

Growing **RASPBERRIES** In Washington



GROWING RASPBERRIES

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Most of the commercial raspberry production in Washington is west of the Cascade Mountains. Some raspberries are grown commercially around Yakima, Walla Walla, and Spokane.

Between 8,000 and 9,000 tons of red raspberries are harvested each year from approximately 3,000 acres. The yearly value for the state is between \$2,000,000 and \$3,000,000.

About 80 per cent of the commercial production in Washington has been processed by freezing in recent years. Only 2 or 3 per cent has been canned. The remaining 17 or 18 per cent has been sold fresh.

Red raspberries are grown much more widely than black raspberries. Some black raspberries are sold for processing, for fresh use, and for coloring in dyes.

Yields of black raspberries are usually less than those of red raspberries. Price differentials between the two berries are not great enough to offset yield differences most years.

RASPBERRIES NEED WELL-DRAINED SOILS

Raspberry plantings on deep, well-drained soils are the most productive, last the longest, and give the best returns from investment and labor. A loam or sandy loam soil from 2 to 4 feet deep is ideal.

With ideal soil conditions and good care, plantings may remain productive for 10 years or more. On poor sites, plantings may become unprofitable in less than five years.

Good soil drainage is important. Raspberry plants grown in a tight clay soil or where there is a high water table are more subject to root killing and root rots than those on well-drained soils.

Plantings on poorly drained soils are weak, unproductive, and short-lived. Some raspberry varieties, such as Sumner and Newburgh, tolerate poor soil conditions better than other varieties. *All do best on well-drained sites.*

Labor Supply

Much of the labor for harvesting commercial raspberries must come from cities, towns, or heavily populated rural areas. Locating commercial plantings close to a good labor supply will help reduce picking costs and will help keep quality high since the berries can be harvested frequently.

PREPARE THE FIELD BEFORE PLANTING

Build Up the Soil

A soil improvement program usually pays unless the area to be planted has

been in sod, hay, or other soil-improving crops. Heavy applications of barnyard manure will increase organic matter in

the soil. So will green manure crops grown the winter before planting. Abuzzi rye is a good choice for western Washington. In eastern Washington hairy vetch is the best winter crop to use before planting.

Prevent Weeds and Diseases

Canada thistle and quack grass, and other noxious weeds should be eliminated before planting raspberries. Ground that has been in sod should be cultivated or cropped one year in order to break down the sod and kill out the grass completely.

Raspberries should not be planted in ground that has had tomatoes or potatoes

on it the previous year. Such soil may be infected with *Verticillium* wilt. Black raspberries are more susceptible to *Verticillium* wilt than red varieties.

The use of soil insecticides before planting is important for the control of root weevils in western Washington. Details of rates and methods are available from your county agent.

Soil for raspberries should be given the same careful preparation that you would give it for any other crop. If a high percentage of the plants is to survive and grow well, the soil must be well worked, firm, and moist when the plants are set.

SELECT DISEASE-FREE PLANTS

Buying certified plants is the best assurance you can have that the plants are disease free. If you can't get certified plants, take your red raspberry planting stock from a young, vigorously growing field that is free of disease. Inspect the field from which you expect to buy your plants. The best time to do this is during the growing season the year before planting.

Hard Plants

Hard plants from the previous season's growth are the best red raspberry plant-

ing stock. They should have good strong canes, $\frac{1}{4}$ to $\frac{3}{8}$ inch in diameter, and well-formed root systems. They should have been *dug* to leave on the feeder roots, rather than *pulled*. Pulling the plants strips away the small feeder roots. The sooner the plants are set after digging, the better. Don't let the roots become dry.

If you get hard plants from the plant grower or nurseryman and can't plant them immediately, it is best to heel them in. Spread them out enough in the row so that soil moisture can get to all of the

Three-year-old raspberry plants.

Left — Plants in well-drained soil grew and produced fruit normally.

Right—In poorly drained soil, new canes made little growth, leaves on old canes yellowed and wilted, fruit was small.



roots. Cover the roots well. Water them if necessary. Plants can be stored at near-freezing temperature if they are protected from drying.

