

even a couple of applications of just straight synthetic fertilizer, whatever you can get in a reasonable amount. But while you are making out the best you can this way, bear in mind that a tree cannot always live on just synthetic plant food any more than a man can live on straight bread or a horse can live on straight corn. All will get along all right for awhile but it requires something eventually to back up this incomplete ration, and one of the best means that I know of to balance up this incomplete grove ration is to provide a good cover crop to rot back into the soil. There may be talking points against a cover crop, but if you can understand tree talk you will soon be convinced that a good cover crop, especially crotalaria, is worth a whole lot of effort and some expense. In figuring out your efforts to allow your grove more privileges, don't go and cultivate it too much. Why it makes me sick at heart to see the way some of my neighbors on the west coast plow their poor groves to death. If their groves had all kinds of fertilizer in the topsoil they wouldn't let it lie still long enough for the roots to pick it up, and it sometimes looks to me that if these growers must spend so much time trying to do something for the trees, that they would better go fishing and put the fish they catch on the grove for fertilizer. Even if they didn't catch but one fish a day their groves would be much better off in many cases.

If you must dig at the soil, after you have

given your grove a reasonable amount of cultivation, go and open up any drainage ditches that the grove may need and then thereafter keep them open so as to maintain a regular root level in the soil.

If your trees are very hungry you needn't generally worry much about the scale or whitefly damaging them unless they are alongside of a dusty road when scale might need some attention at times. Examine the trees, and fruit if any, occasionally for rustmites and don't let them damage your fruit or foliage if you can avoid it. Only one good spraying or dusting, if done at the right time may reduce the mite damage well worth the effort and expense, and most years two or three properly timed sprayings or dustings will handle the mite situation very satisfactorily.

Ordinary years, some dead wood will accumulate in the best groves, and this should be pruned out whenever enough appears to make the operation economical. The "underprivileged grove" is likely to have a more or less heavy percentage of dead wood. I would get this out as soon as possible, but if it is a choice of pruning or fertilizing, I would take the fertilizer every time.

In conclusion, let me say that the element generally most needed by the underprivileged grove, is better management, and the way to become a better manager is to watch carefully what not just one neighbor does, but what they all do and then watch your own doings rather critically.

THE IMPORTANCE OF QUALITY OF CITRUS FRUITS, WITH PARTICULAR REFERENCE TO GRAPEFRUIT

Frank L. Holland, Winter Haven

At the outset let me say that this discussion will not be along usual lines in that the word quality is used with reference to the interior of the fruit and not the exterior. Quality in the minds of most people pertains to external appearance only. This is of great importance and well worth all efforts put forth on this phase of quality in citrus fruits in the past, and will warrant probably increased efforts in the future.

Neither will the discussion cover shipping green or immature fruit. There simply isn't any reason for shipping *inedible* fruit. Such fruit has no quality and therefore is left out intentionally! My desire is that you think only of ripe fruit in connection with my few remarks.

I wish to discuss "Quality," as pertaining to the contents of the fruit, its meat and juice, its flavor, and its real eating and health qualities.

When notified by your Secretary as to my subject, I made it my business to talk with as many growers, buyers and authorities on citrus fruits as was possible. I gained the very definite impression that the eating quality of much fruit has been gradually but definitely getting poorer during the past several years. No less an authority than Mr. H. Harold Hume told me yesterday: "There has been very little good fruit this season, and I am not referring to cold and drought effects."

It may be well at this point to check up on various meanings of the word "quality." From some authorities we find that it is used in three different ways: In a primary way, referring to the shape of an object; in a secondary way, referring to the color of an object; and tertiary, dealing with "ultimate values," degree of goodness of an object, its relative excellence by comparison, or its "peculiar excellence" if not by comparison.

It may be truthfully said that the American public learned to buy, eat and like grapefruit on the basis of eating quality and dietary value of our grapefruit as produced several years ago—you might say due to its "peculiar excellence." Does anyone know of any grapefruit that will compare in eating quality with grapefruit from old seedling trees, or old budded trees of seedy varieties grown on fertile soils. If all our grapefruit was as good as that, and in addition had a bright pleasing appearance, would it not mean much to us. Is it not also true that the fruit produced in former years "held up" during the period of time between picking and final consumption better than a great deal of the fruit produced today.

