% sugar concentration. At 10° C. the rate of germination was very slow and incomplete at the end of 48 hours with a maximum of 9% germination at 35% sugar concentration. For subsequent work a temperature of 25° C. and a sugar concentration of 25% by weight was taken as a standard.

The effect of temperature and humidity during forcing on the viability of the pollen

Pollen shed from catkins forced in a warm, dry room (about 75° F.), and in a cool, humid greenhouse (60° F.) gave pollen germinating 36% and 69% respectively, which indicated that the air temperature and humidity surrounding the developing catkins may have considerable effect on the viability of the maturing pollen. [Pg 59]

The experiment was repeated by forcing the catkins at 10° C., 18-20° C., and 24-26° C., at two humidity levels. The low humidity level corresponded to the natural room humidity, about 25% and the higher level of nearly 100% was achieved by enclosing the branches with catkins in large sealed cans over a water surface. As soon as a majority of the catkins began to shed their pollen or to absciss their full developed anthers, the catkins were removed and dried on a sheet of smooth paper at room temperature until the pollen was shed. The pollen was then collected and stored at 4° C. until used. The results obtained are given in table 1.

Table 1. Percentage germination after 24 hours of Filbert pollen forced at different temperatures and humidities.

	Temperature		
	10° C.	18-20° C.	24-26° C.
Low humidity	80	31	7
High humidity	96	60	12

Later experiments indicate that the pollen viability is greatly lowered if the catkins are removed from the higher humidities prior to the maturity of the anthers as indicated by their tendency to shed their pollen. Apparently the high humidity hinders the dehiscence of anthers and shedding of the pollen grains.

Effect of catkins extracts on pollen germination

The failure of pollen to germinate in the catkins at 100% humidity suggested the possibility that the catkin tissue might contain some substance which prevented germination of the mature pollen grains until after it was shed.

Two mature catkins plus remnants of their unshed pollen were ground in a mortar with a small amount of water in clear quartz sand. One cubic centimeter of the resulting turbid suspension

was added to 10 cc. of warm fluid agar and mixed by rotating the petri dish.

Pollen which gave a 91% germination on the standard medium showed only 50% germination on this catkin extract. Germination was distinctly abnormal with short stubby pollen tubes, often with numerous nodular swellings. In general the pollen tube grew up into the air away from the surface of the agar, rather than down into it or parallel with the surface as in normal germination.

Storage of Corylus and Juglans Sieboldiana pollen

Sulphuric acid solutions to give humidities from 10% to 100% in 10% intervals were made up. The storage chambers consisted of Atlas one-pint, wide-mouth fruit jars. In the bottom of each was placed a small 1-oz. bottle containing 20 cc. of the sulphuric acid solution. The pollen was placed in small glass vials loosely stoppered with cotton.

Two lots of Corylus pollen of 80½ and 96½ initial viability respectively, and one lot of Juglans Sieboldiana pollen of well over 50% viability were used in the experiment. Storage temperatures of 0° 40° and 10° were used. [Pg 60]

The Corylus pollen was placed in storage March 20, 1942, and the Juglans April 12, 1942. The pollen was taken out of storage November 28, 1942 and germinated on the standard agar-sugar medium at 25° C. for 24 hours. Results are given in table II.

Table II. The effect of storage temperature and humidity on percentage germination of Corylus and Juglans pollen

Kind of Pollen	Temperature Centigrade	Degrees Per cent relative humidity							
		10	20	30	40	50	60	70	80
Corylus	10°	0	0	0	0	0	0	0	—
Juglans		—	0	—	0	3	0	0	—
Corylus	4°	0	0	0	0	9.0	0	—	0
Juglans		—	0	—	0	—	0	0	0
Corylus	0°	3.0	1.0	4.5	8.5	0	0	0	0
Juglans		—	0	—	12.0	—	12.0	0	0

This preliminary work indicates that Corylus pollen can best be stored at 0° C. at 30 to 40% relative humidity and Juglans pollen at 0° C. at 40 to 60% relative humidity.

Summary

1. The optimum sugar concentration for germination of Corylus pollen is around 25% by weight in 1.5 per cent agar at 25° C.

2. Forcing the catkins at a low temperature (4° C.) and at high relative humidity (80%) favors the development of a high percentage of viable pollen.

3. The catkins contain some substance which when added to the germination media inhibits pollen germination and causes abnormal types of germination.

4. Preliminary results on pollen storage indicate that Corylus americana pollen can be stored for eight months or more in a viable condition at 0° C. with a range of 30 to 40% relative humidity. Juglans Sieboldiana pollen can be stored at 0° C. at 40 to 60% relative humidity. Whether or not pollen stored for this length of time would be effective in plant breeding should be tested by actual trial. The supposition based upon studies with other pollens is that germination tests are a reliable indication of the effectiveness of pollen in fertilization. [Pg 61]

Storage and Germination of Nuts of Several Species of Juglans

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While working on the general problem of the possible toxic effect of the roots of species of Walnut (*Juglans*) upon other plants we have had occasion to germinate the nuts to produce seedlings for experimental use.[1] The storage treatment employed previous to planting the nuts provided a successful method of supplying viable nuts. The simple treatment used, a modification of that suggested by Barton,(2) is briefly described and the results that may be obtained are indicated in a report of some germination data from the plantings of 1943.

The nuts were harvested after they had fallen from the trees and were stored in a cool place as soon as possible thereafter until the time when the husks were removed. Those harvested at Ithaca were put in cold storage at once; those harvested in California or Texas were delayed a few weeks during shipment. The husked nuts were stratified between layers of moist peat 2 cm. thick in two-or five-gallon crocks. The uppermost layer of nuts was covered with peat to a depth of about 10 cm. The nuts were placed in a cold room at 1 to 3° C. in late autumn and left until they were planted, between April 15 and June 2. Nearly all species used germinated well after about five to six months of cold storage.

Table 1 shows the results obtained from treated nuts of ten species of *Juglans* when they were planted in the open field, in soil in the greenhouse or in moist sphagnum in the greenhouse. While some variation in germination is observed, most of the species gave a good germination under all treatments. The field planted seeds were somewhat slower in appearing above the soil surface than those planted in the greenhouse. This delay may have been caused by the cold rainy weather soon after planting. The firmness of the soil, a clay loam, may also have retarded the emergence of the seedlings.

The germination percentages are based upon lots of 100 nuts except in a few species in which only 50 nuts were used. Differences in the percentage of germination obtained from various plantings of the same species are slight in most species. Even the larger differences in germination obtained in a few species cannot be considered significant but probably indicate variations in the quality of the original lots used.

Summary

Walnuts husked soon after harvest, before they are completely air-dried, and stored in moist peat at 1 to 3° C. for five to six months have their dormancy broken and remain viable for at least three months thereafter. This treatment is effective for all ten species tested. It is probably effective for all species of *Juglans*. This method of handling the nuts has the advantage over outdoor stratifying or autumn planting which often result in much damage or loss of nuts from the activities of rodents.

Table 1. Germination of nuts of *Juglans* spp. after stratifying in peat over winter, at 1-3°C.

Kind	Source	Date entered in storage	Per cent germination		
			Planted in soil in greenhouse April 15	Planted in field April 24	Planted in sphagnum June 2
nigra	(Cornell) Ithaca, N. Y.	Oct. 1	70	80	68
nigra	(Cayuga) Ithaca, N. Y.	Oct. 1	100	—	80
cinerea	—Ithaca, N. Y.	Oct. 1	60	44	8
regia	(Sorrentina) Chico, Calif.	Nov. 9	66	48	8
regia	(Franquette) Chico, Calif.	Nov. 9	80	36	—
regia	—Chico, Calif.	Nov. 9	75	46	—
Sieboldiana	—Ithaca, N. Y.	Oct. 1	100	40	—
honorei	—Chico, Calif.	Dec. 18	60	55	46
pyriformis	—Riverside, Calif.	Nov. 9	10	54	31
rupestris	—Alpine, Texas	Oct. 1	40	83	50
major	—Riverside, Calif.	Nov. 9	90	92	66
californica	—Pomona, Calif.	Nov. 9	62	84	91
californica	quercina —Chico, Calif.	Dec. 18	—	18	25
hindsii	—Riverside, Calif.	Nov. 9	50	56	52

References—

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2. Barton, Lela V. Seedling Production in *Carya ovata*. *Juglans cinerea* and *Juglans nigra*. Contr. Boyce Thompson Inst. 8: (1) 1-5. 1936

A Key to Some Seedlings of Walnuts

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While working with the seedlings of several species of walnuts certain diagnostic characters, by which the common species can be separated, became evident. These characters have been used to make a key to seedlings from one to three months of age. This key has been found helpful to us and it is here presented in the hope that it may prove useful to others who need to handle and determine walnuts in the seedling stage.

The key has two main divisions based upon the types of leaves on the main axis. The first division includes three species, *Juglans sieboldiana*, Japanese butternut, *J. cinerea*, American butternut, and *J. regia*, Persian or English walnut, all of which have only compound green leaves. In addition, one or more pairs of minute simple scales or buds occur on the lower part of the stem but above the cotyledons. The second main division includes species in which the seedlings have several simple, alternate, scale-like leaves followed successively by serrate, lobed and finally compound leaves forming a gradual series. This group includes *Juglans rupestris*, Texas black walnut, *J. nigra*, eastern black walnut, *J. honorei*, Ecuador walnut, *J. pyriformis*, Mexican walnut, *J. major*, Arizona black walnut, *J. californica*, California black walnut, and *J. hindsii*, Hind's black walnut. [Pg 63]

It is important that the leaves on the primary axis arising from the plumule are examined. If the primary axis is injured secondary shoots may arise from the axils of the cotyledons. These may develop various types of leaves not necessarily like those of the primary axis. The key is based upon seedlings grown in the field and in the greenhouse at Ithaca, New York.

A Key to seedlings of some species of Juglans

1. Leaves on the primary axis all compound; 1 to 4 pairs of opposite or subopposite reduced scales or buds sometimes present on the lower axis but above the cotyledons.

2. Scales or buds wanting between the lowest compound leaves and the leaves and the cotyledons *J. sieboldiana*

2. Scales or buds in pairs on 1 to 4 nodes below the compound leaves.

3. Stem with 1 pair of opposite scales or buds near the base; leaflets hairy, serrate *J. cinerea*

3. Stem with 2 to 4 pairs of opposite scales or buds below the compound leaves; leaflets glabrous, entire or denticulate *J. regia*

1. Leaves on the primary axis alternate, forming a gradual series from simple, entire scales to compound leaves; the lower 3 to 8 leaves simple.

4. Lateral veins of leaflets all or mostly all terminating in the notches between marginal teeth *J. rupestris*

4. Lateral veins of leaflets or their main branches all or mostly all terminating in the apex of marginal teeth.

5. Midrib of leaflets glandular hairy.

6. Glandular hairs on midrib of young leaflets interspersed with stellate clusters of gray glandless hairs; lateral leaflets ovate to broadly lanceolate, rugose *J. nigra*

6. Glandular hairs on midrib of young leaflets interspersed with sessile, usually yellow glands; lateral leaflets lanceolate, not rugose *J. honorei*

5. Midrib of leaflets glabrous or nearly so, sometimes with scattered, sessile glands.

7. Leaflets lanceolate, with acuminate apex; rhachis glabrous.

8. Leaflets widest near middle; vein-islets prominently raised; free ends of veins wanting or if present distinct to the apex and mostly unbranched *J. pyriformis*

8. Leaflets mostly widest below the middle; vein-islets not prominently raised; free ends of veins slender, terminating in indistinct branches *J. major*

7. Leaflets ovate or nearly so, with obtuse or acute apex; rhachis somewhat pubescent.

9. Petioles of the 3 lower compound leaves less than 1 cm. long; leaves crowded on a short axis *J. californica*

9. Petioles of the lower compound leaves from 1+ to 3 cm. long; leaves more distant on an elongated axis *J. hindsii*

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Further Tests with Black Walnut Varieties

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In 1937 the Northern Nut Growers Association committee on varieties and judging standards proposed a tentative schedule for the judging and evaluation of black walnut varieties(1). It was pointed out at that time that for one reason or another none of the schedules which had been used in judging walnuts were satisfactory and usable in giving an accurate estimate of the cracking quality and value of a variety. It was recognized also that the schedule proposed was only tentative and that it would need to be modified in the light of future testing and experience. In 1939 the question was again considered(2) and on the basis of tests which had been made, changes were proposed which would make the schedule more realistic. Since then many tests have been made using the modified schedule. The purpose of this paper[A] is to give the data secured in these tests and to consider again the value of the schedule and possibilities of improvement.

Recently a number of papers have been published dealing with the evaluation of black walnut varieties. In 1941 Kline and Chase(3) compiled the available published data and additional tests made by the Tennessee Valley Authority on nut weight and kernel percentage of black walnut selections. Two hundred and twelve clones and 335 tests are reported. As would be expected the samples of the same variety from different localities show variation in weight per nut and in total per cent kernel. For example, in 12 samples of the variety Ohio the weight per nut varies from 14.8 grams to 18.7 and the per cent kernel from 16.6 to 32.9. Twenty-one tests of Thomas show variations in single nut weight from 16.7 to 25.0 grams and in per cent kernel from 19.0 to 30.0. In general the samples grown in the north were made up of smaller nuts with less per cent kernel, indicating that the varieties were not suited to that latitude.

In 1942 Kline(4) worked out a somewhat technical method of evaluating walnut varieties on the basis of cash return per hour of labor spent in cracking with a hand operated cracker. A formula is proposed in which the variables of price and other factors may be substituted. The approach is on a commercial basis and the method is not intended for use in evaluating small samples. The paper represents many tests and establishes or affirms by statistically treated data several points of general interest in walnut testing, namely, (1) that a 25 nut sample is large enough to show varietal or other differences of a gram in total weight or 1 per cent of kernel weight, (2) that unless extreme accuracy is desired, moisture content may be ignored in making tests of 25 nut samples if the nuts have been hulled and air dried for about two months and (3) that the mean weight per nut and per cent kernel of nuts from the same tree may vary appreciably from year to year, for example a variation of 4.9 grams per nut and 3.3 per cent in kernel weight is reported for Snyder. Such variation is recognized and emphasizes the necessity of testing a variety in any locality for a number of years if correct valuation is to be made.

[Pg 65]

In Kline's paper earnings per hour for fifteen black walnut selections are given showing a maximum of $0.279 for the variety Norris, $0.245 for Ohio down to $0.12 for an unnamed seedling.

Lounsberry(5) published kernel cavity measurements for 64 clonal selections and related these to kernel weight per nut. Measurements of the thickness of the partition separating the halves of the kernel are also given. He does not relate these characters to scoring or cracking quality.

The purpose of the scoring system under discussion in this paper is to provide a realistic method of judging the relative merit of different clones of black walnuts that can be used mostly by members of the Northern Nut Growers Association or others having some skill in cracking technique. At the present time the Association has little reliable information either as to the performance of different varieties under different conditions in any one locality, from year to year on the same tree, or the suitability of any one variety growing in far different parts of the United States. It is important that such information be available and a workable basis of evaluation would be of the greatest value in obtaining it. Much of our information at the present time is from the many tests made by N. F. Drake(6, 7, 8) which are of great value in rating varieties. His schedule is an improvement over any previously proposed but fails to provide standard sampling and cracking procedure and includes the items of flavor and color which are in no way objective characters. The use of a point score based on the concept of a "perfect nut" is cumbersome and considered undesirable by the committee.

It is recognized that the value of a variety depends also upon the bearing habit of the tree, the

nature of the husk, disease resistance and other characters.

It has been five years since the present schedule was proposed and enough tests have been made to give a basis for judgment as to the merits and weaknesses of the schedule. As stated in the original committee report it is generally agreed that the best measure of the value of a nut of any clone is the amount of usable or marketable kernels that can be obtained from a given weight of shucked nuts with the least labor. The characteristics of the nuts that contribute to this value are recognized as follows:

1. The size of the individual nut.

2. The per cent of kernel of total sample weight recovered without recracking and without the use of a pick.

3. The total per cent of kernel of total weight of sample.

4. The number of quarters.

5. The plumpness of the kernels.

6. The number of empty nuts or nuts with shrivelled kernels in the sample.

Flavor and color may be important but are so dependent upon personal preference and on the treatment of the samples before testing that they cannot be rated numerically.

In considering the value of any schedule the following questions are pertinent:

1. Is it possible for one operator testing one lot of nuts to obtain the same score with replicate random samples?

2. Is it possible for different operators to obtain approximately the same score on replicate samples? [Pg 66]

3. Does the score give an accurate evaluation of the variation of a variety from year to year in one locality or in the same year in different localities? The latter is very important in determining the regions to which the variety is best adapted and the performance of the variety in any one locality.

4. What are the causes of variation in the scores obtained? Which of these reflect the inherent worth of the sample and which are related to technique, personal equation and methods of handling the sample?

5. What changes may be made in the schedule to weight the various factors to give a more realistic score of what changes in procedure will make the schedule more realistic?

Table 1 gives data on replicate samples tested by the same operator. In the samples of Spear, numbers 1-6 the variation is as follows: weight of single nut 1.3 grams, per cent kernel first crack 2.9, total per cent kernel 2.6, number of quarters 3, penalties 4.5 points, score 9.2 points. In scores figured without penalty the variation is 5.4 points. Sample No. 7 was cracked November 4 before the nuts were dry and hence is not comparable with others.

Analysis of these differences indicates that the variation in nut weight is closely related to the number of shrunken and empty nuts in the sample. This is a difficult factor to evaluate in a practical way. At the time of the 1939 report it was suggested that the score should be figured on the basis of filled nuts. This cannot be arranged easily in testing because if the operator cracks the nuts before weighing there is almost sure to be loss of fragments of shell. Trying to correct the original weight in any way is necessarily inaccurate. Deciding whether or not the kernel of a nut is sufficiently shrivelled to deserve a penalty is a matter of judgment which is a personal matter.

The variation in per cent kernel first crack and total per cent kernel probably represents fairly the difference in the samples. The total per cent is a wholly objective value and varies practically as much as the per cent first crack. Uniformity in the number of quarters is striking. This large number is undoubtedly related to the fact that many of the kernels were shrunken enough to be penalized and others were perhaps shrunken enough so that they did not tightly fill the shell cavity. In general it may be said that the more tightly the kernels fill the shell the more difficult it is to extract large pieces. Thus having the kernels a little shrunken but not enough to seriously reduce their weight favors a higher score. Of course, in some varieties the kernels may he plump and still not fill the shell tight enough to make cracking difficult. This is a desirable condition.

Variability in penalties is more important (i. e. 4.5 points) than any other factor in influencing the final score. Without the penalties the scores of samples 1 to 6 would be 87.5, 84.0, 83.6, 83.7, 82.1 and 82.8 respectively which is fairly uniform. Statistically the presence of empty or shrivelled nuts in a lot from which samples are taken increases the number required to make a satisfactory sample by greatly increasing the individual variation of the single nut. [Pg 67]

TABLE 1

Variation in the score of tests of duplicate samples made by the same operators. Twenty-five nut samples. Nuts grown at Ithaca, N. Y.