Soft Plants

Soft red raspberry plants that have come up in the spring ahead of planting

time are sometimes used. Special care must be given them to avoid wilting or drying out. Transfer them directly, at the time they are dug, to the field where they are to be planted. Set them in the ground at once. Take care not to break the succulent new stems.

SET THE PLANTS EARLY IN THE SPRING

Red raspberries are usually grown in hills $2\frac{1}{2}$ to $3\frac{1}{2}$ feet apart in rows that are 7 to 9 feet apart. The most common spacing is 3 or $3\frac{1}{2}$ feet in the rows and 7 to 8 feet between rows. For many of the tractors, cultivators, and sprayers now being used, 9 feet between rows is necessary.

Number of Plants Needed

You can figure the number of plants per acre at any spacing by dividing 43,560 by the number of square feet needed per plant. Allow space for roadways, packing or loading platforms, ditches, and room to turn at the ends of the rows. Here are the numbers of plants required per acre for some of the common spacings.

$2\frac{1}{2}$ feet x 7 feet, 2489 plants

$2\frac{1}{2}$ feet x 8 feet, 2178 plants

$2\frac{1}{2}$ feet x 9 feet, 1936 plants

3 feet x 7 feet, 2074 plants

3 feet x 8 feet, 1815 plants

3 feet x 9 feet, 1613 plants

$3\frac{1}{2}$ feet x 7 feet, 1777 plants

$3\frac{1}{2}$ feet x 8 feet, 1555 plants

$3\frac{1}{2}$ feet x 9 feet, 1382 plants

Planting Time

Red raspberry plants can be set in the field almost any time during the fall, winter, or spring when the soil can be worked into good planting condition. Spring planting is most common.

Planting should be done early enough for the plants to get a good start before the soil begins to dry out in early summer. February and March in western Washington, or March and April in east-

ern Washington, are the best planting periods. Plants that are set early and well fertilized produce three to five strong canes for the following year's crop.

Planting Operation

The field can be marked off with a hand- or tractor-drawn marker or the plants can be set along a wire stretched over the row. Cross marking with straight, even rows both ways permits cultivating both ways until trellis wires are put up.

Plants may be set: (1) in a furrow plowed out along the row; (2) in holes dug with a shovel; or (3) in holes made by pushing a shovel about 8 inches into the ground and pushing the handle back and forth to make a wedge-shaped hole. The last method is quick and easy, but will not make holes big enough for large plants with strong root systems.

Set the plants so that when the soil is leveled they will be about an inch deeper than they were before they were dug. Spread the roots as much as possible. Be sure the soil is firmed well around them. Cut the canes back to 6 or 8 inches. Irrigating the field or watering individual plants will pay dividends almost any time that the soil is dry enough to work well during planting.

Black Raspberries

Use only well-rooted plants for planting. New black raspberry plants are produced when the tips of the canes come in contact with the ground and take root. Rooting takes place in the late summer and fall. In the mild winters of western Washington some root development takes



A newly set raspberry planting. The plants were set in early spring.

place during the winter. The rooted tips are cut from the canes when the plants are dug in the spring, leaving a 6 to 8 inch "handle." Cut the handles off when the plants are set in the field and mark the plant's location with a stake. Set the new plants so that the crown is about an inch below the surface.

Black Raspberry Spacing

Rows should be at least 8 feet apart. For some tractors and cultivating equip-

ment, 9 or 10 feet may be needed. The plants should be 4 or 5 feet apart in the row if tips are pinched and lateral shoots are developed. Plant requirements per acre for black raspberries are:

4 feet x	8 feet,	1361 plants
4 feet x	9 feet,	1210 plants
4 feet x	10 feet,	1089 plants
5 feet x	8 feet,	1089 plants
5 feet x	9 feet,	968 plants
5 feet x	10 feet,	871 plants

SUPPORT THE CANES ON A TRELLIS

Types of Trellises

The trellis or wire support for red raspberry canes consists of three or four No. 12 galvanized wires stretched along posts 25 to 30 feet apart in the row. The end posts are anchored or braced. They get most of the pull.

