

No attempt is made in this country to maintain the type or to breed up better varieties.

What has been said about flax applies in general to hemp also. The best types of hemp are grown from seed of the second or third generation from China. The quality of Kentucky hemp is kept up by repeated importations, in small amounts, of Chinese seed. So far as I am aware, no attempt at selection of hemp seed has ever been made in this country.

---

### IMPROVEMENT OF CITRUS FRUIT VARIETIES.

By E. J. WICKSON, *Chairman, College of Agriculture of the University of California, Berkeley, California.*

The possibility of improvement of varieties of citrus fruits is obviously conditioned upon opportunity manifesting itself in desirability of different types, forms and characters from those now familiar to the commercial or amateur grower. It is idle in this stage of the advancement of citrus fruit production in California simply to indulge in a general exhortation of improvement or to suggest that change is desirable because it may secure something different. It is also true, as may be insisted upon later, that radical changes in the characters of varieties, which citrus plant breeders are attaining in the eastern and southern states, are not necessarily of any local value to California, and, from our point of view, may not constitute any improvement at all. We have followed a long and devious path of our own toward the excellence which we now possess and reference to it may be instructive to newer Californians.

It was my privilege as a young man to participate in the citrus fairs which were strong promotive and directive agencies in the early development of orange and lemon growing in Southern California. I remember the first held in Riverside nearly thirty years ago. Recent comers cannot appreciate the eagerness, the effort for close and correct discrimination, the enterprise to secure everything which had promise in it and to bring it to judgment, which were characteristic of the arguments of Riverside and of the rival citrus colonies who ransacked the world to secure the golden fleece, not of Kolchis, but of citrus excellence which should prove effective in the success of their unique horticultural enterprises. The result of this world-search brought oranges and lemons from China, India, Persia, the Mediterranean islands and countries, the gulf coast of the south, the West Indies and Mexico, and from far and wide through Oceanica, until there existed in Southern California thirty years ago a larger collection of citrus fruit varieties than in any other single country under the sun. How the visitors at the fairs admired and praised; how the judges at the fairs analyzed and condemned them by dozens, reserving only a few for tentative favor. Praise was most from the idle; merciless criticism

was the only protection for those who were striving to lay the foundation for a livelihood and a competence. And so the motley grow of citrus varieties began to fall before expert judgment which, it must be acknowledged, was strikingly accurate and impartial because those who were called upon to execute it were trained to quick and broad conclusions through their previous participation in commercial, financial, educational and other professional affairs. The men and women who achieved the success of the citrus colonies of Southern California possessed probably a higher order of intelligence and a richer experience than were ever summoned to a single agricultural undertaking before.

Individual and committee decisions and growers' early results saved a few of the scores of varieties of oranges and lemons for wider and longer trial. Local pride intruded measurably also. Each district was willing to send its champion to tilt for the awards so long as chance remained to it, and local names were proudly given. Let me call the roll to awaken the memories of the pioneers: "Asher's Best," "Wolfskill's Best," "Mayberry's Premier," "Baldwin's Favorite," "Wilson's Best," "Kercheval's Queen," "Riverside Navel"—these were some of the names to conjure with for prizes twenty-five years ago, because all these appealed to local pride and loyalty. There were a few more of general growth at that time, but they were neither here nor there. Out of the throng came one to survive, the Riverside Navel; but to become the universal champion it must forsake its early advocates and promoters and stand forth the Washington Navel orange of California.

I am indulging in these historical references to emphasize a fact which seems to me of ruling importance in this discussion and that is that California has attained to singleness of purpose in the matter of citrus fruit varieties by a rigid and long continued process of selection, beginning with pioneer growers, following with pioneer traders and shippers, following again with analytical chemists, consumers and the general development of commerce and investment—every phase of it exercising the principle of selection in its own way, until, on the basis of its quality and characters and the wealth produced, the Washington Navel is the greatest orange in the world, which it was the dream and ambition of the pioneers to attain by their devoted and discriminating effort.

In order to be a little more specific as to the progressive rejection of varieties once esteemed, let me refer to records which I keep of the kinds which in any year seem to command attention of large commercial planters. The following is the number of such varieties in each of the recent years named:

	Oranges.	Lemons.
1890.....	22	9
1900.....	8	5
1905.....	2	3

I disregard in all years a few varieties which are either untried or appeal only to amateurs or are special types which certain growers plant in a small way for special trade. The two oranges which stand large are, of course, the Washington Navel and the Valencia Late: the three lemons are Eureka, Lisbon and Villa Franca, the first being greater than the other two combined and becoming relatively greater. There are, of course, more varieties of oranges and lemons commercially grown and they have some distinctive values which may bring them revival, but the contrast is limited to those largely planted at the time stated.

It may be taken as established that close and long continued selection has given us two varieties which are of acceptable type and that these types are not to be wisely departed from. Each, however, is susceptible of improvement and it is interesting that each has its strength and weakness. In an effort during the last year to secure the conclusions of experienced growers and propagators as to what remained to be desired in the way of commercial varieties of the orange, I received the following replies from many different people, which I condense to a single declaration as follows:

A later Washington Navel, to be good after May 1st; an earlier Washington Navel, to be good before January 1st; a Washington Navel that will hang on the tree like the Valencia; that will not crack on the tree; that will stand hot sun better; that will be free from puffing, as the Valencia.

A Valencia that will not turn green after maturing; a Valencia that will bear more regularly.

A large seedless variety to bridge the gap between the Washington Navel and the Valencia, and displace seedlings ripening at that time; also a variety that shall be as good as the navel and late as the Valencia.