1942. Black Walnuts.

Variety	Treatment	Wt 1 nut grams	% kernel 1st crack	% kernel total	Quarters number	Penalty	Score	Remarks
Spear No. 1	S 18 hours D 15 hours	14.6	24.9	28.0	91	—3.5	84.0	1 empty, 5 shr.
Spear No. 2	D 15 hours	15.7	24.0	26.8	94	—6.1	77.9	3 empty, 6 shr.
Spear No. 3	D 15 hours	15.9	22.9	25.4	92	—3.5	80.1	1 empty, 5 shr.
Spear No. 4	Dry	15.0	23.3	25.4	94	—5.0	78.7	1 empty, 8 shr.
Spear No. 5	Dry	15.4	22.0	26.8	93	—4.5	77.6	1 empty, 7 shr., 20 bnd. qtrs.
Spear No. 6	Dry	14.7	22.7	26.6	94	—8.0	74.8	4 empty, 8 shr., 16 bnd. qtrs.
Spear No. 7	Nov. 4	16.7	27.9	28.8	98		96.7	only partly dried, 16 halves
Snyder No. 1	Dry	16.8	23.1	26.0	87	—4.0	80.7	8 shr., 9 bnd. qtrs.
Snyder No. 2	Dry	16.0	24.0	26.3	74	—3.5	81.0	1 empty, 5 shr., 13 bnd. qtrs.
Snyder No. 3	Soaked	15.8	24.1	25.8	86	—4.0	77.5	1 empty, 6 shr., 8 bnd. qtrs.
Snyder No. 4	Soaked	16.2	23.1	25.6	78	—7.5	75.5	3 empty, 9 shr., 8 bnd. qtrs.
Snyder No. 5	Dry	18.2	19.9	26.4	90	—3.5	76.7	7 shr., bnd. qtrs.
Snyder No. 6	Nov. 4	21.2	27.6	29.8	95		100.8	
Eldridge	Dry	20.8	19.3	23.1	98		80.7	13 halves, not well dried out
Geneva, N. Y.	Dry	20.6	20.0	22.6	92		81.0	

With the variety Snyder a difference of 2.4 grams in weight per nut in samples 1 to 5 suggests poor sampling technique as this is an objective value. A difference of 4.2 per cent in first crack suggests carelessness on the part of the operator in cracking or difference in soaking as this is quite out of line with the variation of .8 per cent in per cent weight of total kernel. The difference of 16 quarters is considerable but represents only 1.6 score points. As with the Spear the variation in penalty of 4 points is greater than other factors except per cent first crack (i.e. 4.2% points). The difference in score of 5.5 points is obviously greater than desirable, but probably indicates the relative value of the samples. Without penalties the difference is 4.5 points. [Pg 68]

Sample 7 of Spear and number 6 of Snyder were cracked November 4th when only partly cured and show the importance of curing in obtaining an accurate rating for a sample. The score of each variety was increased materially in all characteristics and no shrivelling was apparent. As a practical means of recovering the kernels in large pieces, cracking before the nuts are dried out is a decided advantage provided the kernels are cured before they are stored.

The duplicate samples of Eldridge check very closely and show no significant differences.

In Table 2 are given the results of ten tests on carefully replicated random samples of Snyder black walnuts. In making these samples the nuts were spread in a single layer on the floor and lots of 25 cut off the edges of this layer without selection of any kind. Even with such selection there is a variation of 1.2 grams in the average weight of single nuts from different samples. Per cent kernel first crack shows a minimum of 21.8 and a maximum of 26.9 in the ten samples. This difference is related mostly to the presence of 3 empty nuts in the low scoring sample as compared with none in the high scoring sample. The high score is also in part due to soaking. This variability is about the same as with total per cent kernel indicating that cracking technique was uniform. Comparing samples 1 and 2 in more detail it is found that the difference of 11.6 points in the score is caused by the presence of empty nuts in the sample. The average weight of kernels per single nut in sample 1 is 4.9 grams. The difference in the weights of the kernels of the two samples is 15 grams or about the weight of the kernels of 3 nuts. These empties also reduce the score by reducing the number of quarters recovered. Where empty nuts are involved, it is doubtful if random sampling will reduce variation unless the size of the sample is greatly increased, a practice which is not a practical solution in that a 25 nut sample is about as large as

can be handled with any facility. It would seem that this difference in scores was a fair indication of the merit of the two samples. The scores of the other samples show a fair degree of uniformity. The high score of sample 4 is probably related to the soaking treatment though the scores of sample 3 also soaked is lower than that of sample 6 which was not soaked. It seems that when these conditions and with this variety stored in a fairly high humidity, soaking had little effect except to increase the number of halves recovered. [Pg 69]

TABLE 2

Cracking tests by single operator with 10 random replicate samples of Snyder black walnuts. 1942 crop. 25 nut samples.

Sample	Treatment	Wt 1 nut grams	% kernel 1st crack	% kernel total	Quarters number	Penalty	Score	Remarks
1	Dry as received	18.1	21.8	23.1	85	—9.0	72.7	3 empty, 12 shr.
2	Dry as received	18.5	24.0	25.8	99	—5.0	84.3	10 shr.
3	Soaked 9 hrs., dried 14 hrs.	18.6	25.7	28.0	99	—6.0	87.4	1 empty, 10 shr., 8 bnd. qtrs., 16 hvs.
4	Soaked as above	18.3	26.9	28.4	99	—4.5	91.7	9 shr., 5 bnd. qtrs., 19 hvs.
5	Held in cellar 4 days (high humidity)	18.0	24.4	25.7	90	—6.5	82.1	1 empty, 11 shr., 8 bnd. qtrs.
6	Held in cellar 7 days	19.0	25.6	27.2	99	—5.0	88.7	10 shr., 7 bnd. qtrs., 3 hvs.
7	Held in cellar 7 days	18.4	23.9	26.1	96	—6.5	82.3	1 empty, 11 shr., 9 bnd. qtrs.
8	Held in cellar 4 days	19.2	24.8	26.6	98	—5.5	86.4	11 shr., 4 bnd. qtrs.
9	Held in cellar 4 days	18.4	23.7	26.7	92	—7.5	81.6	2 black counted as empty, 11 shr., 12 bnd. qtrs.
10	Held in cellar 4 days	18.6	23.5	25.9	94	—5.5	83.4	1 empty, 9 shr., 10 bnd. qtrs.

Another lot of 24 random replicate 25 nut samples of Ohio black walnut from the original tree was made by scooping the nuts out of a bag with a quart berry box which held about 25 nuts. Care was used not to select the samples in any way. The lightest sample 3 weighed 385 grams, the heaviest 22 weighed 434 grams or a difference of 2 grams per nut. The score of these two samples was 85.0 and 85.4 respectively apparently because there were no empty nuts in either sample. [Pg 70]

The results of tests on 18 of these replicate samples of Ohio are given in Table 3. The nuts were apparently a uniform lot. The kernels while of good quality were in most cases not quite plump and did not fill the cavities of the shell tightly. This doubtless accounts for the large number of quarters recovered. The kernels on the whole were plumper than with the variety Snyder reported in Table 2 and there were fewer empty nuts. Of the samples that were not soaked the variation of 4.3 per cent in the per cent first crack is of the same order as variation of 3.6 per cent for total per cent kernel and indicates uniform cracking technique.

The data in Table 3 gives evidence of the effect of treatments before cracking. The first nine samples marked with an asterisk were held for several weeks in a damp cellar and have an average test score of 86.6. The last seven samples were held in a dry but unheated room for a week before cracking and show an average test score of 83.7. The average score for the two soaked samples was 93.9. Soaking also increased the number of halves and quarters recovered in the same way as shown with variety Snyder in Table 2. None of these samples was excessively dry. In this table the lowest score (sample 19) is directly related to the presence of 3 empty nuts in the sample. The low score of sample 21 is mostly related to low per cent first crack which is caused by large number of bound quarters and the high penalty related to empty nuts and shrivelled kernels. These scores seem to indicate the value of the samples but bring out the difficulty of obtaining equal scores from such replicate samples. The other scores in the table are probably as close to each other as can be expected with samples of this sort.

In this and the preceding tables the number of bound quarters is given as an indication of cracking technique. With the Hershey cracker the nuts of many varieties will split into four quarters without releasing the kernels. The number of such bound quarters is increased if the operator does not put sufficient pressure on the anvils to crush the shoulders of the nut and free the kernel. On the other hand if too much pressure is used and the anvils brought too close together the kernels will be crushed and the score affected adversely. With some varieties, for example, the Adams as shown in samples 1 and 2 in table 5, the nuts are so pointed at each end that the standard anvils do not strike the shoulders of the nut and many bound quarters result. With such varieties cracking with a hammer would probably give a better score. Anvils with deeper cavities in the ends would be an advantage for such nuts. [Pg 71]

TABLE 3

Tests by the same operator of duplicate samples of Ohio black walnuts, treated in various ways before cracking. 25 nut samples. 1942 crop.

Sample	Treatment	Wt 1 nut grams	% kernel 1st crack	% kernel total	Quarters number	Penalty	Score	Remarks
9	*Dry	16.9	25.8	27.1	98	—0.5	72.7	1 shr., 5 bnd. qtrs., 7 halves
10	*Dry	16.8	23.8	25.2	95	—3.0	83.5	1 empty, 4 shr., 7 bnd. qtrs.
12	*Dry	16.2	24.5	25.5	97	—2.0	86.1	4 shr., 8 bnd. qtrs., 13 halves
24	*Dry	16.2	24.8	25.7	86	—3.0	84.2	2 empty, 2 shr., 4 bnd. qtrs., 8 halves
17	*Dry	17.3	24.8	27.3	97	—0.5	89.7	1 shr., 9 bnd. qtrs., 12 halves
21	*Dry	15.9	22.0	25.5	96	—4.0	78.2	1 empty, 6 shr., 14 bnd. qtrs., 17 halves
8	*Dry	16.6	25.2	26.9	99	—1.5	88.8	3 shr., 6 bnd. qtrs., 10 halves
15	*Dry	16.6	25.5	26.7	99	—1.5	89.8	3 shr., 5 bnd. qtrs., 12 halves
23	*Dry	16.4	25.2	26.2	96	—3.0	87.0	6 shr., 4 bnd. qtrs., 10 halves
11	Soaked	16.9	27.0	28.2	100	—1.5	93.5	Soaked 1 hr., moist 18, dried 12 hrs., 3 shr., 5 bnd. qtrs., 25 halves
16	Soaked	16.8	27.1	28.2	100	—0.8	94.3	Soaked as above, 1 shr., 5 bnd. qtrs., 16 halves
4	Dry	16.2	23.6	26.4	98	—3.5	82.9	7 shr., 10 bnd. qtrs., 15 halves
5	Dry	17.1	23.6	25.0	93	—3.0	83.1	1 empty, 6 shr., 5 bnd. qtrs., 10 halves
18	Dry	17.0	25.3	26.6	97	—2.0	88.6	4 shr., 6 bnd. qtrs., 8 halves
19	Dry	16.3	21.5	23.7	85	—4.5	75.1	3 empty, 3 shr., 9 bnd. qtrs., 8 halves
3	Dry	15.4	24.7	27.0	97	—3.0	85.0	6 shr., 8 bnd. qtrs., 5 halves
7	Dry	16.0	25.7	25.7	94	—3.5	86.1	7 shr., 6 halves, end reversed in cracking
22	Dry	17.4	24.1	25.8	94	—2.5	85.4	5 shr., 8 bnd. qtrs.

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TABLE 4

Variation in score of replicate samples of 3 varieties of Black Walnuts tested by different operators and of same varieties from different sources

Sample	Treatment	Wt 1 nut grams	% kernel 1st crack	% kernel total	Quarters number	Score
Operator 1						
Thomas	—Jones, Pa.	14.6	28.8	30.3	95	96.8

Thomas	—Baum, Pa.	14.3	25.6	27.0	100	89.0
Thomas	—Worton, Md.	16.4	28.2	30.8	94	97.6
	Average	16.4	25.8	28.1	91.0	91.2
Operator 2						
Thomas	—Weber, Ind.	22.0	22.2	23.8	47	83.0
Thomas	—Jones, Pa.	17.5	26.7	31.4	55	92.1
Thomas	—Baum, Pa.	17.0	24.0	26.5	72	85.5
Thomas	—Worton, Md.	16.7	19.5	26.4	64	75.3
	Average	18.3	23.1	27.0	59.5	83.9
Operator 3						
Thomas	—Jones, Pa.	18.1	16.2	27.1	52	69.2
Thomas	—Baum, Pa.	16.1	19.1	26.6	68	74.4
Thomas	—Worton, Md.	18.0	17.8	27.2	61	73.3
	Average	17.4	17.7	27.0	60.3	72.3
Operator 1						
Ten Eyck	—Weber, Ind.	18.0	20.5	27.5	57	78.5
Ten Eyck	—Jones, Pa.	15.4	21.1	23.2	99	79.1
Ten Eyck	—Baum, Pa.	14.3	26.3	30.2	93	91.3
Ten Eyck	—Worton, Md.	15.0	28.0	31.0	83	94.8
	Average	15.7	24.0	28.0	83.0	85.9
Operator 2						
Ten Eyck	—Weber, Ind.	19.1	24.4	26.5	38	84.8
Ten Eyck	—Jones, Pa.	16.4	24.6	24.6	64	84.3
Ten Eyck	—Baum, Pa.	15.8	25.7	26.5	54	86.0
Ten Eyck	—Worton, Md.	15.4	25.5	28.7	55	86.2
	Average	16.7	25.0	26.6	52.7	85.3
Operator 3						
Ten Eyck	—Weber, Ind.	16.8	17.3	24.6	57	69.4
Ten Eyck	—Jones, Pa.	15.2	21.1	23.3	84	77.4
Ten Eyck	—Baum, Pa.	15.0	18.3	19.7	69	68.4
Ten Eyck	—Worton, Md.	15.7	25.2	30.1	76	88.5
	Average	15.7	20.5	24.4	71.5	75.9
Operator 1						
Ohio	—Weber, Ind.	17.2	28.5	29.7	89	98.0
Ohio	—Jones, Pa.	16.4	28.7	29.9	96	99.2
Ohio	—Baum, Pa.	14.2	31.1	31.1	99	101.9
Ohio	—Worton, Md.	13.7	30.8	30.8	88	99.5
	Average	15.4	29.8	30.4	93.0	99.6
Operator 2						
Ohio	—Weber, Ind.	19.1	25.1	28.3	59	89.3
Ohio	—Jones, Pa.	17.2	27.3	27.5	64	91.9
Ohio	—Baum, Pa.	15.0	27.4	28.1	63	90.1
Ohio	—Worton, Md.	14.9	26.1	29.1	58	87.4
	Average	16.5	26.5	28.2	61.0	89.7
Operator 3						
Ohio	—Weber, Ind.	17.7	21.4	27.7	65	80.8
Ohio	—Jones, Pa.	17.2	22.9	28.2	74	84.5
Ohio	—Baum, Pa.	15.0	24.9	29.3	81	87.5
Ohio	—Worton, Md.	14.6	22.4	28.7	66	80.3
	Average	16.1	22.9	28.5	71.5	83.3

Table 4 gives the results of tests of similar samples of three varieties from four different sources by three different operators. The tests are not satisfactory because pretreatment was not uniform and there is insufficient data on penalties which are omitted. Some samples of the varieties Ten Eyck and Thomas contained empty nuts and shrivelled kernels which would preclude equal scores. The variety Ohio was uniformly filled from all sources. In the variety Ten Eyck there is a difference of 10.5 per cent in total per cent kernel in samples from the Baum orchard. This was [Pg 73]

related to 6 empty nuts in the sample cracked by operator 3. In the variety Ohio in which the kernels were plump the greatest variation between duplicate samples in total per cent kernel is 3 or only about 10 per cent of average total per cent kernel.

An examination of these data show the following points of interest: (1) that the duplicate samples showed considerable variation in weight of single nut and total per cent kernel, characters not dependent on personal skill or judgment. Operator 2 did not crack the whole sample of 25 and may have selected the larger nuts, thus securing a greater weight per nut with all varieties. The superior filling of the nuts of Ohio appears to be related to the fact that in the orchards in question this variety was observed to hold its leaves longer than the others which lost their leaves in late summer before harvest by leaf blight. Shrunken kernels are a logical result of early defoliation.

In the per cent of kernel obtained in first crack operator 1 recovered a higher per cent than operator 3 in all of the eleven possible comparisons and higher than operator 2 in 9 out of 12 possible comparisons. This probably is the result of soaking the samples by operator 1 and not by the others or possibly due to greater skill or care in cracking. The number of quarters recovered by operator 1 is greater in all cases than that obtained by either operator 2 or 3. This is also a result of soaking or skill or both. The score of operator 1 was in all tests of duplicate samples higher than that obtained by operator 3 and higher than the scores of operator 2 in 9 out of 12 comparisons.

The scores of the different samples are apparently mainly determined by the per cent recovered at first crack and the number of quarters, at least the only cases where the scores of operator 2 exceed those of operator 1 are where the per cent first crack and the number of quarters are greater for operator 2. This is related to the presence of empty nuts.

The data obtained for the variety Thomas by operator 1 and 2 show for the most part the same relative scoring of samples from different sources. For example with both operators the score of the samples from the Weber orchard was lower than that from the Jones and Baum orchards and the sample from the Jones orchard scored higher than that from the Baum orchard. In the samples from the Worton orchard the relative scores are reversed. The scores o£ operator 3 are quite out of line. With the variety Ten Eyck the differences between scores of samples from different sources are not consistent. Operator 2 obtained scores that were essentially alike for all four samples whereas the scores of operator 1 show differences of more than 10 points. This is related to empty nuts in the sample. With the variety Ohio there is reasonable uniformity in the scores obtained by all operators. This was the only variety with well filled nuts and for that reason alone the score would be less variable. [Pg 74]

TABLE 5

Tests by different operators on duplicate samples of black walnuts, soaked and unsoaked. 25 nut samples. 1942 crop.

Sample	Treatment	Wt 1 nut grams	% kernel 1st crack	% kernel total	Quarters number	Penalty	Score	Remarks
Operator 1								
Ohio No. 1	Dry	16.8	26.1	27.6	97	—4.	88.5	5 bnd. qtrs., 18 shr., 8 halves
Ohio No. 2	Soaked	16.7	27.3	27.8	99	—1.5	93.5	2 bnd. qtrs., 1 shr., 1 empty
Operator 2								
Ohio No. 6	Dry	15.9	26.3	26.7	93	—1.	90.2	1 empty
Ohio No. 13	Soaked	15.9	25.8	26.4	93	—1.	89.0	1 empty
Ohio No. 14	Soaked	15.7	25.2	26.3	96	—.5	89.0	1 shriveled
Ohio No. 20	Soaked	16.7	25.3	26.4	94	—1.	88.9	1 empty
Operator 1								
Grundy No. 1	Dry	23.8	24.1	24.6	99	—.5	93.7	1 shriveled, 2 bnd. quarters
Grundy No. 2	Soaked	23.2	24.2	24.2	100	—.5	97.2	1 shriveled, 2 bnd. quarters
Operator 2								
Grundy No. 3		22.4	24.0	24.0	88	—2.	89.2	2 empty
Grundy No. 4	Dry	23.5	24.7	25.5	98	—.5	95.0	1 shriveled
Operator 1								

Adams No. 1	Dry	14.2	18.3	24.5	70	—0.	70.0	35 bnd. qtrs., well filled, good quality
Adams No. 2	Soaked	14.4	17.3	23.7	78	—2.5	67.1	2 empty, 20 bund. qtrs., 1 shr.
Operator 2								
Adams No. 3	Dry	14.6	18.1	24.0	77	—3	67.5	3 empty
Adams No. 4		14.3	19.6	25.4	78	—3	72.3	2 empty

The average scores of all samples of each variety are Ohio 90.0, Thomas 83.4, and Ten Eyck 82.4. These are not out of line either with the scores obtained for these varieties elsewhere or the relative merit of the varieties. [Pg 75]

Because of the variability obtained in the tests shown in Table 4, another series of tests of similar samples by different operators was arranged in the summer of 1943. The samples of Ohio were some of the same lot reported in Table 3. The varieties Grundy and Adams grown in Michigan were carefully sampled to give comparable lots. The results of these tests given in Table 5 show no greater variability between the scores of the two operators for any one variety than between tests by the same operator and indicate that it is possible for different operators to obtain comparable scores on duplicate samples provided great care is used in treating and cracking the samples.

The differences in average score between the different varieties is consistent and apparently gives a correct indication of their relative merit. Grundy shows an average score of 93.7, Ohio 89.7 and Adams 69.2. The high score of Grundy is related to the large size of nut and high per cent first crack. The low score of Adams is related to small size of nut and low per cent first crack resulting from a large number of bound quarters. The kernels of this variety were plump, filling the cavity of the shell full and shattered on cracking.

