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I

A SURVEY OF THE COLORADO PEACH MARKET

A. W. Epp, Economics Section


Introduction

Colorado peaches were well received on the market during the 1942 season. In general there was a strong demand for fruits and vegetables, and peaches moved readily into the hands of the consumers at prices considerably higher than in recent years. The survey on which this report is based was made during the early part of the peach marketing season, August 30 to September 14.

Some marketing problems are apparent from year to year and are not greatly affected by the relative supply and demand situation. Other problems in marketing appear only in years of abundant crops or in years of an abnormally low demand. This should be kept in mind in considering the problems discussed in this report. No congestion of peaches on terminal markets was observed this year, although information received indicates that some congestion may have developed in the latter part of the marketing season. The average time between the picking of peaches and the time they were sold to consumers was probably considerably less this year than in other years. Comments of dealers regarding brushing, packing, and the general quality of peaches, however, should not be affected by the changed conditions this year.

Purpose of the Study

Peach growers of Mesa County have been interested in getting information regarding the marketing and distribution of their peaches. The purpose of this survey was: (1) to determine if Colorado peaches were available to consumers in all communities in the area generally supplied with Colorado peaches; (2) to observe the quality of Colorado peaches when packed in Mesa County and when they arrived on distant markets, and to compare the quality of Colorado peaches with that of peaches from other areas; and (3) to contact dealers and consumers of Colorado peaches to get their comments and criticisms regarding the quality of our peaches and present methods of marketing them. In short the purpose was to find out what Mesa County growers and shippers can do to make peach production and marketing more profitable for the producer.

Area Covered and Procedure

The survey covered parts of six states: Kansas, Missouri, Iowa, Minnesota, Nebraska, and Colorado. Approximately three-fourths of the Mesa County peach crop is shipped into these six states (1939, 77%; 1940, 77%; and 1941, 80%). The large markets studied were Wichita, Kans., Kansas City, Mo., Des Moines, Minneapolis, St. Paul, Omaha, and Lincoln. In these cities brokers, wholesalers, and retailers were interviewed. In the smaller communities between large cities contacts were generally limited to retailers to find out if all communities were supplied with Colorado peaches. A total of 97 dealers were interviewed—64 retailers, 25 wholesalers, and 8 brokers. Only a few consumers were consulted. In the short time available for the survey it was felt that more could be accomplished in discussing the matter with dealers.

Maturity and Quality

In general the quality of Colorado peaches is considered superior to any other
peaches handled. Many regard the flavor as better; some feel that Colorado peaches are juicier or sweeter. However, some dealers personally preferred peaches from the South Atlantic States or from California. This is also true of some customers interviewed. Dealers in general felt that Colorado peaches had as good keeping qualities as any and many considered them superior in this respect. Many dealers reported that they had very little or no spoilage in Colorado peaches. One must bear in mind, however, that peaches moved into the hands of the consumer more rapidly this year than normally. Some dealers stated that they did not have peaches on hand long enough to test their keeping quality.

Some breakdown or decay was observed at various places. One dealer had peaches on hand that showed considerable decay. A number of boxes examined had numerous peaches spoiled and others spotted. A few boxes were completely spoiled. This dealer declared he lost $15 worth of peaches in 2 days. This same condition was observed on other markets. It seemed to run in the packs of a few growers. It was not general in all Colorado peaches. Only a few dealers made complaints in this regard.

A majority of the people interviewed were fairly well satisfied with the average maturity of the peaches received, although a number of dealers complained that the peaches received were somewhat green. Not one dealer complained that the peaches received were too ripe. A quite common remark of dealers was, "These peaches are rather green, but of course we like them that way." One dealer who was sorting a considerable amount of peaches made the statement that he had to keep the peaches so long before they were ripe enough to sell that many were spotted. In another grocery store a box of green peaches was left over from table sales. A sack of these peaches was purchased and kept for 2 weeks. They never became edible. Even when soft they were tasteless.