The three-wire trellis has a single top wire about 4½ feet from the ground. It is fastened directly to the side of the post. As the pruning is done, the fruiting canes are tied to the top wire. The bottom pair of wires in the three-wire trellis may be fastened directly to the sides of the posts or to crossarms nailed to the

post. They should be about 30 inches above the ground. Their chief purpose is to hold the new canes in the row.

The four-wire trellis has two top wires rather than one. These may be held to the crossarms by notches cut near the ends of the arms or to the posts by strong nails bent into the shape of a hook. If the wire is fastened by notches or hooks, it can be temporarily unhooked and swung out over the new canes to pull them into the row.

Treating the Posts

Treating the posts with a 5 per cent solution of pentachlorophenol will ex-

tend their life materially. To make the 5 per cent solution, mix a gallon of Penta (50 per cent by weight) with 10 gallons of kerosene, stove oil, diesel oil (#400), or other light oil. Stand the posts upright in a 50-gallon drum with enough of this solution to cover 3 or 4 inches above the part of the posts that will be in the ground. Since fir and cedar posts take up this solution slowly, they should be soaked as long as seven days. Information on other methods of treating posts can be obtained from your County Extension Agent. Use only well-seasoned posts.

CUT OUT OLD CANES AFTER HARVEST

At the time red raspberry plants are set in the field the old canes should be cut back to 6 or 8 inches. Do not attempt to produce fruit the first season. The first growing season should produce three to five good strong canes per plant. These will produce berries the following year.

During the second growing season, shoots will come up between plants in the row and between rows. Keeping the plants in hills makes weed control by tillage and hoeing easier. To do this cut out all of the new shoots, except those in the hills. Use hoes or cultivating equipment. Special sprayers can be built to control young canes or shoots between hills. County agents have plans for these sprayers.

Remove Old Canes

The canes that have produced fruit can be cut out any time from the end of harvest through late winter. Cutting them out soon after harvest simplifies spraying for insects, disease, or weed control. It also simplifies planting winter cover crops. Cut the old canes as close to the ground as possible. When you cut out the old canes, cut out the new weak canes, also. The number of canes each plant or

VARIETIES OF RED AND BLACK RASPBERRIES

Varieties of raspberries selected for planting should be productive, have long life and freedom from disease, be easily and rapidly picked, and well adapted to processing or fresh markets. In areas of cold winter temperatures, hardiness is also necessary.

SUMNER: Berries large, medium red, bright, sweet, firm. Very good quality fresh or for freezing, excellent for canning and jam. Plants productive. Very hardy. Some resistance to root rots. Resistant to rust and mildew. Canes numerous, of medium height, straight, slender. Plants grow slowly the first year. Ripens with Washington and Puyallup, three to five days later than Willamette and Canby. Increasingly grown because of dependability, yield, and processing quality.

WILLAMETTE: Berries very large, dark red, tend to become purplish on standing, slightly acid, firm. Stands handling well. Fair in quality as a freezing berry, good when canned. Plants productive on good soil, hardy, susceptible to root rot. Canes medium to large, tall, straight. Laterals strong. Ripens with Canby, three to five days earlier than Washington, Puyallup, and Sumner.

PUYALLUP: Berries very large, medium red, sweet, fairly firm. Quality good for fresh use or processing. Plants productive on good soil, hardy. Susceptible to root rots and mildew. Canes medium to large, straight. Fruiting laterals medium length, strong. Ripens with Washington and Sumner, three to five days later than Willamette and Canby.

