THE BEST PAPAWS

Superior Fruit Found as the Result of Association's Offer—The Largest Trees —Importance of Proper Maturity of Fruit—Choice Varieties Merit Wide Dissemination

THAT the North American papaw (*Asimina triloba;* not related to the Central American papaya, which is sometimes called papaw) is a more promising fruit than even its admirers have believed, is the opinion of all those who have seen the material sent to the American Genetic Association during the past fall. Better fruits have been discovered than most horticulturists thought possible, and no great difficulty has been found in shipping them. It is hoped that the discovery of these superlative varieties of papaw will lead to their widespread propagation and dissemination.

It will be recalled that the association last spring was enabled, through the generosity of one of its members, to offer a reward of $50 for the photograph of the largest papaw tree and a similar reward for the best papaws. This offer does not expire until January 1, 1917, but as the papaw season is now well past, and contributions have ceased, there seems no impropriety in printing, at this time, the results.

Seventy-five samples of fruit were received, the first on August 18, from Rockway, Tenn., and the last on October 23, from Purcellville, Va. From letters of correspondents it appears that the season extends nearly three months, *i.e.*, from before August 1 to late October.

Reports of 230 different stations of the tree were sent in. They cover almost the whole of the recognized range of the species, as may be seen in the attached map (Fig. 11). It is clear that the tree will succeed in a very large part of the United States.

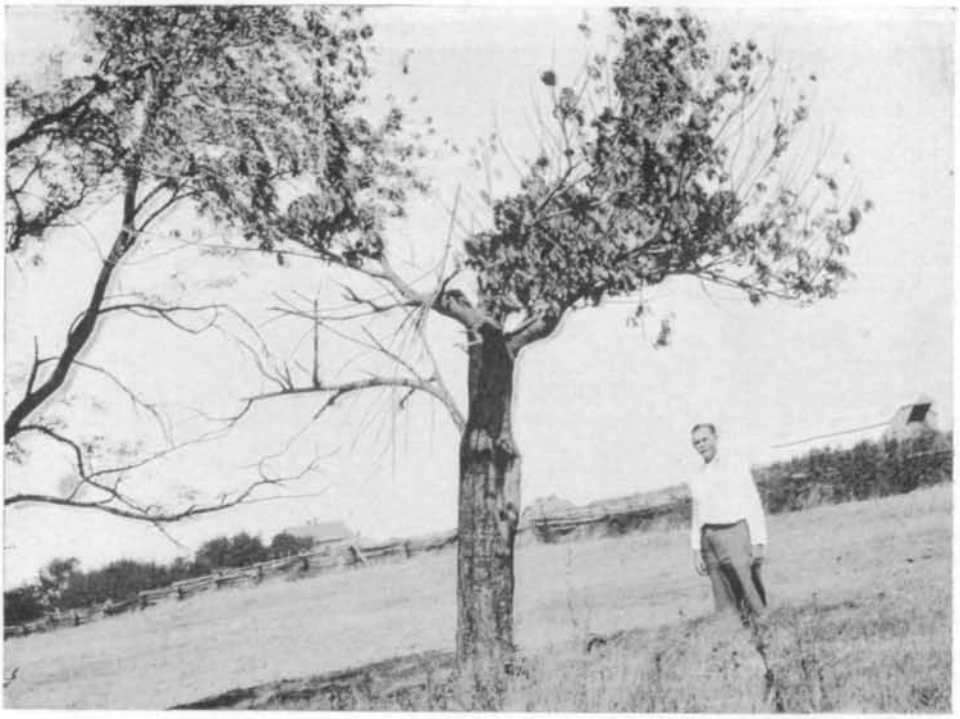
The best fruit received is considered to be that sent by Mrs. Frank Ketter, of 615 S. Sixth Street, Ironton, Ohio, on September 9. The three largest of the eight fruits weighed 10, 10 and 12 ounces. The latter is the largest size reached by any fruit which the association has received. Numerous reports have been made of fruits that weighed a pound, or even more, but none such was seen by this association. All correspondents agree that the past summer was particularly unfavorable to the development of the papaw in the middle west, because of the long drought, and this may be responsible for the fact that no fruit larger than 12 ounces in size could be secured.

CHARACTERS OF A GOOD FRUIT

Mrs. Ketter's fruit, packed in excelsior, arrived in perfect condition, and had matured very evenly. The skin is comparatively tough and thick and does not discolor markedly; the flesh is medium yellow in color, mild but very rich in flavor, neither insipid nor cloying. The amount and quality of the flesh, together with the good shipping and ripening qualities of the fruit, make this an extremely desirable variety and Mrs. Ketter will be paid the $50 offered for the best fruit. She writes as follows:

"The papaws that you received from me in September were grown in dense thickets consisting of locusts and mulberry trees, and it was impossible to get a good photograph of the tree itself while the foliage was on, for which I was very sorry, as I wanted to try to get *one* of the prizes at least, as I felt that these papaws were the finest around here and so many that go up to our place want to buy some to send to their friends, as they claim they never saw such fine ones.