In Table 6 are given the results of 54 tests of 38 selections or clones. In general it appears that the score is a fair indication of the worth of the sample. Low scores are related mostly to low per cent first crack and to the presence of empty nuts or shrivelled kernels in the sample. It is evident also that if a sample is too dry with many varieties a low score will result. Just what soaking treatment is most expedient is not too clear. Soaking 12 hours and drying 24 proved to be a satisfactory practice. The method followed by Mr. Stoke of soaking for 5 minutes and keeping the sample in a wet burlap sack for 24 hours is all right but is cumbersome if many samples are to be tested. Soaking one hour and holding 24 hours in a closed container like a coffee can give good results but percentage should be figured on dry weight and kernels should be air dried for 24 hours before weighing.

One weakness in the schedule is that it tends to give a small nut an advantage if the per cent kernel obtained in first crack is high. Thus a sample of the Mintle grown in Iowa which weighed but 13.6 grams per nut and total per cent kernel of 32 scored 101.1 points chiefly because the per cent first crack was 31.5. The same variety grown at Ithaca weighing 13.7 grams per nut but with 23.9 per cent first crack and 24.3 total scored 83.8. Possibly a penalty could be taken for nuts weighing less than 18 grams. On the other hand a large nut like the Grundy weighing about 23 grams would have a 10 point score advantage over Mintle and this may be enough for this character.

The six samples of Thomas grown on different trees in Ithaca, N. Y. in 1942 show great variation in score as has been the case in other years. Poor scores are related to shrunken kernels and such samples come from trees that are making poor growth because of poor soil conditions and competition with weeds. Also shriveled kernels are the result of defoliation by early frosts which may be very local and affect some trees and not others. [Pg 76]

TABLE 6

Tests and Scores of Black Walnut Varieties from Various Sources.
25 nut samples unless otherwise indicated.
All scores figured on basis of 25 nuts.

- D—Dry
- S—Soaked
- No.—Hours dried or soaked

Variety	Source	Treat-ment	Wt 1 nut grams	% kernel 1st crack	% kernel total	Quarters number	Penalty	Score	Remarks
Adams	Becker, Mich. '42	D	14.7	11.3	21.4	44		52.4	Poor; 62 bound quarters
Benton	Smith, Wassaic, N.Y.	S-5	13.2	26.8	28.2	94	-2.0	88.5	Plump kernels, good flavor, 2 empty nuts

Sample No. 1 (23)	'42	D-8							
Sample No. 2 (24)	'42	D	12.9	23.1	23.6	74	-3.0	75.3	3 empty nuts
Bontz	Snyder, Iowa	S-12	18.7	20.3	22.0	85	-10.0	68.8	Nut long like Ohio. Shell
	'40	D-12							chamberProminent spur; oily; poor to med. extr.; few shrunken
Boothe	Stoke, Va.	S-16	15.3	24.5	29.2	87	-2.5	85.1	Good quality;
	'40	D-10							flavor good, 28 blind qtrs.; ext. poor
Burrows	Snyder, Iowa	S-12	17.5	13.5	24.4	35	-0.3	59.9	No data
	'40	D-4							
Calhoun	Becker, Mich. '42	D	15.4	26.0	28.5	94		90.6	End cracks, 2 empty nuts, 3 shr.
Cayuga	Ithaca, N.Y.	S-12	13.8	26.1	26.7	100	-3.5	85.9	kernels, good extr.
middle tree	'42	D-24							
Climax	Becker, Mich. '42	D	17.2	25.3	27.3	90		90.8	Some shrunken kernels
Cornell	Ithaca, N.Y.	S-12	16.5	24.9	25.1	80		89.0	
(20)	'42	D-24				100%			No empty nuts,
Creitz	Stoke, Va.	S-15	18.8	22.0	23.8	100	-1.3	83.4	kernels full very good extr., good color [Pg 77]
	'40	4-4							Excellent cracker.
Cresco	Ithaca, N.Y.	S	16.7	15.9	21.0	80		67.0	Shell thin; good flavor mild
(6)	'42								
Eldridge	Geneva, N. Y.	S-12							Not promising at Ithaca
(15)	'42	D-24	21.1	24.0	24.5	96	—10.	80.0	Dried in husk; kernels shrunken
Finney	Snyder, Iowa	S-12	19.5	18.0	22.4	82	—12.5	62.4	Shell thick; kernels shr.,
	'40	D-48							spurs prominent. Tough to crack
Freel	Ithaca, N.Y.	S	12.1	17.9	19.6	80		65.7	Shell thick, kernel thin.
(6)	'42								Not a good nut
Galloway	Snyder, Iowa	S-12	16.4	22.3	23.2	94	mdash;0.3	81.7	Kernel smooth, flavor good.
	'40	D-24							Extraction good
Harris	Snyder, Iowa	S-12	18.5	23.8	25.6	100	mdash;12.5	76.4	Dark color. All kernels
	'40	D-12							withered. Flavor poor. Extraction very good
Homeland	Stoke, Va.	S-5	19.1	20.4	25.8	89	mdash;12.5	81.7	Smooth kernels;
	'40	D-16							flavor good; closed suture
Karnes	Stoke, Va.	S-16	20.3	25.6	29.4	56	mdash;12.5	91.8	Tight in shell.
	'40	D-7							Kernels oily, shatter. Flavor good. Shining pellicle
Korn	Korn, Mich.	D	16.8	19.0	27.9	62	mdash;12.5	74.9	Kernels fill cavity very full.
	'39								Shatter.
McCoy	Snyder, Iowa	S-12	19.4	20.7	21.2	90	—0.8	79.6	Smooth kernel; some slight
	'40	D-4							shrinking. Thick shell
McGee	Becker,	D	13.7	16.2	26.8	83	—0.8	67.8	Bound qtrs., hard

	Mich. '40	D-4							pointed nuts, hard cracking
Michigan	Korn, Mich. '39	D	20.0	23.0	30.3	90	—0.8	90.1	Kernels plump, very good nut
Mintle	Snyder, Iowa '40	S-12 D-12	13.6	31.5	32.0	95	—1.0	101.1	Flavor mild, extr. very good. Very good nut, smooth shell
Mintle	Ithaca, N.Y. '42	S-12 D-24	13.7	23.9	24.3	100		100	No empty nuts, kernels plump, good extraction
Ohio	Snyder, Iowa '40	S-12 D-24	18.5	24.0	27.4	79	—1.3	86.8	Shell chamber smooth. Flavor sharp. Extraction fair.
Rohwer	Snyder, Iowa '40	S-12 D-48	21.5	24.0	28.2	84		92.0	Kernel smooth, extr. fair. Kernels plump. [Pg 78]
Rohwer	Stoke, Va. '40	S-15 D-3	18.5	18.0	22.4	79	—.3	73.3	Fair extraction; flavor fair. Spur prominent. 11 blind qtrs.
Schwartz	Snyder, Iowa '40	S-6 D-14	20.3	21.8	25.6	86	—3.0	82.2	End cracked. Spurs prominent. Some shrinking. Not too good. 11 blind qtr.
Sifford	Stokes, Va. '40	S-16 D-7	23.6	23.7	25.6	100	—11.0	82.8	Large nut. Good extr. Kernels shrunken
Snyder (4)	Jacobs, Ohio '42	D D-7	19.6	26.1	28.0	94	—11.0	95.4	Not entirely cured
Snyder (14)	Smith, Wassaic, N.Y. '42	D	21.9	22.0	26.4	91		88.2	11 bound qtrs. Kernels lg. rather dark, a good nut
Sparrow (11)	Ithaca, N.Y. '42	S-12 D-24	15.5	20.7	22.4 96%	42	—14.5	63.2	1 empty, all shrunken, end cracks; poor quality
Sparrow (10)	Smith, Wassaic, N.Y. '42	D D-24	16.5	21.6	28.2	85	—14.5	82.3	Well filled, kernels bright, good flavor, good nut
Sparrow	Snyder, Iowa '40	S-6 D-19	16.1	25.1	31.2	84	—14.5	90.3	Flavor good; smooth nut, spur medium prominent. 13 blind qtrs.
Sper	Becker, Mich. '42	D	16.2	20.0	25.6		90	78.0	Kernels somewhat shrunken
	'42	D	16.7	27.9	28.7		98	96.6	No. 4, 1942 not completely dried. Not recleaned
Stabler	Stoke, Va. '40	S-5 D-20	14.5	20.2	22.8	80	—9.0	65.3	Flavor mild. Easy extr. 12 blind qtrs. Many shrunken
Stabler	Wilkinson, Ind. '40	S-12 D-24	14.9	25.7	27.2	77	—3.0	84.6	End cracks; 6 bound qtrs. 2 empty nuts, 2shr. kernels

Stambaugh (7)	Graham, Ithaca, N.Y. '42	recleaned S-12 D-24	19.3	24.0	24.0	28 100%	—12.5 —3.0	61.3	All kernels shrunken. Poor quality
Sterling	Korn, Mich. '39	D	19.8	25.2	25.9	97		92.8	Kernels plump. Very good nut
Tasterite (4)	Graham, Ithaca, N.Y. '42	recleaned S-12 D-24	13.5	25.0	25.0	100%		86.0	All kernels plump; quality fair
Thomas	Snyder, Iowa '40	S-12 D-12 D-24	17.2	22.9	25.6	91	—1.0	83.9	Good extraction. Some shrunken
Thomas	Wilkinson, Ind. '40	S-12 D-24	18.5	21.5	27.1	26		77.7	End cracks; 21 bound qtrs., Kernels plump; oily, clinging
Thomas No. 1	Ithaca, N.Y. Tree 1 '42.	D	20.6	19.1	22.1	96		79.4	Some shrunken
Thomas No. 2	Ithaca, N.Y. No. 2 '42	S-1½ D-6	20.6	14.4	18.2	91	—1.0	67.6	1 empty nut; some shrunken
Thomas No. 3	Ithaca N.Y. No. 3 '42	D	20.4	19.1	22.1	96	—1.0	79.2	
Thomas No. 4 '42	Ithaca N.Y. No. 4	D	20.1	15.5	16.8	82	—16.0	36.2	4 empty nuts; all shrunken
Thomas No. 5 (24)	Ithaca N.Y. No. 4	S-12	20.5	23.4	24.0	90	—8.0	80.5	4 empty nuts; 8 shr. kernels; 2 blind qtrs.
Thomas (20)	Ithaca N.Y. No. 6 '42	S-12 D-24	19.8	17.6	18.4	94	—10.0	63.7	2 empty nuts; 16 shr. kernels
Thomas	Wilkinson, Ind. '40	S-12 D-24	20.5	21.1	25.4	69	—7.0	75.3	3 empty nuts; 4 shr. kernels, 23 bound qtrs.
Troup (4)	Graham, Ithaca, N.Y. '42	S-12 D-24	16.0	16.0	18.0 100%	16	—20.0	51.0	All kernels shr., 2 empty nuts, quality poor
Vail (8)	Ithaca, N.Y. '42	S-12 D-24	15.3	20.8	21.8	30 94%	—17.0	60.2	4 empty nuts, 6 shr. kern., 2 blind qtrs., end cracks
Vandersloot	Ithaca, N.Y.	S-12 D-24	27.5	13.4	16.6	58	—3.0	64.4	1 empty nut, 4 shr. kern., 11 bound qtrs., ext. poor
Wiard	Iowa '40	S-12 D-12	18.8	26.8	29.4	83		95.4	One of best, well filled. Smooth kernel, good flavor, good extraction

DISCUSSION

In the light of the data presented some conclusions can be drawn on the various questions raised at the beginning of this paper. It is evident that if approximately the same score is to be obtained by one operator on duplicate or replicate random samples, great care must be used in sampling. There is a tendency in taking samples to pick out the larger nuts or in some other way fail to take a good random sample. Selections submitted for contests are likely to be quite misleading as to the value of the variety and reflect in considerable part the contestant's skill in selection rather

than the merit of the clone. The Freel walnut seems to be an example of this. At least as grown at Ithaca it is very disappointing.

It is evident that if comparable scores are to be obtained the samples receive the same treatment particularly as regards moisture content. Samples should be dried sufficiently to show the shrinkage of poorly developed kernels but in no case be allowed to dry to the point of checking the shells. Uniform soaking practice is a step in the right direction. A green or partially dried nut will test much higher than one properly cured as evidenced by Snyder, sample 6 and Spear, sample 7 in Table 1.

It seems probable that no schedule can be devised that will eliminate the necessity for skill on the part of the operator. To obtain satisfactory uniformity in scores, it is essential that the operator be skilled in the use of the cracking machine and use continuous care in applying the necessary pressure and in holding the nut in the anvils. Undercracking or overcracking, reversing the ends of the nut in the anvil or failure to hold the nut vertical may affect the score.

The presence of empty or poorly filled nuts in a lot of nuts from which samples are taken at random introduces greater variability in the samples than that found in lots with all nuts filled. This is true because the chances of getting an equal number of empty nuts in 25 nut samples are small and the presence of each empty nut decreases the per cent kernel and also the numbers of quarters possible. Variations due to empty nuts could be eliminated by greatly increasing the number of nuts in the sample but this is not practical for the purposes this schedule is intended to serve.

The question of whether or not it is possible for different operators to obtain equal scores on duplicate samples is not satisfactorily answered by the data in table 4. As the data stand the scores are far from equal. There is, however, a consistency in the scoring of each operator and it is quite probable that with more uniform treatment of nuts before cracking and more careful sampling better agreement would be achieved. This is borne out in the data given in table 5 in which the variation in scores between the two operators was no greater than that obtained by the same operator.

From a study of the data secured it appears that the causes of variation in the scores of duplicate or replicate samples are the result of (1) lack of care in making replicate random samples, (2) differences in treatment of samples before cracking, particularly as regards moisture content, (3) differences in the skill or care of the operator making the tests, (4) presence of empty nuts or shrivelled kernels in the sample which introduces variation not compensated for in a 25 nut sample and further complicates the matter because assigning penalties for shrivelled kernels involves personal judgment. [Pg 81]

The first three of these can be minimized or eliminated by care and skill. The fourth item is not so easy but procedure can at least be standardized. Increasing the size of the sample is not practical if much testing is to be done.

All things considered it would seem that the scores indicate fairly well but not accurately the relative merit of the samples and thus can be relied upon to determine the relative merit of a variety or clone, the suitability of the variety for growing in a given locality and the variability of a variety grown in the same region but under different conditions. To determine the merit of a variety as compared to another both must be grown under the same conditions. The over-all value of a variety can only be determined from samples of well filled nuts. In any case the more samples tested the better.

The following suggestions are made as to procedure:

1. In taking a random sample no selection as to size, uniformity, or any other quality should be made. Suggested procedure would be to scoop up about 25 nuts in a berry basket or with the hands from the main supply and reduce the sample to 25 without conscious selection. What we in the Northern Nut Growers' Association want is a measure of the merit of the crop of the tree or variety in question and not the value of a highly selected sample.

2. It is not practical to bring samples to a uniform moisture content before cracking is done. The following precautions, however, may be followed: (a) Take care to see that nuts are reasonably well cleaned and free from fragments of husk. Scrubbing or beating the nuts together in a sack will usually remove most of the loose material. Of course the best practice is to wash the nuts immediately after shucking. (b) Cure samples until they are dry enough not to lose more weight preferably in an unheated room. This takes at least a month or 6 weeks. (c) Avoid storing the samples in a heated room where they will become so dry that the shells will check or crack. If this occurs the normal cracking fracture of the shell is destroyed and a satisfactory test cannot be made. (d) Nuts that have become so dry that the kernels shatter may be moistened by soaking about 2 hours in cold or lukewarm water then holding them in a moist condition for 18-24 hours, followed by drying for 10-12 hours before cracking. Nuts that are to be soaked should be weighed before soaking and the dry weight used in figuring percentages. The kernels of soaked nuts should be dried for 24 hours before weighing, preferably under the same conditions in which the samples were stored before weighing.

3. Care and skill on the part of the operator are of the greatest importance, particularly in the thoroughness of cracking. The most important variable in the score is the per cent kernel recovered at first cracking. The score is reduced by undercracking the nut so as to leave the quarters bound or by overcracking to the point of smashing the kernels. If the nuts have a long

point so that the rims of the anvils do not contact the shoulders of the nut, poor cracking will result. At the present time a cracker with interchangeable anvils is not available. Using different sized iron pipe couplings in a vise may help solve the problem. Some varieties will crack better with a hammer than with a cracker of the Hershey type with standard anvils. In cracking a sample for test the operator should try to recover the most possible out of the first crack without using a pick or recracking. [Pg 82]

4. The empty nut problem is probably the most difficult and is not satisfactorily solved by cracking nuts in excess of 25 until 26 filled nuts are secured. This necessitates weighing the sample after the nuts are cracked which is usually impracticable because of loss of parts of shells in cracking and because additional nuts are not available. Empty or shrivelled nuts in a sample are a serious defect which should count heavily against it. On the basis of experience it seems that a better method is to crack the random sample of 25 nuts and let the empty nuts and shrivelled kernels affect the score as reduced weight per nut, reduced per cent kernel and the penalty as well. Shrivelling that is obvious and which adversely affects the appearance of the kernels should be penalized. Possibly further experience will suggest a better way of handling this problem.

The proposed score of a sample is made up as follows:

1. The weight of a single nut in grams.

2. The per cent kernel of total weight of sample recovered after first crack x 2.

3. The total per cent kernel of total weight of sample divided by 2.

4. One tenth point for each whole quarter recovered.

5. Penalty of one score point for each empty nut in the sample.

6. Penalty of ½ point for every nut with shrivelled kernel.

The makeup of this score does not differ from that previously used except in the matter of procedure with empty nuts. It is felt that the items included are weighed in a realistic manner and that difficulties in scoring have been due to methods of handling the samples rather than in the scoring schedule itself. It does not seem likely that this schedule or any schedule will be valuable unless used by experienced operators who are willing to take the precautions indicated. Also it is apparent that wherever possible more than one sample of a lot to be scored should be tested and the average score used.

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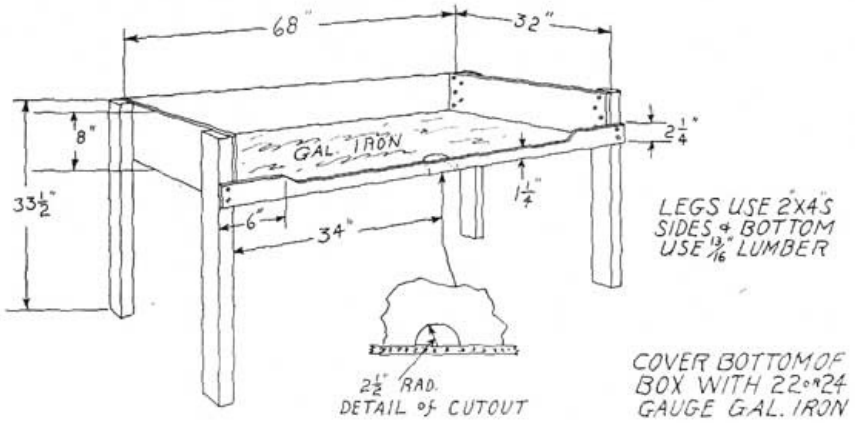
Shelling Black Walnuts

By* G. J. Korn, *Berrien Springs, Michigan

The methods used in the shelling of black walnuts by one of the commercial growers in southeastern Pennsylvania may be of interest to some of our NNGA members. For the last three seasons I have helped this grower with the harvesting and shelling of his crop. The Thomas variety predominated in his 40-acre nut orchard. This variety is truly a very outstanding nut when properly grown. The Thomas is large, cracks well, its kernels may be readily removed in large pieces, mostly quarters, and they are of excellent flavor and color.

Care in selecting the orchard site, soils, methods of cultivation, fertilizing and spraying appear to be of prime importance in the production of high quality nuts. The matters I shall speak of in this article, however, will have to do mostly with the harvesting, husking, curing and cracking of the walnuts and picking their kernels.

