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KENTUCKY FRUIT NOTES

Articles for "Kentucky Fruit Notes" are assembled under the direction of W. D. Armstrong, Horticulturist, at the Western Kentucky Substation, Princeton, Kentucky.

SPECIAL STRAWBERRY EDITION

Kentucky Agricultural Experiment Station
Lexington, Kentucky

Strawberry Insect Pests and Their Control

P. O. Ritcher

Insects are responsible for more reduction in strawberry yield than is commonly realized. Too often poor growth of plants or delayed setting of runners because of crown borer damage is blamed on dry weather. Also, poorly formed berries are often blamed on frost damage or cold weather when plant bugs or other insects are the real cause of the trouble. This past season damage from either crown borer, plant bugs or the strawberry weevil was severe in many Kentucky patches. Injury from plant bugs and strawberry weevil was evident during harvest in the spring; crown borer injury did not show up until late in the summer.

Crown borer

Injury. Plants are killed or stunted and runner formation is reduced. Crowns of injured plants contain blackish tunnels made by the borer grubs (Fig. 5). Injury is much worse in dry seasons.

Life history. The adult insect (Fig. 6) is a small brown and black snout beetle about $1/16$ -inch long, which overwinters in or near the strawberry patch under litter or in the soil. Adults become active on warm days in February and March and eat holes in the strawberry leaves from the underside. They lay eggs from March on through the summer, either in the plant crowns or in holes gnawed in the bases of the leaves. Eggs hatch into small, whitish, legless grubs which bore through the strawberry crowns and leave dark colored, winding, frass-filled burrows behind them (Fig. 5). The oldest grubs become full grown by early June and after a 10-day pupal stage, new adults begin emerging late in June. Adults continue to emerge thru October. There is usually only one generation a year and as a rule only mother plants are infested by the larvae.

Control. 1. Set new patches with plants that are free of borer. Use plants from patches certified to be free from borer or use plants dug before March 1 and washed free of all soil or use plants fumigated with methyl bromide. 2. Set new patches on land previously cultivated and that is not closer than 350 yards to old strawberry patches, patches of cinquefoil or wild strawberries all of which are often heavily infested with crown borer. 3. If necessary to set a new patch close to an old infested patch apply bait to crowns of newly set plants. The best bait consists of dried, chopped, apple refuse coated with 3-1/2 percent sodium fluosilicate or 2-1/2 percent lead arsenate. A half teaspoonful of bait should be applied to the crown of each plant. First application should be made in March and again at 10 day to 2 week intervals. 4. Burn over old strawberry patches soon after harvest and plow them under. Don't leave old abandoned patches over the farm since they are breeding grounds for crown borer and other strawberry pests.

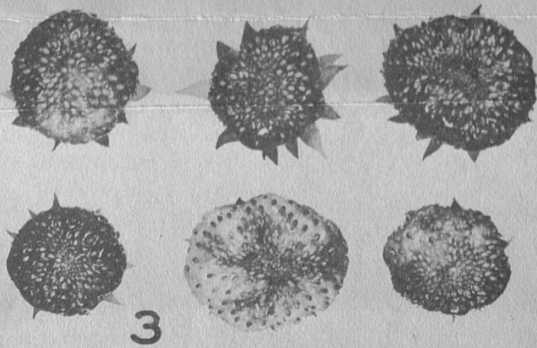
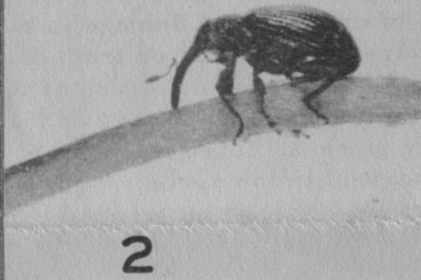


Fig. 1 - Strawberry weevils and their injury to strawberry buds.

Fig. 2 - Strawberry weevil (much enlarged).

Fig. 3 - "Button berries" caused by the feeding of the tarnished plant bug.

Fig. 4 - Tarnished plant bug (greatly enlarged; natural size 1/4 inch long).