Here we have each variety described, in part, in the terms of the other, and new varieties described in the terms of both. It is very clear that we have come to a definite attainment of what is desirable in a commercial orange for our California purposes and that whatever we do for improvement should include no serious effort to break from this type but rather to enforce it upon any disposition toward variation.

Practically the same condition prevails in our approved varieties of lemons, for the following are described as desirable improvements:

Increased disposition in the Eureka and Villa Franca to bear summer fruit and with resistance to frost like the Lisbon: a Eureka with more uniform shape, smoother skin and color like the Lisbon: a Lisbon with fewer or freedom from thorns like the Eureka.

In lemons then, no departure is needed from the type which has been determined by selection hitherto, but there may be new characters within the type. Before final suggestion is undertaken concerning this effort a brief reference to the assurance that we have correct types for our purposes may be pertinent.

The Washington Navel orange as it goes from California into the world's commerce is a combined product of grower's skill and climatic conditions operating upon its own natural qualities and characters. Neither of these factors alone could achieve its present position. The navel mark is neither peculiar to it nor determinative of it, for there are other navels which are inferior here and our navel is inferior elsewhere—even in Behia, whence it came, it has no such quality and standing, because in coming to California it passed from humid, tropical to an arid, semi-tropical environment. The tropical orange is not in the same class with the semi-tropical from the point of view of commerce. Trade in tropical oranges is local or limited: trade in semi-tropical oranges is world-reaching. The orange produced in an arid, semi-tropical climate is dense and compact, firm and better in keeping and carrying characters. It is also of more sprightly flavor and richer composition. Those who are disposed to exalt the humid-air orange for superior sweetness forget that the California orange, as compared, for instance, with the Florida product, has not less sugar but adds to it more acid; being, in fact, not less sweet but more sour. In both sugar and acid are nutritive substances, the superiority of the California fruit from a dietary point of view is clear. Such an orange, enclosed in a thin skin of silky texture and beautiful finish; comes very close to an ideal upon which to found an industry. How well such a type of orange serves that purpose is shown by a production for 1906 estimated to have reached a selling value of twenty million dollars—the greatest value ever attained by any state or nation in the citrus line, and delivered to purchasers at a greater average distance than any other ever attempted. Far less in degree but similar in kind has been the development of the California lemon industry; and though its greater difficulties have been by no means overcome, the advancement in the attainment of suitable varieties has secured something suitable to build upon, as already shown.

The improvement of citrus fruit varieties as diligently pursued by expert plant breeders of the United States Bureau of Plant Industry and of the southern experiment stations is of great pomological interest and promise generally. The objects aimed at, are, however, of rather remote applicability to California because the conditions to which they endeavor to adapt their new fruits of citrus origin do not exist within the range of our large commercial citrus industry. They are endeavoring, by hybridization to induce a combination of maximum hardiness with quality by which, through selection, they may attain something at least tolerable from an amateur's point of view. They wish to produce something like an orange or like a lemon which can be grown under what are now found to be non-citrus conditions. They are inviting the most startling changes of types of citrus fruits, that some departures may fall on their side. To the Californian the work is interesting. Even if they should fail to secure an orange which would bear fruit in Pennsylvania, they may produce orange blossoms and thus minister to a charming requirement even of northern people.

But although California has no need for such changes of type in citrus fruits and has, as shown, worked so diligently and long for the attainment of the types which are at present supreme in her industry, there is still ample opportunity for improvement within the types. Such improvement is to be attained not by hybridizing, but by selection—the very effort which has opened the way for California progress hitherto. But why need this work be pursued differently now?

In the first place the citrus interest of California is too great in its commercial and cultural problems and responsibilities to serve itself pomologically as it did at its beginning. Second, the improvement of a type, removing its defects and adding to its excellencies, requires closer work than to recognize the type itself and found an industry upon it. It requires the most acute perceptions of minute characters and tendencies, and most diligent search for them. It necessitates the determination of what is absolutely the best in form, substance and finish, vigor and productiveness, and the conditions under which all these are attained. It invites the closest pursuit of the best fruit as it appears in packing house or exhibit, or as it secures special price and fame in the trade, to the trees whence it comes. Its subsequent steps are analysis, measurement, comparison, photographic and written records and study of environment including culture, and the best possible discernment of the relations of all these determinations to each other. The supreme test is propagation under various conditions to test constancy and the last resort is multiplication that the whole industry shall have the advantage of the best thing there is of its kind to plant. Incidental to the foregoing is the test of stock on which such trees are to grow; which stocks are best for this or that, or here or there, and how has it been demonstrated?

Such work will require the services of the best trained and most expert men in pomological science. They must have good eyes and clear heads, not too much cumbered with other affairs, and they must have full knowledge of why they seek and quick recognition of the signs of appearance.

It is to secure advanced work of this kind that alert and influential orange growers at Riverside appealed successfully to the legislature of 1905 for the provision of a special Citrus Experiment Station and made a tender of valuable land for it which is now being improved, for the purpose intended, by the Experiment Station of the University of California. It is designed to be the home for such important pomological work although many other cultural phases and experimental problems of orange growing will naturally be associated in its effort. Our meeting at this time is for the purpose of marking its beginning along its designated lines. It is eminently appropriate that we should assemble for this purpose in Riverside and almost upon the very spot where the first citrus fair of the pioneers marked the first great break towards the attainment of the world's high mark in commercial production of citrus fruits which now belongs to California.