For specific comparison, from the quality viewpoint, of some standard varieties of citrus fruits as produced today and in past years, let us consider briefly some of the characteristics given by authorities as being descriptive of typical fruits of certain varieties.

For instance, Dancy tangerines: flesh, dark orange; juice abundant, colored; pulp melting, acidity and sweetness well blended; flavor rich and sprightly; quality excellent.

Pineapple orange. Juice abundant, pulp melting; acidity and sweetness well blended; flavor rich, vinous, sprightly.

Valencia orange. Juice abundant; acidity and sweetness well combined; pulp melting; flavor rich, sprightly and vinous; quality excellent.

Ask yourself honestly how much of your fruit meets such specifications. Will a basket of your fruit fill your dining room with the incomparable aroma given off by real quality fruit having honest to goodness flavor?

Now as to characteristics of grapefruit. Duncan—bitterness well marked; acidity and sweetness good; a variety of superior quality.

Excelsior—bitter principle well marked; acidity normal; quality good.

Walters—bitter principle strongly marked; acidity and sweetness good; quality very good.

Marsh—bitter principle not strongly marked; acidity and sweetness medium.

It will be noted throughout that the actual quality factors of the seedy varieties are given a higher rating than those of seedless.

This whole question of "Quality" in seedy grapefruit appears to be one of the most important, if not the most important, problem in citrus circles today in Florida. We have a tremendous acreage of seedy grapefruit that has been unprofitable generally in recent years. If anything can be done to improve the seedy grapefruit situation it should have a very marked beneficial effect on the citrus industry of the State as a whole.

Our grapefruit does not benefit by advertising programs of other states like our oranges do. In fact it may be said probably that the widespread and efficient orange advertising programs of other states have made the country orange minded, as far as citrus fruits are concerned. It is also true that oranges do not have the same specific competition that grapefruit have due to certain fundamental differences in the two kinds of fruit, manner of use, etc. Grapefruit must compete with all other breakfast fruits and dishes, practically all other salads and now with ginger ale. It doesn't get any help from California and gets nothing but hard competition from Texas, both as to advertising and sales. It must have

merit of its own to support our advertising and sales efforts, if we are to get back on a profitable basis in our common grapefruit industry.

Our out-of-state grapefruit competition has been principally with seedless varieties. Some feel that the bad situation in the Florida grapefruit deal is a result of other things besides poorer quality including: developing an inferiority complex because of the seed in our fruit. Many feel that this has developed due to the continuous advertising of "seedless" fruit by our principal competitors. This must be merely a bug-a-boo as far as grapefruit are concerned, because we all know that when the juice is served the seeds are removed; when the fruit is served in half it is cored regardless of whether it was a seedy or seedless variety; and when sold in cans the consumer sees no seed, but practically all canned grapefruit is some "seedy" variety. In other words the final consumer; the person who actually eats the fruit or drinks the juice, knows little or nothing of the seeds that were once present in the fruit, excepting of course in home consumption.

If the profitless situation of our seedy grapefruit industry has developed because of an inferiority complex due to seeds in our fruit, or because of unconscious feeling that the seedless fruit would run it off the market, it would seem that there are some things that could and should be done to correct it.

First: Growers must fertilize and otherwise care for their groves in such a manner as to produce grapefruit of real flavor and quality. Produce the kind of grapefruit that made the public learn to like and use it years ago.

Second: Advertising and sales agencies should conduct their campaigns so as to capitalize on the *superior qualities* of seedy or common grapefruit. Let the consuming public know that such fruit has better flavor, richer juice, greater medicinal and dietary value. Above all, tell the public that seeds in grapefruit are indicative of such valuable characteristics in the fruit itself.

In connection with the first point, suggested above, there is need for some research on the part of State and Federal agencies dealing with these points that go to make up eating quality, and what practices are necessary if the very high-

est eating quality grapefruit is to be produced by growers.