When the walnut husks may be easily dented with the thumb they are ready to gather. This is usually about October 5 in that locality. The harvesting is begun immediately, as the kernels will become somewhat damaged as to flavor and color if the husks are allowed to darken and decompose. When the nuts have ripened they do not remain in prime condition for harvesting for more than about 10 to 15 days. By this time the husks will have begun to decompose and darken the kernels. Just as soon as the nuts are ripe they are shaken from the trees. The nuts are gathered into bushel baskets and hauled in a pick-up truck to the husker. One of the old cannon type corn shellers, once quite common in Pennsylvania, is used to husk the nuts. A farm tractor furnishes the power to run the husker. The nuts are run through the husker a couple of times to assure a clean job of husking. The cleanly husked nuts drop into a basket at the end of the husker. Only 3 minutes or slightly more time is required to turn out a bushel of husked nuts. The freshly husked nuts are washed in a large copper kettle of water by vigorously stirring them a few minutes with a common garden hoe. About 1½ bushels of nuts are washed in each batch. All nuts that float lightly on the water are skimmed off and discarded. The nuts are then spread out about 2 or 3 nuts deep on trays to dry. The frames of the trays are made of 1x3 inch lumber and are 1½ feet wide and 3½ feet long; ¾ inch mesh galvanized chicken wire netting forms the bottoms of the trays. Walnuts dried indoors in the shade produce lighter colored and finer flavored kernels than do those dried outdoors in the sun and rain. When nuts are being dried indoors, care should be taken to see that they have a good circulation of air or the nuts may start molding in the early stages of their curing. Although the outside of the walnut shells may dry off quite rapidly, it takes considerable more time for the inside of the nut to cure properly for storing. The nuts should be left on the trays for a few weeks to insure thorough curing.



The cracking of the nuts is done with one of the small mechanical crackers that is to be found on the market. The more care exercised in the cracking at the nuts, the less work and time will be required in separating the kernels. After cracking the nuts they are sifted through a series of screens. This helps very materially in preparing them for rapidly picking their kernels. It is quite [Pg 84] important that this operation be done properly if the kernel picking is to be made simple and rapid. The cracked nuts are first sifted through a screen made of 1-inch mesh chicken wire netting. Next the nuts are sifted through a screen made of ½-inch mesh hardware cloth. All material which will not pass through this screen should be kept separate. Some of these pieces will require recracking and kernel picking with the fingers. The material which has passed through the ½-inch mesh screen is now sifted on a hardware cloth screen with 5 meshes to the inch. Only the very fine material will pass through this screen which is not suitable for further kernel recovery. The material which remains on the ½-inch mesh screen is now placed on the table especially made for kernel picking. This table is shown in the accompanying sketch. The table is of suitable size to allow two people to use it at the same time. The operators sit on stools about 20 inches in height, and work from the low side of the table. A small amount of the material is brought forward and spread out very thinly before the operator. A piece of ½-inch softwood dowel about 5 inches long with 4 No. 9 sewing needles imbedded in one end is used to pick up the kernels. The needles are placed in the form of a square and should be only about 3/32 of an inch apart to do the best work. The picks should not be used to pry kernels from the shell, as the needles would soon become bent and worthless. The picks are meant to be used only to pick up the kernels from *among* the shells. As soon as the operator has removed all the kernels from the small amount of material he has brought forward from the rear of the table, he shoves the shells into the hole at the edge of the table and they drop into a receptacle. The pick is used with the right hand, and the kernels are removed from the pick with and into the left hand. As soon as a convenient handful of kernels has been obtained, they are dropped into a small pan which sets on the table near the operator's left hand. The rapidity with which kernels may be picked by using these methods is surprising. It is sometimes necessary to moisten the nuts and hold them in this condition for 2 or 3 days before cracking them, to keep the kernels from shattering unduly. After the kernels are picked out they are dried very thoroughly. Trays whose bottoms are lined with screening somewhat finer in mesh than that used for windows, are used to dry the kernels. Care

should be taken to not overheat the kernels, or their flavor and color will be impaired. Good clean lard or similar cans with tight fitting covers are used for storing the kernels. The kernels are stored in a cool dry place. Any kernels which are to be kept over the summer months, are placed in cold storage.

Better Butternuts, Please

S. H. Graham, *Ithaca, N. Y.*

"As to palatability, there are many persons who would be disposed to place the butternut at the very head of edible nuts." This is the opinion of Luther Burbank in Vol. XI, page 32, of "Luther Burbank, His Methods and Discoveries."

The butternut tree is noteworthy as being at home in a greater variety of soils than the blackwalnut as well as being hardier than the black walnut or the hickory. It ripens so early that [Pg 86] the nuts always have plenty of time to mature while the richly flavored kernels are rarely shrunken and never astringent. Despite these good qualities, a search through the publications of the Northern Nut Growers' Association for the past thirty years proves that comparatively little interest has been manifested in it. It would seem quite in order to inquire into the reasons for this neglect. Five of them come to mind: 1. Too early blooming. 2. Difficulty of propagation. 3. Curculios. 4. Melanconis disease. 5. Lack of sufficiently good varieties.

The butternut too often blooms so early that its blossoms are caught by frost. The filbert has the same fault and so, to a less extent, has the Persian walnut. Late blooming varieties of each have already been selected. It does not seem too much to hope that late blooming varieties of butternut may also be found. I know of one butternut that has had good crops every year but one for the last ten years but have never visited it at the right time to observe its blooming habit. President Weschcke reports that butternuts on black walnut stocks have their blooming retarded for a few days.

Many experienced nut tree propagators have little success in grafting the butternut. But Mr. Harry Burgart of Michigan, has found that nursery trees may be successfully grafted if the operation is performed at a point three or four feet from the ground, while the late Dr. G. A. Zimmerman of Pennsylvania, found that very early grafting gave him the best results. He reported that his best catch was from grafts set March tenth. Some moderately successful propagators do not pay careful attention to outside temperatures when they cut their scions. In contrast to this let us see what Mr. J. F. Jones thought about it. He was undoubtedly the most successful nut tree propagator in the East and he was always as generous in sharing his hard earned knowledge as he was skillful in its application in his own commercial nursery. Note this from his paper in the 1920 annual report. "In the case of trees that bleed freely when cut, we must guard against taking scions after hard freezing weather and before the tree has fully recuperated. This semi-sappy conditions following low temperatures that freeze the wood seems to be a provision of nature to restore the sap lost by evaporation. We always try to avoid taking scions of any kind soon after hard freezing weather. I have found scions of English and Japanese walnuts, cut from trees in this condition, to be practically worthless for propagation, although they may have been cut in late winter long before the sap gets up in the tree naturally." This warning would undoubtedly apply to the butternut as it bleeds freely when cut. Another pitfall for the inexperienced propagator lies in storing scions in packing material that is too moist. Sphagnum is commonly used. It should be no more than slightly moist to the touch.

If left to run wild, the butternut curculios are a serious menace to the butternut, the Japanese walnut and the Persian walnut. Their life history as described at length in U.S.D.A. bulletin 1066, is briefly as follows: The beetles (called elephant bugs by some because the side view resembles the elephant) spend the winter in the ground. As soon as new growth appears on the host tree they begin feeding on the tender leaves and stems. Soon they begin laying their eggs in crescent shaped punctures which they cut in the new shoots and nutlets. The larvae hatch in a few days and tunnel through the pith of the shoots seriously injuring and stunting their growth while the [Pg 87] infested nuts soon fall from the tree. The eggs may be laid from late May to early August. They hatch in a few days. The larvae complete their growth in four or five weeks when they enter the ground to pupate. In about a month they emerge as adult beetles and begin feeding on leaves and leaf stems as their parents did in the spring, but they will do no egg laying until the following spring. Poison spray applied in early spring and again in late August and September should so reduce their numbers that they will not become a serious pest. Our State Experiment Station suggests the use of a cryolite spray as it is more effective against curculios than arsenical sprays and less likely to injure tender walnut foliage. The Mitchell hybrid, (butternut x heartnut) with us, appears to have natural immunity to the curculio. This brings to mind a secondary but very important reason for finding better butternuts,—namely that they may be used as a starting point for the super variety that someone should give the world from his long rows of crosses between the best butternuts and the best heartnuts.

The nut growers of this country are indebted to Dr. Arthur H. Graves of the Brooklyn Botanic Garden for a complete study of the Melanconis disease of the butternut. This study was begun in New York City but has since been widely extended. He thinks that the disease is probably present

throughout the entire range of the butternut and is usually responsible for the dead limbs that are so often seen in butternut trees. The Japanese walnut is also susceptible. The disease usually enters the tree through twigs that have been injured in some way. His conclusions, after thorough scientific laboratory and field work covering a period of over twenty years, is that it is caused by a weak parasitic fungus attacking rapidly only when the host tree is in a weakened condition; that it may lie practically dormant in vigorous trees and that it may be successfully combatted by fertilizing, mulching, providing necessary water in time of drought and avoidance of any condition that might weaken the tree. All dead twigs and all twigs showing fruiting bodies of the fungus should be pruned off some distance below the apparent infection as soon as discovered and the pruning wounds painted. Dr. Graves thinks it possible that butternuts grafted on black walnut stocks may have their vigor increased sufficiently to help in warding off the disease. Mr. Weschcke says that, although the Melanconis disease is prevalent in his locality, there has never been the slightest indication of it on the butternut trees which he has growing on black walnut stocks. If kept free of disease the butternut may reach great size. Dr. Robert T. Morris has stated that when he was a boy there were magnificent butternut trees over the greater part of Connecticut.

There still remains the stumbling block of lack of really outstanding varieties bearing nuts of good size, large percentage of kernel and perfect shelling quality with heavy and regular bearing. This is a large order to fill but it is a fair guess that somewhere there are wild trees better than any thus far brought to light. Trying to locate them should be an exciting assignment for a nut tree enthusiast. Do not think lightly of a butternut tree just because it looks small and unthrifty. It may be that the fault lies in an unfavorable location. Only an appraisal of the nut will establish its value.

The butternut is fairly abundant throughout its range which extends well up into Canada. In central New York there are uncounted thousands of butternut trees along fence rows, in the large and small valleys and along little streams. One person with limited time can hardly hope to examine more than a small proportion of them during the period when the nuts are ripe. The scout for better nuts should lose no opportunity to tell his errand to the people that he meets. I have found the average stranger interested and cooperative. He may direct you to a superior tree that you would never otherwise find. For this work one must be able, like the successful inventor, to hold his enthusiasm after many disappointments. If the coveted variety is not found, one at least has been out in the woods and fields during a wonderful time of year. [Pg 88]

The Use of Fertilizer in a Walnut Orchard

By* L. K. Hostetter, *Pennsylvania

Sometime in the fall of 1941 Professor Fagan of Pennsylvania State College, and Mr. Graham of Cornell University, called on me and proposed to make some fertilizer tests in my walnut orchard. The following spring Professor Fagan sent me 16 bags of fertilizer, one bag for each tree.

These tests were divided into three parts and each part had one tree that received nitrogen, superphosphate and potash, one that received nitrogen and superphosphate, one nitrogen and potash, one superphosphate only and one potash only and a sixth tree that received no fertilizer.

In the first group all the trees received a liberal amount of mulch. In the second group they received no mulch but the same fertilizer as the first group and in the third group they received the same fertilizer, no mulch but raw lime was added to the fertilizer. One tree received lime only.

There was a heavy sod in the part of the field where these tests were to be made. This sod was torn up with a springtooth harrow (weed hog) about March 15th and the fertilizer was applied on May 6th.

That year was a very poor one in which to make these tests, for during all of July and August we had continuous rainy and cloudy weather and by the first of September all of the leaves had turned yellow and dropped.

Most of the trees had a big crop of walnuts which were gathered about October 10th, the nuts from each tree being kept separate. After they were cracked the kernels were weighed and graded and believe it or not, the tree that received lime only had the best grade of kernels, and second best were one that received lime and potash and another lime, nitrogen and potash. The tree that received mulch and potash also had a very good grade of kernels.

In 1943 the same tests were repeated. This was again a poor year for we had very little rain during all of August and September just when the trees needed it most. The tree that received nothing had the best quality of kernels and again all the trees that received potash had good kernels.

In 1941 I grew two acres of tobacco and the following spring the stalks were cut in one-inch pieces and put on about twenty-five trees. The first year I could not see that it did any good but this past summer all the kernels from these trees were just perfect. It surely is a pleasure to

crack walnuts when at least 98% of the kernels are perfect. [Pg 89]

Lime and Fertilizers for Our Black Walnut Trees

By* Seward Berhow, *Iowa

In 1941-1942-1943 black walnut crops from trees growing in timberland in competition with other trees were nearly a total failure. The nuts were fair in number but not filled, the kernels badly shriveled, tough, lacking greatly in flavor and discolored. Some of these black walnut trees have been bearing for 50 years. Are they through, due to having used up all the soil fertility?

Wild or native black walnut trees, growing on good soil and not crowded have done better. It looks to me as if it is time our experiment stations, particularly those having black walnut trees on or near their grounds should start studying the cultural requirements of nut trees in the way of lime and fertilizer for better nuts. I have experimented by applying lime and fertilizer to a few bearing trees with very good results. But we need to know the proper amounts to be used for all sizes of trees from the transplants to the bearing trees of different sizes. Such investigations can best be conducted by our experiment stations.

There is a very substantial increased demand for grafted nut trees each year. This is evidence that we should make a study of our nut tree culture and care.

The Propagation of Black Walnuts Through Budding

By* Sterling Smith, *Ohio

The propagation of black walnuts by budding has proven a highly successful experience. By following this method over a period of several years, under normal weather conditions, the results have been fairly uniform.

Stocks, upon which to bud, may either be secured from private nurseries, state forestry departments, or by planting the seed of vigorous native nut trees. If one desires to produce his own stock, the nut seeds should be planted soon after they are gathered. A garden nursery row makes a desirable place for small plantings. If a large scale increase is contemplated it is best to plant the seeds where the trees may be left to grow to maturity. Plant two or three seeds a few inches apart (within a hill) and space these hills as the land available will warrant, anywhere from twenty-five to fifty feet apart. Should all the nuts sprout there will be a three-to-one chance for a healthy tree, and if more than one good tree is produced in each hill the excess stock may be transplanted. After the stock has grown for one year it should be cut back to within four inches from the ground. Such stock makes good material for experimental grafting. By pruning the stock in the spring it forces new growth upon which to place buds later in the season. In the budding process the Jones patch budder has been very successfully used.

Along the southern shore of Lake Erie the first week in July is a favorable time to begin this procedure. Due to the fact that the northeast side of the tree is the coolest and shadiest the greater part of the day, there the buds should be set. With the budding tool cut through the bark [Pg 90] of the stock, several inches above the start of the new growth. Do not remove the bark. This produces a gathering of callus-forming material at this point and aids in the healing in of the bud which is to be later placed there. My experience shows successful results in many instances where I had failed to make this previous cut.

Bud wood should be new and vigorous growth, the first five or six buds nearest the spot from which the growth started being the best. When the bud wood is available cut off the first four or five leaf stalks close to the buds. By the time the buds are ready for use the remainder of the leaf stalk will have ripened or dried and fallen off, and the bark underneath hardened off. If this is not the case the bark is apt to rot at this point, which is directly beneath the bud itself. Bud wood, procured from any source, should be trimmed with the stub of the leaf stalk cut as closely as possible to the bark. If the budding is not done immediately those cuttings may be wrapped and stored in a cool place (about 40° F.) for several days before using. In a hot, dry season the actual budding should be started soon after the middle of July. Due to the excessive amount of rainfall during 1943, buds which were set on July 24th yielded poor results, while those applied later in the summer, about August 12th, healed in one hundred per cent.

Procedure: Cut the patch bud from the bud stick with the bud in the center of the patch. Place this patch bud between the lips, as this is a clean and convenient place to hold it. Next, cut the patch, which has been previously marked out, and quickly place the new patch in the opening, tying in place. As many as three or four buds may be similarly set before they are coated with wax. Parapin wax (a paraffin and pine gum mixture) is an excellent substance for coating the buds, due to its rubber-like, non-cracking qualities. A convenient homemade contrivance for melting the wax may be made by soldering a small can into the top of a railroad lantern. Rubber

bands of good quality have been made especially for budding by several large rubber companies. These are ideal for tying the buds in place and may be reused several seasons. Treekote, an asphalt emulsion, has proven a successful substance for coating the new work. After the buds have set for two weeks remove the rubber bands and examine. Where buds have failed to heal in properly, and room remains on the stock, new buds may be applied just below the scar.

When the trees show signs of growth, the following spring, cut them back to the top of the bud patch, cover the cut with Treekote and prevent all growth on the original stock from developing. The placed buds are frequently slower in starting than the natural buds. A stake driven beside the young stock makes a convenient support for the rapid new growth, which should be tied to prevent breaking by strong winds.

Trees started in the nursery may be transplanted to permanent locations the following spring, inasmuch as the spring of the year has proven a more satisfactory time for transplanting than the fall. To attain success in transplanting the newly dug tree, roots should be exposed as little as possible to the air. Prepare the holes before digging the trees, moving one tree at a time for best results. Move as much of the root stock as possible, usually about 18 to 24 inches. Trim roots with a sharp knife, making a clean cut facing downward. Remove at least half of the top growth [Pg 91] of the tree and plant at once, tamping the loose dirt firmly about the roots. Water generously and slowly around the loose soil to aid in washing the dirt thoroughly around the newly disturbed roots. With severe pruning, trees may be transplanted after new growth has started. During periods of drought the soil around the trees should be thoroughly soaked from time to time.

In conclusion, it may be said that due to varying conditions of soil, climate and locality, for best results the proper time to bud may be either earlier or later in localities other than northern Ohio. Various factors may alter the procedure in those localities due to the individual operator's experimentation, from which he has devised methods giving him the best results.

Note: The trade-name items mentioned in this article may be obtained from any reliable nursery supply house.

Northern Nut Growing

By* Joseph Gerardi, *Illinois

Judging from the demand for nut trees the public is fast becoming aware of the possibilities of growing its own nuts. Heretofore nut growing has been confined to two favorable sections of the United States, the west coast and the southern pecan groves. But, now we can safely plant the pecan as far north as Springfield, Illinois, and from all indications some trees found in Cass County will extend the northern limit another one hundred miles.

The pecan is the favorite nut of nearly everyone, in fact it is preferred to any other nut for its pleasing flavor and easy cracking. Wild nuts used to be gathered from native trees without consulting the owner, but since they are selling at good prices the owners of trees gather them themselves. Fortunately, through efforts of far-seeing individuals some very good pecans have been found that can be grown successfully much farther north than the southern pecan belt. Our nut enthusiast, Dr. A. S. Colby, has drawn the attention of the writer to three promising pecans that he located in Cass County, Illinois. This extends the northern pecan limit much farther north than we formally considered them adaptable.

For this locality we can now boast of quite a list of pecans that have been doing well. Of the older introductions Greenriver and Busseron can safely be recommended, and of course, the local finds are all good here, at least the parent trees are doing so well that the public is planting them in preference to the older introductions. West of the Mississippi River Giles, Clarkville and Norton can be recommended.

Prospective pecan planters should bear the following remarks in mind. Environment has a decided influence on the behavior of plants and the nut tree is no exception. As they are taken farther north of their original habitat the nuts become smaller and do not fill as well. The black walnut may be considered an exception to this statement. Many local finds and some southern pecans are perfectly hardy as far north as Chicago and Ontario, but can not be expected to ripen any of their nuts. Many southern pecan trees in this locality are wonderful lawn trees but as bearers they are worthless. [Pg 92]

The Black Walnut

The list of black walnuts is altogether too long. Of the numerous introductions only a few are retaining their popularity. In this section I would still plant Stambaugh for its cracking and bearing qualities and its thin shell, but its flavor does not equal that of Thomas and Mintle. The Mintle is smaller but a much better cracker than Thomas. It is also a young and heavy bearer, grows fast and straight as a candle and grafts easily. The Elmer Myers will become the most

popular black walnut in sections where it does well, provided its thin shell will withstand machinery hulling without injury to the nuts. We have not fruited the Myers as yet. The black walnut is fast rivaling the pecan, and for confection surpasses it because it retains its flavor after being cooked or baked.