One shipment of immature peaches was observed in central Kansas. These peaches, still green, were shriveled until they were approximately 1 1/2 inches in diameter; their skin was wrinkled and their general appearance was very bad. They were on display in the show window and were advertised as Colorado peaches. Early shipments of immature peaches are poor advertising for Mesa County fruit. The grower has the additional loss of a reduced yield because the peaches are harvested before they are full size.

In general the complaint was not that the peaches were all too green, but rather that there were too many green peaches in the shipment. A lack of uniformity was apparent in many shipments examined. Under the present marketing system it is also possible that the ripest peaches go to Chicago and the greenest peaches stay in Denver. If something could be done to make for greater uniformity of ripeness and some method could be developed whereby ripest peaches would go to nearby markets and greener peaches to more distant markets the question of maturity would be largely solved.

Pack

In the nearer markets in Colorado, Kansas, and Nebraska the bushel basket is the preferred container. In Iowa and Minnesota practically all Colorado peaches handled were in boxes. Dealers were generally well satisfied with the type of container. Many dealers reported difficulty in getting baskets early in the 1942 season.

Numerous complaints were received regarding the way both baskets and boxes were packed. In the case of the baskets it was just a matter of not filling the baskets full enough so that they would look full when lids were removed for display. Unless
baskets are shaken down when packed the peaches settle considerably in shipment. There was also some complaint that baskets packed with peaches just meeting the minimum of 2 inches did not sell very readily.

In the case of boxes, dealers were more caustic. They complained that peaches were smaller than labelled and that the boxes were not full. Many boxes examined in various markets would have taken at least another row of peaches without difficulty. In some cases the top layer was approximately two-thirds filled. Many boxes examined contained a number of undersized peaches. Boxes marked 50's would have in them some peaches that were definitely 70's and sometimes even 80's. Federal regulations allow a variation of \( \frac{1}{4} \) from the number of peaches indicated on the box, but the consumer feels that he has not received full value if the box is not full, even though it meets the requirements of Federal regulations. Greater care in sizing peaches and in filling containers would result in much more attractive packages.

**Brushing**

Peaches from competing areas are quite commonly brushed. Some dealers had not handled any unbrushed peaches this season until Colorado peaches arrived. It is the general opinion among dealers that Colorado Elbertas are fuzzier than Elbertas from any other area.

Practically all dealers contacted in the larger markets want brushed peaches. Wholesalers and retailers can sell them more readily and often get a premium for them. Clerks in stores complain of the fuzz in handling unbrushed peaches. One retailer said, "You should brush every peach even if you have to have 10 or 15 cents more per box." Another retailer said, "Look at these unbrushed peaches. I'll never buy another unbrushed peach." In the truck area where consumers are not accustomed to buying brushed peaches and where a very large percentage of the peaches are sold by the bushel for canning, brushing is not so important. A few dealers in this area were not familiar with brushed peaches. Nevertheless, by far the most common suggestion for improving Colorado peaches was to brush all the fruit.

**Distribution**

Colorado peaches are seemingly well distributed in the territory covered by the survey. Not a single retail dealer was contacted that had not had an opportunity to buy Colorado peaches. However, one should not infer from this that retailers are supplied regularly in areas that may be farther from distributing centers. It seemed that in some areas trucks hauling bulk peaches were not as plentiful as last year. This was early in the season. A few dealers early in the season complained that the peaches offered them to date were mostly culls.

Many dealers complained that they could not get enough peaches this year. This was not due to jobbers and brokers failing to call on them but rather because of the strong demand for peaches. Brokers and jobbers frequently stated that their orders were only partially filled.

**Truck-Rail Competition**

The matter of trucking peaches out of Mesa County has been a controversial question for a number of years. Some observations were made regarding this problem.

The territory including eastern Colorado and the west half of Kansas and Nebraska is strictly truck territory; very few peaches are shipped by rail into this area with the exception of the Denver market. The territory east of Kansas City and Omaha is strictly rail territory; few trucks haul peaches as far as these
two cities. The problem area is the transition area between the strictly truck and strictly rail territories.