Strawberry weevil

Injury. Crop reduced by cutting off of bloom buds (Fig. 1), blooms and green berries.

Life history. The adult (Fig. 2) is a tiny brown or blackish weevil with a long beak which deposits its eggs in the unopened blooms and then girdles or cuts the buds so that they die or fall to the ground (Fig. 1). Usually a single egg is laid in each bud. The egg soon hatches into a whitish legless grub which eats the contents of the unopened bud, pupates, and then emerges as an adult weevil. New adults feed for a short time and then go into hibernation in fence rows or woods.

In Kentucky adult weevils appear in strawberry patches in late March or early April and begin cutting buds about the time the first blossoms open. Beetles are most active on warm sunny days. They also attack the buds of wild blackberries.

Control. In patches where weevil was bad last year make treatment as soon as first blossoms open. In other patches treat as soon as first cut buds are noticed.

For years cryolite has been the standard insecticide for the control of strawberry weevil. This material has given good results in Missouri, Tennessee, Canada, and several other berry-producing areas. Cryolite is usually used as a dust diluted with 2 parts of talc or dusting sulfur to one part of cryolite. From 30 to 50 pounds are needed to treat an acre.

Some of the new organic insecticides will undoubtedly replace cryolite for weevil control in the near future. Evidence on the value of DDT dusts is conflicting. Canadian workers report good control with 3% DDT dust. However, in tests which W. D. Armstrong and the writer made in Marshall county, Kentucky, in 1948, 5% DDT dust gave no control at all.

Canadian workers also report good results with DDT spray. This is confirmed by Mr. G. E. Marshall of the Purdue Agricultural Experiment Station who got good control of weevil last year in a berry patch near Bowling Green, Kentucky, which he sprayed with 2 pounds of 50% wettable DDT per 100 gallons.

In a test which we ran near Sharpe, Kentucky, last season, excellent weevil control was secured with one application of a 5% chlordan dust. We plan to continue experimental work on the control of strawberry weevil in 1949.

Tarnished plant bug

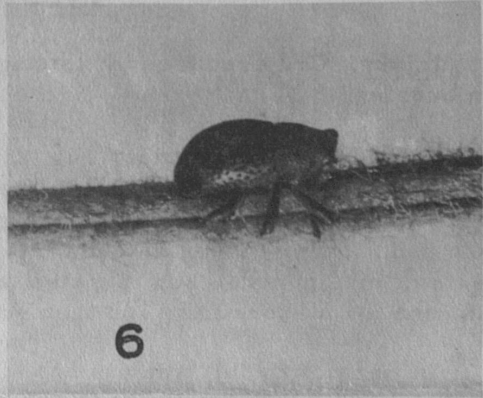
Injury. Fruits often fail to develop to normal size and have a hard, seedy tip (often called "button" berries) (Fig. 3).

Life history. The insect responsible for this type of damage is a small, brownish plant bug (Fig. 4) which breeds on weeds in and near berry patches. The

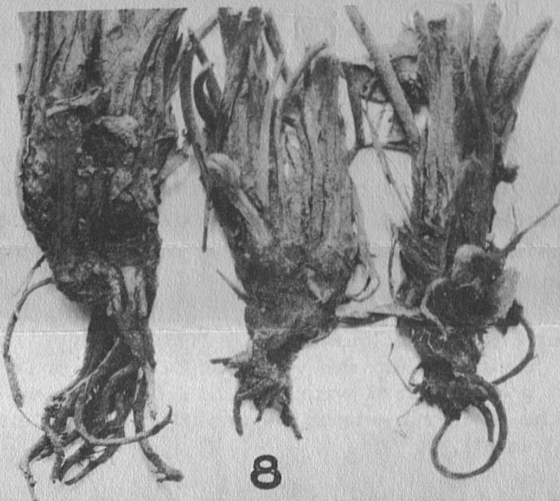
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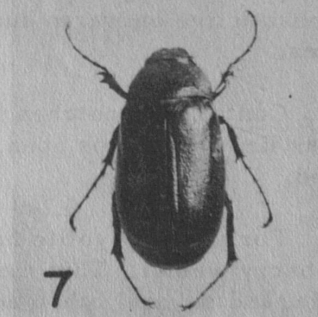
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Fig. 5 - Crown borer grubs working in crown of strawberry plant.