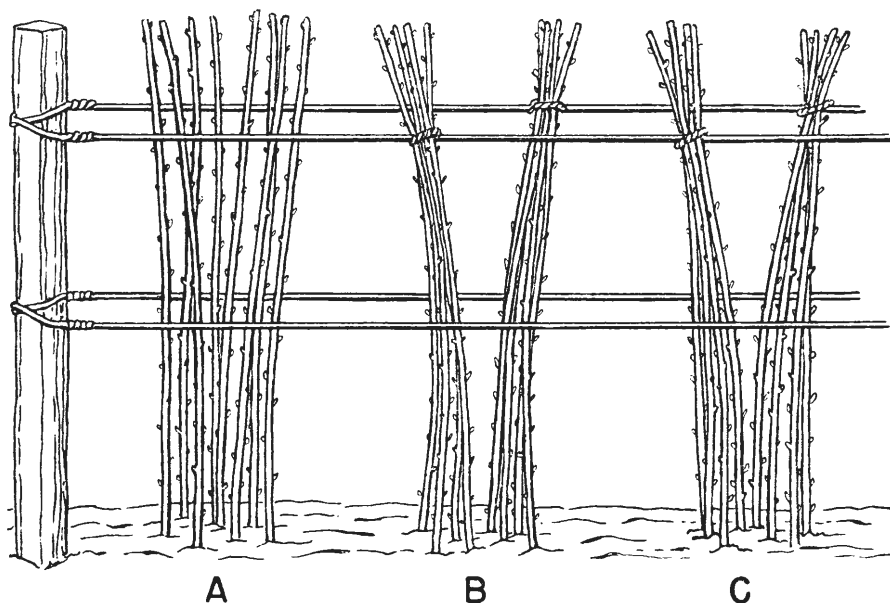
CANBY: Berries large, light red, mildly acid, fairly firm. Fair quality but lacks firmness as a processing berry. Plants productive on good soil, very susceptible to root rots. Very hardy. Canes large, tall, smooth, straight. Fruiting laterals strong. Ripens with Willamette, three to five days earlier than Washington, Puyallup, and Sumner. Has produced top yields at the Irrigation Experiment Station at Prosser.

WASHINGTON: Berries small to medium in size, bright medium red, sweet. Excellent in color and flavor for fresh use and for processing, but lacking somewhat in firmness. Plants productive on good soil, hardy, susceptible to root rot and raspberry rust. Canes medium size, tall, fairly straight—some tendency to droop and to branch. Laterals strong. Ripens with Puyallup and Sumner, three to five days later than Willamette and Canby.

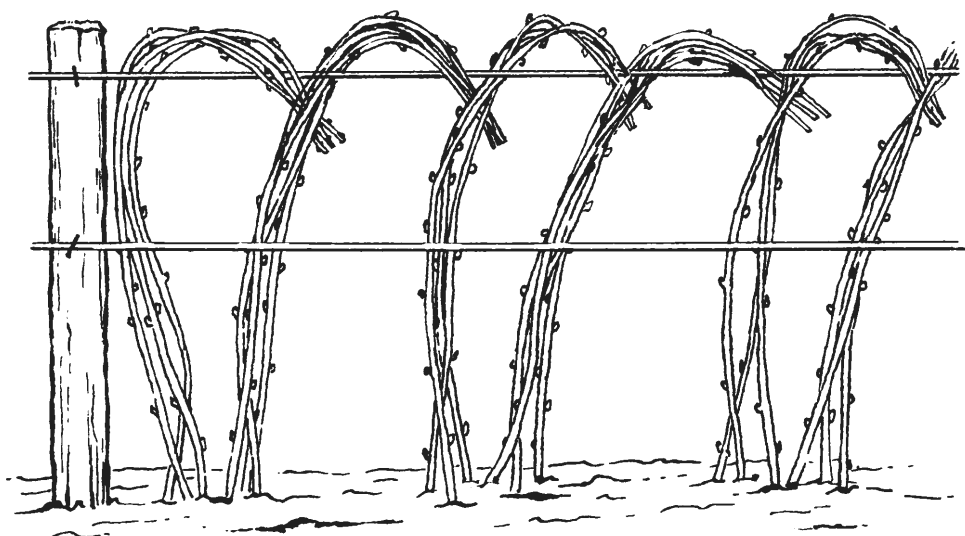
FAIRVIEW: (For trial) Released by Oregon State University and the USDA in 1961. Has been tested in Oregon and to a limited extent in Washington. Berries medium large, bright medium red, fairly firm. Good color and flavor as a frozen berry. Not suitable for canning. Plants grow vigorously on well-drained soil. It is somewhat tolerant of heavy, poorly drained soils. Ripens with Willamette and Canby.