Dealers outlined the problem as follows: The difficulty arises from the fact that trucks do not bring enough peaches into the territory to supply the market but the peaches that are brought in are often sold below cost of rail-shipped peaches. It seems that commonly the trucker sells his peaches direct to the retailer. This cuts out the broker and wholesaler. The trucker also sells his peaches to the retailer for considerably less than the wholesaler can sell peaches received by rail through the regular channels. In some cases the trucker stops at the sale barn or on the street and retails his peaches himself, usually underselling the grocer who handles rail-shipped peaches.

One dealer suggested that no peaches be sold to truckers until 500 cars of baskets have gone out by rail. Another suggested that something be done to eliminate the in-and-out trucker who gets a load or two of peaches, then quits hauling produce. Later he may haul some potatoes or apples and then go out of the trucking business again. It is doubtful if anything can be done at present to remedy the situation. The most harmful practice that could be remedied is the selling of immature, undersized peaches to truckers before the season officially opens. Such peaches certainly are poor advertising for the bulk of the peaches which follow.

What will be the trucking situation by the time the 1943 crop is ready for harvest? It is expected that the number of trucks operating during 1943 will be materially less than during 1942. Should a truck shortage develop in 1943 it might result in some difficulty in marketing the peach crop. The market area which has in the past received its peaches by truck would have to use other means of transportation for a considerable part of their peaches or handle fewer peaches than normally.

The area which normally receives its peaches by rail is dependent on trucks for the distribution of peaches to retailers. A considerable portion of the peaches shipped to the larger markets are distributed by truck in less than carlots. Relatively few of the smaller towns and villages have received rail shipments of peaches in recent years.

It is possible that a feeling of uncertainty may develop among dealers under such conditions. They may not be able to buy from trucks yet be reluctant to order by rail, either because they cannot handle a full carlot or because they feel that later some peaches may be brought in by truck. Such conditions could result in a greatly reduced outlet for Colorado peaches. What the situation will be in August 1943 cannot be predicted now. This is a problem that will require careful study as the 1943 harvest approaches.

Advertising

The Board of Control and some of the shipping agencies have used various types of advertising in the past to help sell Colorado peaches in the consuming area. A number of retailers, wholesalers, and brokers were asked to express their opinions regarding the effectiveness of various types of advertising. It was the almost unanimous opinion of all dealers interviewed that point-of-sale poster advertising is money wasted. Relatively few retailers made use of the advertising material distributed this year. Some of the chain stores will not even accept that type of advertising material.

Radio spot and newspaper advertising were highly recommended by dealers. Choice between the two types may depend somewhat on the particular market. Des Moines dealers seemed to favor newspaper advertising, while Minneapolis and Omaha
dealers were strong for radio advertising. Several brokers and jobbers felt that any money that Colorado peach growers would want to spend for advertising could be spent most effectively by pooling it with advertising funds of the dealers, thus providing more funds for a coordinated advertising campaign. One broker was sponsoring peach canning demonstrations in grocery stores and felt that this method was very effective.

Comparison of Colorado Peaches with Those from Other Areas

Most of the peaches from competing areas were off the market before the marketing-survey trip was made. Arkansas and Illinois, the two strongest competing areas, come on the market earlier. Southern and central California Elbertas also come on earlier than Colorado Elbertas. Northern California peaches come on the market about the same time or a little later than Colorado peaches but no California Elbertas were observed on the markets visited. Michigan peaches were available in a number of markets at the same time as the Colorado peaches.

