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BREEDING OF THE

ORCHARD AND GARDEN FRUITS.

Under this heading attention will be directed in this paper to the following well supported facts:

(1) In the states west of Lake Michigan no important advances have been made in the great work of adapting fruits to our peculiar climate and soil by growing seedlings from the varieties introduced from Southwest Europe, nor from their seedlings originating in the Eastern or Southern States.

(2) Our valuable seedlings of the orchard and garden fruits have come from the varieties introduced from East Europe or North Asia, and from our native species.

(3) Methodic crossing and hybridizing have given in the past, and promise to give in the near future, more valuable and certain results than we can hope for from chance breeding from intermingled varieties and species.

SEEDLINGS OF WEST EUROPEAN FRUITS.

Our early commercial relations were with Southwest Europe and naturally the apples, pears, cherries, plums, apricots, peaches, grapes and small fruits of England, France and Germany were the principal ones first placed on trial in this country. Some of these varieties are still grown in parts of the Union, but their places have mainly been taken by their American seedlings. The fact that seedlings grown on our own soil have taken the places of the varieties first introduced has fixed a general belief that continued seedling production will in time develop varieties as hardy as the Duchess apple, the Gakovsky pear, or the Early Morello cherry. The advice of Marshall P. Wilder to plant the best seeds of the best fruits has been constantly kept before the people of the Western States. In the papers and horticultural reports the subject of seedling fruits has been constantly discussed, the standing committees of Horticultural Societies on seedlings...
have made their annual reports, and the District and State Societies, and the State Fair lists, have offered the most liberal premiums on exhibits of promising seedlings. Yet the fact remains that under propagation, not a single seedling of the apple, pear, cherry, plum, apricot, peach, grape, or variety of the small fruits, from West-European varieties or their American seedlings has been added to our western lists for the past thirty years. This result is not surprising as the most learned and experienced horticulturists of the old world are not believers in the acclimation of fruits from unlike climates in one, two, or even five centuries. As instances the peach and grape have not extended their limits of profitable production in Europe during the past four centuries, yet constant efforts have been made to extend their culture by seedling production. In California the French and Spanish grapes do well, but that we will be able to grow them in Iowa in the open air by continued seedling production for a thousand years is not believed by experts in such matters. But every neighborhood of the west has its thrifty and fruitful seedling apple trees twenty or more years of age, and nothing short of trial will convince many that they will not prove equally hardy under propagation. The writer has had many years experience in this line. Thirty years ago he planted seeds of Fameuse, Roman Stem, Willow, Tallman Sweet, Flora Bellflower, Romanite, and other varieties then regarded as Ironclads. The original trees of many of the seedlings from these seeds are still standing on the old Homestead and adjoining farms in Benton County, Iowa, in good condition and are bearing good crops of good fruit for all seasons. In a single orchard on the grounds of the late Milo G. Pratt, 100 of these seedlings were planted twenty-eight years ago. Fully two-thirds of the trees are yet in good condition and many of them appear to be as hardy as the Duchess. All the best varieties have been propagated and not one of them has proven as hardy as Roman Stem.

Mr. Lyman Burdick, of Shellsburg, set an orchard of the best seedlings of the Pratt orchard, root grafted in the ordinary way, fifteen years ago and to-day not one of them is left. Yet they are on ground quite as favorable as the original trees which are still perfect at double their age.
During the past fourteen years we have tested in like manner fully 100 varieties of seedling apples from Vermont, Canada, Wisconsin, and Northern and Central Iowa, which had attracted local attention by the health and longevity of the original trees. During the recent test winters not one of them has stood as root grafts as well as Golden Russet or Roman Stem.

During the past thirty years the same principle has held good with the grafted seedlings of the pear, cherry, plum, and other West European fruits, and with their American seedlings.

**East European Seedlings.**

I believe it will be generally admitted that our seedling apples which under propagation have proven hardier than Fameuse or Roman Stem exhibit the birth marks of the Russian or Siberian races of the apple. Without knowing their history the expert will not hesitate in classing the Wealthy, Whitneys No. 20, Pattens Greening, Harry Kaump, Malinda, Wolf River and McMahon, with the East European races. With equal promptness he will class every one of the seedlings originated by Peter M. Gideon with the Siberian or Russian apples.