Fig. 6 - Adult crown borer, much enlarged.

Fig. 7 - May beetle, adult stage of white grub (slightly larger than natural size).

Fig. 8 - White grub injury to roots and crowns of strawberry plants.

Fig. 9 - White grub.

injury is caused by the young bugs (nymphs) sucking the sap from the small green berries. The adult bug overwinters in the adult stage and is present in berry patches at blooming time.

Control. Fairly good control of this insect on other crops has been secured with 5% DDT dust applied at the rate of 30 pounds per acre. Chlordan by itself is ineffective but mixed dusts containing 10% chlordan and 5% DDT have given control superior to that obtained with DDT alone. Other materials which have given good control of plant bugs in experimental tests in other states are 2% parathion, 20% chlorinated camphene and benzene hexachloride (3% gamma isomer content).

White grubs

Injury. Plants wilt suddenly and die. Digging shows large white grubs (Fig. 9) of May beetles have eaten off the large roots or gouged out the crowns (Fig. 8).

Control. Grow a cultivated crop for at least 2 years before setting strawberries. Plants set on land infested with grubs can be protected from attack by putting 1-1/2 ounces of a mixture of 1 part of lead arsenate and 20 parts of fine, dry sand on the roots and in each hole when plants are set. When plants are found wilted because of grub attack, dig out the grubs and destroy them before they can move to other plants.

Leaf-roller

Injury. Folded leaves turn brown and die. Damage caused by a small green larva.

Control. If severe damage has been caused to new plantings, spray or dust three times at weekly intervals in the fall to destroy the overwintering population. Use a cryolite dust made of 1 part cryolite, 2 parts talc, and 2 parts of flour; or spray with 3 pounds of lead arsenate in 100 gallons of water; or spray with 5 pounds of cryolite in 100 gallons of water, using some good spreader. If treatment is delayed until spring, treat before blossom time.

Cutworms

Injury. Newly-set plants are cut off at or just below the ground level.

Control. Use poison bait prepared from 1 pound paris green mixed with 25 pounds of bran. Add just enough water to moisten all the particles but not enough to make the mash sloppy. Scatter the bait evenly over the patch at dusk, using 10 to 15 pounds per acre.

SOME STRAWBERRY DISEASES

W. D. Armstrong

RED STELE

The red stele root rot disease has long been a serious problem in the strawberry producing sections of Illinois, New Jersey, and a number of other states. Kentucky growers have been very fortunate in that losses from this disease have been relatively light, to date. The writer first saw the disease in an Aroma patch near Paducah in the spring of 1939. Another strawberry crop was planted on this same field in 1944 and was again virtually ruined by red stele in 1945. It was seen in a few other berry fields in the Paducah section and at Lexington in 1947 and it is suspected to be spread more generally than is realized. In 1948 additional evidence of the disease causing injury around Louisville and Covington was seen.

The disease is caused by a fungus that thrives in poorly drained soils and causes most injury in cool, wet seasons. The disease is often carried to the new field on the roots of the newly set plants and can be spread by surface water run-off, as well as by cultivation tools that have been used in diseased spots. If set in high, well-drained soil, infected plants may develop healthy runner plants and grow into a productive field. However, if the soil is low, poorly drained or of a tight, wet nature or if a wet, cool spring follows, the new patch may grow nicely the first season and then go to pieces early the following spring. The disease is inactive during the warm part of the year. Hence, infected patches often are vigorous and healthy looking during the summer. This condition prevailed in a three-acre field of Blakemores in the Paducah-Kevil section in 1947 and the entire crop was lost except on a high ridge down the center of the field.