Although in some of the markets there is a decided preference among consumers for Colorado peaches, there are some consumers who have a preference for peaches from each of the various areas. Dealers expressed a definite preference for Colorado peaches because of superior keeping quality. Many dealers complained of the rapid breakdown of Arkansas and Illinois peaches this summer. However, the quality of the 1942 crop was below normal in both of these states. Michigan peaches observed on the market were not superior in quality but were generally more attractive than baskets of Colorado peaches. The ring face on Michigan peaches had been packed more carefully. The most highly colored cheek was turned up on each peach. The basket was neatly trimmed and quite attractive. Peaches from the South Atlantic States, Georgia, the Carolinas, and Virginia are generally considered to be of very high quality, although relatively few peaches from this area reach the main Colorado market territory. Not one complaint was heard regarding the quality of these peaches.

Conclusions and Recommendations

Colorado peaches enjoy an enviable reputation on the market among dealers and consumers. No doubt Colorado peaches are superior to other peaches in some respects. However, in order to maintain this enviable position it will be necessary for Colorado producers and shippers to put on the market a peach that is just as attractive, of just as high quality, and in a pack that is up to the standards of other areas. It would be unwise to assume that Colorado peaches are so superior that they can be marketed without regard to the competition from other areas. The consumer is still the final judge as to the relative merits of peaches from different areas.

On the basis of this survey of a part of the Colorado peach-marketing areas the following recommendations can be made:

1. Brush all peaches that are not shipped in bulk.

2. Give much more attention to proper grading and packing of peaches. Consider more closely supervised packing in order to get greater uniformity of maturity, size, and quality of peaches in the pack.

3. Permit peaches to mature to full size in order to reduce the number of small peaches on the market. More careful thinning may help in this respect. Two and one-fourth inch or 70 size peaches and larger are definitely preferred.

4. Prevent the early season shipment of immature, undersized peaches. Consumers wait for Colorado peaches. They prefer to wait until the peaches are mature.
Some of these recommendations probably cannot be put into full effect for the duration of the war because of a shortage of materials and labor. Some progress may be possible even during the war period. The demand for peaches may continue strong through the present emergency. After the war the demand may decline and competing areas will have years of abundant crops again. In order to obtain fair returns for their peaches it will be necessary for Colorado growers to be ready to meet the competition from other areas with attractive packs of high-quality peaches.
A serious trouble with pear trees was reported in parts of a pear orchard east of Clifton, Colorado, in 1939. It appeared in a number of pear varieties including Bartlett, Anjou and Kieffer. Distinguishing characteristics of the trouble were severe burning of the margins and the tip halves of the leaf blades early in the growing season, a decrease in leaf size, failure of the fruit to develop properly, very short terminal growth, a scaly appearance of the bark, and a dying back of the new growth.

Tests for possible toxic materials including arsenic, selenium, and boron showed none of these present in sufficient quantities to account for the injury. Soil tests showed that total salts in the soil and the pH were not excessively high (1200 to 1300 parts per million salts and pH of 7.8). Nitrate tested about 5 parts per million. Phosphate content of the soil tested very low. The soil was also comparatively low in calcium sulphate, and tended to be very tight and puddled. Greenhouse tests with sunflowers on subsoil from this orchard showed exceptionally great response to additions of phosphorus. Cover crops grown in this orchard also gave increased growth from phosphate treatment.

In 1941, the growers treated some trees with a mixture of fertilizer materials including triple superphosphate, ammonium sulphate, and calcium sulphate and noted improvement in the treated trees the same year. However, no attempt was made to differentiate between the effects of the different materials used.

With funds furnished by the Mesa County Research Committee, specific fertilizer materials were applied under controlled conditions to 30 trees in the most seriously affected part of this orchard, in the spring of 1942. Applications of phosphorus, sulphur and potassium were made alone and in various combinations. The trees treated were selected with the aid of the grower on the basis of tree appearance and previous season's growth. Only seriously affected trees were included and all were of the Kieffer variety. Selections were made in the early spring before the trees had leaves out. All materials used in these treatments were put down to the root zones in auger holes. The depth varied from 12 inches to nearly three feet. Final foliage readings were made September 4, 1942. Treatments and quantities of materials applied were as follows:

- Sulphur alone - 5, 10, and 15 pounds per tree.
- Triple superphosphate alone - 5, 15, and 25 pounds per tree.
- Potassium chloride alone - 2, 6, and 10 pounds per tree.
- Sulphur 5 pounds and triple superphosphate 5 pounds per tree.
- Sulphur 10 pounds and triple superphosphate 10 pounds per tree.
- Sulphur 15 pounds and triple superphosphate 25 pounds per tree.
- Triple superphosphate 5 pounds and potassium chloride 2 pounds per tree.
- Triple superphosphate 15 pounds and potassium chloride 2, 6, and 10 pounds per tree.
- Triple superphosphate 25 pounds and potassium chloride 10 pounds per tree.

Recovery, where triple superphosphate was used, either alone or in combinations with other materials was remarkable. Trees which in 1941 showed serious foliage, twig, and fruit symptoms appeared in excellent condition. As a result of the 1942 treatment, tree growth and leaf size and color were good. The fruit was
normal and not small and knotted as it was the previous year on these trees or on untreated trees in the poorer part of the orchard. Even the lowest phosphate application, 5 pounds per tree, caused definite improvement.

The use of sulphur alone showed satisfactory improvement when not less than 10 pounds per tree were applied. The combination of sulphur with treble superphosphate gave good improvement from as little as 5 pounds of each per tree. Heavier applications gave excellent results.

There were no apparent benefits from potassium fertilizers when applied alone or in combination with the other materials.

The fact that both phosphate and sulphur corrected the trouble could be interpreted as indicating a deficiency of either phosphorus or sulphur or both since the phosphate fertilizer contained a small amount of sulphur as an impurity. However, the irrigation water, the native shales from which the soil was formed, and nearly all the soils in the Clifton area are so high in soluble sulphates that it seems improbable that there could be a deficiency of sulphur as a nutrient. Soil tests verified this. It is therefore concluded that the trouble was a result of phosphate deficiency and that the benefits from sulphur were caused by a decrease in alkalinity and a consequent increase in the available phosphorus in the soil.

Observations made in the pear producing areas between Palisade and Grand Junction early in September, 1942, show that the trouble is not limited to the section immediately around the test orchard but that isolated trees in many of the pear orchards in this valley show identical symptoms. These observations would indicate that the soil condition apparently responsible for this malady may be widespread over the valley.

In connection with the symptoms present on these pear leaves, it is of interest to note that they are very similar to phosphate deficiency symptoms which have been observed on citrus leaves (1), and resemble in many respects the symptoms of phosphate deficiency disease (black heart) in sugar beets. The increase in anthocyanin pigments, often associated with phosphate deficiency in tree fruits, (2), was not observed.

Literature Cited.


VIRUS DISEASES OF STONE FRUITS

E. W. Bodine, Botany & Plant Pathology Section


1. Confirmation tests on the X-disease of peach in Colorado, as to its virus nature. Chart maps were made showing that no spread had taken place in the orchards where the disease now exists. About 50 cases of the X-disease were found. The eradication of all diseased trees was recommended.

2. The rasp-leaf disease of cherry was proven to be of virus nature. Rapid spread appears to be taking place in the North Fork cherry district; especially around Paonia, Colorado. The Royal Ann variety of cherry appears to be the most susceptible as far as symptom expression indicates. Eradication of all diseased trees was recommended.

3. Further studies were made as to the prevalence of the Golden-net virus disease of the peach, apricot and plum in the commercial orchards. Very few new cases of the disease were found on peach. None on apricots were located. Peach trees affected with the virus in 1941 appeared to be recovering from the initial shock. Fruits are smooth and normal. Therefore no eradication methods have been suggested for its control.

4. An apparently new virus disease of peach was found in Palisade peach area, which falls into the class of the barking cracking type. Healthy Elberta test trees inoculated with diseased buds in the fall of 1941 showed excellent symptoms of the disease in spring of 1942. The one tree found in Palisade has been removed. The leaves are small and narrow and the internodes shortened.