NEWBURGH: Berries fairly large, light red, fair quality and flavor. Plants productive. Very resistant to root rot. Very hardy. Ordinarily not grown where other commercial varieties of better quality are successful.

MUNGER: Principal variety of black raspberry grown. Superior to other varieties in yield, fruit quality, and plant characteristics.



Mature raspberry canes after spring pruning and tying to four-wire trellis. A—Hill after spring heading. B and C—Hills with canes spread and tied. The canes in each hill are divided into two equal groups. The ties on the wire are spaced 18 inches apart, or half the distance between the hills.



Mature raspberry canes after cutting out old canes and weaving the new ones. Tips have been removed in early spring. Canes are inside trellis wire. Tips are bent down outside the top trellis wire, then crossed under the wire. The next bundle of canes is wedged between the tips and the trellis wire.

hill can support is determined by soil fertility, moisture, and planting distance. All of the good strong canes each plant will produce should be left to bear fruit. This may mean 8, 10, or with exceptionally good growing conditions, as many as 12 red raspberry canes per hill.

Tie the canes to the top trellis wire, either in one or two bunches for each hill. Cutting the canes back or tipping them should be left until late winter or early spring after the danger of hard freezes has passed. Canes are usually cut back to $4\frac{1}{2}$ or $5\frac{1}{2}$ feet. In areas where plants produce long laterals and children pick berries, leaving canes $5\frac{1}{2}$ feet long makes the berries too high for some youngsters to reach.

Weaving the Canes

On productive soil where the plants produce vigorous canes 8 feet tall or more, some tonnage may be gained by leaving longer canes. Berry size will be reduced slightly, but total tonnage will

be increased as a result of the longer canes. If the canes grow to 8 or 9 feet, they can be cut back 18 inches. This will leave a total length of $6\frac{1}{2}$ or 7 feet after the tips are cut in the late winter or early spring.

Leaving longer canes makes it necessary to bend the tips down to keep them within reach of the pickers. The tips may be tied to the top trellis wire. But it is faster to bring the tips over the trellis wire, bend them under the wire, and wedge the next cane or bundle of canes between the tips and the trellis wires. Canes may be woven on a single top trellis wire, but where growth is so vigorous as to favor weaving, two top trellis wires are desirable. It is best if there are not more than three canes in each bundle when the canes are bent down and woven.