Symptoms: The trouble usually becomes noticeable just before harvest. The symptoms are low, small, light foliage that often wilts as the berries try to ripen. These symptoms usually occur first in the lower parts of fields, in little draws, dips or depressions. Most of the foliage scorches on seriously infected plants and the berries do not mature or are seedy and of very low quality. Most of the infected plants continue to lose vigor and die out. The disease can be identified easiest by carefully digging suspected plants and splitting the roots lengthwise. In diseased plants the central core (or stele) of the roots is a dark red or copper color. This corresponds to the appearance of the lead in a pencil split lengthwise.

Control measures: At present the best control seems to be to avoid the disease, if possible. This can be done, to a large extent by setting only clean plants that have come from inspected fields. Use higher, well-drained soil as far as possible, especially after the disease has become established on the farm. Setting berry plants on small ridges has proven helpful in infected areas. Lay out the berry rows so as to encourage good surface water drainage but, of course, still attempt to reduce erosion. Keep new settings of berries out of infected fields for at least five years, since the disease remains in the soil for

an unknown length of time. The use of resistant varieties would be an ideal control measure; however, to date, we know of no satisfactory shipping berry that is resistant to the trouble. The United States Department of Agriculture and several state experiment stations are attempting to breed new varieties that are resistant. The Temple and Fairland varieties seem fairly resistant to red stele and are doing nicely in several infected areas in other states but little is known, to date, of their behavior in Kentucky. However, they both showed promise in 1948 and many more fruiting tests will be observed in 1949. Where tried, these varieties seem to be satisfactory for local markets and processing but too soft for a dependable shipping variety. Much testing of resistant seedlings and new sorts is scheduled for Kentucky the coming season, as well as possibly some breeding work.

The presence of this disease in a section (as it is known to be started around Paducah, Louisville and northern Kentucky) makes it more important than ever to use only inspected plants for setting. Several growers are known to have brought the disease onto their farms by digging plants from a neighbor's infected field. It will take the cooperation of all growers in a section to keep this disease from seriously crippling the industry. This is especially true in sections of western Kentucky and elsewhere where much of the soil devoted to strawberry growing is rather tight and poorly drained.

BLAKEMORE YELLOWS

This is a disease condition that causes the foliage of the Blakemore variety to be yellowish and mottled. The disease spreads only from mother plant to daughter plant and does not spread to other varieties. Where yellows is present, fewer runner plants are made and these produce less fruit than normal green plants.

Control: When Blakemore plants are bought, insist on yellows-free plants. When yellow plants are seen in the field they should be dug and destroyed to prevent an increase. Thus, by carefully roguing, most Blakemore plantings can be kept fairly clear of this trouble.

VIRUS DISEASES OR XANTHOSIS

This disease is fairly new in Kentucky. Its symptoms are varied and often obscure; hence, it is hard to combat. It is spread from plant to plant by a white aphid. So far, this aphid has not been found or reported in Kentucky. Plants with the disease have been located in Kentucky, but these had been shipped into the state from one of the middle Atlantic states where the disease is very prevalent in many nurseries. The runner plants from diseased plants are also diseased, and setting such plants is a sure way to get the disease started on your place.

Symptoms: This disease shows up in different ways in different varieties. Some diseased varieties have low foliage with small leaves or the leaves may be cupped. Also, when infected, some varieties fail to produce any, or only a

few, runners. In other varieties the symptoms are very hard to detect. The symptoms become more pronounced the second year. Diseased plantings are generally non-thrifty and low producing. The disease does not live over in the soil.

Avoiding the disease: In order to avoid the disease, one should set plants only from fields that are known to be very vigorous, productive and healthy and, in general, do not get plants from a territory known to be infected with the disease and the aphid that carries the disease. Hence, the use of disease-free, Kentucky-grown plants should offer an excellent means of avoiding this very serious trouble.

STRAWBERRY VARIETY YIELDS

W. D. Armstrong

During the last few seasons, the Tennessee Shipper and Tennessee Beauty have been the most outstanding new varieties under experimental test, both at Lexington and at Princeton. In general, at both locations, yields of the Tennessee Beauty have been highest among the commercial shipping type varieties. The firm fruit of these two varieties carries well to nearby or distant markets and handles well under refrigeration.