5. Ring-spot of apricot disease was studied as to its prevalence in district. Several new cases were found. In orchards where the disease has not been eradicated very little U. S. No. 1 fruits were picked from the diseased trees. Eradication of all diseased trees is under way.

6. Antagonism between the strains of the peach mosaic virus continued. Antagonism was found between the following: Severe and medium; severe and mild; severe and Hairy Break, and between severe and spot type. Buds have now been taken from these trees and inserted into healthy Elberta test trees.

7. Further relation of odd peach varieties to the peach mosaic virus was studied. Again as in the past it appears that the odd peach varieties which exist in the orchards are the sole carry-over host of the peach mosaic.

8. Microchemical tests which detect mosaic infected trees have been developed by Dr. A. O. Simonds.

Publications on Virus Diseases of Stone Fruits

Bodine, E. W. and J. H. Newton. Rasp-leaf of cherry. (Accepted for publication, Phytopathology).


Antagonism between strains of the peach-mosaic virus in western Colorado. (Abstract) Phytopathology. 32:3. 1942.


PEACH FERTILIZER TRIALS
Palisade, Colorado

L. R. Bryant and Robert Gardner, Horticulture and Agronomy Sections

Tests of commercial fertilizers were laid out in the Ralph Cannam orchard (Orchard No. 1) on Orchard Mesa, and in the H. R. Davis orchard (Orchard No. 2) west of Palisade on First Street. Since this trial was the first made by the Colorado Experiment Station in this area, the treatments were designed to demonstrate which fertilizer elements would show responses with peach trees. These treatments were on the basis of single levels of nitrogen, phosphorus, and potassium; the nitrogen being applied in the form of ammonium sulphate at the rate of 5 pounds per tree, phosphate as triple superphosphate at the rate of 5 pounds per tree, and potassium as potassium chloride at the rate of 1 pound per tree. Treatments were as follows: (1) nitrogen; (2) nitrogen and phosphorus; (3) nitrogen and potassium; (4) nitrogen, phosphorus and potassium or so-called "complete" fertilizer; (5) phosphorus; (6) phosphorus and potassium; (7) potassium; and (8) check or no treatment. Each treatment was placed at random in the blocks and replicated 3 times. Six trees per treatment were used.

Data were taken on yields, terminal growth, and fruit bud set.

Average tree yields are given in Table No. 1. A study of these data indicate that the response in yield of all the trees receiving nitrogen was excellent, mean yield increases over those from the check or untreated trees being from 1.23 to 1.49 bushels per tree. Phosphorus alone or potassium alone, or the two in combination, did not increase yields to a point where they would appear to be profitable.

Table No. 2 shows the mean lengths of terminal growths on these same trees. While Orchard No. 2 did show some significance in growth increase, the combined data from the two orchards failed to show sufficient growth increases following any treatment to be of significance.

In Table No. 3 is given the mean number of fruit buds set on 200 inches of growth. Here, again, all treatments in which nitrogen had been included showed significant increases in the number of fruit buds set, while no treatment in which nitrogen had not been included did.

Caution should be used in the application of these results to the orchard since they are for but one year. It is true that, from these data, nitrogen did show significant increases in both yield and number of fruit buds set, and that all treatments in which nitrogen was not included failed to show increases of significant size. However, this does not mean that, under specific conditions or over a longer period of time, the use of either phosphorus or potassium or both together might not be required. It must be remembered that all soil nutrients which are used by plants must be within a satisfactory range or relationship with each other, and that deficiency in one nutrient material will influence yields and growth adversely even if all others are present in satisfactory amounts. Thus it may be only a matter of time before some nutrients other than nitrogen will become limiting factors. This has already occurred in some other peach areas and has been reported on pears in the Palisade area.