"The tree is wild, receives *no* attention whatever, and bears well every year. As this tree from which that



THE LARGEST PAPAW TREE

Most people know the papaw only as a shrub, but in this specimen it reaches a really respectable size; and a few other trees not much smaller have been found. The tree above appears to be slowly dying, possibly of old age. But a number of instances have been found where the papaw has borne fruit regularly for sixty or seventy years, and no one knows how much longer. The idea that it is a short-lived tree seems, therefore, not to be wholly true. Photographed near Boonville, Ind., in August, 1914, by C. P. Close. (Fig. 9.)

fruit was taken grows in a thicket it does not have the spread it should.

"The tree bears one-half to 1 bushel and bears annually.

"At the base it measures from 6 to 8 inches in diameter and about 20 feet in height.

"Plenty of twigs could be obtained for grafting and a great number could be obtained for transplanting of smaller trees growing in this thicket which bear the same quality of fruit as I sent you.

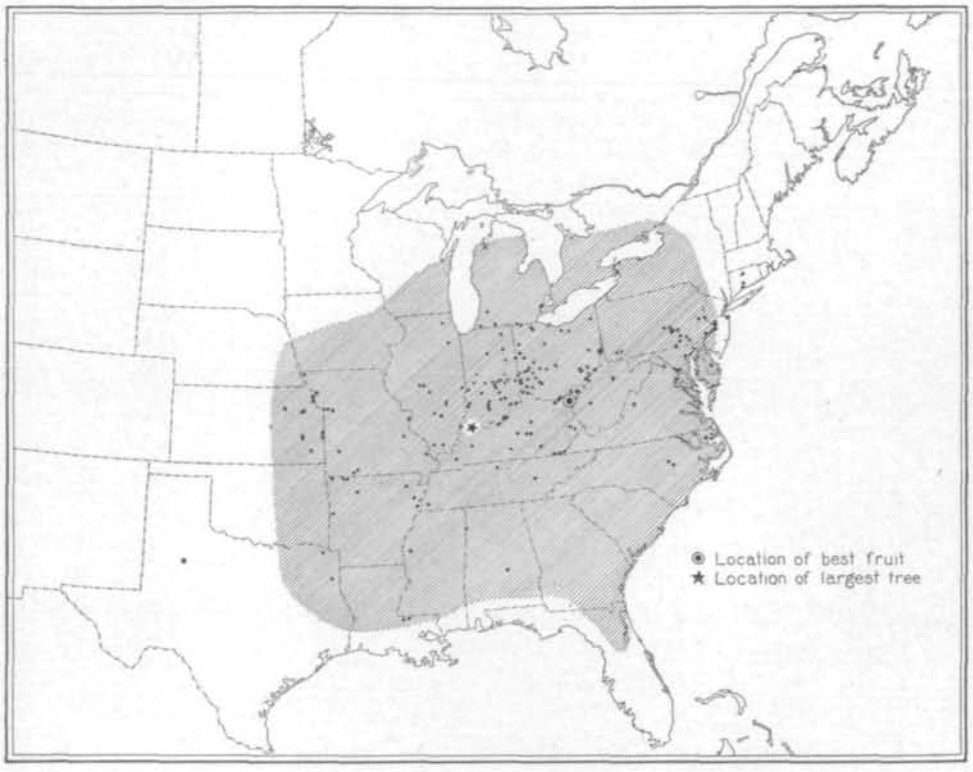
"This tree is located on the hills of Lawrence County in Fayette Township in the most southern point of Ohio."

Six other samples of fruit stood out above all the rest in quality, and are worthy of propagation. They were sent by the following:

John Cheatwood, Gallia, Ohio, September 12. Weight, 10 to 12 ounces. These fruits, whose yellow flesh was very mild and good, came from one of a cluster of four trees about twenty-five years old which, Mr. Cheatwood says, all bear fruit of the same quality, that in most years reaches a much larger size than the above. The group bore about 2 bushels of fruit this year.

S. C. Martin, R. F. D. No. 9, Springfield, Ohio, September 19. Weight 10 to 11 ounces. Flesh yellow and of superior quality, seeds not large, skin tough. Fruit arrived in perfect condition and matured evenly.

William Rees, Jr., R. F. D. No. 3, Pleasanton, Kans., September 19. Weight 8 to 9 ounces. Flesh pale yellow and of good flavor, seeds excep-