1947 yields at the Kentucky Experiment Station at Lexington were as follows, in 24 quart crates per acre: Tennessee Beauty - 243; Premier - 172; Tennessee Shipper - 154; and Blakemore - 145. Aromas do poorly indeed at Lexington; so, they have been left out of more recent tests there.

At the Western Kentucky Experiment Substation at Princeton we have the following seven-year average variety yields to report. The figures given are the average of the seven crops of 1942 to 1948, inclusive, and are as follows: Tennessee Beauty - 196 crates; Blakemore - 186; Tennessee Shipper - 166; and Aroma - 91 crates per acre. These long-time records are interesting in that they show Tennessee Beauty to be more than doubling the yield of Aroma. These two late berries ripen at the same time and it is easy to see why growers are abandoning Aroma in favor of Tennessee Beauty. As an average, Blakemore has produced more than Tennessee Shipper, its competitor in western Kentucky for the early berry market. Also, Blakemore seems able to stand summer drouths better than Tennessee Shipper in western Kentucky.

STRAWBERRY CULTURAL NOTES

Early setting: Many strawberry growers over Kentucky, who waited until spring to plow and order their patches, failed to get their berries set in 1946 and 1947 because of the continuous rainy period during February, March and April. With the above in mind and due to the importance of early setting, many growers are planning to break their ground during late fall or winter. In this rough, coarse condition much winter rain can be absorbed by the soil and in the spring it can be put in planting order by simply harrowing, disking or dragging. Strawberry men would do well to play safe and fall-plow at least part of their area to be planted in 1948.

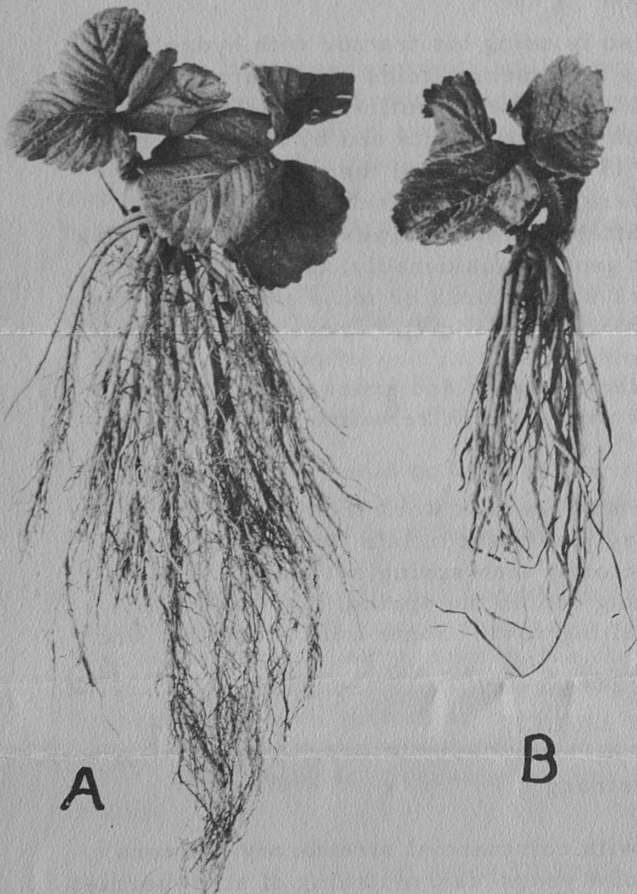


Fig. 6 -

- A. - Normal strawberry plant;
 B. - plant affected with red stele root disease.

Note the absence of small feeding roots in B, as compared with the normal root system.