The East European pears have been too recently introduced to give us bearing seedlings. Hence the old seedling pear trees which have been reported as promising during the past thirty years have not stood under propagation even as well as the hardiest seedling apples of the West European race.

Among the Cherries introduced from West Europe was the Cerise de Ostheim. The original home of this was in the Southern Provinces of East Europe and Central Asia. Its American seedlings have proven as hardy as the original type, but seedlings of the Richmond and English Morello have not proven hardier than their type. The Russian Mennonites near Windom, Minnesota, introduced sprouts of a dwarf race of the European cherry known as Vladimir. The fruit from a seedling of this cherry forwarded by De Wain Cook of Windom, Minn., almost exactly reproduces our No. 25 imported from Orel, Russia, and Mr. Cook reports the tree hardy in that trying climate.
The only seedling European plums that have proven hardier in tree and fruit bud than the Lombard are known as Richland and Communia. We do not know their exact history but they were found among settlers from Northeast Germany and we have reason to believe they were grown from pits of the East European plums.

The seedlings of the French and German apricots have not proven hardier than the original varieties. The seedlings of the Russian apricots have proven as hardy as the originals, but it must be remembered that the apricot is only grown in Russia in the South where the hardier peaches succeed fairly well. The Shense apricot was grown from a pit imported by our Agricultural College from Northwest China. While not a true iron clad it succeeds well south of the 42d parallel in Iowa and is fully as hardy as the original forms grown in Northwest China and Mongolia.

The seedlings from the peaches from West Europe, and from their American seedlings, have in no case proven hardier than Hill's Chili or Wager. On the other hand our seedlings grown from pits introduced by the College from Northwest China, and Bokara in Central Asia, are as hardy as the varieties from which they came, and fully forty per cent. hardier than the old race originally from Persia.

That the West European grapes, strawberries, raspberries and blackberries have utterly failed with us need not be stated, nor that their American seedlings have proven equally unadapted to our climate.

OUR NATIVE SEEDLINGS.

Our fine native plums of the west first occur to mind. Without much doubt we have the finest indigenous plums of the north temperate zone. Some of our best varieties have been selected from the wild thickets such as the De Soto, Wolf, Wyant, Rollingstone and Rockford. But the possibility of securing equally hardy and valuable varieties from the pits of our best selected sorts is demonstrated by the Hawk-eye, Milton and other varieties now attracting attention. In accordance with the lesson we wish to impress in this paper we shall secure hardy seedlings from the Rollingstone,
Wyant, Desoto and other northern prairie varieties, and less hardy ones from the *Americana* varieties found east of the lakes or south of the 40th parallel. In like manner the seedlings of the Wild Goose, Marianna, Forest Rose, and other varieties of the Chickasaw species, will not prove much harder than the originals unless they are crossed by the pollen of a hardier race.

As yet our native apple has not been developed beyond the select native varieties found in our primitive timber borders. The Soulard and the seedling varieties of Mr. Patten and Mr. Fluke are not larger or better in any respect than yellow fruited varieties seen thirty-five years ago in the Benton County thicket. That valuable varieties will be developed from it is more than probable, but they must come from methodic hybridizing with our cultivated apples.

The fine dwarf Juneberries now quite extensively grown in the western states are selected varieties from the brush patches of the eastern foothills of the Rocky Mountains. Thus far their seedlings have not excelled the original forms.

As with the plum we were blessed with excellent native species of the grape, raspberry, blackberry, and strawberry, which by selection, and possible crossing with foreign varieties, have given us varieties which we are proud to call Americans.

**Methodic Crosses and Hybrids.**

The well informed and experienced florist has a full library to guide him in the work of transforming a common native flower into “something new and strange” by artificial crossing or hybridizing. In the production of novelties the work of pollination has become commercial with our leading florists of both Continents.

In the improving of fruits by systematic breeding we have fewer guides and the literature of the subject is fragmentary and scattered. But enough can be gathered in any respectable horticultural library to establish the settled principle that a prepotent, vigorous, and truly hardy mother stock will fix in a majority of instances the stamina and character of its seedling, and the pollen used will largely control the size, season, and quality of the fruit.
All past experience would lead us to expect a hardy seedling from the De Soto or Wyant plums without regard to the pollen used in fertilizing. If fertilized with the pollen of the tenderest plum grown in California we might reasonably expect a modification of the fruit but the tree in a majority of cases will follow the mother stock in hardiness. As an example we fertilized the blossoms of the De Soto four years ago with pollen of a very large and good plum grown in Oregon. The resulting seedlings were planted on very rich garden soil and made a growth of four feet the first season. The succeeding winter was unusually severe, yet not a terminal bud of the hybrids was injured. In leaf the hybrids follow mainly the native species, but the specimens of fruit produced last year had the lobing, color, and bloom, of the European species. That they will prove decided acquisitions cannot as yet be determined as the first fruits of rapid growing young plum and cherry trees are small.