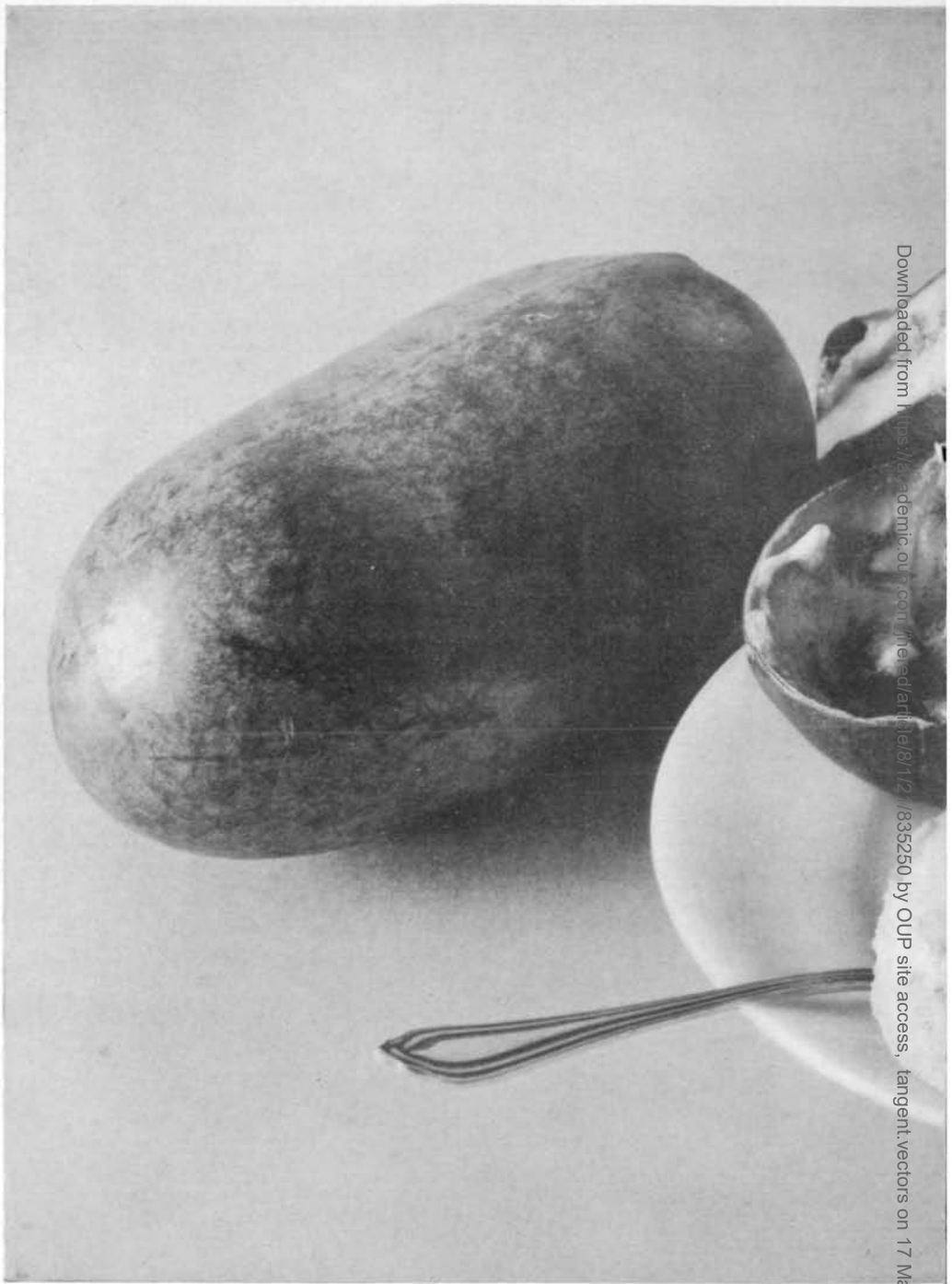
RANGE OF THE PAPAW IN NORTH AMERICA

The range shown by shading is that established by the U. S. Forest Service on the basis of all available previous information. Correspondents of the American Genetic Association have contributed about 230 new stations, which are shown by dots on the map. They cover almost every portion of the accepted range, but only in a few cases go beyond it. The absence of reports from some parts of the range may show that the papaw does not grow to perfection there, or it may merely show that the offer of the association was not widely advertised in those regions. Map prepared by the courtesy of the Forest Service. (Fig. 11.)

tionally small. Although not a large fruit, this ships well and has good quality. They come from two trees in the bend of a creek, on "made soil."