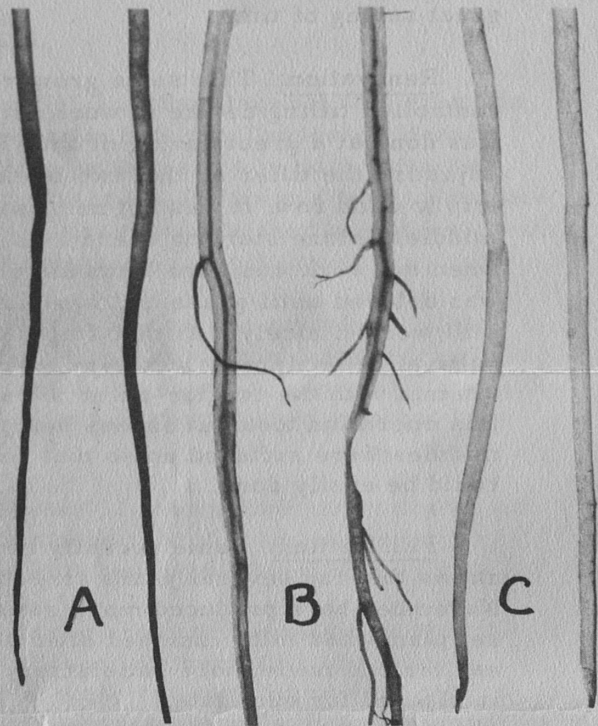


Fig. 7 - Strawberry roots affected with the red stele root disease.

- A. - Diseased roots showing dead, discolored tip ends; upper portion of roots not discolored.
 B. - Diseased roots split lengthwise to show red-dened central portion.
 C. - Normal roots split lengthwise to show absence of red center. (All slightly enlarged.)

Mechanical setting: In 1946 and 1947 Lester Harris of Kevil, Kentucky, set his strawberry field with a tobacco setting machine with excellent results and a great saving of time.

Renovation: This same grower also is using his tractor with hydrolic-controlled tilling device to work out his strawberry fields after harvest. This was done at a great saving of time and results were entirely satisfactory. By adjusting the tiller so that two teeth run in each middle and by making a round trip to each row, it was not necessary to remove any of the mulch from the middles before starting operations. Here again best results were obtained when the work was done immediately after harvest. However, where the work was delayed until grass and weeds had grown considerably, the tractor-tiller still worked nicely. At that stage, work with a horse or mule and single-row cultivation equipment was very, very slow and difficult. There was no special attempt with the tractor-tiller to narrow the fruiting row of plants. However, this operation took out excess berry plants, weeds and grass and the hard middles were softened up so that row cultivation the remainder of the season could be easily done.

Fall setting: Some recently reported research work from New York shows that for several years strawberry plants set in late October or early November have produced more satisfactorily than spring set plants. The fall set plants had to be mulched after setting but, in the spring, they grew off earlier and made more satisfactory fruiting rows. Some work along this line is planned for our state.

STRAWBERRY MULCH

W. D. Armstrong

Cooperative mulching tests made with commercial strawberry growers and started in 1938 indicate that 3 out of 4 years' fall mulching of strawberries will pay a handsome profit over spring mulching. For the 9-year period, fall mulching has produced an average of 30 crates per acre more than spring mulching. The greatest increase was 80 crates per acre, in the spring of 1940, following a period when temperatures went to 10° and 12° below zero with no snow on the ground. As a result of that cold period, many non-mulched plants were killed or the crown and roots were so badly injured that very low production resulted. In February and early March of 1947 the near-zero temperatures resulted in much crown and root injury to non-mulched strawberries over the entire state.

SUGGESTIONS: In order to prevent infesting the fields with rye, wheat, or cheat, it is suggested that the baled straw be taken to the patch in October or early November and the wires clipped so that the straw will soak up the fall rains and germinate any grain before spreading. This straw is then ready to spread in late November or early December when it seems that the temperature will go down to 15° to 20°. These dates vary and may be later in southern Kentucky and earlier in the northern portion. One and one-half tons of straw per acre seem about right for the Purchase Area, with about 2 tons around Henderson, Greenville, and Bowling Green, and from 2 to 2-1/2 tons per acre around Louisville and Covington.