In the meantime, however, we do know how to grow better fruit than many of us have been doing in recent years, and we can get back to our own original standard of quality fruit at once, and improve on that as additional facts are developed.

In connection with the second point suggested, it would seem desirable for some research to be done on dietary and medical values of our seedy grapefruit, compared with seedless varieties, and compared also with competitive products.

As said above, however, practically everyone will agree that a real good seedy grapefruit is far superior in eating and juice quality to seedless grapefruit. It is also generally considered that the health values of seedy grapefruit are greater than those of seedless fruit. We see many competitive articles, including our oranges, advertised largely on the basis of their vitamin and mineral content. Our seedy grapefruit have outstanding values along these lines so why not capitalize on them, and at the same time be selling the public a more desirable, more valuable and more tasty fruit to eat.

The whole country is diet conscious, and our common seedy grapefruit undoubtedly have special value along this line. Yet we say little or nothing about this, and actually blush and apologize because our fruit has seeds, all of which pleases our competitors. Also, in so doing, we eliminate our chances of making a profit, and stint our groves so the original quality of our fruit is lowered beyond a profitable point.

Perhaps it will be possible for the discussed Citrus Commission to sponsor some research work on grapefruit along this general line of diet value. Although the proposed bills, I believe, provide specifically for advertising funds, it would seem reasonable that the Commission could legally and wisely spend some of this money along lines of nutritional research in order that they may really have more valuable data to use in their advertising programs.

Such a program of advertising and sales need not react harmfully to the sales of our seedless grapefruit in Florida, because of the difference in the range of the marketing seasons which the two

types generally have. The facts would seem to be that such a program would benefit growers of seedless grapefruit, in that the market for seedy grapefruit, being raised over its present level, should have a tendency to relatively increase the price, or at least strengthen the market for seedless grapefruit when its season came in. Also could we not stress the "Seedless" nature of such varieties *during their marketing period*, thereby taking a leaf out of the book of experience of our competitors.

In making the statement earlier that eating quality of much grapefruit has become poorer in recent years, questions naturally arise in our mind as to reasons for such condition. There probably are many reasons but among others occur the following: First, earlier plantings were made on more fertile soils while later plantings have been made on less fertile and thin soils. The consequent effect on eating quality of fruit must be recognized. Second, it is probable that many of us newer and younger growers fail to really understand and appreciate true eating quality of citrus fruits as was true of such men as Messrs. W. S. Hart, E. L. Wartman, H. B. Stevens and other gentlemen who have truly understood citrus fruits from a quality point of view. Third, variations in rainfall and climatic conditions from season to season. Fourth, changes in grove practices in recent years are quite generally considered as having tremendous effect on the eating quality of fruit, particularly on thin sandy soils.

Reference is made to changes in fertilization, cultural and other phases of production.

A word in connection with the last named reason may be in order. We growers have deliberately planted groves on some thin, sandy lands because of cold protection and for other reasons. When we did this we knew that the soil was relatively infertile and that our production programs, particularly with regard to fertilizers, would be necessarily somewhat more expensive than they would be on heavier lands. Are we pulling down essential quality in a mad scramble of economy along production lines? Are we carelessly or deliberately destroying the foundation on which a successful industry must depend? Can we expect to regain and maintain a profitable

grapefruit business if our fruit does not have eating quality, regardless of how pretty it may be to look at?

The whole matter at the present rather resembles the old question of "Do we live to eat or eat to live." Shall we find out and do the things necessary to produce and sell grapefruit of real eating and medicinal quality thereby making our business profitable, or shall we mosey along waiting and hoping for a high market during a big crop year to set us up financially?

Probably we will all admit that scientific studies of the values of citrus fruits, particularly with regard to quality factors, are of great importance to growers. Both State and Federal agencies have been doing a great deal of constructive work, but with insufficient funds and personnel, it is impossible for them to do everything. It would seem to be to the advantage of us all to get behind a movement now under way to get the Legislature to appropriate more money for citrus research work, so that this matter of eating quality, in addition to other important items, may be investigated. Judging from market prices for much of our grapefruit this year, we better rush this appropriation for research work along, or we will need an undertaker rather than a research worker.