Persian Walnuts

The Persian walnut in spite of its popularity does not appeal to me. Its flavor can not compare with that of the pecan, hickory, or black walnut. Besides, it is too exacting as to climate and soil. We have tried all the supposedly hardy ones but so far only one will withstand our changeable climate. This one came from a New York nursery and the name was lost. We list it as the Schmidt for the man who owns the tree. This tree is now some twenty years old and bearing well. So far it is remaining healthy as also are the trees grafted from it. Our trouble with all other varieties of this species is that they make a second growth in fall and then succumb to frost. Of all the Broadviews, Shafers, Pekins and Crath seedlings we have grafted in the last ten years not one is now alive in this locality. Something puzzling to me is that two Broadview seedlings we now have growing from seed I obtained from Mr. Corsan of Islington, Ontario, are growing slowly but are still healthy after the '40 and '41 seasons. All the rest of the trees from this same seed succumbed.

Filberts, Hazels and Their Hybrids

The Winkler hazel failed to bear the past season the first time in 15 years. All pure filberts we have tried in this locality are a failure. Of the hybrids, Bixby and Buchanan are promising.

Chestnuts

The Mollissima chestnut is very promising in southern Illinois. The tree requires protection in this locality as it sun scalds badly if not protected. No doubt many orchards will be planted in the future.

Propagating Nut Trees

This is a fascinating subject full of disappointments. We have our ups and downs as does everyone else who attempts it. I get numerous letters telling of their experience and troubles asking for details just how to go about it. What makes it so fascinating is that in certain seasons we have fabulous success and them again in others almost complete failure. Fall of '41 and spring of '42 we averaged 75% catches in budding chestnuts. Fall of '42 and spring of '43 our chestnut budding was just about nil, only 3 or 4% catches, and I am at a loss how to account for this variance.

A budded chestnut tree is much superior to a grafted one as far as the union is concerned. Grafted trees usually do not knit well the first season while at two years the union is good. So we also must learn our chestnut propagation all over again. [Pg 93]

I have a letter before me from Brother Borst asking why his walnut buds took so well and not one of them vegetated in spring. This happened to us a number of times on both walnuts and hickories. Also, in the same season, we have had one or two varieties, of which we did not set many buds or grafts, to show 100% catches, while other varieties set the same day would be 100% failure. Apparently all scions used were in prime condition. Why then this great variance? While we used the double-bladed knife for budding and the side graft for grafting, other methods are just as successful under skilled hands. The skill of the operator has much to do with it.

Fall budding of persimmons. The persimmon has only about ten days in which it will fall bud. Before or after this period budding will not succeed. It also is important that the scions be taken from thrifty trees a number of years old. The ordinary "T" shield budding gives good success on the persimmon either spring or fall. The spring bud sticks should be perfectly dormant.

Butternut and Japanese Walnuts and Their Hybrids

None of these are worth the space they occupy in this locality. 1-18 on which I reported last year didn't set a nut this season. Of all the heartnuts I am acquainted with none are satisfactory. There is a siebold tree in St. Louis that so far we have been unable to graft that promises to be adapted to this vicinity. It is good bearer, good cracker and pleasant flavor. This class of nuts is adopted to the north where the pecan is unsatisfactory.

The Hicans and Hickories

The hicans are numerous in this and adjacent counties. While a number of them are good, I have located none that can compare favorably with Bixby, Gerardi, and Pleas for this locality. The Pleas is a bitternut hybrid and has some bitterness in the kernel, but no more than the English walnut and people like it. Of the twenty hicans we have tried the above three only are satisfactory.

In this latitude the hicans are unquestionably the most satisfactory nut trees to plant. They grow fast, bear young, have a high flavor, crack well and are unsurpassed as shade or lawn trees. Here the Gerardi and Bixby are the best so far fruited. The Pleas is very ornamental but lacks flavor. The Burlington and Fairbanks are adapted to the north but here are not satisfactory bearers.

I have reports on about 25 Gerardi hican seedlings. They are all worthless, smaller in nut than either pecans or hickories. The peculiar thing is that some of the pecans are decidedly bitter in flavor as also are some of the hickories. Two of the seedlings show shellbark blood.

Handling the nut weevil and plum curculio. Two years ago the few nuts the Gerardi hican had were all wormy. Last spring I cultivated the ground with a one-horse cultivator and gave our chickens free access to the feast. They made so good a job of it that not a single nut was stung this season. Where the ground can be flooded for several days this will also exterminate the weevil. The same treatment applies to plum curculio. Cultivation should be done before growth starts in spring, or quite late in fall. [Pg 94]

If anyone ever got a Pleas hybrid nut to grow I would appreciate ever so much to hear from him. So far all my trials to germinate the nuts have failed.

I may add that in my estimation no land on this globe is blessed with a nut flora that equals that of the United States.

Nut Puttering in an Off Year

By* W. C. Deming, *Connecticut

I did manage to get over to Avon Old Farms, the boys' school, and topwork a few hickory trees. All grew, about a dozen, except three scions of one kind that I put in one tree. This is the third year that I have grafted hickories on the grounds of this school, some three thousand acres. The school was planned and built by Mrs. Theodate Pope Riddle, and I was told there that it cost seven million dollars. It is a beautiful and original group of buildings in the lovely Farmington River Valley, well worth visiting.

Mr. Sperry the science teacher, is deeply interested in the nut trees. Dr. Arthur Harmount Graves and I have both given him a number of chestnut trees, and I have added a variety of others, walnuts, persimmons, papaws, pecans, filberts and others as well as the topworked seedling hickories. The trees have been given reasonably good and intelligent care. Many trees were badly winter killed or injured last winter when the temperature dropped to twenty-four below zero in Hartford, official, and is said to have reached forty below in Litchfield county. Japanese chestnuts were especially badly injured. But hybrids having an American strain seemed generally to be little injured. Filberts also showed bad injury. Pecans, persimmons and a papaw seemed to have weathered the winter, though they should be further observed before deciding. The nut trees have been set out in orchard form over tracts of a number of acres and well fertilized. The land is good.

Incidentally Mr. Sperry expressed the thanks of the school with more than one bottle—of fine maple syrup which he and the boys make every spring.

The mollissima chestnut tree in my yard at Litchfield, which Dr. Graves considers remarkable because it bears a moderate crop of fertile nuts every year without apparent benefit of outside pollination, was stripped almost bare of branches by an ice storm. It had reached thirty five feet in height, mainly, perhaps because pretty well surrounded by taller trees. Now it has to start over again from a much lower height. It bore a few nuts on the remaining branches this year.

On account of the restrictions on driving I did not visit Mr. Beeman at New Preston, but he wrote me that he had a few quarts of hickory nuts, chiefly Glover from one of his large topworked trees. He has a couple of acres set out to grafted hickories, some of which have been bearing for several years. Pretty good for a man now 86 who began nut growing less than ten years ago and who has serious physical handicaps. He is the man, as many of you do not know, who, when he began with nut trees, built scaffolds 40 feet high about each of two hickory trees in his yard, and topworked them almost to the last branch by a method of his own One reason for his success is [Pg 95] that he is a violin maker with a record of perhaps fifty violins, violas and 'cellos, and he makes his own tools. He is a modest man whom it is a privilege to know.

I have had some interesting experiences with papaws this year. For the first time I have succeeded in growing the seed intentionally. The only other time when I have had seedlings was when a bunch of them came up by themselves in the yard as thick as hair on a dog. Last year (1942) in the fall, I scattered a lot o£ seed in a perennial bed and poked them in with a cane and also in a reentrant angle of a house looking to the northeast, behind some rather luxuriant Christmas roses (helleborus niger) where there wore also lilies-of-the-valley and jack-in-the-pulpits and the soil had been rather heavily enriched. In both places the papaws came up quite freely, especially in the angle of the house where the sun struck only a short time each day. The chief reason, however, was probably the rich, deep soil. These seedlings with taproots 6 to 8 inches long were easily transplanted with their leaves on. I brought four of them to St. Petersburg, Florida. They are said to be native in upper Florida.

Dr. Zimmerman, who was our authority on papaws, said that he thought hand pollination was necessary for good crops. I have been making observations on this for several years and in 1942 obtained confirmatory results. Last spring (1943) I hand-pollinated a tree about 18 feet high using pollen from a number of other trees. This was the same tree on which I had had good results in 1942 over the limited part of the tree that I had been able to reach from the ground. This year I used a stepladder. Also, because the tree was close to a tool house, on the grounds of the park superintendent, I was able to reach the top of the tree from the roof of the tool house. From this tree I gathered about 100 fruits, all but two perfect, weighing together 23 pounds. There were several bunches of three and four and one of six. The quality I did not think as good as some. But it seemed a pretty good demonstration of the value of hand pollinating.

In the yard of a house in Hartford, belonging to the widow of a high school classmate of mine, I found a number of papaw trees, some of them as big as they often grow, perhaps forty feet high and up to a foot in diameter. The lady told me that they used to bear abundantly when her neighbor just over the fence kept bees. Since these are gone she has had very few or no fruit at all and the squirrels got them, if there were any. I pollinated a lot of blossoms that I could reach from the ground and in the fall they were quite loaded with clusters of fruit, but much smaller than those on the first tree described. They were, however, of better quality. There was also a small number of fruit in the high branches of the trees and some of these the squirrels cut off, but apparently just for fun as I did not see any sign of their eating them.

I am writing this in St. Petersburg, Florida. I boarded first with a man who describes himself on his card as a tree surgeon doing grafting and budding, spraying, fertilizing and pruning. This year he took the agency for the Mahan pecan and has sold quite a number at $5 each, with one order for twenty trees. These are put out by the Monticello, Florida nursery. The history of their buying the Mahan pecan tree, and a picture of the parent tree in its original home, is given in the files of the American Nut Journal, an index of the seventeen volumes of which I completed this [Pg 96] year. Mr. Stewart sets out all the trees he sells and is meticulous in doing so. Nearby is a good sized Mahan tree with still quite a crop of nuts (in November) after a good many have been gathered. Mr. Stewart speaks well of this pecan tree as a good bearer, with nuts well-filled and of good quality. I haven't cracked enough of them to verify these statements but they are offered by the Monticello Nursery in fifty-pound lots. They sell at Webb's in this city for 65 cents a pound. Schleys I believe sell for 45 cents at the same place. The Mahan is, I think, the largest pure pecan, about a third larger than the Schley and those I have seen were equally thin-shelled. I mention this because I had supposed that pecans did not do well as far south as this. Yet I see many trees about the city, some with fair crops on them and some in good foliage, though many, or all of them I have observed, are partially defoliated by the fall web worm. I saw one fine tree that I was told was a Stuart. The Moneymaker also is said to do well here. I speak particularly of the Mahan because it has not, so far as I know, had the unqualified approval of the experts. But what has? And I don't know that it deserves it.

It is a joy to be among the many citrus fruit trees, the guavas, papayas, avocadoes, loquats, surinam cherries, new and strange fruits and flowers of many kinds in Florida. The Australian or Queensland nut, Macadamia ternifolia, grow and bear well here, I am told—but the squirrels got all the nuts! But the greatest joy of all is the freedom from ice and snow.

Nut Nursery Notes

By* H. F. Stoke, *Roanoke, Va.

The present season has seen an increase of interest in nut tree planting that is new in my experience. This interest is apparent not only in retail orders, but is reflected in inquiries received from large general nurseries, many of which have not been listing nut trees. I do not believe that this interest in food-producing trees is a passing phase of the war, but that it will continue if honestly catered to and wisely directed.

With apologies for personal reference, the demands of my small commercial nursery on my time and attention have become so heavy that I am faced with the necessity of either building a permanent organization of skilled workers or dropping out altogether. Due to advancing years and other considerations I am choosing the latter course. Because of this I feel free to make certain remarks as to the future of nut tree production that I would hesitate to make if I were still in the business.

Without doubt many of the large commercial general nurseries will take up the growing and selling of nut trees. We who have pioneered in this work, should welcome the increased public interest that will result from the more extensive advertising and cataloging of nut trees. The specialist who has worked out propagation, pollination and variety problems should be more than able to hold his own against the competition of newcomers in his field, however large.

As all old-timers know, there are certain factors in the growing of nut nursery stock that do not lend themselves to the mass-production methods of the large general nurseries. Stocks, generally, take longer to produce. It may take as much as six years to produce a saleable hickory [Pg 97] tree from the time the seed is planted. Failures in grafting and budding walnuts run high,

especially with beginners. A catch of twenty-five per cent means either selective hand digging must be resorted to or seventy-five per cent of the seedling stock must be sacrificed if power digging is used.

Suitable grafting stock for chestnuts is still a matter of controversy. Good authorities claim that Chinese chestnut is unreliable as a root stock while others, including myself, as stoutly maintain that the main need is for proper technique in grafting and budding. These and other considerations, including the training of workers in improved technique, offer certain obstacles to the newcomer which, in turn, offer certain temptations that may result in harm to the whole movement toward nut tree planting.

To be specific, the difficulty of producing good grafted or budded trees of named varieties may readily tempt the less scrupulous to sell any kind of nondescript seedling, while at the same time giving the public the impression that superior stock is being offered. This is, in fact, already being done. I have before me the catalogues of three large general nurseries. One of them offers what are obviously seedling Chinese chestnuts in these words: "Only two years from now, right on your own grounds, you can pick up big, fat, tasty chestnuts from the trees you plant this year."

Of English walnuts—no variety name given and quite obviously seedlings—the following description is given: "Thin-shelled, large, delicious nuts, producing heavy crops and demanding good prices". In both these cases the prices asked are as high or higher than good, grafted, named varieties can be bought for elsewhere.

The second catalogue offers seedling black walnuts, not so designated, and also "Thomas Improved" black walnuts at a higher price. Seedling English walnuts, not stated as such, are offered as having commercial possibilities and being as good in quality as those grown elsewhere. The third catalogue is entirely ethical and legitimate. It lists a limited assortment of well-selected varieties under their true names.

When misguided buyers purchase a seedling chestnut tree with the expectation of "picking up big, fat, tasty chestnuts in two years from planting" and realize a handful of nuts after ten years of waiting, or nothing but empty burrs because of lack of pollination, nut tree planting gets a black eye. The same is true when the buyer tenderly nurses a weak-rooted English walnut seedling for fifteen years before he gets a few small, thick-shelled, astringent nuts.

When nurseries that show honesty in their advertising write me for information I give them the best I have. When their advertising is otherwise I do not trouble to answer. One party, after asking many questions, wound up by saying he wanted "to get in on this nut game." My impression was that if he had said "shell game" he would have more accurately stated his case.

Buyers should be on their guard not to be deceived by flowery, but vague descriptions. If catalogues list nut trees by recognized variety names it is pretty safe to assume that the trees are as represented. If recognized variety names are omitted the trees may safely be considered to be seedlings and that they will produce a wholly unknown quantity, no matter how alluring the [Pg 98] advertising. Of course, this is not intended to discourage the planting of new varieties offered by nurseries of known reputation for integrity, nor of such strains as the Crath Carpathian walnut importations, from which new varieties are emerging.

As a practical note I wish to state that the black walnut is by far the most satisfactory stock on which to graft walnuts of any species. Not infrequently seedling English walnut trees take from ten to fifteen or more years to come into bearing. I have fruited fifteen or more varieties by grafting on black stocks, and in no case has it required more than five years for the trees to bear. Frequently they have borne in two or three years. The English walnut is also a more vigorous grower on black walnut roots than on its own.

The Sherwood butternut grafted five or six years ago on butternut stocks has not borne yet; grafted on a small black walnut in the nursery row in 1942 it bore one nut in 1943 and has many staminate buds for 1944 visible at the present time. Walters heartnut bears the second or third year on black walnut; it has not borne for me on butternut after seven years. The same holds good for the other heartnuts.

In the grafting of chestnuts, defective (incompatible?) unions can generally be spotted the first year. They develop with a transverse fissure into which the bark ingrows. Good unions show new tissue entirely around the closing wound; the final scar as healing approaches completion being vertical, i. e. longitudinal with the stock. This result can be obtained by proper technique.

The members of the Association can do much to further the cause of nut tree planting by discrimination in recognizing the ear-marks of honest advertising and encouraging their friends to make their purchases from conscientious, responsible nurserymen. Our Association nursery list is a valuable help in this direction.

Report from the Tennessee Valley

By **THOMAS G. ZARGER, TVA, *Norris, Tennessee***

Black Walnut Industry—in the early fall of 1943, a survey was made of the black walnut industry in the Tennessee Valley and Nashville Basin. Four commercial cracking plants had shelled 10 million pounds of nuts purchased in 1942. This year, cracking plants have offered to buy unlimited quantities of nuts in the shell at the relatively good price of $4.50 per 100 pounds. Because of the manpower shortage, especially on the farm, the collection of nuts has not exceeded the preceding year. Pasteurizing plants had processed a quarter of a million pounds of kernels purchased in 1942. This year only three pasteurizing plants will operate, and a smaller quantity of kernels will be processed. The kernel supply from the home-cracking industry has decreased because the sanitation requirements of the Federal Food and Drug Administration are difficult to meet in the homes.

Bearing Habits of Wild Black Walnut—Looking forward to a fuller utilization of the wild black walnut crop, the bearing habits of the black walnut tree is being investigated. Four-year records are now available on tree growth, nut yield, and nut quality of sample trees located throughout [Pg 99] the Tennessee Valley. For 121 trees, with a range in diameter from 4 to 28 inches total dry nut yield, in pounds, averaged as follows: 1940, 31; 1941, 24; 1942, 38; 1943, 29. There is some evidence of alternate bearing, with a heavy crop followed by a very light crop. How much larger nut crop a larger tree is expected to bear was found to increase on an average trend from 0 pounds of filled nuts for a tree of 4-inch diameter to 65 pounds for a 24-inch tree. Judged on the basis of nut quality, only one of the sample trees compared favorably with standard propagated varieties of black walnut. Filled nuts on the average, amounted to 83 percent of total nut crop weight, and had a total kernel percentage of 21. Recovery of marketable kernels averaged 17 percent of total nut weight. In order to learn still more about the bearing habits of the black walnut, records on all sample trees will be carried on for two more years.

Macedonia Black Walnut—A sample of black walnuts from a tree growing on the home place of Mr. N. U. Turpen at the Macedonia Community at Clarksville, Georgia, were sent to us for evaluation in 1939. The nuts were thought to be two years old—from the 1937 crop. When tested, the kernel content averaged about 40 percent—the highest on record for a black walnut. The tree, supposed to be the one which bore the nuts we tested, had not borne any appreciable amount since 1937. Since the tree yielded good crops in 1942 and 1943, we are now in a position to report further on the Macedonia walnut. Based on cracking tests of nut samples, the average nut weight and kernel percentage were 16.8 grams and 28 percent in 1942; and 16.4 grams and 29 percent in 1943. It is apparent that the Macedonia black walnut has not exhibited those exceptional characteristics of thinness of shell and high kernel percent which were found in the original sample tested.

Report from Minnesota—Letter from Carl Weschcke to Miss Mildred Jones

The winter of 1942-43 was the most damaging on fruit and nut trees within my experience of 25 years in River Falls, Wisconsin. The main reason was that we had a long wet fall and all vegetation was in a succulent green condition when our first snow storm of September 25th hit us. For other details of this winter and the Armistice Day storm of 1941, the second in its deleterious effect on horticultural varieties, please write Mr. C. G. Stratton, Coop. Observer, of River Falls, Wisconsin, who is in charge of the U. S. Government weather bureau there. Mr. Stratton furnished me with an affidavit showing one of our very coldest winters in which the temperature went down, in February, to 47° below zero. This was in 1936. This winter of extreme cold did very little damage to trees, and an apricot on which I had taken out a plant patent, subsequently called the Harriet apricot, went through this winter without any damage and bore fruit the next year. This gave me such confidence in its hardiness that I began to propagate it for sale. The winter of 1942-43 wiped out practically all of the apricot trees of this variety and all of the early Richmond cherries that had been growing on my farm for nearly twenty years. It killed more than half of the catalpa trees which were nearly as old. It also killed outright a large Stabler black walnut which had been grafted on a Minnesota seedling nearly twenty years previous. This was a fine large flourishing tree that bore each year and I had thought because of this behavior [Pg 100] that Stabler was to be considered one of the hardiest of the black walnuts. It had stood up better than Thomas many winters. I could go on enumerating failures of many other varieties and species but it is a long story and a sad one.

