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AFTER HARVEST CARE OF STRAWBERRY PLANTS

by

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AFTER HARVEST CARE OF STRAWBERRY PLANTS

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Since fruit bud formation in the single crop strawberry is said to take place following harvest and until late fall, it is important that strawberry plants which are to be cropped the next year be given the care necessary to promote favorable growing conditions for fruit bud formation. Such care includes cultivation, soil fertility, disease and insect control, and moisture supply.

Topping Strawberry Plants

Cutting the tops off the strawberry plants following harvest is practiced when there are certain destructive insects to control or when foliage diseases such as strawberry leaf spot are causing injury. Topping, when practiced, should follow immediately after harvest. Delaying the topping for a period of time after harvest has resulted in decreased fruit yields the next year. The tops may be cut off with hand scythes, knives, sickles, or a mowing machine. Careless handling of the mowing machine has resulted in damage to the crowns of strawberry plants; then, too, the mowing machine does not cut off all the tops. The mowing machine is not regarded as suitable for topping by many who have used it for this purpose.

Destroy Strawberry Crown Moth

"Old strawberry fields infested with the strawberry crown moth should be plowed under immediately after harvest before moths emerge and lay eggs," states Oregon Station Bulletin 357 on Insect Pests and Diseases of the Strawberry in Oregon.

When strawberry plantings early in the life of the field become lightly infested with crown borers, the plants which are affected can often be detected in the late fall by their dwarfed appearance, dark colored foliage, and a tendency to wilt. Examination of such plants if affected with the crown borer will often show the crown borer larva working in the crown just below the ground level. A pull on the top of the plant will usually cause it to break where the borer is working and this break often exposes the larva. Such plants if removed from the field at the time and destroyed will lessen the number of adults to deposit eggs the following season. There are growers who follow this procedure in an attempt to lessen the number of crown borers when the infestation is not heavy.

The Oregon Experiment Station (6) reports partial to good control of the crown moth when plants are topped immediately after harvest. The bulletin states: "Seven-eighths of the patch may be topped and one-eighth of the patch left untopped. The position of the untopped rows in the field does not appear to be important and may be left where most convenient, probably at the edges of the field."

After the egg laying season the trap rows are destroyed. Growers in Oregon have often expressed satisfactory control of crown borers resulting from topping plants immediately following harvest. This method of control is not always completely effective, but it does afford a measure of protection.

The Plant Pathology Department at the Oregon State College recommends the topping of strawberry plants after harvest when strawberry leaf spot, a fungous disease, is a problem. The foliage is raked to the center of the rows and burned after it becomes dry. This destroys the leaf spot disease holding over in the old foliage, which is a source of infection to oncoming foliage.

Cultivation

The cultivation following harvest should be shallow and frequent enough to remove weeds which use soil moisture. Experimental work with the cultivation of strawberries does not support the contention that deep cultivation of strawberry plants is necessary.

Fertilizers for Strawberries

Commercial fertilizer applications to strawberry plants in climates similar to that of Oregon show variable results. Because of these variations, set rules for the use of commercial fertilizers on strawberry plantings cannot be given with assurance that they will give the increased yields sought.

Generally, wherever strawberries are grown, thorough fertilizing of the soils with barnyard manures, cover crops, and commercial fertilizers previous to planting strawberries is the recommended course of action. It has been repeatedly pointed out that the use of commercial fertilizers on depleted soils after the strawberry crop has been planted, does not often give the desired increases in fruit yields.

Spring fertilizer applications to strawberry fields in Oregon have been variable. Under favorable conditions of sufficient moisture supply, spring applications of commercial fertilizers have shown some benefit, but in other instances yields of fruit have not been improved by their application and fields receiving heavy fertilizer applications in the spring have returned decreased yields when moisture supplies have been limited.

Results of Spring Application of Fertilizers to Strawberry Plants in Washington County in 1937

Fertilizers used were commercial mixes and mixes made from high analysis fertilizers.

Variety of strawberries - Marshall. Soil type - Melbourne loam.

Field planted in spring of 1936.

Fertilizers applied in furrow alongside of row March 8, 1937.