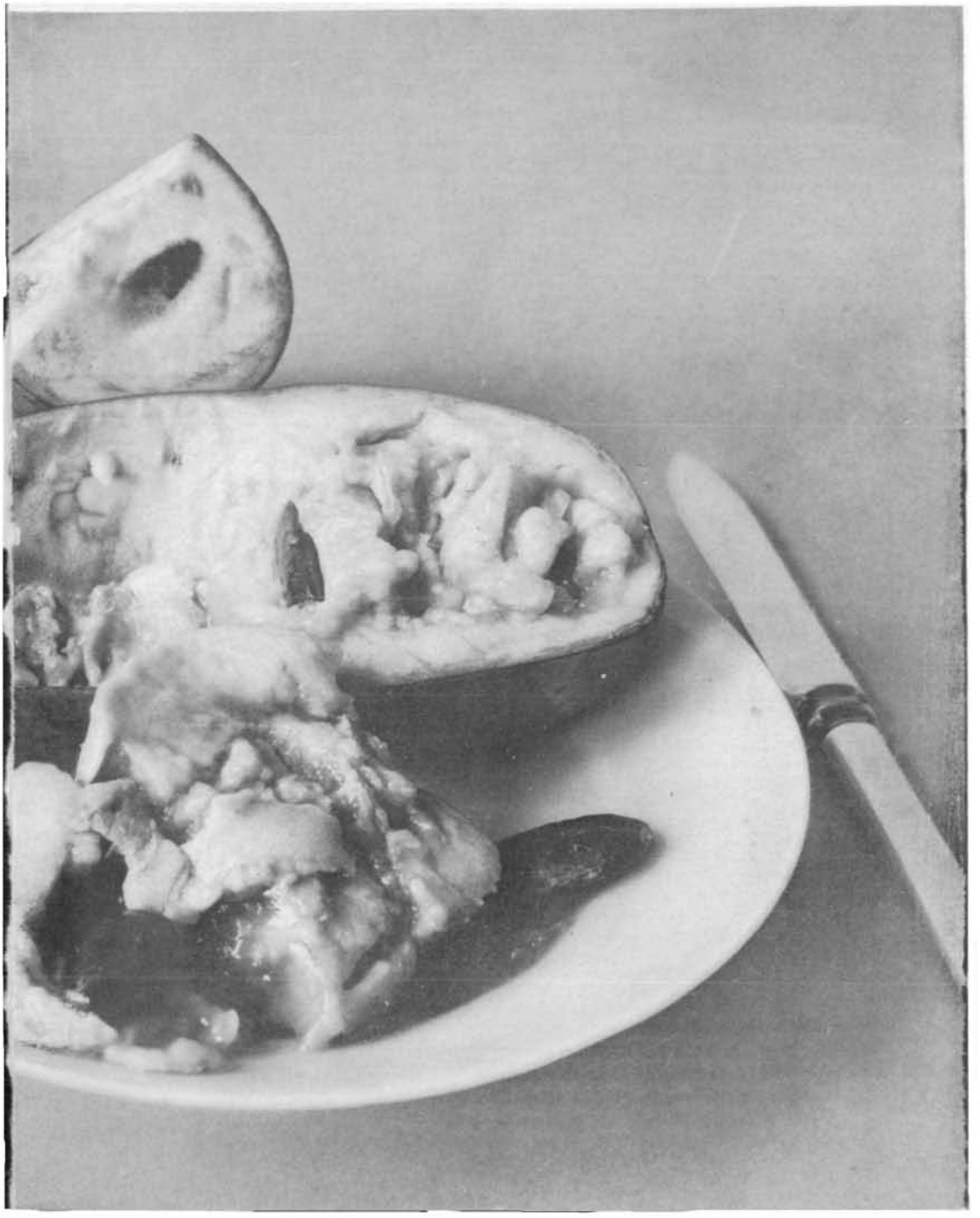
Edward Oswald, Hagerstown, Md., October 2. Weight up to 11 ounces. Flesh yellow, flavor good; shipped well and matured evenly. These fruits were grown on a tree which Mr. Oswald transplanted from the woods to his farm, and to which he has given some care.

Dr. B. S. Potter, Julietta, Ind., October 5. Weight 7 to 8 ounces. Although a small fruit, this one has a mild and satisfying flavor, and ships fairly well; it is also late in maturing, which may be an advantage commercially. Flesh a rich yellow in color. Dr. Potter writes that he had one fruit this year which weighed 14 ounces, and adds, "In 1911 I produced three papaws in one cluster, each weighing slightly more than 1 pound. I have more than an acre of papaw trees, from 6 to 10 inches in diameter, and all, save one, bearing fruit of the variety sent you. This grove produces annually from 15 to 25 bushels. It is not an uncommon thing to gather 3 bushels of a morning. They begin ripening as early as August 6. My trees have not missed bearing in abundance for the last seven years. In 1911 I sent 2



THE LARGEST WILD FRUIT IN NORTH AME

The papaw produces, even in the wild state, an occasional fruit which compares favorably with our papaw, as the cultivated apple is than a wild crabapple. The original wild apple was probabl tors, and the same holds true of most of our cultivated fruits. The papaw has had no syste suppose that a little attention from horticulturists would result in the production of a members, to locate a number of the best trees in the country, with the hope that fruit grow thick enough skin to ship well. They have a mild and seductive flavor, with the characteristic that temperate-zone pomology can furnish. Cultivation may be expected to improve the go probable that the size of the fruit can be still further increased, since specimens have often be to have been too dry to bring out these large fruits. A good tree should bear from 50 to 10(the Office of Foreign Seed and Plant Introduction, U. S. Department of Agriculture. (Fig.