Under the head of "East European Seedlings" the fact was noted that a seedling of the Vladimir cherry of Russia has proven as hardy as its parent in Minnesota. As like our native plum, it is a fixed type in a trying climate we might assume safely that all of its seedlings will be hardy. We have also reason to believe that a large per cent. of its seedlings will be hardy if grown from its seeds fertilized with pollen of the early Richmond or less hardy sorts grown in the south of the Morello class. With the apple the same law will hold good if the mother stocks used belong to established families long grown in a climate as severe as that of Central Russia.

In accordance with these well settled principles we have made during the past four years a number of crosses of the apple on the College grounds with the greatest possible care with a view to securing real hybrids or crosses or positive failures. The stamens were removed at a stage of development of the flower when fertilization was impossible, covers of thin muslin were at once applied, the blossoms were protected from above at the critical moment when the pollen was applied, and the covering was restored with the overhead shelter still in place. Some notes on the crosses made, the
reasons why certain varieties were selected, the present outlook, etc., will have some interest at this time and value for future reference.

**Crosses made four years ago:** (1) The blossoms of Silken Leaf (No 327 and 75 m) were crossed with Osceola pollen kindly sent us by the late Henry Avery, of Burlington, Iowa. The silken Leaf is a typical variety long grown in Central Russia. After twenty years of trial in the cold north it has proven fully as hardy as Duchess, as perfect in foliage, as regular in bearing, and as free from blight. Its fruit is large, even sized, and handsome in color. But it lacks in quality for dessert use and does not keep much later than Fameuse. The Osceola is nearly best in quality and a later keeper. Hence our hope to secure improved quality and keeping capacity in the Silken Leaf seedlings. The seedlings have all the marks of the true Ironclad. Most of them have leaves like those of the mother variety, but some of them resemble the Osceola in leaf and habit.

(2) The Silken Leaf crossed with Roman Stem pollen.* The object was the same as in the above. The seedlings are all vigorous, do not look like seedlings, and not one of them resembles the Silken Leaf in leaf, bud or habit. They all have better foliage than the Roman Stem and appear to be a combination of the two parents of great interest. From this cross of two prepotent sorts we expect valuable and interesting results.

(3) Silken Leaf was crossed with pollen of the Longfield, (No 161). In this case neither variety is a long keeper. But we may expect Ironclad seedlings that will produce keeping fruit north of the 43d parallel.

(4) The Department Cross was fertilized with Osceola pollen. The Department Cross (No. 413) is not true to name. It is a typical Anis from the home of the Duchess on the Volga. It is fully as hardy as the Duchess, as good a bearer, and as free from blight. What it needs is an increase in size and quality and capacity for later keeping, which the Osceola may supply. The seedlings are varied, but all are models in leaf and vigor of growth.

(5) Department Cross was crossed with pollen of Scott's-Winter. Here we have a union of two very hardy varieties
and Scott's Winter is a good keeper. The seedlings are varied, but all show remarkable vigor and inherent vitality.

*Crosses made three years ago:* These were made by Mr. John Craig, now of the Experiment Station at Ottawa, Canada, under the guidance of Director R. P. Speer.

(6) Beautiful Sweet (No. 453) was crossed with pollen of Garden Apple (No. 214). This union of two sweet varieties of excellent quality was made with a view of noting the result of unifying two typical Russian families. We do not expect a larger, handsomer, or better apple than the Beautiful Sweet, but we do expect a varied lot of good sweet apples for late summer and fall use. Yet we may secure a mixed lot mostly sour. The seedlings are remarkable in thrift and perfection of leaf.

(7) Ostrokoff (4 m) was crossed with pollen of Ben Davis. Our No. 4 from Moscow is a typical Ironclad tree on varied soils up to the 44th parallel. It is a regular and full bearer and at Ames it keeps fully as well as the Roman Stem. But when bearing heavily it is not quite up to market size, and it is off on color which is a dull green and yellow. Crossing with Ben Davis will not improve its quality—which is already good—but we hope it will increase its size and improve its color. The seedlings are varied. Some of them resemble the Ben Davis, but most of them follow the mother variety.