Land cropped to grain and clover for period of years previous to berries.

Table I

<u>Fertilizer Used</u>	<u>Soil Treatment and Results</u>		<u>Yield Increase Over Check Plot (Pounds)</u>
	<u>Amount Per Acre (Pounds)</u>	<u>Yield Per Acre (Pounds)</u>	
Average of three unfertilized plots, 1937		4,626.08	
3-10-10 made from high analysis fertilizers	Equivalent to 500 lbs. commercial 3-10-10	6,130.44	504.36
3-10-7 made from high analysis fertilizers	Equivalent to 500 lbs. commercial 3-10-7	6,195.6	569.52
3-10-10 commercial mix	500	5,890.56	264.48
5-6-8 commercial mix	500	5,848.32	222.24

Note that there were creditable increases from the spring applications in 1937 and that the higher yields were from plots receiving high analysis fertilizers.

The spring and early summer season of 1937 had rain quite well distributed throughout the season. This rain was no doubt favorable to the spring application of fertilizers.

Fertilizer demonstrations were continued on this strawberry field in 1938. Fertilizers were applied in the fall of 1937 and in the spring of 1938. Same plots received both fall and spring applications.

The 1938 strawberry season was a comparatively dry one. Note results in Table II from fertilized plots in the same field as in Table I, but for the 1938 season.

Table II

Strawberry Fertilizer Demonstration 1938
Washington County, Oregon

(Fall applications of fertilizers were made September 14, 1937.
Spring applications of fertilizers were made March 1, 1938.)

	<u>Yield Pounds Per Acre</u>	<u>Increase Over Check Plots</u>	<u>Decrease Over Check Plots</u>
Average of unfertilized plots	5,827		
360 pounds 8-27-19 applied in spring	5,368		459 pounds

Table II - Continued

	<u>Yield</u> <u>Pounds Per Acre</u>	<u>Increase Over</u> <u>Check Plots</u>	<u>Decrease Over</u> <u>Check Plots</u>
*200 pounds 11-48-0 1/2 spring, 1/2 fall	6,379	552 pounds	
*410 pounds 7-24-24 1/2 spring, 1/2 fall	5,687		140 pounds
*360 pounds 8-27-19 1/2 spring, 1/2 fall	5,776		51 pounds
1,000 pounds 3-10-10 1/2 spring, 1/2 fall	5,137		690 pounds
1,000 pounds 3-10-7 1/2 spring, 1/2 fall	5,703		124 pounds
360 pounds 8-27-19 applied in fall	6,145	318 pounds	

*From high analysis fertilizer

Returns from Fertilizers in 1938

Fall applications of 8-27-19 fertilizer made in September, 1937, in Washington County returned \$1.63 for each \$1.00 expended for fertilizer. 11-48-0 fertilizer, 100 pounds in September, 1937, and 100 pounds March 1, 1938, returned \$4.60 for each \$1.00 expended for fertilizer. In 1938 the four split applications, fall and spring, containing relatively high potash returned a decreased yield in comparison with the unfertilized plots.

These results are given because they appear in line with the reports from other sections of the United States concerning spring applications and fall applications of fertilizers on non-irrigated land planted to strawberries.

Suggestions for Fertilizer Use on Strawberry Fields

Fall or after-harvest applications of commercial fertilizers are recommended when it is wished to use commercial fertilizers in the strawberry fertilizer program. August applications may be preferable to September applications in Oregon provided early fall rains occur.

Heavy applications of nitrogen bearing fertilizers are not recommended for non-irrigated strawberry fields in the spring of a fruiting year. Such applications may promote excessive growth and in absence of adequate moisture may result in decreased yields. For many Oregon soils it is suggested that 150 to 200 pounds of 16-20 ammoniated phosphate be used per acre in early August on irrigated strawberry fields and in early September on non-irrigated strawberry plantings, or use 500 to 800 pounds of 4-12-4 fertilizer or a similar mix. The 16-20 ammoniated phosphate carries 16 percent nitrogen and 20 percent phosphorus. The 4-12-4 has 4 per cent nitrogen, 12 per cent phosphorus and 4 per cent potash. For the red upland soils, applications of about 300 pounds of 11-48-0 per acre are looked upon with favor.