To make this report more concise I will now give you my opinion as to what is hardy under these severe tests. To begin with, one of your father's hazel hybrids, of which I have two bushes, stood all of this very well. These bushes, which are perhaps fifteen years old, are still flourishing, although the main trunks are decaying rapidly. Several of the sprouts are blossoming freely. These two bushes have borne only one crop of nuts, although they blossom freely, and the catkins are about as hardy as anything in the filbert line that I have seen. The reason for their not bearing is lack of pollination. I never did find out what was satisfactory, even at the time that I hand-pollinated them to get a crop of nuts. The nuts are much more satisfactory than Winkler or Rush hazels. The Rush is absolutely worthless here; is subject to blight and is very tender to our winters. The Winkler is a very hardy variety, bears something every year. The trouble with the Winkler is that it matures its nuts so late, much later than the Jones' hybrid. I never have propagated your father's hybrid for sale as I did not know a hardy pollinizer for it. I have sold a

few Winklers, recommending them for proper locations. I have one Winkler planted by a small lake cottage up at Delta, Wisconsin. This is about thirty miles west of Ashland, Wisconsin. This territory is very uncertain for successful corn raising so the Winkler is quite a hardy bush.

Four hybrid plants that bear worthwhile nuts, which grew from seed planted in 1933 and 1934, are perfectly hardy, almost as hardy as the native wild hazel and hardier than any other worthwhile filbert or hybrid that we have. This hardiness is no doubt due to the fact that the mother plant was an ordinary wild Wisconsin hazel. These hybrids, from the native hazels, we call "Hazilberts," and have obtained a United States trademark on all plants produced after this manner. Here again I have not recommended nor sold any of these because of my lack of knowledge as to the correct pollinizer; this has yet to be developed. They do not pollinize themselves nor do they pollinize each other satisfactorily. They have all the finest characteristics that you could ask for except prolificacy which may be due to the lack of a proper pollinizer. They are the most resistant to the hazel blight of anything that I have worked with so far in 25 years. Hard winters, such as we have had recently, have no deleterious effect on them. They blossom and do not lose any of their wood and apparently there is no injury. They are very vigorous plants and can be trained to a single tree standard or they make very tall-growing vigorous bushes. I have placed these filberts and their hybrids first on my list of recommended trees because they are going to be the backbone of nut tree production.

I have nearly one hundred experimental European filberts, mostly of wild varieties, of which about a dozen are hardy both in pistillate and staminate bloom, even in our most severe winters, although of this dozen only about two or three have nuts which could possibly be considered commercial. Practically all of these are being injured in one way or another by the blight. Many have passed out of existence and only two or three have been able to resist the blight so that it doesn't seem to make any headway. I do not do anything for a blighted filbert—it must take care [Pg 101] of itself. I have experimented along these lines, however, using chemicals and other means of protection. I do not know of anything adequate except to build resistance in the plant itself through cross-breeding.

The next really successful plant is the Weschcke butternut. This is a native butternut which I discovered on my own farm. Every local woods has butternut trees in it. We must have at least five hundred butternut trees in our woods; they are subject to some kind of a bark disease but this seems to encroach on the life of the tree very slowly since trees that I remember showing signs of this disease nearly twenty years ago are still living. They are awful looking sights, however, by this time. Such large trees that have developed this blight are possibly in the neighborhood of fifty years old. The Weschcke butternut is a medium size to small butternut. Its great value lies in the fact that it splits exactly in half and the shell structure is so shallow that by merely turning the nut upside down the kernel falls out—nothing to hold it in the shell. Very frequently the kernel stays absolutely intact, its wings being held together by the little tender neck joining them at the point of the nut. The nut kernel is tender and light colored. The difficulty here is grafting them on black walnut roots; after they are grafted they grow very rapidly and bear at once. I have had them bear the first year grafted.

Next in line of hardiness and reliability is the Weschcke hickory. This is now an old-timer; since its successful grafting in 1934 it has borne an ever-increasing crop every year. This is not to be measured in bushels, however, but in pounds. No other hickory nut has begun to touch it, in its regularity, reliability and its quality: that is, no hickory so far north. It is the thinnest shelled hickory of any that I have ever tested out, and releases its kernels about the best of any. It has one fault, however; the staminate blossom is abortive, never produces any pollen. It needs a pollinizer and we have been recommending the Bridgewater and the Kirtland which we know by actual experiments have produced pollen in large amounts, sufficient for pollinization of this tree. Even before Kirtland and Bridgewater pollens were available those trees, grafted to the Weschcke, bore hickory nuts every year, but in very small quantities. I am now quite sure that they borrowed pollen from the wild bitternut trees which are in abundance nearby. There is also the other possibility, which has not been conclusively proved, that this variety is a parthenogen. Innumerable hard frosts in early springs have destroyed butternut crops and walnut crops, but these hickory nuts invariably come through such seasons and escape the early fall frosts, which come in September, for the reason that the nuts are matured usually the second week in September. We therefore can recommend the Weschcke hickory freely. We have not determined how far north it can live, but I believe the 45th parallel is very safe, and as far west as the Dakota line. It originated at Fayette, Iowa, and probably would thrive far into the south. It grafts extremely well on the wild bitternut hickory root which is about the hardiest known. Your father was very partial toward it as a stock. This root system does not handle all hickories by any means. In all my trials using pecan scions the only pecan which grafts well on it and survives indefinitely, is the Hope. This is also a very hardy tree but we cannot recommend it as a nut tree because we have never seen the parent tree bear any nuts. The parent tree is now twenty years old. Quite a large tree but no nuts. It is growing in an unfavorable location for bearing since it is [Pg 102] shaded by much larger trees. It is growing right here in St. Paul.

The Bridgewater and the Beeman are two more hickories which are very hardy and which come into bearing quickly, also are successfully grafted on bitternut root. They do not mature their nuts so reliably nor so early by any means as the Weschcke. For a little further south they might be very reliable. They are fully as hardy and satisfactory in every other respect. The hickories that have proved to be fairly hardy but have produced very few nuts are the Cedarapids and the Kirtland. The Beaver hybrid hickory is probably next for nut production satisfaction, grafts well

on bitternut root but does not seem to have a long life. The trees that I bought from your father nearly twenty years ago are now dead although they lived to become large fine trees and bore in some seasons very nice crops of nuts. The Fairbanks hickories, grafted some seventeen or eighteen years ago, are still surviving, but bear very few nuts, some seasons practically nothing at all. They very seldom ripen as they mature very much later than the natives or the other varieties mentioned above. I do not consider the Fairbanks a very edible nut anyway as they become very rancid after a couple of months. The Beaver is not a good keeper either. This is rather an important characteristic in a nut and one in which the Weschcke excels, as in ordinary office temperature it usually keeps two or three years. I believe that this is partly due to the thin shell. My theory is that the thin shell expands and contracts with heat and moisture conditions without cracking. This prevents air from getting at the kernel, and since it is the oxygen which is mostly responsible for rancidity, this exclusion of air probably accounts for the fresh state that these nuts maintain for a long time. I have noticed that thick-shelled shellbarks and, to a lesser degree the shagbarks, crack open, in minute hairline cracks, and these nuts which split like this invariably soon become rancid.

Now the black walnuts are next in order. For many years I considered the Ohio a worthless variety. They would seldom mature any of the nuts, and although they were regular bearers the thick hull was a nuisance. I have had twenty years' experience with this variety and they are the hardiest of all the old ones. They stand up very well and each year the nuts become a little more satisfactory. Evidently the trees have the ability to acclimatize themselves and they stand up better than Thomas, Stabler or Ten Eyck of the old varieties that I have tested.

More recent varieties which I have tested and have proved satisfactory, are the Paterson and the Rohwer; I recommend these two above all other black walnuts. I have two seedlings which I am watching with a great deal of interest. One is from Minnesota and the other is a failed grafted tree which sprang up from the root and so far is beginning to bear prolifically a medium sized nut with a rather thick shell which does not crack out very well but the quality is superb. It has a thin hull which you can pop off by merely pressing your thumb against it after it is thoroughly dry, coming off very clean leaving a good looking nut. The kernel is very light straw-colored and you can generally get them out in good pieces, about one-quarter of the whole kernel. Above all it matures very early, about the middle of September or sooner, and this is the deciding factor for any nut, because, no matter how well It cracks, how prolific it may be, or hardy, if you do not get a ripe nut you have nothing for here in the north. I feel quite certain that this is going to be the standard black walnut for the north. For want of a better name I have been calling it the "Ruffy" [Pg 103] because the hull, when green, has a pimply surface and a rough appearance.

The other black walnut that I am watching is a seedling resulting from ten bushels planted nearly twenty years ago, the only tree to bear because of the crowded condition of all these walnuts planted so close together. I have been watching it for six or seven years and was never able to get a mature nut until this year. Reason was that in most of the seasons the nuts were empty; other times I did not wait until they were fully ripe, being too anxious to find out what was inside. This tree I have named the "Walbut" because it seemed to me it might be a cross between a butternut and a walnut. The kernel is very light colored. It cracks out the best of any walnut I have ever tested. It is difficult to graft, so far in my experience. I have no living grafts from it although I have tried again and again to graft it on other large isolated stocks in the orchard. It has a square shape, with deep indentations near the point. It is something to watch, and work with although it does not seem to be extra hardy in spite of the fact that it is a native tree. At present it is merely an interesting variety to experiment with and it may possibly be of some use later on. The branches have shown curious little birdseye markings—it has a habit of developing buds which die and form little brown structures in the wood and it is possible that the tree may be a fancy timber tree. The shell has only one structure down the center, thereby insuring that the halves come out whole.

An ornamental known as the lace-leaf walnut is very hardy here, doesn't winter kill at all but so far has not borne any nuts. The Deming Purple is not hardy; the Stabler is very unreliable considering the last few years; the Thomas is still one of the best except it suffers from winter injury occasionally; the Ten Eyck very seldom bears any nuts although we have several very large trees now. The Elmer Myers possibly has a chance; it is still living. The Snyder has survived the last few winters and in my opinion it is one of the best nuts I have ever seen. The grafts have borne a few nuts already in the second year of grafting. They set a couple of nuts even after a severe winter last year, but they fell off during the summer, much the same as the Thomas and many of the Ohio did. The same thing happened to practically all of my hybrid hazels, also the Winkler and even the wild hazel kept continually dropping the nuts until there was practically nothing left. No doubt this effect was produced by a peculiar season. We should not hold it against the nut trees since it was a universal condition.

Last summer about one-half dozen of the pecan trees which I had been playing around with for twenty years, started to blossom but only had staminate bloom, There might possibly be a crop of pecans this coming year—I do not have any hopes that any of these seedlings will be able to mature their nuts, but there is always a possibility and they are certainly hardy. None of them that I have tried to graft will live on bitternut roots.

Chestnuts are difficult to get started but once they are started they grow very well although there are only a few surviving out of many thousands of seeds planted. Every year one or more comes into bearing—they generally do not mature their nuts, and what I have tasted of them are not anything to brag about except that they are sweet; the size is insignificant and they evidently [Pg 104]

have much of the native chestnut blood. I am still testing such varieties as the Carr, Zimmerman, and Connecticut Yankee. So far these have shown themselves to be quite tender varieties. I do not consider the chestnut worthwhile because of the constant threat that if a grove should be started it might soon have the blight in it.

I have several Chinese chestnut seedlings which are making a fairly good growth and in time may become productive trees.

We have one hybrid white oak which has an edible kernel but out of about one hundred nuts you might get one wholesome one free from weevils. The tree is very old and is rapidly declining. The nut is small but the tree is quite prolific. I merely mention it to show that there are possibilities in developing the oak. I think our mutual friend, J. Russell Smith, would probably like to hear this as he advocates the use of oaks, and I agree with him that there are possibilities for human food to be used first-hand. I am all out of sympathy with second-hand food production as pork or beef or any meat products, as you know. One reason is that it is economically wrong as it takes many times more acreage to produce meat than vegetables for the same amount of food energy to be derived. My authority, the Encyclopedia Brittanica, which says it takes 64 pounds of dry fodder to produce 1 pound of dry beef, and 32 pounds of dry fodder to produce 1 pound of dry mutton, etc., etc.

Be Thrifty with Nut Trees

By* Carl Weschcke, *Minnesota

There has been too much accent put on the profit to be made on nut production. No matter how much income a man may receive, if he has not learned to save out of that income he will never be better off for having received it. Now, nut trees offer a particularly practical way of saving out of income. If one has a large family to feed the saving may amount to a hundred dollars or more a year. When this fine food, contained in the kernels of nuts, is used right in your own family, and supplies the family's entire requirements of nuts, you will find that you have made very substantial savings in your family food budget.

First of all, it is different from income from the sale of nuts because when you sell nuts they must be sold in the competitive market, and usually to the wholesaler if you have a considerable amount to dispose of. Therefore you save the profit made by the wholesaler and the retailer by using your nut crop rather than selling it. This is really being thrifty. If you have a large crop of nuts you will find that you can easily increase the uses in combination with other foods so that less other food has to be purchased in order to meet the family needs. And with the higher prices of ordinary foods you can easily visualize what a tremendous saving this might be.

Nuts are a fine luxury food, but in a way they can quickly become a necessary food by being used as a replacement for meat. I don't like to use the term "substitute for meat" as it implies that nuts are inferior to meat, and nothing could be further from the truth. Nuts are more *NUTricious* than any meat, pound for pound, and what meat can you store away that will keep as sweet and edible as a nut for so long a time!

Plant nut trees to save your income not to increase it. You will never have to pay a tax on that saving. [Pg 105]

Report of Season 1943

By* George Hebden, *Corsan, Canada

The winter of 1942-43 was one of the coldest ever known here. One day it was 33° below zero and another it was 38° below. Filberts did not seem to take any notice of the severe cold and my Stranger Jap heartnuts that are said to be tender went through with flying colors. One or two varieties of Russian walnuts (J. regia) froze to the ground as did all the Pomeroys. Some of the Crath walnuts froze from a few inches to a yard, but the majority did not lose a bud. Strange to say all the extremely large varieties of J. regia came through unscathed as did my Chinese. Asiatic tree hazels missed cropping but came through unscathed. Winkler and Rush hazels were not harmed, though the Rush is a bit tender and succumbed the winter of 1933-34. In fact 1933-34 was a harder winter on trees than 1942-43 as that winter all but my Daviana filberts were hit more or less.

Last fall (1943) all trees went into their winter's sleep in most excellent condition and the twigs are hard to the top buds. Signs on twig terminals indicate a large crop of nuts for the fall of 1944. Thus I hope to be able to have on display for the convention-to-be a most interesting show. Besides nuts of all the hardy varieties I always have a real big show of hardy and tropical water lilies and lotus, a complete collection. Also a complete collection of grapes and many other horticultural curios rarely seen.

I was many years finding persimmons hardy enough to survive our winters, but at last I have at least 2 and maybe 3 varieties that passed last winter in perfect condition. I am north of Lake Ontario and just a mile west of Toronto. I doubt that northern pecans, big western shellbarks and hicans will have a long enough season to ripen. The Weiker hickory, which is a cross between shagbark (Carya ovata) and shellbark (C. laciniosa) hickories, ripens completely each season. Catawba grapes won't ripen except in a rather long summer. Just across the lake the golden muscatel grapes have ripened two or three times in my memory.

Barcelona and Kentish cob seem to be the only two filberts that are tender with me. Du Chilly and Italian red live and crop regularly. I have several very large new varieties of seedling filberts. I like to grow seedling filberts, they show wonderful variations in fruiting. The same with heartnuts. I never lose a seedling heartnut for if the tree yields an unsatisfactory nut I promptly bud it to a Stranger which is the most regular and heaviest cropping heartnut I know of. Yes, every year a monster crop of nuts whose meats come out whole.

Our hybrid Jap heartnut × native butternut crosses are of three types and all excellent and will hold their own with any nut that grows. No nut can beat our butternut for eating. But the shells are too thick, the trees crop only about every 4 years, are unhealthy and shed their leaves soon after September 1st. On the other hand, the hybrid outlooks it, outcrops it and outlives it and our friendly neighbor Russia is very greatly intrigued with these new nuts developed here at Echo Valley. They are thin-shelled, very easy to crack, meats come out easily, trees have a tropical look, crop early, grow fast and very large, leaves hang on green almost to November and the crop ripens early, just after the filberts which are the first nuts to ripen with me, while the Winkler hazels are the last, though the hybrid filbert-hazels are almost as late. [Pg 106]

A very beautiful sight here are the many different nut trees growing on black walnut stock to be seen all over the 20 acres. They are heartnuts, Jap walnuts, hybrids, English walnuts and butternuts, as well as superior named black walnuts.

People don't want beautiful trees nearly as much as they do trees that grow nuts. For instance, they don't buy pecans from me, because though they are quite hardy and beautiful, yet the northern pecans don't mature their crop sufficiently in our short season. Down in extreme southwestern Ontario the pecan has cropped and ripened.

One mistake we must not make is not to be too sure of the value of a nut because it is large, thin-shelled and has a fine flavor but is a poor cropper. The nut that produces a very heavy crop is the valuable nut. Thus McAllister hican and the Stabler black are worthless because of their extremely thin crop.

Another nut that looks large and excellent on the tree is the Ohio black walnut, whose huge dirty hull and small nut condemns it. I like thin-hulled nuts that come out clean.

American Walnut Manufacturers Association Carries Out Industrial Forestry Program

By* W. C. Finley, *Forester

The forestry program now in operation is ambitious in scope, and has as its objectives the promotion of forest practices which will encourage growing and harvesting American Walnut as a permanent crop.

One of the greatest evils which we are attempting to eradicate is the cutting of small diameter trees. The Walnut Industry has expressed a desire to conserve small diameter fast growing walnut trees for future use and is advocating that farmers, timberland owners and log producers leave these trees in the woodlots to grow into high quality timber. We are trying to educate the farmer, timber owner and log producer in forestry practices which will serve not only their best interests, but which in the final analysis, will serve the lumber industry as a whole. Trees less than 14 inches d.b.h. if cut constitute a real loss in potential high quality and more valuable logs because the logs they produce are too small to be used advantageously. On the other hand, trees of 14 inch d. b. h. and up are in demand and are playing a patriotic role in furnishing material for use by the armed forces, namely gunstocks. The public in general, and tree farmers and timber owners in particular, must be made aware of the fact that while the present walnut timber supply is adequate, conservation of immature trees must be practiced to the full to assure the industry with sufficient raw materials for future use.

Success in this particular phase of our program is being enhanced greatly through the excellent cooperation of Extension Foresters, State Foresters, U. S. Forest Service, Timber Production War Project Foresters, Foresters of the Soil Conservation Service and Tennessee Valley Authority Foresters. These various agencies are working hand in hand with us on those objectives of our program which, in a measure, dovetail with various phases of their own programs. One of the most interesting aspects of our program is our work with 4-H Clubs. We are sponsoring a contest among those members who are interested in forestry. Each contestant is required to plant 25 [Pg 107] seedlings, record certain data and write a story about his woodlot giving specific information. Two winners will be chosen from each county participating. Winners will be chosen on the basis

of the best story submitted; judges will be 4-H officials and the Extension Forester from each state. The reward to be presented winners will be one week's vacation at 4-H Summer Camp with all expenses paid by the American Walnut Manufacturers Association. This contest is open to all 4-H Club members in the States of Indiana, Illinois, Iowa, Kansas, Kentucky, Michigan, Missouri, Ohio and Tennessee.

In addition to this, the Association Forester will conduct a one day forestry program at the summer camps at which time he will present the winners with special certificates.