(8) Department Cross with Ben Davis. From this union of the heavy bearing Anis with the equally heavy bearing Ben Davis we have reason to expect abundant crops of large finely colored winter apples growing on trees at least as hardy as the Wealthy and possibly some of them as hardy as Duchess.

(9) Antonovka fertilized by Wythe pollen. The Antonovka (26 m) is a typical Ironclad, with the serious fault of blighting on black soils and in sheltered positions. It has done best on exposed prairie ridges north of the 43d parallel. The cross with Wythe will not change its yellow color, but may improve its keeping and quality and give a tree that will succeed farther south and on varied soils. We shall watch the results with much interest. The seedlings give much promise.
Little Hat (No. 272) was crossed with pollen on Roman Stem. No. 272 was selected as a mother stock mainly on account of its remarkable hardiness of tree, having been proven harder in tree and more nearly free from blight than our native crab. Its fruit has the needed size, fine color, and quality.

The crosses should give nearly sweet winter varieties for the north.

Anisovka (No. 185) crossed with pollen of Autumn Strawberry. The Anisovka is of the Duchess family but hardier in tree and fifty per cent better in quality. This should give high colored varieties of fine quality for all parts of the state.

Seedlings of the Ostrokoff (4 m) from trees standing beside other Ironclad late sorts. These seedlings are very interesting. Not one of them has the crabbed look common to seedlings, and resemble the mother variety in all respects.

Pyrus toringo crossed with Wythe pollen. These hybrids are curious if not valuable. What is known as Pyrus toringo is a dwarf species from East Europe with fruit of the size of the pea. From uncrossed seeds the species is reproduced with its small serrated leaves. The crossed seedlings have larger and thicker leaves and an upright habit. If they should give fair sized fruit it would demonstrate great possibilities in the way of development of low primitive forms by hybridizing.

Pyrus ringo with pollen of Duchess. Pyrus ringo is a native species of East Europe of upright habit and dark green and very thick leaves. On the College grounds it attracts the attention of all visitors as a model tree. But its fruit is not larger than a common crab. The Duchess hybrids show a remarkable transformation in leaf, bud, and habit. Its fruits will be watched for with much interest.

Crosses were made two years ago on Duchess as a mother stock, using pollen of Iowa Keeper, Rawles Janet, Roman Stem, Tallman Sweet, Ben Davis, and Boone Crab. The general belief has been that the mother variety, if of a prepotent race, will usually determine the season of fruit of the seedlings. But this has been proven a false belief by Mr. C. G. Patten, Mr. G. P. Peffer, and others. Hence our numerous
crosses of late keepers with our widely known Ironclad. As
the mother stocks used have been mainly much later in season
of fruit than Duchess we shall watch the season of the Duch­
ess crosses with great interest.
(16) Iowa Keeper crossed with pollen of Wythe.
It will be noticed that 16 and 17 are crosses of our common
apples. The results are a surprise to all visitors. The seed­
lings are small and scrubby and the leaves are small and
unhealthy, not one of them shows the health and vigor
needed for our climate. Iowa Keeper is fully as hardy as
Roman Stem, but its seedlings as crossed with Wythe seem
to breed back to a tenderer form.
(18) Roman Stem crossed with pollen of Wythe.
The seedlings are thorny, scrubby, and with small poor
leaves. Not one of them has any promise.
The present promising appearance of our crosses and hybrids
from mother varieties of known adaptation to trying interior cli­
mates, joined with the general results of methodic crossing of
plants and animals on both continents, impresses the belief that
from the seedlings above noted we will secure a greater
number of valuable varieties for our prairie climate than
could be developed in several generations from the “seeds of
the largest specimens of our best fruits” so often referred to by
believers in seedling production.

Our purpose is to plant all our seedlings in orchard, in the
meantime securing fruit as soon as possible by top-working
on bearing trees. With our crosses and hybrids of the pear,
cherry, plum, apricot, peach, grape, and small fruits we have
as yet made less advance. On the college grounds we have
excellent facilities for methodic work in all these lines which
we shall improve as rapidly as possible and report at a future
time.