CA, YET ALMOST UNKNOWN TO HORTICULTURISTS

ng-cultivated European fruits. The fruits from these desirable trees are as much better than the common tuch inferior to even the crabapples we know today. The pear is an equally great improvement on its ances- tic improvement and yet produces such fruit as that shown, natural size, above. Is it not reasonable to tinctly superior fruit? This association believes so and has been able, through the generosity of one of its will propagate these good strains by grafting. These best fruits are not only large and meaty, but have a paw aroma, but not to an excessive degree; eaten with sugar and cream they offer one of the richest dishes qualities of the fruit, and lessen its defects, reducing the number and size of the seeds, for instance. It is reported which weighed a pound—*i. e.*, a third as much again as the above, although the past summer seems ruits like the above, regularly every year, beginning three or four years after it is set out. Photograph by

TRUNK OF THE GREAT PAPAW

Close view of the prize-winning specimen near Boonville, Ind., showing characteristics of the species. Dendrologists agree that the wood of the papaw is light, spongy, and of little value, but it is said to have been somewhat used for building purposes in the southern States. When freshly cut it shows beautiful yellowish and greenish tints, and gives out an easily recognizable odor. Photograph by Thomas P. Littlepage. (Fig. 12.)

bushels to Los Angeles, Cal. They reached their destination in perfect shape. Later I sent several hundred choice papaw seeds to Artesia, Cal., where I now have a fine lot of trees.[1] The trees readily sell at $1 per tree."

J. C. Roach, De Kalb, Mo., October 12. Weight 7 to 8 ounces. This fruit is of unusual shape, very long in proportion to its breadth, sometimes almost like a banana in form. The quality is good, but not equal to that of the others here listed; as a shipper, however, it is perhaps the best of all, the skin being notably tough and thick. The fruits (eighteen in one box) all arrived intact, although they were quite ripe, had been on the road three days or more, and were protected only in a few cases by a light wrapping of tissue paper. Mr. Roach states that his pasture contains eight or ten large trees of this quality, as well as many seedlings, and that he will be glad to furnish seedlings or twigs to those who wish to propagate the variety.

Most of the papaws received came from wild trees or bushes, but a few people have already taken up the cultivation of the fruit. Benjamin Buckman, of Farmingdale, Sangamon County, Ill., sent a box with a number of named varieties from his grove, as follows:

Cheeley, secured from and named after Jefferson Cheeley of Iuka, Ill.
Hann, from Arkansas.
Early Best, secured from W. C. Stout of Indiana.
Arkansas Beauty.
Scott, secured from C. S. Scott of West Virginia.
Endicott, from George Endicott, Villa Ridge, Ill.
Hope's August, from Anthony Hope of Paint, Ohio.
Hope's September.
Uncle Tom, from J. A. Little of Cartersburg, Ind. This is probably the first named variety of the papaw on record.

None of these fruits was larger than 7 ounces, and they were not ripe enough to allow a fair judgment of their quality.[2]

The largest tree found by this association is 4 or 5 miles southeast of Boonville, Warrick County, Ind. It was found and described by T. P. Littlepage, of Washington, who also sent photographs of it; but his photographs did not comply with the conditions of the association's offer, as they did not show the tree in foliage. C. P. Close, of the Bureau of Plant Industry, Washington, had a photograph of the same tree in full foliage, which he submitted at the request of Mr. Littlepage and, with the consent of the latter, the $50 to be paid for the largest tree will go to Prof. Close.

Ordinarily the papaw does not reach a larger diameter than 1 foot. This specimen, shown in Figs. 9 and 12, is 6 feet 6 inches in circumference at the base, 5 feet in circumference at 3 feet above the ground, and 25 feet high. It appears to be dying now, although it still bears a few fruits; Mr. Littlepage attributes its decline to the fact that the pasture in which it stands is growing up in blue-grass sod. He states that a still larger tree, 5 feet in circumference shoulder high, is lying on the ground near it, having been blown down a few years ago; and he mentions another flourishing tree northeast of Boonville which he says is about 4 feet in circumference.

Other good records were sent in by:

George Yaeger, Salamonia, Jay County, Ind., 40 inches in circumference.

George W. Harp, New Paris, Preble County, Ohio, 40½ inches at 20 inches above the ground.

William D. Hewitt, 671 Bullit Building, Philadelphia (tree at Burlington, N. J.), 38 inches at 2 feet above ground.

J. C. Roach, De Kalb, Mo., 38 inches at 4 inches above ground.

[1] G. P. Rixford, of San Francisco, states that he has found bearing papaw trees at Santa Barbara, Loomis, Berkeley (University grounds), Miller and Lux Ranch, Forest Ranch P. O. (near Chico), and Coloma (Sutter's Mill, where gold was first discovered), in California, and that some of these fruits seem to him of better quality than any eastern papaws he has eaten.

[2] Mr. Buckman's orchard contains altogether twelve named varieties of papaw. In addition to those above mentioned, he enumerates Cox's Favorite, Early Cluster, and Propst Early.

THE PAPAW RAPIDLY SPREADS

Whether planted or wild, the papaw spreads rapidly by means of suckers from the roots, which sometimes prove to be a great nuisance. At the right of the above tree, near the corner of the shed, can be seen a number of these suckers. If unmolested they will soon form a thicket, as shown in the succeeding illustration. The tree above is located near Maytown, Lancaster County, Pa., and is about 35 years old. It measures 35 inches in circumference at 2 feet from the ground and bore 1½ bushels of fruit last August. Photograph from Mrs. Joseph P. Draper. (Fig. 13.)