Any orchard application of commercial fertilizers should be based on known facts and not on any blanket recommendation. In an area such as that around
Palisade, soil conditions and fertility levels vary widely. Soils already high in nitrogen could not be expected to show yield increases from the use of commercial nitrogen such as are reported here. Naturally an orchard in which legume cover crops, commercial nitrogen or manure had been used would show higher levels of nitrogen than one in which none of these practices had been followed, and results from the application of a nitrogen fertilizer could not be expected to be as great. Thus fertilizer applications should be made only on the basis of tree needs as shown by previous soil treatments, general appearance, leaf size and color, fruit size and time of maturity, and terminal twig growth, and not on the basis of what someone else is doing.

Table No. 1 - Mean tree yields in bushels of peaches under fertilizer tests. Palisade, Colorado. 1942.

<table>
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<th>Orchard Number</th>
<th>W</th>
<th>NP</th>
<th>NPK</th>
<th>P</th>
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<tr>
<td>Mean</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>*</td>
<td>*</td>
<td>**</td>
<td>*</td>
</tr>
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</table>

* Yields significant over check yields at odds of 19 to 1.
** Yields significant over check yields at odds of 99 to 1.

Table No. 2 - Mean length of terminal growth of peach trees under fertilizer tests. Palisade, Colorado. 1942.

<table>
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<td>8.94</td>
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Note: No significant increases in mean length of short growth from any treatment in the mean from the two orchards.
Table No. 3.—Fruit bud set per 200 inches of growth.
Palisade fertilizer trials, 1942.

<table>
<thead>
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<th>Orchard Number</th>
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<th>Fruit bud set per 200&quot; of growth.</th>
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<td>143</td>
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<tr>
<td>Mean</td>
<td>**</td>
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</tr>
</tbody>
</table>

**Significant over check fruit bud sets at 1 percent point or odds of 99 to 1

(6356-42)
CHLOROSIS IN ELBERTA PEACHES

L. R. Bryant and Robert Gardner, Horticulture and Agronomy Sections


Treatments were applied to paired green and chlorotic trees in three orchards in the Palisade area in the fall of 1939. The orchards were as follows: John Cutter, West First Street, Palisade; Shiveley Orchard, Vineland; and Arthur Walton, Orchard Mesa. The trees in the Cutter orchard were 35 years of age or older, those in the Shiveley orchard about 20 to 25 years, and those in the Walton orchard were planted in 1924. Treatments consisted of sulphur at the rate of 5, 10, and 20 pounds per tree and a heavy straw mulch. Each treatment was applied to two trees in each orchard, one normal green and one chlorotic. The 1941 observations were made September 1.

(1). John Cutter orchard. All trees which were chlorotic before treatment did not recover and have been removed. The check tree in the normal group showed moderate chlorosis. The sulphur treated trees are still in fair to good condition, averaging rather better than most trees of this age.

(2). Shiveley Orchard. In the normal group, the untreated or check tree is now severely chlorotic, and the tree given 20 pounds of sulphur shows slight chlorosis. The other three trees are in good condition and they produced a good crop of good fruit this summer. The trees which were chlorotic when treated had responded as follows: check, severe chlorosis; 20 pounds sulphur, removed; 10 pounds sulphur, a good normal green; 5 pounds of sulphur, a good normal green; straw mulch, medium chlorosis.

(3). Arthur Walton orchard: None of the chlorotic trees in this orchard showed more than slight improvement and all the trees selected as normal in 1939 now show medium to severe chlorosis. It seemed evident that other factors are complicating the situation in this orchard. The results in these two trials might be evaluated as follows:

(1). In practically all cases where chlorosis was not more than slight in severity satisfactory recovery followed the application of sulphur; or sulphur, iron sulphate and aluminum sulphate.

(2). In the majority of the trees treated showing medium severe chlorosis, recovery was satisfactory. Sulphur alone gave as good recovery as did sulphur in combination with iron sulphate and aluminum sulphate.

(3). Recovery following treatment in trees showing severe chlorosis was erratic, some showing complete recovery and others giving no apparent response to treatment. This indicates that when a tree is injured beyond a certain point, satisfactory recovery can not be expected.