In conclusion, I wish to restate that this country learned to buy, eat and like grapefruit on the basis of the eating quality and dietary value of Florida grapefruit as produced years ago, you might say due to its "peculiar excellence." At the present time it appears necessary that we must get back to producing such grapefruit again, find out and advertise what makes up its peculiar quality, its medicinal and dietary values; advertise our fruit as what it really is. The starting point of this must of necessity rest with the growers who are the producers of the fruit, backed up by advertising and sales agencies.

Suggested research work should be of help in future years, but it is felt that we already have ample practical knowledge and other information, pertaining both to production and consumption of seedy grapefruit, on which growers, advertising and sales agencies can base an active, successful

campaign for restoring our common grapefruit industry to a basis of *quality* and *profit*.

There's no denying that our common grapefruit industry is sick. The tremendous investment at stake would seem to warrant taking immediate and, if necessary, extreme measures for its recovery.

SUMMARY

This is a brief, general discussion of the importance of eating quality in citrus fruits, with particular reference to grapefruit.

The situation, as it exists in part, with respect to seedy or common grapefruit is emphasized. Some thoughts are expressed concerning some of

the factors contributing to this situation from viewpoint of eating quality; and from viewpoint of advertising, sales and consumption of such fruit.

Some suggestions are advanced as to needs for, and ways and means of (1) improving the eating quality of much grapefruit as now produced, (2) capitalizing on the natural superior eating quality and other characteristics of seedy or common grapefruit. It is suggested that this would be of benefit to consumers and the industry as a whole, as well as to individual growers.

Footnote: I wish to acknowledge the constructive suggestions of Mr. C. W. Lyons of Tampa in connection with parts of this paper.

RECENT DEVELOPMENT IN CITRUS SOIL FERTILITY INVESTIGATIONS*

George M. Bahrt† and A. E. Hughes
Soil Fertility Investigations, Bureau of Plant Industry
U. S. Department of Agriculture

As a result of experiments with citrus on several soil types in Florida, it has been reported (1) that fruit obtained from trees to which complete fertilizer and manganese sulphate were applied, required more pressure to crush than fruit from trees receiving only commercial fertilizer. It was later reported (2) that tangerines and oranges obtained from trees to which manganese sulphate was applied in addition to the complete fertilizer had a more intense color in rind than fruit from the plots to which fertilizer only was applied.

In 1930 experiments were started to investigate the action of single and double strength acid and basic forming fertilizer on acid and basic soils and the influence of minor essential plant food elements used with each fertilizer. A single strength fertilizer was used, having a formula such as 4-8-8 or 3-8-5, and a double strength fer-

tilizer, having a formula such as 8-16-16 or 6-16-10. The acid soils selected were the Norfolk fine sand, rolling phase, at Winter Haven, typical of citrus soils of the ridge section of Florida, and the Norfolk fine sand; Low Hammock phase, at Mims, typical of acid Low Hammock citrus soils. The basic or neutral soils selected were the Portsmouth loamy fine sand at Mims and Palm Beach sand at Vero Beach. The reactions of the acid and basic soils treated with single and double strength acid and basic fertilizers are reported in another paper at this meeting by Dr. A. E. Hughes.

The constituents as shown in Table I were selected for use in these experiments. All single strength acid and basic forming fertilizers obtain one-third of their nitrogen from organic sources. The double strength acid and basic forming fertilizers secure all their nitrogen from chemical sources. The equivalent acidity and basicity is in terms of calcium carbonate and is based on the reports of PIERRE (3) (4).

Table II shows the average of orange tree

*Prepared for presentation before the Florida State Horticultural Society by George M. Bahrt. Acknowledgment is made of suggestions of J. J. Skinner of the Bureau of Plant Industry, in charge of Soil Fertility Investigations in the Southeastern citrus and truck crop belt.

†In charge of Soil Fertility citrus and truck crop investigations in Florida.