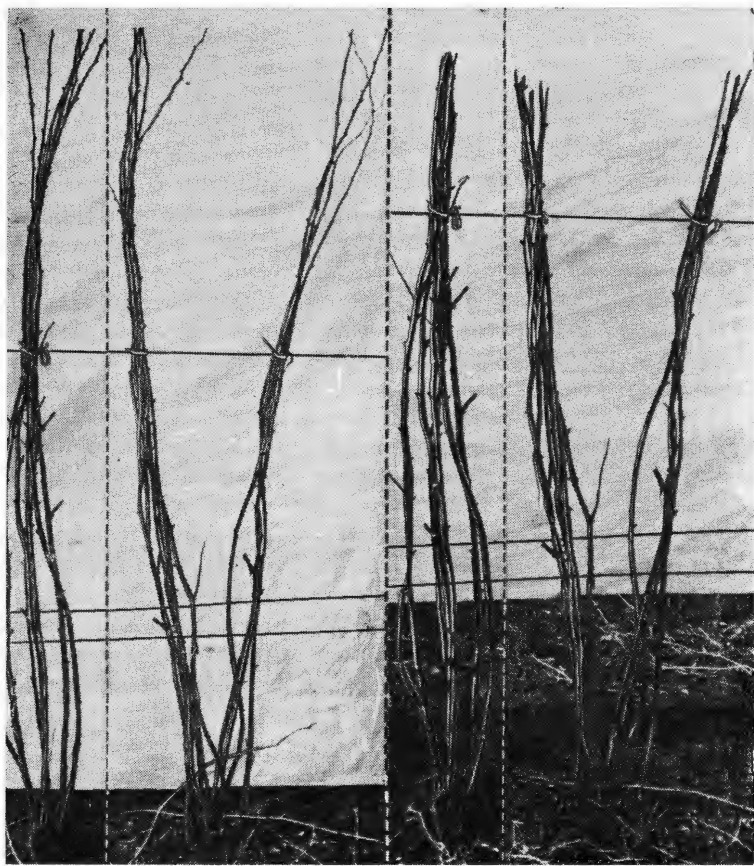
Pruning Black Raspberries

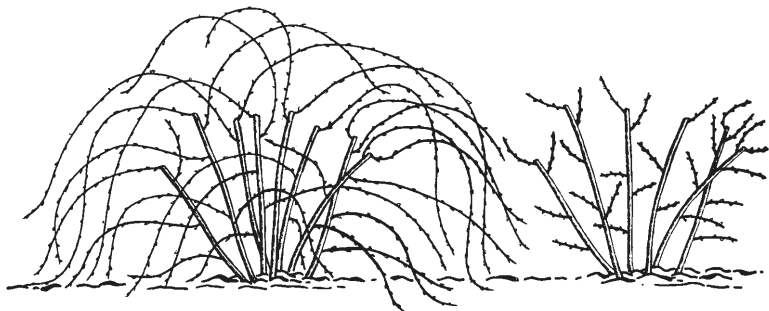
Black raspberries are sometimes trained on trellises, but the most common

Mature raspberry canes tied to a single top wire.

Left — Weak canes cut out and strong canes tied.

Right — Canes cut back or tipped.





Mature black raspberry plants before and after pruning. The new shoots were headed during the growing season by pinching out the tips. Left—Before dormant pruning. The old fruited-out canes and some of the weaker ones have been removed. Note the length of the laterals resulting from the heading. Right—After pruning. The weak canes, those less than 1/3 inch in diameter at 1 foot above the ground, were removed. The laterals were cut five to eight buds long. The stronger the cane, the lighter the pruning.

practice is to pinch off the tips of the new shoots in the summer when they reach knee height—about 18 inches. This causes the canes to branch. During the dormant season cut out the weak canes

and cut the branches on the strong canes back to 6 or 10 inches, depending on plant vigor. The old canes that have fruited can be cut out either at the end of the harvest or during the winter.

MAINTAIN ORGANIC MATTER IN THE SOIL

Manure

Barnyard and poultry manure are good sources of soil organic matter and plant food. Annual applications of 8 to 12 tons of barnyard manure or 5 to 6 tons of poultry manure per acre should be made if manures are available. Manures are low in phosphorus, so 500 pounds of ordinary superphosphate (18 per cent) or 200 pounds of treble superphosphate (48 per cent) per acre should be applied annually in western Washington to supplement the manure.

Cover Crops

Growing winter cover crops is also a good way to keep up soil organic matter. In western Washington, plant winter rye

in early September and work it down in the spring by mid-May. In eastern and central Washington, plant spring oats or barley and hairy vetch in August and work them down in late May. If left longer the cover crop may take so much water that the raspberry plants will suffer. Even where irrigation is available, avoid letting the rye get beyond the heading stage. Heavy straw requires large quantities of nitrogen to break it down. When large quantities of strawy material are plowed under or mixed with the soil, extra nitrogen should be applied. If the material is left on or near the surface, there should be no need for extra nitrogen.

USE FERTILIZER TO KEEP PLANTS VIGOROUS

Raspberry plants must be kept in good vigor if they are to produce good crops over a long period of years. Soil tests are the best guides to phosphorus and

potash fertilizer needs. You can get shipping cartons and instructions for sending soil samples to Washington State University from your county agent.

Western Washington

Western Washington soils may need all three major plant foods—nitrogen, phosphorus, and potash. If a soil test is not made, and manures are not used, apply 800 pounds per acre of a 5-15-10 fertilizer, or its equivalent, each year as a general practice. Such an application provides 40 pounds of nitrogen (N), 120 pounds of phosphate (P_2O_5), and 80 pounds of potash (K_2O). Apply the fertilizer when growth starts in the spring. Put it in a furrow or band 12 to 18 inches from the center of the row, and 2 to 4 inches deep. If equipment to put the fertilizer in the soil is not available, scatter the fertilizer on the soil surface near the row and work it into the soil with a cultivator or harrow.