The program was planned by the Association's Forestry Committee, consisting of Chester B. Stem, C. B. Stem, Inc., New Albany, Indiana, Chairman; B. F. Swain, National Veneer and Lumber Company, Indianapolis, and Seymour, Indiana; Clarence A. Swords, Sword-Morton Veneer Company, Indianapolis, Indiana and Burdett Green, Secretary-Manager of the American Walnut Manufacturers Association, Chicago, Illinois. The committee worked in close cooperation with Harris Collingwood, Washington, D. C., Forester for the lumber industry. Of especial help were several of the Midwest's outstanding foresters from regional and state offices of the various governmental forestry agencies—men who have had years of woods experience in the areas where most of the Walnut Association's forestry activities will be carried on.

The Crath Carpathian Walnut in Illinois

***By* A. S. Colby**

The Persian walnut (*Juglans regia*), usually and incorrectly called the English walnut, has been highly prized both for the beauty of the tree and the quality of its nuts since ancient times. The species flourishes in Southern Asia and Europe and in our Southwestern and Pacific Coast States, but most of the attempts that have been made to fruit it in Northern and Eastern sections have failed. The varieties or strains tried there were for the most part native to sections of the Old World where the winters are comparatively mild and they were therefore not able to survive our colder and more changeable climate. The late E. A. Riehl, of Alton, Illinois, tried repeatedly to grow named varieties of this nut which are successful in California, but often stated that the species had no future in Illinois. In extreme southern Illinois, at Robert Endicott's place, in Villa Ridge, several Persian walnut trees are growing but their bearing habits are disappointing.

One of the most promising recent developments in Northern nut culture is the introduction into America of hardier strains of the Persian walnut, through the efforts of Rev. Paul C. Crath, of Toronto, Canada, a native of Poland, and whose father was the head of the Agricultural College in the Ukraine. He went back to his own country as a missionary in the early 1930's, and there noticed the hardiness of the Persian walnuts growing in that severe climate. Realizing the possibilities of these strains for fruiting in North America, he combed that rich Russian agricultural region in the Carpathian Mountains for seed for experimental planting over here, harvesting it from trees uninjured at temperatures of -40° F. These parent trees were carefully [Pg 108] selected for regular production of good crops of thin-shelled, easily-cracked nuts of good quality. The trees were growing at such distances from others that cross-pollination was avoided. Rev. Crath had observed that seedlings from such self-pollinated trees usually bore nuts that closely resembled those of the parent.

Each tree from which nuts were saved was given a number in order to keep future records straight. The nuts were planted in a nursery established by Rev. Crath near Toronto. Wishing some point in this country where his trees could be distributed without the difficulty and delay incurred in moving small shipments across the border, Rev. Crath arranged with Mr. Samuel H. Graham, of Ithaca, New York, to take sole charge of their distribution in the United States. Considerable interest has been aroused in the possibilities of these strains and their distribution has been wide-spread, with over 2,000 seedlings sent to many Northern States since 1937. In a few more years, after a considerable proportion of these numbered seedlings have come into bearing, we shall have some valuable information regarding their possibilities in sections of the country where previously it had not been considered possible to grow Persian walnuts.

Several Illinois horticulturists have planted seedlings of these strains and have already brought one or more of them into bearing. Others have used scion wood of the Crath types in top-working black walnut trees. The sample Crath Carpathian walnut No. 1 on display at the 1942 meeting of the Illinois Horticultural Society at Quincy was grown by Mr. Royal Oakes, of Bluffs, Illinois. Mr. Oakes topworked a black walnut with Crath Seedling No. 1 scions in 1938 and harvested six nuts in 1942. At the Illinois Agricultural Experiment Station at Urbana, we have over 20 Crath seedlings under number, planted in 1937 and 1939. They are all healthy and vigorous, and several bore pistillate flowers in 1942.

Comparatively little is known about the bearing habits of the Crath walnut strains. Several growers have noted that their trees began to bear pistillate flowers within a few years after planting but set no nuts. Evidently the staminate catkins necessary for pollen production are somewhat slower in appearing. Other strains of Persian walnuts are said to be slow in this regard, usually beginning to bear female flowers from 3 to 5 years before male flowers are produced. It is thought possible that Persian walnut pistils will accept black walnut pollen. Mr.

Oakes reports that there were no staminate flowers on the Crath (from which he picked the nuts he exhibited at Quincy), but black walnut pollen was abundant nearby at that time and for good measure he also brought in butternut bouquets. As he states, "something worked."

The prospective planter should understand that these new walnut strains are as yet only in the experimental stage. It is believed that some of them have considerable promise, at least in the southern and the central, and possibly in the northern, parts of this state. However, they must be properly planted and cared for if one expects them to grow and bear. Too close planting should be avoided and some attention must be given to forming the head when the tree is young. No one knows exactly when they will bear, how much, and how long. In their native country, trees have been observed estimated to be over 300 years old. Most of us can expect to enjoy nuts from trees we plant, with more for our grandchildren and great-grandchildren. One might ask also in this connection, as does one nut nurseryman, "How soon will a Chinese elm or soft maple bear nuts?" [Pg 109]

Parent tree of Ohio black walnut, on the farm of Charles Arbogast, 1½ miles northwest of McCutchenville, Ohio. The tree is 2½ feet in diameter and very vigorous. It is said to bear heavy crops in alternate years.
Photograph by O. D. Diller, Ohio Agricultural Experiment Station, Oct. 8, 1943.

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Ohio Nut Growers' Meeting

***By* G. J. Korn, Berrien Springs, Mich.**

A meeting of Ohio nut growers was held at the Wooster, Ohio, Experiment Station on September 5, 1943. A very pleasant and profitable afternoon was had in the exchange of ideas and reports on the growing of nut trees. Most of those present were members of the Northern Nut Growers' Association. As the annual meeting of that organization had been cancelled for the duration of the war, the Ohio members decided to hold a meeting of their own at Wooster. The growers presented reports on the varieties with which they are working and evaluated their merits and performance. As an example, Mr. A. A. Bungart of Avon, said he had spent a good share of his spare time for two summers in examination of several hundred native black walnut trees, and has never found a nut as good as the varieties Todd or Thomas. He still feels, however, that there are superior walnuts growing wild and that continued search for them is well warranted. Several other kinds of nut trees are being grown by Mr. Bungart, such as filberts, Chinese chestnuts, and Crath Persian walnuts. In a summary of his report he said, "In viewing the growing of nut trees, I am convinced that it is a wonderful hobby, and that the contributions of various individuals and groups will eventually establish nut growing in the northern states on a commercial basis." [Pg 111]

Mr. Eugene Cranz of Ira also gave a very interesting report. This past summer Mr. Cranz passed his eighty-first birthday, and for many years has been keenly interested in general forestry practices. One of his particular interests is nut culture; a very superior hickory tree grows on his place, which bears a very high quality nut. During the course of his remarks, he expressed great optimism in the matter of developing the Chinese chestnut into a valuable commercial nut crop.

Mr. J. Lester Hawk & Son of Beach City, concurred in Mr. Cranz's opinion on this matter, and cited as an example the 2 Hobson Chinese chestnuts which they planted on their property in 1917. These two trees have been bearing crops of well-formed tasty nuts for a period of 20 years. Mr. Hawk reports that he had sold several hundred seedling trees from these trees last year, and reports that he has about 2,500 one-year seedling trees in his nursery at the present time.

Many other interesting reports were given on cultural practices and on the merits of various types of nut trees adaptable to northern conditions. Mention should be made of the especially fine illustrated talk given by L. Walter Sherman, superintendent of the Mahoning County Experiment Farm at Canfield. Colored slides were shown by Mr. Sherman, of his grafting technique and of individual trees throughout the state from which he has collected scions. Three acres of the Mahoning County Farm are being devoted to nut growing and research at the present time. This planting includes 21 different varieties of black walnut. Mr. Sherman is keeping an accurate record of the trees as they develop, their source of scions, and other items that may be of interest. Besides recording this data, he is also making color slides of his cultural methods and progressive stages of the trees' growth.

In spite of unavoidable interruptions to their individual efforts occasioned by the war, those in attendance expressed the belief that real progress is being made in this particular field. A committee was chosen to draft tentative plans for a 20-year research program on nut culture in Ohio. The great enthusiasm shown at this initial meeting indicates that a meeting of Ohio nut growers is likely to become an annual event.

On my return home to Michigan from attending the Ohio meeting, I stopped off near McCutchenville, Ohio, to visit the parent "Ohio" black walnut tree. The accompanying photos taken by Mr. O. D. Diller, Dept. of Forestry, Experiment Station, Wooster, Ohio, show the majesty and beauty of this great tree. [Pg 112]

Walnut and Heartnut Varieties Notes and Remarks

By* J. U. Gellatly, *Westbrook, B. C.

BARLEE BLACK WALNUT—1935 crop grown in Kelowna, B. C.—1 nut—44.0 per lb., 1 kernel—206.1 per lb., 21.36% kernel.

BROADVIEW NUTS—1941 crop, 5 nuts—29.5 per lb., 68.7 kernels per lb., 1 best kernel 64.8 per lb., 51.5 shells per lb., 42.85% kernel.

CALLANDER HEART NUT—20 Nuts—124.8 per lb., 20 kernels—392.7 kernels per lb.—31.8% kernel.

CANOKA HEART NUT—1941 crop—1 nut—79.6 per lb., 24½% kernel, 105.5 shells per lb., 324.0 kernels per lb.

CANOKA HEART—1941 crop—5 nuts average—90.4 per lb., 123.3 shells per lb., 338.5 kernels per lb., 26.7% kernel.

CHINESE OR MANCHURIAN WALNUTS 1941 crop grown O. K. Valley—5 nuts—27.1 per lb., 5 kernels—62.0 per lb., 5 shells—48.1 per lb., 43.73% kernel. Kernels very fine flavour.

COGLAN WALNUT—from Coglan, B. C.—1 nut—47.7 per lb., 1 kernel—113.4 per lb., 1 shell—82.5 per lb., 42.1% kernel. A very good thin shell nut of Franquette type.

FRANQUETTE WALNUTS 1941 crop—outside dry storage or unheated shed. 5 nuts—30.0 per lb., 1 largest nut—26.4 per lb., kernel of this nut 78.2 per lb., 1 small kernel 141.75 per lb., 1 medium kernel—79.6 per lb., 5 kernels—94.1 per lb., 5 shells—45.3 per lb. 32.48% kernels. Kernels best of flavour.

GELLATLY HEART NUT—1939 crop—20 nuts—64.2 per lb., 252.0 kernels per lb., 25.5% kernel. Shell heavy—cracking only fair.

HEART NUT—from R. P. Wright, Erie, Pennsylvania, U. S. A.—1 nut—84.0 per lb., 266.8 kernels per lb., 122.6 shells per lb., 31.48% kernel.

IMPIT BLACK WALNUT—1941 crop—1 nut—25.2 per lb., 1 kernel—141.8 per lb., 17.78% kernel. 2 nuts—25.6 per lb.,—2 kernels—137.5 per lb., 18.64% kernel.

IMPIT BLACK WALNUT—1941 crop—10 nuts—25.2 per lb., 10 kernels—110.4 per lb., 28.8% kernel. Cracking time 12 minutes to crack with hammer.

MACKENZIE HEART NUT—20 nuts—48.3 per lb., 20 kernels—193.0 kernels per lb., 25% kernel—extracting and opening with knife—4 minutes.

NORTH STAR WALNUT—1941 crop grown in O. K. Valley—5 nuts—28.8 per lb., 5 kernels—76.9 per lb., 5 shells—46.1 per lb., 37.48% kernel.

NURSOKA HEART NUT—1940 crop grown at Peachland, B. C.—1 nut—72.0 per lb., 103.1 shells per lb., 238.7 kernels per lb., 30.2% kernel. Extracting time 6 minutes.

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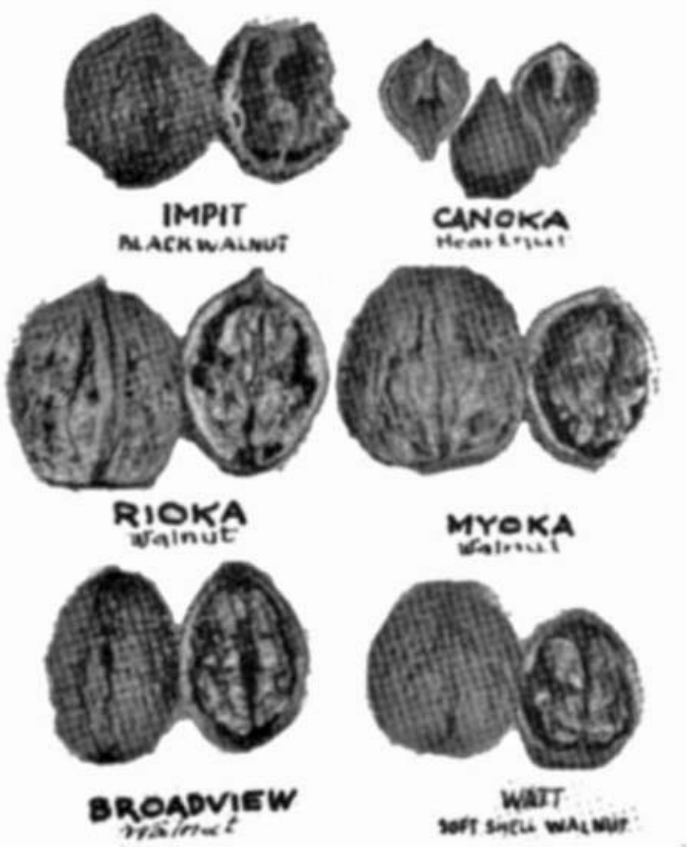

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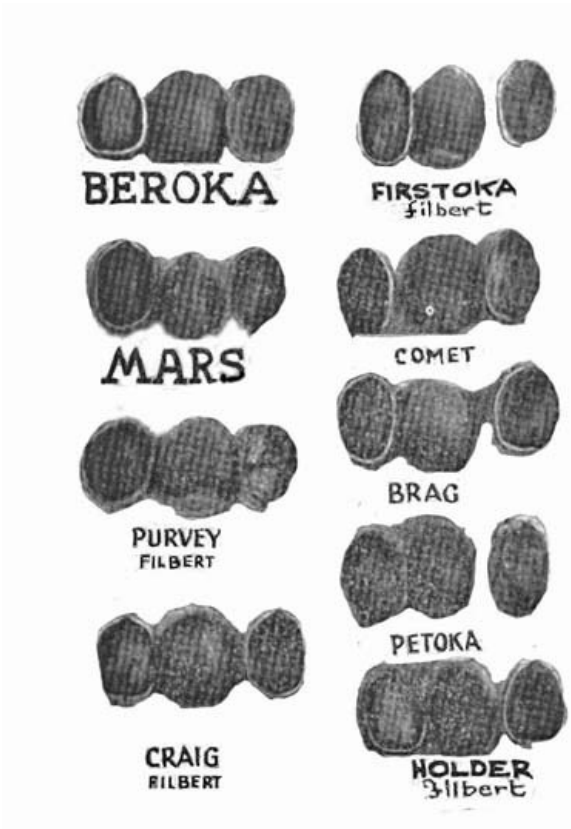

[Pg 115]

O. K. HEART NUT—1933 crop grown at Kelowna, B. C—20 nuts—103.1 per lb., 382.8 kernels per lb., 26.9% kernel. 3.5 minutes to open and extract with small penknife.

PENOKA HEART NUT—1939 crop—1 nut—96.5 per lb., 412.4 kernels per lb., 23.4% kernel.

ROVER HEART NUT—1941 crop—10 nuts, average—79.4 per lb., 98.6 shells per lb., 408.6 kernels per lb., 19.4% kernel.

ROVER HEART NUT—1939 crop—1 nut—96.6 per lb, 378.0 kernels per lb., 25.53% kernel.

ROVER HEART NUT—1935 crop—20 nuts—90.7 per lb., 302.4 kernels per lb., 30% kernel.

SMYTHE HEART NUT—5 nuts—95.7 per lb., 5 kernels—276.6 per lb., 34.6% kernel. Well sealed but easy to open.

SPREADOKA WALNUT "J. REGIA"—5 nuts—49.3 per lb., 5 kernels—105.0 per lb., 5 shells—92.95 per lb., 46.95% kernel.

THACKER HEART NUT—1942 crop—10 nuts—103.1 per lb., 324 kernels per lb., 31.8% kernel.

VAUX ENGLISH WALNUT—1940 crop—a new seedling on J. U. Gellatly's lot. Large nuts—heavy shell. 1 nut—36.3 per lb., 1 kernel—90.7 per lb., 69.8 shells per lb., 40% kernel.

WALSH WALNUTS—1941 crop grown in O. K. Valley—5 nuts 24.3 per lb., 5 kernels—57.7 per lb., 5 shells—42.2 per lb., 42.26% kernels. Kernels bland flavour.

WALTERS HEART NUT—1934 crop—20 nuts—47.2 per lb., 180.4 kernels per lb., 26.2% kernel. 13 minutes to open and extract with penknife.

WALTERS HEART NUT—1940 crop—1 nut—58.2 per lb., 226.8 kernels per lb., 78.2 shells per. lb., 25.64% kernel.

NO. E. 16—From Ross Pier Wright—235 West 6th St., Erie, Pennsylvania, U. S. A. 1 nut—61.3 per lb., 232.6 kernels per lb., 83.2 shells per lb., 26.35% kernel.

WATT WALNUT—from Himalayan Mts., India, B. C.—grown 1940. 1 large nut—35.4 per lb., 1 kernel—75.6 per lb., 1 shell—66.7. per lb., 46.876% kernel.

Letters

Abstract of letter from Thomas Mitchell, 259 W. 29th St., New York, N. Y., to Julio P. Grandjean, Box 748, Mexico, D. F. I am a tree breeder interested in creating hybrid crop trees, oaks and, if possible, bi-generic hybrids of carob with honey locust and with mesquite. I have, in the past seven years, made over a thousand crosses of poplars and about 600 inter-specific oak crosses. This spring I made 250 oak crosses at the Arnold Arboretum, of which about 20% seem to be ripening viable acorns. I have a list of 90 varieties of hybrid oaks and about 60 varieties of American Asiatic and European species which are available here or at the Arboretum. I will send this list to any one who is interested in trying to graft them on native oak seedlings, and will send scions to any one willing to send me acorns, scions or pollen.

I believe the oak tree to be, potentially, more valuable than any other crop tree.

Abstract of letter from W. G. Tatum, Lebanon, Kentucky, to the Chairman of the Survey Committee. We have had reports from E. C. Rice of Absher, Ky., but his work with trees and his wonderful personality are not well enough known to us. Besides his large plantings of nut and fruit trees he does general farming. He has almost all of the finer varieties of nut trees, many of them large, in bearing and doing well.

Lewis Edmunds of Glasgow, Ky., discoverer of the Edmunds black walnut, is a general farmer whose plantings of nut tree, while not large, include many of the older and better known sorts, as well as later discoveries of his own, including a very thin shelled walnut, shagbark hickories, a seedless persimmon; and he is planning a large planting of chestnuts. He has a Stuart pecan that bears well-filled nuts every year, apparently without benefit of pollen from another tree.

Our experiment station has issued a new leaflet on nut growing in Kentucky and our State Forester, Mr. Jackson has given radio talks on the subject.

I am planning and planting all the time and have at least a small start of most of the better strains of all varieties. I have a little nursery where I grow and graft my own trees. I consider Edmunds a very fine black walnut. I think that more free exchange of graftwood should be encouraged among our members, and we should encourage and help newcomers in learning the art of grafting. I got 90% of my Stambaugh grafts to grow this season, in a row of stocks running from the size of a lead pencil to that of the average man's little finger, using scions near to the size of the stocks, grafted by the "whip and tongue" splice method.

Letter from H. F. Stoke to Miss Mildred Jones: I am pleased to comply with your request to report on those varieties that have given me the best results in this locality. It is perhaps unfortunate that some of them are unknown or obscure varieties that are not generally in the hands of the nursery trade. (As an aside, I am quitting the nursery business, so what I say is without prejudice or any personal bias.) [Pg 117]

I am listing the varieties in order of my estimate of them for this locality based on my own personal experience. I am becoming increasingly hard boiled in my judgments based on two considerations: first, that a nut tree should bear within a reasonable time and that the crops should be regular and reasonably abundant; second, that the nuts should be fit to eat after they have been grown. These two considerations knock out many varieties that have been highly touted.