STRAWBERRY VARIETY TRENDS

W. W. MAGILL

The Blakemore variety still represents 65% of the strawberries grown in Kentucky. We find a gradual increase in acreage in both the Tennessee Beauty and the Tennessee Shipper variety. It has not been the policy to push these two newer varieties, but simply get strawberry growers to give them a trial, alongside their Aroma, Blakemore, or Premier. On most farms where they have been given a fair demonstration trial, they have already established themselves.

The Tennessee Beauty variety is rapidly replacing the Aroma as a late and heavy producing variety. Sales agencies who sell our commercial berry production of Kentucky continue to speak well of both varieties, especially concerning their ability to reach the market in a sound and attractive condition and hold up well in the grocery stores.

The banner yield on an acre for 1948 was 452 twenty-four quart crates of the Tennessee Beauty. They were produced on good land that had received a liberal application of fertilizer, and rye and vetch had been turned under.

In the Louisville and Covington Strawberry areas of Kentucky, both of the Tennessee varieties have been heavier planted than in other parts of the state. With a shortage of berry pickers, the ability of these two new berry varieties to hold in good condition, even three or four days between pickings, has stimulated the planting of both varieties.

The Tennessee Supreme variety has been discarded as being too soft to ship.

FERTILIZER TRENDS FOR STRAWBERRIES

W. W. Magill

Strawberries naturally follow tobacco in the crop rotation in Kentucky. The good prices received for tobacco during the past few years, together with a limited tobacco base on many farms have greatly influenced the production methods of tobacco in an effort to get a high yield of good quality tobacco.

The liberal use of farm manure, heavy application of fertilizer (1,000 to 2,000 pounds per acre) with a fall and winter cover crop of rye and vetch, to be turned under late in the spring, has been used on many tobacco fields. We find that such a treatment for tobacco production for a few years results in developing an excellent field for strawberries.

Superphosphate in liberal application to the strawberry field helps to increase the yield.

To get the new berry planting off with a good vigorous growth and early runner formation, many growers apply from 500 to 800 pounds per acre of a complete, high grade fertilizer, drilled or broadcast just ahead of or soon after planting - then during January or February broadcast an additional 500 to 1000 pounds of 20% superphosphate directly on top of the mulch.

During late April and early May the strawberry plant produces masses of tender white rootlets at or near the ground level and which seem to "grab" this superphosphate that has washed through the straw mulch and remains on top of the soil. Although the strawberry is not considered a grain crop, we must remember that there are hundreds of seeds on the surface of a strawberry, thus, it is a grain or seed crop. We should also consider the fact that a strawberry changes from a seedy mass 1/4 inch in diameter to a plump, ripe berry (probably one inch or more in diameter) all within three to five days' time, and in order to make a large berry, properly developed and of a uniform texture, an abundance of quick acting phosphate fertilizer is needed.

In Jefferson County in 1948, where 500 pounds of superphosphate per acre was broadcast in February, on the matted row, we received an increase of 50 crates per acre, and where 1000 pounds per acre was broadcast it increased the yield 100 crates per acre.

HINTS AND OBSERVATIONS

W. W. Magill

Something New

A puff of 3% chlordan dust on each plant of strawberries that showed an attack of ants (aphis on the berry plant roots) apparently gave satisfactory control, according to J. H. Miller, County Agent, Marshall County, Kentucky, who conducted the trial demonstration during the early growing season (June) of 1948 in a newly planted berry field. Mr. Miller reports an outstanding contrast in new runner formation where the dust was applied on affected plants.

Unfortunate

These berry fields we have allowed to stand through the third or even the fourth and fifth picking year have paved the way for crown borer development on many farms. Keep in mind that crown borer can be "prevented" without any cost, but it cannot be "controlled" once it gets a start in a berry field.

I Predict

That 1949 will be an excellent year to plant an acre or more of strawberries. That strawberry prices will continue good for a few years. That the Kentucky acreage of Tennessee Shipper and Tennessee Beauty of strawberries will gradually increase. That the berry growers who apply from 1,000 to 1,500 pounds of superphosphate per acre will make 400% on the money he pays for this superphosphate. That strawberries will continue to "pay off" as well or better per acre than burley tobacco.