South of the Lewis River and possibly in other areas of western Washington, the lack of boron may cause cane dieback or reduce plant vigor and yields. Soil analysis for boron is available through the WSU soil testing lab. Make a special request if you want a boron test run on soil samples you send in. If your soil needs boron, broadcast 20 pounds of agricultural borax or its equivalent per acre in the winter or early spring. It may be necessary to apply boron each year where it is most severely lacking.

Eastern and Central Washington

Eastern and central Washington soils are much less likely to be low in potash and somewhat less likely to be low in phosphorus. Here again soil tests are the best guide. The greatest need is usually for nitrogen. If a soil test is not made to determine phosphorus and potash needs, apply 80 pounds of nitrogen and 40 pounds of phosphate per acre, in addition to the nitrogen from the vetch cover crop. This amount of fertilizer can be applied in one of the following combinations:

1. 100 pounds of ammoniated phosphate (11-48-0)
and
200 pounds of ammonium nitrate (33 per cent nitrogen)
2. 200 pounds of ammoniated phosphate (16-20-0)
and
250 pounds of sulfate of ammonia (21 per cent nitrogen)
3. 250 pounds of ordinary superphosphate (18 per cent) *or* 80 pounds of treble superphosphate (48 per cent)
and
250 pounds of ammonium nitrate (33 per cent nitrogen), *or* 400 pounds of sulfate of ammonia (21 per cent nitrogen).

CULTIVATE TO CONTROL WEEDS

By the time the raspberry plants are three years old the roots will have grown out until they meet and intermingle between rows. Raspberry plants are shallow rooted. Avoid deep cultivation. Don't go below 3 inches; 2 inches is much better. Rotary type cultivators, properly operated, are very good. Cultivation should be limited to controlling weeds and keeping down raspberry shoot growth between rows.

Some hand hoeing is usually needed to keep down shoots and weeds between hills in the row. Two, three, or even more

hoeings may be necessary where chemical weed control is not used.

Chemical Weed Control

Chemical weed control of annual weeds in red raspberries in western Washington has proved economical and effective. You can get information on materials, rates, and timing from your county agent.

The branching of black raspberries makes cultivation and hoeing difficult during the late summer and fall. The use of chemicals, applied after pruning in the dormant season, will do a good job on annual weeds in western Washington.

IRRIGATE TO GET HIGHER YIELDS

Irrigation is a necessity in most parts of eastern Washington if good yields of raspberries are to be produced. In western Washington, irrigation will increase yields of raspberries materially, most years.

No one general rule can be made for determining the irrigation needs of raspberries. Soils vary in their water holding capacity. Light sandy soils may hold less than an inch of usable water per foot of soil depth. A medium-textured soil may hold about 2 inches of usable water per foot of depth. Heavy soil may hold up to 3 inches per foot of depth. This means light, shallow soils must be irrigated with smaller amounts of water, and more often, because the water is depleted more quickly. Highest yields are produced if moisture in the root zone is not allowed to become less than half of what the soil will hold.

Western Washington

In western Washington, 2 acre inches of water or more are needed each month

through the summer. This includes both rainfall and irrigation.

Eastern Washington

In eastern Washington, 2 to 5 inches of water or more per month are needed in the spring and early summer, 7 to 10 inches per month in mid-summer, and 2 to 4 inches per month in the fall. Watering should be tapered off after harvest to harden up the canes. A final irrigation in the fall may be needed to protect the roots during the winter.

At Harvest Time

Heaviest moisture needs are just before and during harvest. At this time the growth of new canes and rapid development of the berries draw heavily on water in the soil. Good berry size depends to a considerable extent on enough soil moisture. Because raspberries are shallow rooted, examine the soil often to be sure that it stays moist during the growing period and particularly during harvest.