PLANT BREEDING PROBLEMS

Many Opportunities on Pacific Coast—New Varieties with Definite Characters Needed—Fundamental Work with Old Varieties Must Be Done —What Has Already Been Accomplished[1]

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THE Pacific coast has become world-famous because of the excellence of its fruits and fruit products. Most varieties and types of fruits that have been tried on this coast have succeeded remarkably. In fact, in most cases they do better here than they do in their native homes, growing to unusual size, developing a high degree of color, and attaining superior quality.

Now, while this fact of the success of deciduous fruits on the Pacific coast is a source of pride and satisfaction, as well of material profit, to us, I believe that it is, on the other hand, likely to lead us to the comfortable but dangerous assumption that our fruits are good enough; that, having apples, pears, plums, etc., which meet every market requirement, we have lost sight to a very large extent of the great contributions which we might make to the field of horticulture by producing new and still better varieties.

Not only should we be thus desirous of originating fruits of ever surpassing excellence, but we should be very eager to contribute to the knowledge of genetics, that we may be of service to our co-workers in this field. Do not understand me to imply that nothing has been done in this line on the Pacific coast. Consider the many contributions of Luther Burbank; the Loganberry of Judge Logan; the famous cherries of Lewelling (such as the Republican and the Bing); the introductions of other practical breeders (the Lambert, Centennial, Deacon, Lake, Hoskins, and Vesta cherries); or the superior strawberries of the Pacific Northwest; and many other improved fruits which I will not stop to enumerate—but the man who says that we have plenty of good enough varieties of fruits and nuts at the present time, and therefore need not try for new varieties, has failed to analyze the situation carefully.

SOME IMPORTANT NEEDS

We need a walnut, for example, that is immune to the ravages of the walnut blight. We need pears which can survive the attack of the fire blight. We need cherries that are never attacked by gummosis. We need prunes, especially in the Northwest, that mature earlier, are sweeter, and, if possible, larger. We need a red apple in the spring. While it is true that we have the Winesap, it is nevertheless a fact that the Winesap is very exacting in its requirements and is restricted to a rather limited area. We need an apple of wide adaptability, such as the Ben Davis, but having at the same time the qualities of the Esopus (Spitzenberg) or the Winesap, and this apple to be in its prime for the late winter or early spring market. We need cherries which escape the rainy season. Especially do we need a flesh-colored cherry of better shipping quality than is possessed by any variety we have at the present time. These are only a few of the suggestions that could be made for the practical plant breeder.

The men who are working in the field of genetics on the Pacific coast at the present time can be divided into two great classes. The first class may be called that of the plant-lover, or so-

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called practical professional breeder. The aim of these men is to produce some new plant by chance or otherwise. Most of the fruits or horticultural products that have been obtained so far have come very largely by accident. I refer to the work of the Lewelling brothers, Hoskins, Logan, Burbank, Father Schoener, and many others who might be mentioned. I would in no way belittle the work of these pioneers in our field. They have contributed some of the world's choicest fruits. To Burbank we owe much; he has shown us the possibility of obtaining great variation in plants by change of environment, has taught us the value of working with large numbers and has demonstrated a wonderful aptitude and ability in segregating the valuable plants from the hosts of worthless.

One cannot help feeling, however, how much better it would be if, in connection with the origin of such cherries as the Lambert and Bing, something could be known in regard to their parentage, and the tendency of these parents to produce such fruit. Such facts would make a contribution to plant breeding well worth while, as we would have laid down fundamental foundation stones for future investigators to build on.

WORK OF SCIENTISTS

The second class of workers are our experiment station workers, research men, so to speak, who fall naturally into several divisions. First, there are those men who devote their time largely to testing certain theories of evolution; to working out certain laws of heredity; men who are attacking the fundamental problems of genetics, those which deal with the very principles of the science. A goodly number of such men will be found on the Pacific coast who will be willing to devote their lives to this work.

Second, there are those men who are dealing with problems of a somewhat indirect nature, but having a close relation to the fundamental problems of genetics. I mention the pollination studies, such as have been conducted at Oregon Agricultural Experiment Station. Some of these studies have already been published in four bulletins.