Filberts. The Buchanan and its second generation seedlings have been better filled and more productive than any of the European hazels. Italian red comes next. Brixnut and Longfellow are strong, healthy growers, but the former does not fill well and the latter bears sparsely. Barcelona is out.

Chinese chestnut. Hobson, Carr, Zimmerman, Reliable. Hobson heads the list as most precocious and productive. It requires a pollenizer. Carr will bear partial crops without cross-pollination. Zimmerman is almost as productive as Carr, but its need of cross-pollination is unknown to me. Reliable is the smallest of the four, of high quality and a steady bearer of moderate crops. Pollination requirements not known. (The original Zimmerman sent me by Dr. Zimmerman was worthless. The present Zimmerman, furnished me by Dr. Smith, is a satisfactory nut.)

Japanese chestnut. Austin is the best of the lot.

Hybrid chestnut. One of Dr. Colby's hybrids is promising but has not been released and should not be listed without his permission. The hybrid I have been selling as Stoke is a better nut than any of the Japs, including Austin. A moderate producer of moderate crops of beautiful, high quality nuts ripening the first of September. The Government's S8 Van Fleet hybrid is a very prolific hybrid of rather poor quality. It should be satisfactory for people who cook their chestnuts. Mr. C. A. Reed should be consulted before listing. S8 will outyield any chestnut I know of. Tree is less vigorous than Stoke and more subject to blight.

Black walnut. Homeland, Creitz, Mintle, Thomas. Homeland is a local nut and is unknown to the trade. It makes a poor test score, partly because of its pointed shape, partly because of the plumpness and tenderness of the kernel. It fills out much better than Thomas growing beside it: bears moderate crops every year, both on the parent and on grafted trees. It is a nice, upright, healthy grower; new growth tinged with purple. I consider quality first class. Creitz bears regularly and well; nuts very like Ohio but husks thin and it cleans much better. Kernels apt to be shrivelled somewhat. Mintle good bearer, plumper than Creitz, pellicle somewhat off color. Thomas does not fill so well, especially if given much nitrogen, which Homeland will stand. Stabler worthless here.

English walnut. Bedford, Lancaster, Payne, Franquette. Bedford is a local nut found on an abandoned farm in Bedford County, Va. A regular bearer of high quality nuts of the Mayette type. Blossoms late, a little before Mayette and Franquette. The only one of fifteen varieties that I have fruited that can be depended on to pollinize itself; medium size, well sealed, cures well, no bitterness to pellicle, no "sticktite" nor moldy nuts. Lancaster, very large, very vigorous tree, precocious, prolific, quality of nuts good but not best; staminate blossoms early, pistillate late. Requires a pollinizer. Franquette, Mayette and Bedford should answer. Payne will not stand [Pg 118] winter temperatures much below zero; requires cross-pollination; needs seemingly met by Crath and Broadview. Good nut of good size and quality, precocious and very prolific. Moderate grower. Worst fault starts too early in spring. Good for south and upper south. I forgot to mention that one of the worst faults of Lancaster is that the nuts must be dried promptly on ripening; sometimes the kernels mold before the nuts fall from the tree. Franquette should rank with Bedford except that it usually bears poorly, although rarely it bears a good crop. Always blossoms freely. Trouble seems to be pollination. Bedford may be the answer; Mayette is not, and also bears very poorly. King and Chambers, recommended by Carroll Bush as pollinizers for Franquette, produce their staminates too early here. Broadview is vigorous, precocious, prolific, large with a pellicle too bitter for human consumption. Nuts sometimes spoil on the tree, like Lancaster.

Heartnut. Like most English walnuts heartnuts blossom too early in the spring and are usually killed back by late frosts here. Walters is the only one that blossoms late enough to produce usually a crop.

I still think that a well-filled Sifford is the best black walnut I have seen, but the parent tree generally produces poorly-filled nuts, and the young trees have been very slow to come into bearing, so I have left it off the list. Early defoliation appears to be the cause of poor filling in wet seasons. When well filled it runs 32% kernel.

Any and all of the nuts listed, of all species, are perfectly winter-hardy here, except that Payne English walnut was injured by a temperature of 10 below zero some years ago. All English walnuts, except Franquette and most seedling Chinese chestnuts lost their crops last spring by a freeze May 5th. Hobson, Carr, Zimmerman and Reliable came through with crops.

It will be most unfortunate if the many nurseries that, in my opinion, will go into nut tree

production should boost seedling trees just because they do not have or cannot produce the named varieties. If the public can be at this time educated to demand select varieties it will influence the planting of nut trees favorably for the next hundred years. If they get shunted off on to seedlings it will take another twenty-five years to awaken the present interest. One might as well expect an apple growing industry to spring from the indiscriminate planting of seedling apple orchards. This goes especially for the English walnut and the Chinese chestnut.

Abstract of letter from Rev. P. C. Crath, Cannington, Ontario. Only a limited report is possible this year. In Toronto there are four Carpathian walnut trees 20 to 25 feet high which bear nuts regularly. One of these bears nuts of huge size, another smaller nuts with very thin shell and with the flavor of the Cashew nut. The other two trees produce regularly medium sized nuts with thin shells. In Islington, near Toronto, Carpathian No. 34 belonging to Mr. J. Robson continues bearing. Mr. Robson died last spring and I am naming this tree No. 34 the "Robson" in his memory. The eight Carpathians along the Welland Canal are doing well and bear every year. The tree in the yard of the Rev. Foster at Welland is a nice big tree and bears every season but squirrels carry off all the crop. In Ontario until the present time the curculio has not attacked [Pg 119] Carpathian walnuts. Prof. C. T. Currelly of Canton has some nice big trees of his own grafting. One of these is of the Landyga type that in its seventh year now has never shown any cold injury. We can feel assured that the Landyga type is the best for the cold regions of Ontario. A tall and beautiful No. 46 that had a bacteriological canker near the root has thoroughly healed. Other No. 46 trees on the same estate are doing fine. The original No. 34 (now Robson) on Prof. Currelly's farm is doing exceptionally well. It is the type of a good market walnut. The Harbey Carpathians, belonging to J. regia maxima, with very thin shells are also doing well.

My Ukrainian and Turkish filberts on Currelly's estate have now become small bushes, 40 in number bearing abundantly.

Abstract of letter from Sylvester M. Schessler, Genoa, Ohio. To keep scionwood I place sticks, such as elder, on a cement floor, lay the scions crosswise on these, cover them with sawdust and throw an oilcloth over this. In May I graft by the slotbark method nailing the scion and tying with string or rubber bands and wax with Acme Grafting Compound put on cold. I cover with a two pound paper sack and later stake up the new growth. I like fair sized scion wood cut from near the base of the new growth and often graft with two year old wood carrying some one year wood. I will exchange graft wood and have several varieties of Ohio prize winners bearing nuts. I also do budding by the patch method. [Pg 120]

Experiment Station Investigates Tree Believed to be the Oldest Chestnut in Connecticut

Progress Report from Connecticut Experiment Station, Dated November 15, 1943

Many years ago, at a time when the American chestnut was still the king of the woods, a farmer set out a small orchard of nut trees on the bank of the Connecticut River flood plain north of Hartford. Now, some 60 years later, one lone Japanese chestnut survives. Dr. Donald F. Jones of the Agricultural Station in New Haven, who recently investigated the tree, believes it is by far the oldest living chestnut in the State. And the most interesting thing about the tree is that it shows no signs of blight, the disease that destroyed all the native chestnuts.

Dr. Jones' attention was called to the tree late last fall by a hunter who noticed a deposit of chestnut hulls in the river bank. On investigation, the man discovered the tree and was impressed by its size. This fall the tree was visited in search of nuts. There, rising above the brush and brambles of what is now a tobacco field, stood the chestnut, 30 foot high and 18 inches in diameter. The men were able to rescue only six nuts, their visit being a little late for the main harvest. The nuts were among the largest Dr. Jones has seen. They have been planted at the Experiment Station farm in Mount Carmel.

Inquiry in the neighborhood of the chestnut revealed that two or three people knew about the tree and had gathered the nuts that are produced profusely every other year. One of the neighbors recalled that 60 years or more ago, when he was but 12 years old, a man named John P. Jones had set out the nut trees. But the original source of the trees is unknown and it remains a question whether the planter got the trees from a nursery in this country or directly from the Orient.

Though the lone survivor is somewhat neglected, with several dead branches that have been left untrimmed, a neighbor was interested enough in its possibilities to plant some of the nuts. This resulted in one six-year-old seedling tree. Unfortunately, this already shows blight and is apparently the result of pollination by some blighted American seedling or sprout in the

neighborhood. The nuts collected this fall may also give disappointing results but should transmit to later generations the blight-resistance of this Japanese parent. In addition to planting the nuts, Dr. Jones will take scions from the tree for grafting on young trees at the Station's Mount Carmel farm. Those should produce results more quickly than the seeds. Next summer pollen will be collected from the tree for use in hybridizing some of the young trees already growing here.

Dr. Jones has for many years been interested in the development of a useful chestnut for Connecticut conditions. Some of the young trees, crosses between American and Asiatic types, show promise but will take several years of testing to prove their value. The new "find" may be of considerable help in shortening the length of time necessary to get a tree that is blight resistant, of large fruiting habit and of good timber quality. [Pg 121]

(Note by Editor—This tree has been known to me for probably fifteen years. It was brought to my attention by Mr. Charles Vibert of East Hartford and named by me the "Vibbert," [with two b's to insure the right pronounciation]. The name has been published and I have sent scions to a number of people and grafted trees myself. The tree bears a very large nut, twelve selected ones weighing over a pound. I have gathered a good many quarts of them and exhibited them in Hartford and Litchfield. So far as my observation goes this large size is at least partly due to the fact that there is only one filled nut in a burr, the other two being aborted. This fact, and the fact that the crops are small, I have attributed to the partial inefficiency of self-pollination, there being no evident outside source of pollen. One year I grafted several other varieties into the top of the tree. Most of those grew a year or two but then died. I have believed that this was due to blight. There has been much dead wood in the tree ever since I have known it and I had supposed that this was blight.) [Pg 122]

Report of Committee of Ohio Nut Growers

A. A. Bungart, *Chairman*

On September 5, 1943, members of the Northern Nut Growers' Association living in Northern Ohio met at the Wooster Experiment Farm to discuss nut growing in the State. At this meeting a committee was formed to work out plans and suggestions for a twenty-year nut growing program. It was felt that greater progress would result if something more definite were done by way of coordinating the work of the Forestry Department with the effort of individuals. The committee, meeting here on October 31, 1943, submits the following report. The chairman has attempted to incorporate most of the material submitted by members of the committee and by others.

The committee recommends the appointment of a full time research man in nut culture, or two part-time workers. This man, or men, would form the hub around which the 20 year program would be built. There should be a division of labor: certain individuals already embarked on a program of their own should continue their work and coordinate it with a specialist at Wooster, or whatever place is designated as headquarters. For example, Mr. Silvis favors the hickory over all other nut trees. As a young man he can reasonably look forward to many years of experimentation with various varieties and under different conditions. Mr. Davidson is following a plan of planting large numbers of black walnut seed from blocks of trees in which natural crossing might combine the desirable characteristics of several better-than-average named varieties. Mr. Sherman has collected English walnuts from trees in the northern part of the state. Already he has seedlings of many varieties growing at Canfield.

Now, each of these projects is excellent and should be encouraged in every way. Whenever members of our organization find new and better nuts of those species, they should send nuts, or scions or data about the trees, to these gentlemen.

As time goes on there should be opportunities to farm out projects to individual growers. Mr. Fickes, for example, by experience and because of his favorable location could well carry out experiment suggested by a specialist, (or as a research worker to help with one of his own.)

It would seem, apart from large scale operations to be mentioned later, that the specialist or expert should make his headquarters a clearing house for information sent by members. It should be his job to study some of the scientific phases of nut culture, such as artificial crossing, pollenizing data on various species and varieties of nut trees, genetic investigations, value of the proper root stocks, and, as time and information would warrant, the publishing of monographs on phases of nut growing. Finally such specialist might consider broadly the problems of securing an increased food supply from Ohio forests.

2. Devote the 9 acres at Apple Creek to nut tree planting. Plant two or three trees of each variety that has especially good traits. Also set out numbers of seedling stock upon which to graft scions of promising trees. By having the main planting near the Experiment Farm, the plant breeder at Wooster should also attend to nut trees. [Pg 123]

3. The Forestry Department should procure seed of hardy English walnuts and of other nut trees; grow one-year seedlings and distribute these in small numbers (not over five or six) to people who will plant them in good locations. Such action should be started at once; in twenty years or less something good might result.

4. Continue the planting of all promising varieties of the different species of nut trees at Mahoning so that the bearing habits, production, etc., could be under strict observation and study, and so that a supply of scion wood might be available for other plantings and for commercial propagation.

5. Establish a similar project in some other section of Ohio; the southeastern section would seem to be the logical place when nut growing becomes a commercial industry in Ohio.

6. a. Graft promising hickories in the tops of established hickory seedling trees. There is a volunteer stand of such hickories on the lands of the Mahoning Valley Sanitary District that would be ideal for such top-working. No doubt many other such places could be located.

b. Same as "a" but using black walnuts.

c. Same as "a" but using English walnuts.

Suitable black walnut seedlings are now growing on the Mahoning Valley Sanitary District for projects 6b and c.

7. Encourage the planting by the Forestry Department of better seed from the best named varieties. While this would be a long-range program it would be preeminently worth while. The forests of Ohio have all but disappeared. Organizations with vision and unselfishness must begin to replace them.

8. Urge a program of education. Nut trees require good soil and proper care. It would be folly for an organization to sponsor a program for nut tree planting, unless the growers are provided with proper cultural directions. The tendency in the past has been to plant nut trees in out-of-the-way places, and let nature take her course. Nature took her course; the result, scrubby trees and disgruntled planters.

9. Initiate future nut contests for the purpose of arousing public interests in nut growing and for bringing to light new varieties. Four-H clubs, county agents, boy scout troops, sport clubs, all might be urged to co-operate with the Forestry Department, or with our own organizations, in making a state-wide survey for better nuts. One member of the committee thinks that the Ohio Farmer contest did not bring to light all the good wild trees, although every nut grower is indebted to that splendid paper for its cooperation in the past.

10. Favor a moderate amount of publicity. Any plans, developments, or discoveries should be put before the public in scientific journals, farm papers, and the daily press. But propaganda of a sensational of exaggerated nature ought to be discouraged. In other words, the committee thinks that false claims and high pressure publicity on new varieties would do more harm than good. [Pg 124]

11. Study the pollenizing problems of all the better varieties of nut trees, especially the black walnut, chestnut and hickory species, and test the better varieties to find those best suited to Ohio conditions.

12. Develop and perfect a simplified means of propagating nut trees and incorporate this information in a bulletin for all who are interested in nut trees. Many farmers and fruit growers shy from nursery prices for nut trees. If they could propagate their own they would be more likely to plant them.

13. a. Urge a means of developing better kinds of nut trees and nut hybrids for Ohio. Specifically, embark upon a program of artificial crossing and hybridizing. While some might object to the length of time required to check results, the committee thinks it possible to check three generations within a 20 year program. This could be expedited by budding or grafting the crossed seedling upon the stock of a bearing tree. The original seedling should be saved to check its growth, shape and other characteristics not apparent in the grafted branch. A Thomas-Elmer Myers cross might possibly combine the desirable traits of both parents, or a McAllister-shagbark cross might increase the productivity of the former. A nut, for example, having the cracking qualities of the English walnut, and the hardiness and retention of flavor when cooked or baked of a black walnut, would be a worthy achievement. Also, securing pollen from a hybrid English black walnut and back crossing with either species might produce the dream tree.

N. B. Hybrid vigor might be a blessing for the quicker growth of all forest trees. Experiments in nut trees might be applied to other species.

13. b. Establish in the same tree two varieties suitable for crossing. This seed should be distributed for propagation by the Forestry Department to public institutions and to others for reforestation on waste lands or water-shed project or private grounds.

By selecting isolated trees for this mating, the nuts would either be self-pollinated or a cross of the desirable varieties. This it would seem would yield better nuts than the hit-an-miss methods of nature.

14. Use a new yard stick for measuring the value of nut trees for commercial production. Size of nut, thickness of shell, cracking qualities are desirable traits but they might not be deciding factors in evaluating a tree. Other factors equally important perhaps even more so, are size of nut clusters, rate of growth, consistency in bearing annual cross, yield per tree of shucked nuts, resistance to blights and insect nests.

15. Compile a list of the best articles that have appeared in the N.N.G.A. reports and print them

in pamphlet form for distribution to Ohio growers. All the articles on black walnuts would be found in the one booklet, and so on for all other trees in which Ohioans would be interested.

16. Check carefully the experiences and observations of all the members so as to assemble data on the behavior of nut trees. This information would be more useful in determining what crosses would be desirable. The Thomas nut, for example, has been both praised and condemned. What would be the concensus of opinion on the merits of this much debated variety? [Pg 125]

17. Make northern Ohio the nucleus of the N.N.G.A. Geographically and climatically, this section of the state represents an ideal spot for nut tree experimentation, in the northern states. The experiment farms at Wooster and Canfield, the Findley State Forest, the various state properties, all could be brought into a closely knit functioning project.

CONCLUSION

The committee thinks that a 20 year program along these 17 lines, or a modification of them, will eventually prove successful. If such an organization can offer farmers and all others interested in nuts and conservation a better walnut, filbert, hickory or chestnut suitable for Ohio soils and Ohio climate the effort would seem worth while.

So far people interested in nut culture have been called "nuts." Practical-minded people are apt to smile at such nut experiments, but a glimpse at our state proves that nut enthusiasts have vision, and a faith in the future; that they are modern Johnny Appleseeds with more of Johnny's methods but less of his madness.

The history of our state is a history of squandered natural resources, of get-rich-quick methods, of wanton destruction of all forms of plant and animal life. If this organization can in a small way stop the erosion of gullied hillsides, check the rampage of swollen rivers, arrest the fertility of Ohio farms from floating to the Gulf or the Ocean, if it can find some substitute for the magnificent chestnut trees now gone forever, if it can make better nuts grow where none or poor ones grow now, if it can sell conservation and a love of trees to every farmer in Ohio, this organization or any other will be conferring a rich legacy upon future Ohioans. [Pg 126]

OBITUARY

Dr. John Harvey Kellogg died at the age of 91 at his home in Battle Creek, Michigan, on December 14, 1943, from pneumonia. Until his death he was one of our two honorary members, the other being his brother, W. K. Kellogg. Our only other honorary members have been Henry Hales, H. E. Van Deman, and Dr. Walter Van Fleet. The Kelloggs were thus honored because of their large gifts to the association, their entertainment of the association twice at Battle Creek, and the numerous papers on nuts as food sent to the association by Dr. Kellogg. He once gave us $500 as prizes for a nut contest. He was present at our Stamford meeting and at those in Battle Creek. A full account of his life and works was printed in the N. Y. Times for December 16, 1943; and from a medical standpoint, in the Journal of the American Medical Association for December 25, 1943, p. 1132. Other accounts may be found in the Michigan newspapers and elsewhere. He was certainly one of our most eminent members. He was resolute and sincere in his beliefs, forceful and persistent in advocating them though they differed quite radically from the beliefs of most of the medical profession. He would not permit his patients to use alcohol, tobacco, meat in any form, or tea and coffee. Those who had been excessive users of these things were often immensely benefitted by a stay in a Kellogg sanitorium. He joined our association on account of his advocacy of nuts as food to replace in part the absence of meat. Of late years he had laid more emphasis on soy beans. Whatever may be thought of his radical views on food there can be no doubt that he did an immense amount of good not only by his treatment of individual patients but also by the wide dissemination of his teaching and his invention of many useful forms of so-called "health foods." [Pg 127]

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