F. C. Jordan, Allegheny Observatory, Pittsburgh, Pa., 35 inches.

Helen L. Trice, R. F. D. No. 7, Heltonville, Ind., a double tree which measures 62 inches in circumference at 6 inches above ground. One fork is 37 inches in circumference, the other 33. It is not clear from the photograph whether this represents one tree which has forked, or two trees which have grown together.

The wood is light yellow, with a specific gravity of only about 0.40. Dendrologists invariably describe it as weak, soft, and worthless, but W. T. Coleman, of Bono, Ark., writes that he knows of a house in which all the rafters and joists are made of papaw, and that in earlier times it was much used for barn logs. The inner bark is said to have been used for making nets.

LIFE OF THE TREE

The tree is generally described as short lived. W. D. Hewitt believes that the trees on his property at Burlington, N. J., are at least 80 years old. "I know of one patch," says R. R. Bane, of Wellsburg, W. Va., "the trees of which must be nearly 100 years old, as I am 59 myself and the trees were large when I was a boy." James

Mooney, of Martinsville, Ohio, says, "I know some trees about here that are 8 or 9 inches in diameter, the owner of which tells me he gathered papaws from them sixty years ago, and they look as though they might live sixty years longer." Mr. Mooney continues:

"We have several distinct varieties growing about here: the small early yellow, the large oblong yellow and several kinds of large white papaws. The little yellow will be ripe in a few days or about the twentieth or twenty-fifth of August, while others will not be ripe until September, October and as late as the latter part of November—in fact I have found good papaws under the leaves as late as December.

"We live on one of those beautiful ridges or watersheds that separate the white swamps from the highlands. Papaws will not grow in the swamps with the exception of the foothills of creeks and rivers. It seems to prefer the uplands where grow sugar trees and black ash, and in the kind of soil that supports May apples and ginseng—a rich, brown loam with a good covering of leaf mold. The papaw is one of the slowest growing trees I ever saw and is inclined to be a little cowardly when growing in company with other forest trees that crowd it out or shade it too much. It will thrive better in thin woods where all other underbrush has been cut out, and where the overhanging boughs do not interlace and cut out the sunlight. I do not know of any insect that destroys the papaw tree and none that attacks the fruit except the little black and yellow beetle that bores into the fruit after it has fallen to the ground; and I believe that I know of no animal except man and the opossum that would eat a papaw—with the exception of a small rat terrier dog that follows me in my rambles in the woods and meadows; I do not believe he eats them because he has any particular love for them but just to show his faith in me, as he eats only those I give him.

"Here are some things to remember when planting papaw seed: that it is one of the most tender and brittle trees and needs a good windbreak to parry off the wind storms that will surely come and strip it of branches and foliage; and that the best papaws grow in the richest soil, the primitive soil—I mean the kind of soil where logs have rotted and where the land slopes sufficiently to let the water drain off."

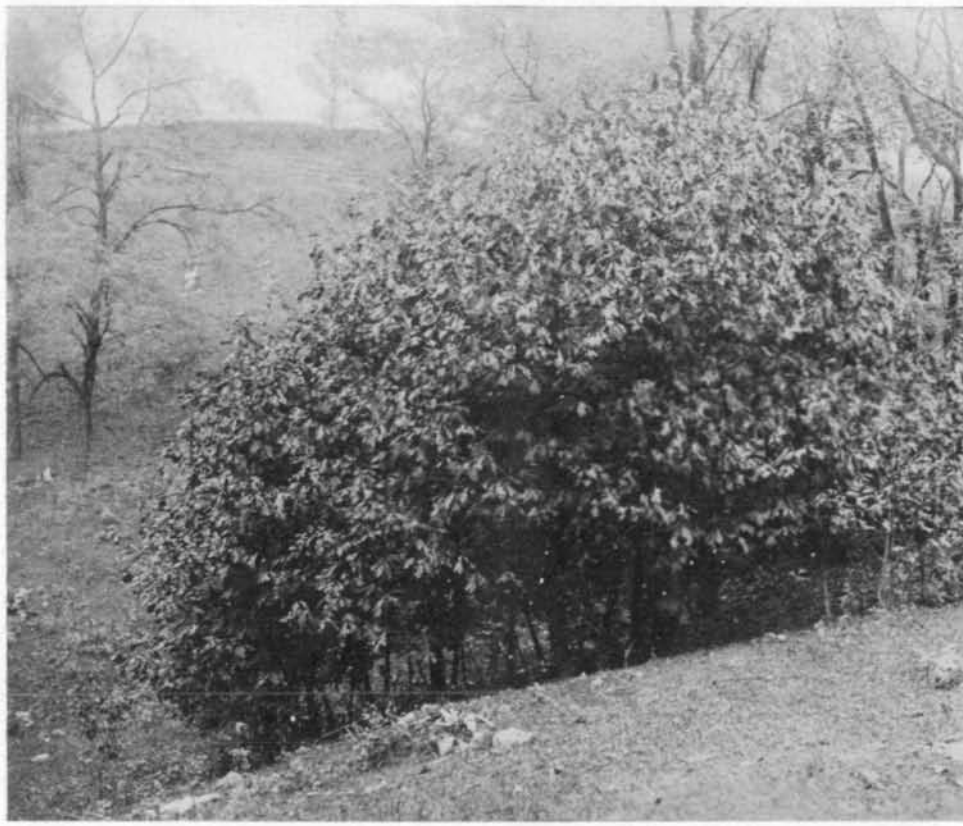
Miss C. V. Krout, of 218 West College Street, Crawfordsville, Ind., adds the following notes:

"In our yard are two groups of papaw trees which have been continually grown for about fifty years. Of course they have died out from time to time, but never all at once, and have renewed themselves by sprouts and seeds. We have never cultivated them, and are of the opinion that pruning and cultivation are hurtful to them.

"The papaw sprouts annoyingly, and in three years these sprouts will bloom, if thrifty, but bear sparingly until about five years old. When they are about twenty they are at their best as producers of fruit. They are the only shrub-tree—if I may coin a name—which has a dark brown bloom, so like the Calicanthus it is often mistaken for it; the bloom of the Indian Arrowwood and the Wake-Robin are of the same color. In the woods about here they grow in deep soil with a carpet of moist leaves around their feet, but ours have a very sunny exposure—in sunlight all the day."

Most of the correspondents grow them from seed, by planting the entire fruit, and then thinning out the less thrifty seedlings. Under favorable circumstances they are reported to bear in the third or fourth year after planting.[3] The yield is variable: one tree is described which was carrying about 400 clusters, with 4 to 6 fruits in a cluster.

[3] Actual commercial plantings of the papaw seem to be few. There is, or was, an orchard of thirty-five trees at Danville, Ind., which the late James A. Little planted for the late Judge John V. Hadley of the Indiana Supreme Court; and an orchard of more than 100 trees belonging to L. Swartz at Charleston, W. Va.



THE PAPAW IN A STATE OF NATURE

Most people know the papaw, not as an isolated tree, but as a shrub growing in dense thickets like the small one above. Such a thicket may start with a single seedling, or all the seeds in one fruit may sprout and grow close together. As the trees grow, they send out suckers from the roots, as shown in the preceding illustration, and so gradually extend their area. From time to time the older trees die, but their places are taken by new ones, so that the thicket rarely diminishes in size, but always tends to enlarge. In some of the southern States tracts of many hundreds of acres are covered by thickets of this character. Usually the closely crowded trees do not bear such good fruit as those that are isolated and have more light; yet the best fruits received by this association came from just such a thicket as that shown above. Photograph made in Lancaster County, Pa., by Mrs. Joseph P. Draper. (Fig. 14.)

A good tree appears to bear 50 to 100 fruits. It is certain that the size of the fruit could be considerably increased if the tree were gone over in the early summer and all the fruits picked off except one in each cluster. At present the sale is local and apparently not great, and the price is low. H. S. Bomberger, of Palmyra, Pa., states, "I always ship the fruit in berry crates in quart boxes and get $5 a bushel for them."

Occasionally some one is found who is subject to poisoning by the papaw. Benjamin Buckman writes, in sending a shipment of fruit, "I had to pack this box in an outhouse, and wash my hands and face thoroughly in soapy water, because one or two in my family are affected by a single ripe papaw in the room, as badly as the most virulent case of poison ivy I have ever seen, and sugar of lead (often used in ivy poisoning) has no effect on the poison what-

ever." Prof. M. A. Barber, of Kansas University, who studied this poisoning, concludes[4] that it is dependent on a constitutional idiosyncrasy, some people being affected by papaws just as some people are poisoned by strawberries, or oysters. The degree of ripeness of the fruit seemed, in his case, to make some difference in the effect. The poison appears to be in the skin of the fruit, not in the flesh, and there is no record of unpleasant consequences from eating the fruit, which seems to be of a particularly wholesome character.

All of the fruit received by the association had yellow flesh, but it is certain that white-fleshed varieties exist, as almost every correspondent who has had any extended experience with the papaw mentions them. They are distinguished most clearly by Prof. Stanley Coulter:[5]

"Two forms, not separated botanically, are associated in our area. They differ in time of flowering, in size, shape, color and flavor of the fruit, in leaf shape, venation and odor and in color of the bark. They are of constant popular recognition, never seeming to intergrade." The white fleshed fruit is generally said to be inferior, and this probably accounts for the fact that no such fruits were sent to the association. It is also said by some correspondents to be larger. It is very probably a distinct subspecies, if not a good species. The papaw's genus, Asimina, has not been exhaustively studied, but already six or seven distinct species have been constituted in it. With the exception of the papaw itself, they are all small shrubs. One of them, *A. speciosa* of Georgia and Florida, has an ornamental yellowish-white flower, and might be crossed on the papaw with a view to making the flower of the latter more conspicuous.