Claims that any particular fertilizer formula can be used on a given soil with assurance of a profitable return at harvest are based on assumption unless trials have definitely established a place for that formula. Based on information at hand, suggestions are made herein for fertilizer use and they should be accepted as suggestions.

Nitrogen and phosphorus are more apt to be the elements first needed for fertilizing strawberries on Western Oregon soils. In the place of 16-20 ammoniated phosphate as mentioned above, 150 to 250 pounds of 11-48 ammoniated phosphate may be suited to some soils. The grower may substitute 75 to 100 pounds of sulphate of ammonia and 200 to 300 pounds of 18 percent superphosphate per acre. Treble phosphate may be used instead of superphosphate. Other fertilizers carrying approximately the same amounts of nitrogen, phosphorus, and potash can be used.

Recent findings of the Oregon Experiment Station show that nitrogen, phosphorus, and sulphur are more often the elements needed by crops grown on Oregon soils and for this reason fertilizer mixes containing sulphur are favored. Sulphate of ammonia and superphosphate carry approximately twenty-four and nine percent, respectively, of sulphur and are suitable for use in preparing fertilizer mixes when sulphur is needed.

Placing Fertilizers - Fertilizers when applied to non-irrigated strawberry plants in early September, may be broadcast, but preferably they should be placed under the surface alongside of the rows. Soils should be moist for quick results. When irrigation does not follow fertilizer applications, it is desirable to place the fertilizers deep enough to reach the moisture. In dry seasons this may not be possible. It is suggested that fertilizers be applied to strawberry plantings in early September so they will be in place for the plants to use when the first fall rains supply the necessary moisture.

When fertilizers are broadcast between the rows, a light cultivation should follow by way of incorporating them into the soil.

Caution About Broadcasting Fertilizers - Commercial fertilizers should not be broadcast over strawberry plants when the leaves or crowns are wet or damp because severe burning can result. It sometimes is a practice to broadcast fertilizers when the plants are dry and then brush the plants to dislodge and work the fertilizer to the ground. Under-surface application along the side of the rows is preferable to broadcasting.

Irrigation of Strawberry Fields

Usually those strawberry fields in the Willamette Valley which have been irrigated should receive sufficient water after harvest to keep them growing until about August 15, at which time they should be given a thorough irrigation to carry them through the balance of the season. When there is not sufficient rain in September and October to keep the soil moist another irrigation may be necessary.

Light cultivation should be given after each irrigation except where matted rows make cultivation impossible.

The Oregon Experiment Station (14) reports: "Irrigation was profitable with the Marshall variety, but with the Ettersburg 121 variety it was not. Irrigation doubled the average net income of the Marshall variety and decreased the net income of the Ettersburg 121 variety 50 percent."

Oregon Experiment Station Bulletin 357 states that experiments of irrigating Ettersburg 121, Narcissa, Marshall and Corvallis varieties all showed an increase in yields under irrigation except Ettersburg 121.

Irrigated strawberries were superior in attractive red color, size and smoothness.

Remove Crinkle Disease from Planting Stock

Crinkle disease of strawberry plants is responsible for heavily decreased yields. During the fall months growers should examine strawberry fields from which planting stock is to be taken for the appearance of crinkle disease. The runners can be kept removed from the crinkle diseased or otherwise inferior plants to reduce the amount of this disease in planting stock.

A more thorough method of reducing crinkle disease is to purchase plants from reliable growers who make a specialty of producing disease-free and vigorous plants. A practical procedure is for the grower to establish an isolated nursery plot for plant production from which all the weak, diseased, and inferior plants can be removed at regular intervals during the plant production period. This plan is one which is successfully followed by a number of strawberry growers in Oregon.

Removing crinkle diseased plants from strawberry nursery stock can best be done after fall rains start new growth.

Crinkle disease is treated more fully in Station Bulletin 319 of the Oregon State Experiment Station.

Strawberry plant certification and improvement of planting stock is given in Extension Circulars Numbers 307 and 325, Oregon State College Extension Service.