(4). Results from mulch as a treatment for chlorosis were not sufficient to justify its use for that purpose.

(5). From data available at the present time, indications are that satisfactory results may be expected in trees following treatment in the early stages of chlorosis before too serious tree damage has occurred.
INSECT VECTORS OF THE PEACH MOSAIC VIRUS

L. B. Daniels, Entomology Section


The work of the Entomology Section of the Experiment Station with the possible insect vectors of the peach mosaic virus was continued thru the 1942 season. The cloth house was put up on April 18th.

The first experimental tests were begun April 24th, with insect material taken from the mosaic trees in the Fiegel quadrat. Ten trees were caged. On May 3rd a second collection of material was made from mosaic trees in the Figliusk, quadrat. Twenty tests were undertaken with the lot. May 4th a large collection of aphid material from trees cut by eradication crews was obtained in the Fiegel quadrat. Forty tests were started from these collections. On May 8th a series of seventy tests were undertaken, using material selected from severe, mild, chlorotic and hairy break types of mosaic. The feeding position of the test cages were varied from the tender basal growth to sucker to mid-tree, and top. Each mosaic type and position of feeding was replicated five and ten times in a series. The test trees had been pruned prior to the start of the experiment to obtain satisfactory foliage for insect feeding.

On May 18th a positive mosaic case (J-168) began to appear. This was 16 days after the transmission test had been started. Upon May 21 a second positive case (M-178) appeared 18 days after the beginning of the transmission test. The development of these two cases has been followed closely throughout the season. In both cases the aphids had been taken feeding on the top leaf clusters of severe mosaic trees. The experimental feeding in the first positive had been done on basal sucker growth while in the second the feeding was mid-way up on the three year old seedling.

These two positives represent the first definite evidence of transmission under the controlled conditions and protection of the cloth house constructed in 1941. The house has been divided into sections to carry out several experimental procedures.

The above outlined tests have been carried out in the section designated as Number II of the cloth house. The procedure in this section has been to use each individual tree as a test tree. All trees have been numbered and tagged with a metal tag. In setting up an experiment a number of trees are taken, their serial numbers recorded, and a muslin cage placed over the part to be used in confining the feeding insects. For each test tree an adjacent tree is designated as a control. During 1941-107 tests were undertaken using two species of Tarnish Plant Bug, and several species of aphids common in the orchards at Faliside. Readings were made on these trees May 6th. There were no trees showing mosaic symptoms.

In the other experimental set-up being carried in Section 1 of the cloth house 210 trees are being used in a large scale natural spread test. Sixteen cases of peach mosaic were recorded for the 1942 season. In this experiment green peach aphids have been allowed to develop and spread at will thru the entire section. In 1941 only 6 cases of mosaic were described. There was an increase of 10 positive mosaic cases and possibly two others by late June 1942.
The various positives in this experiment are being used in further experiments in section II. Colonies of green peach aphids from ten of the positives have been used in a series of tests in section II. Fifty trees have been used in these trials.

The total number of experimental tests for 1942 is 155. Advantage has been taken of trees being removed by eradication crews. There has been abundance of excellent material to work with during the season.

Further spring and fall studies have been followed on the migration and late season build up of aphids in the orchard. Wild morning glory is recognized as a most important late summer and fall breeding host for green peach aphid in the Palisade area. There is little doubt that this insect is most abundant in areas where this plant is plentiful.

Progress has been made in the propagation of peach seedlings on culture media for experimental use in the laboratory at Fort Collins. Seventy-five tests were run during the winter months of 1942. Difficulty has been experienced in getting good mosaic inoculum trees during the winter months. The work at Fort Collins has been expanded during the fall months of 1942.

Plans for 1943.

1. Continuation of tests now under way at Whitewater.

2. Construction of thirty cages (8"x3'x8') for more detailed tests with various types of mosaic.

3. To continue further the development of the laboratory transmission tests at Fort Collins.
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