The work on the cherry has been of special interest to plant breeders, since it has shown that in the Northwest, at least, the possibility of using the Napoleon (Royal Ann), the Lambert, and the Bing is somewhat restricted, as they are sterile, and are also intersterile, so that wherever cherry seedlings are produced, they will not come as the result of crosses of these three varieties, but may come from the crossing of these varieties with others of perhaps not as great commercial value. Then there is a splendid work that Shamel is doing in southern California on the bud variation studies of citrus.

A third class consists of those workers who are forced to take up some problem having for its aim a definite commercial need, but coupled with foundation studies in genetics. I refer to the work that Webber has done with the citrus fruits, cotton, etc., to the work with the pear that is being done at the Southern Oregon Experiment Station where over twenty species of *Pyrus* have been collected, and where over 1,000 varieties of pears are being tested, to note first, their resistance to the fire blight, and secondly, to work out their value as parents in producing immune or resistant varieties of pears.

Other work is being done at the Oregon Agricultural Experiment Station with apples, cherries, prunes, etc., much along the same line as that which is being done with the pears, but of course with different aims.

I have mentioned more the work of the Oregon station, since I am more familiar with the work of that station, and not so familiar with the work under way at the other stations on the Pacific coast. Undoubtedly, however, they are also taking up this work very extensively.

PROGRESS HITHERTO SLOW

Our progress in the past has been very slow; perhaps we can almost say we have done little or nothing, practically no fundamental work in genetics as far as plant breeding is concerned. We have only touched the surface.

However, progress must be slow in a problem of this nature, and we must all be patient. The promise is very great for the future. We feel that we are on the doorstep of a dawning of great things. The workers in plant breeding are holding their breath, so to speak, for they realize that the time is close at hand when very definite, startling progress will undoubtedly be made.

Let us encourage our young investigators in every way that we can. Encourage those in the field of pure science. Encourage those who are working with the problems of morphology, cytology, physiology, and biochemistry, because many of these must be worked out before very definite progress can be made on other phases of our investigations. Let us continue our many pollination studies, for they are bound to contribute much to our knowledge of genetics. We must know more of the fundamental laws of genetics, and their adaptation to the plant kingdom, and their ultimate relation to our commercial progress. In a relatively short time we should know the value for breeding purposes of our leading varieties of fruits on the Pacific coast; we should trace back their pedigree as far as possible, and know the value of any one given variety as a parent for future work.

Some of the most promising commercial varieties may prove useless as parents, and some very unpromising commercial varieties may prove very valuable as parents. I have seen one illustration of this in apples, for example. Take the seedlings of the Ben Davis. We have found in our work that, no matter whether the Ben Davis was a male or a female parent, the seedlings from this variety tend to be weak, that they are lacking in vigor and vitality. Yet the Ben Davis apple is often spoken of as a tree of wonderful vitality. My observation of this variety, however, in the Pacific Northwest, would lead me to conclude that it is not one of great vitality. It becomes decrepit at an early age, and its seedlings are certainly very unpromising. On the other hand, we have a variety which is very seldom heard of, the White Winter Pearmain, for example. This variety when used as a parent produces vigor. It gives vegetative strength, and strong sturdy seedlings result whenever this variety is used as a parent. I simply cite these two cases to show that the field is large, that we have more work than all of us put together can do in many generations to come.

The field is measureless, the opportunity unlimited. Optimism should be the watchword of our young workers. Let the Pacific coast not only contribute to horticulture by growing to unexcelled excellence the well-known varieties of fruits, but let us contribute just as generously with new gifts of flower, fruit and vegetable, and at the same time do our share in contributing to the world's knowledge of genetics.

Grape Breeding

The first plant-breeding work in the horticultural department of the New York Agricultural Experiment Station (Geneva) was done with grapes. "The main problems with this fruit are as follows: Inheritance of color—a special effort is being made to find varieties which are pure for the various colors; inheritance of size and shape of bunch and berry; high quality; season of ripening; stamen type and its corrolary problem of self-sterility and inheritance of sex. A large number of European grapes, *Vitis vinifera*, are being grown in an attempt to find varieties adapted to this region and to use in crossing with our native species. The grape material now on the grounds comprises two vineyards of about 350 named native varieties, about fifty varieties of *Vitis vinifera*, some 800 crosses now in bearing, about 1,600 self seedlings of known varieties now in bearing and about 3,500 crosses still to fruit."