In general, it is not certain that much is to be expected from hybridization of the papaw. None of the other members of the genus is of commercial value, and the members of the family, the Annonaceae or Custard Apples, are mostly tropical. Commercially the most promising cross would seem to be with one of the Annonas—the delicious South American Cherimoya, for example, whose fruit sometimes reaches a weight of 5 pounds. But there is a considerable obstacle to the success of this cross, in the fact that the fruit of the papaw is a simple berry, while that of the Annonas is compound by the coalescence of the ripening ovaries. The cross is worth trying, nevertheless, for success would be of great importance. G. P. Rixford reports that the cherimoya has been successfully grafted on papaw roots at Santa Barbara, Cal., and this may make possible an extension of the growth of the Annonas north of their present limits. At present they are hardy only in Southern California and Florida, while the papaw is hardy as far north as the Great Lakes and Connecticut.

At present the papaw seems little used except to eat raw or to make by fermentation a rather bitter beer. Its addition to custard pie produces a satisfactory effect. Dr. C. F. Langworthy, of the U. S. Department of Agriculture, who tested its possibilities, concludes that the best way of treating it is to beat the flesh up with cream. It also makes a delicious ice cream.

It is the opinion of those who have handled the fruits sent to the American Genetic Association, that the papaw's reputation would be much better if it were eaten at the proper stage of maturity. It is by many supposed to be eatable only after it has hung on the tree for some time, when the flesh becomes dark in color and slightly fermented. In this condition, however, it seems to the writer and his associates to be really unfit to eat. The fruits that have given the greatest satisfaction are those that were picked just as they began to soften, and allowed to ripen in a cool temperature. Some that were

[4] Barber, M. A. Poisoning Due to the Papaw (*Asimina triloba*). Journal of the American Medical Association, December 30, 1905.

[5] Report of Indiana State Geologist, 1899, p. 745, quoted in Eleventh Annual Report, State Board of Forestry, Indianapolis, 1912.

THE ORNAMENTAL FORM OF THE PAPAW

When given sufficient space, the papaw heads up into a shapely tree which is an ornament to any lawn. Its large leaves have a distinctly tropical appearance and its flowers, although not conspicuous, are attractive. It is notably free from infestation by insects and little susceptible to plant-diseases. Being hardy over a wide area, it can be strongly recommended for planting wherever room is available. (Fig. 15.)

quite hard when received at this office were placed in a refrigerator and after two weeks were found to be in a perfect condition for eating. It is probable that varieties differ in the evenness of their maturity; but assuming that the variety be a good one, it seems likely that it should be picked before fully ripe and allowed to mature indoors. Experiment would easily determine the proper conditions. Several persons who previously despised the papaw were quite converted when given fruits that were not overripe. If this idea of maturity of the fruit is sound, it offers considerable advantages commercially, since the fruit can be picked and shipped while still firm, and allowed to ripen after its arrival at market.

While hybridization offers some interesting possibilities in improving the papaw and reducing the number or size of seeds, it seems likely that simple selection will give quicker good results. If seedlings or inferior trees are grafted to such superior varieties as are described at the beginning of this article, the esteem of and demand for the fruit should increase rapidly.

Seeds should be planted while fresh, and are excessively slow in growing, sometimes not appearing until a year from the following spring. If given good care they then make fairly rapid growth, and may be transplanted when 12 to 18 inches high. This is preferably done when they are dormant, but has been done successfully when they are in full leaf; the secret is to take up a very large ball of earth around the roots. They should be grafted early in the spring. It is commonly supposed that they thrive best with some shade but a number of experiments show that they do well in full sunlight. The soil should be well drained, and can hardly be too rich. The tree is notably free from diseases and pests, and is desirable for ornamental as well as commercial planting. Its large, dark, handsome leaves make it a striking landscape tree for lawns of considerable size. Planted anywhere within the range shown on the attached map, it should succeed; and if it is grafted to a good variety, given sufficient fertilizer, not allowed to bear too many fruits in a single cluster, and these fruits properly matured, it can hardly fail to please.

A New Text-Book of Genetics

GENETICS AND EUGENICS, a text-book for students of biology and a reference book for animal and plant breeders, by W. E. Castle, Professor of Zoölogy in Harvard University and Research Associate of the Carnegie Institution of Washington. Pp. 353. Illustrations 135. Price, $2.00 net. Cambridge, Mass., Harvard University Press, 1916.

Dr. Castle's book is notable not only because of its contents, but because it is the first comprehensive advanced textbook of genetics in the English language. It contains a general discussion of evolution and the historical explanations of it, devotes a short and somewhat inadequate chapter to biometry, and then discusses Mendelism at length, principally from the animal breeder's viewpoint. Dr. Castle's treatment of all disputed subjects is frankly critical, a fact which adds much to the value of the work; it is also practical, lists being given of the unit characters so far isolated in domestic animals. The treatment of eugenics occupies forty-four pages, is conservative throughout, but particularly sound in its treatment of Mendelism in man. A good bibliography is added, and a reprint of the R. H. S. translation of Mendel's original paper; according to those who have compared this translation with the original, it needs revision. But on the whole the book is admirable both in plan and execution and will be indispensable to every serious student of genetics.