Other States Report on Care of Strawberry Plantings

Value of Topping Plants

A West Virginia (3) recommendation for renewing the crop is to proceed immediately after the last picking to cut off the tops of the plants for the control of foliage diseases and insect pests.

The recommended treatment for strawberry fields after harvest in Minnesota (4) is to destroy the old foliage to control insects and diseases.

From Illinois (5) comes this statement: "The best time to renew a strawberry bed is in early summer as soon as possible after the crop is harvested.Clip off the foliage with a sickle or scythe or, if the patch is large, use a mowing machine with the bar set high. Rake leaves to the center of the rows and burn when dry."

Concerning Cultivation

An English (1) publication on strawberry culture states that investigations on the root systems and crown formation in strawberries have clearly indicated that during August root development recommences and continues at a rapid rate, slowing down as the temperature falls in December.....In the early spring the next period of growth takes place when shoot and leaf development are much more pronounced than root production.....After treatment of strawberry plantings consists of breaking up the land between the rows with a horse cultivator or hand hoe, or by the use of a small tractor. Weeds should be cleaned out and a suitable tilth produced. It is important at this stage to refrain from deep cultivation, which would disturb the new rooting system that is developing.

A statement from Connecticut (2) reads: "Shallow cultivation should begin immediately after setting and should be continued at frequent intervals until the end of the season.....Thorough hoeing during the first of the season before the runners have begun to form will save much labor later."

Other States and Countries Discuss Fertilizers

Strawberry production suggestions and recommendations from eleven states and Great Britain and Canada all support the recommendation that previous to planting, preparation of strawberry soils by use of barnyard manures or by cover crops and fertilizers is essential for successful yields of quality fruit. These states and countries are in accord favoring late summer or early fall application of commercial fertilizers where such are to be used, and a majority caution against spring fertilizer applications to bearing fields where such applications are made for the purpose of increasing strawberry fruit yields.

Reports from Great Britain (1) state that experience shows that it is impossible to grow strawberries without adequate applications of farmyard manure worked into the ground before planting. Neglect to prepare the ground suitably, and omitting farmyard manures is to insure failure.....In wet seasons ordinary balanced mineral manures give good returns, but such mineral fertilizers cannot maintain a vigorous stock indefinitely.

A Michigan State College bulletin (12) makes the following statement regarding the fertilization of strawberries: "Fertilization is of doubtful value on good soils. The application of nitrogen is profitable at the time of renovation following harvest, and possibly on poor soils when applied at the time of setting. Spring applications of nitrogen before harvest are often not profitable."

A Virginia recommendation (13) is: "Repeated tests have demonstrated that a fall application (in late August or early September) is more suitable than a spring application. The crop produced the next year is better, the berries are firmer, and the danger of soft berries, due to excessive amount of nitrogenous fertilizer, is eliminated."

A report from Missouri (11) states: "In general, fertilizers are applied to strawberries with little knowledge of the results that may follow. Moreover, a study of the results of fertilization throughout the country shows that the effects are very variable and that the strawberry does not respond the same under all conditions to fertilizer treatments."

"There is some very good evidence pointing to the fact that highest yields are often obtained when fertilizers are applied as late as the first half of September of the first year and as late as the middle of August of the fruiting year. This is significant in that these dates are near the time of fruit bud differentiation or when some of the buds of the strawberry change over from leaf or shoot buds to fruit buds."

Quantities of 250 to 300 pounds per acre of 4-12-4 fertilizer are suggested for use when renewing fields and beds of strawberries.

In reports from Tennessee and Ohio, 100 pounds of nitrate of soda or sulphate of ammonia per acre, side-dressed in August, increased the yield 20 to 50 crates per acre. It is thought that nitrogen stimulated the formation of fruit buds. Spring applications of nitrogen applied during the harvest year are not recommended in these states because of resulting soft berries.

Kentucky reports that either phosphorus or a high phosphorous complete fertilizer may be applied just before plantings are made, but it is preferable to use a green manure crop just preceding strawberry planting to insure a volume of organic matter in the soil.

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