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Extension Circular 1231 June, 1933

The Home Orchard and Fruit Garden

Some of the returns are in satisfaction.

The University of Nebraska Agricultural College Extension Service
and United States Department of Agriculture Cooperating
W. H. Brokaw, Director, Lincoln

The Home Orchard and Fruit Garden

BY E. H. HOPPERT

A good home orchard and fruit garden is a valuable asset on the farm. If adapted varieties are chosen and the fruit plants are given reasonably good care, satisfactory returns can be secured in most years. Success in growing fruit for the home, however, should not be measured alone in terms of dollars and cents. The convenience of having an abundance of fruit available on the farm is a source of considerable satisfaction. A good orchard helps to improve the appearance of the farmstead and it may be located in a way that will help protect the farm yard from winter winds and snow drifts.

Small fruits, such as strawberries, currants and gooseberries; and plums, cherries, and early apples, can be grown in every county of the state without special cultural precautions. If winter protection is given black raspberries, red raspberries, and grapes, these fruits will generally yield satisfactory crops. Winter varieties of apples require a longer growing season than do summer and fall varieties and as a rule are less hardy. Furthermore, the winter varieties require more spraying to keep them from becoming wormy. Unless the home orchard owner is willing to go to the trouble of spraying the winter varieties, it may be wise for him to omit these from his planting and confine his efforts to those varieties and fruits that do fairly well without spraying.

LOCATION

The small fruits are frequently planted around the borders of the vegetable garden where they will not interfere with the garden operations and yet receive the protection and care usually given vegetables. Here they are close to the house and usually close to the well so that they may be irrigated in severe drouth periods. The raspberries, currants, and gooseberries need protection from hot winds. Native small fruits like the buffalo berry, June berry, or the choke cherry, could be used for a windbreak back of which the other small fruits might be planted. Currants and gooseberries might also be grown on the north side of sheds or buildings as a foundation planting.

The farm orchard is generally placed close to the house for convenience. In eastern Nebraska where the soil is rather rolling, low, damp places should be avoided. Here late spring frosts would damage the bloom to a greater extent than would be the case on high ground. A south or

a west slope is less desirable than an east or a north slope. Hot, dry winds usually come from the south and west and trees that are exposed to the full sweep of these winds suffer much more than do those on east or north slopes.

In central and western Nebraska where moisture is usually lacking in midsummer, the trees live longer and produce better when located in the valleys or in broad canyons.

WINDBREAKS

Windbreaks are a decided advantage in the growing of a home supply of fruit, especially in western and central Nebraska. For apples, pears, cherries and plums, currants and gooseberries, it is not so important to have the windbreak on the north since the buds of these fruits are quite hardy. A windbreak on the south and west would be a great benefit, however, since it would protect the fruit plants from the hot, dry summer winds. The fruit buds and even the new wood of peaches, grapes, and raspberries are easily killed by dry winter winds. These fruits would benefit greatly from a windbreak on the north and west.

An evergreen windbreak is the most effective type for protection against winter winds. Austrian pine and Western Yellow pine may be grown anywhere in the state. Jack Pine is suitable on sandy soil. The red cedar makes a very effective windbreak but it transmits cedar rust to some varieties of apples. Apples can be grown near the cedar trees if varieties are chosen that are resistant to cedar rust. Broad leaf trees like Russian olive, Russian mulberry and Chinese elm are very satisfactory, especially on the south side of the fruit garden and orchard.

Large species like American elm, soft maple, and cottonwood should not be closer than 75 or 80 feet to the fruit trees or they will sap the ground occupied by the fruit trees. The evergreens and other broadleaf trees mentioned may be within 40 or 45 feet of the fruit trees.

SPACING TREES AND PLANTS

Fruit trees should be given sufficient space to develop without crowding. In low, rich soil trees grow larger than they do on high ground or on thin soil; accordingly they should be set farther apart on the rich soil. The following table suggests proper planting distances for the various fruits.

TABLE 1.—*Suggestions for Spacing Fruit Trees*

Kind of fruit	Distance apart in row (feet)	Distance between rows (feet)
Apples	30–35	30–35
Cherries, pears	18–20	18–22
Plums	16–18	18–20
Grapes	8–10	8–10
Blackberries	4– 5	7– 8
Raspberries, black	4– 5	7– 8
Raspberries, red	3– 4	6– 7
Currants, gooseberries	4– 5	6– 7
Strawberries	1– 1½	3½–4

The planting distances recommended for apples is greater than is actually required by the trees for fifteen years or more. Therefore filler trees are sometimes planted between each two trees in the rows. Cherries, peaches, plums and early bearing varieties of apples are used as fillers. When the trees begin to crowd, the filler trees are pruned severely to permit the natural development of the permanent trees.*

SELECTION OF VARIETIES

Some kinds of fruits can be grown in every county of the state. Others, because of their lack of hardiness, should not be planted in drier and colder sections. In the more favorable parts selection is made primarily on the basis of quality whereas in the regions with severe winters quality must give way to hardiness and drouth resistance.

For conveniencee in designating varieties for the different regions, the state has been divided into five districts

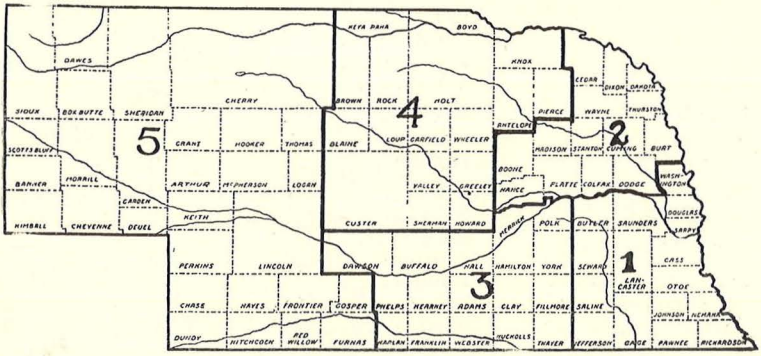

FIG. 1.—Districts of Nebraska.

* See discussion under pruning.

(See Fig. 1). Table II gives a list of the varieties most likely to do well in these districts. It is realized that this is not a complete list for some of the districts where conditions are favorable for growing fruit, yet it will serve as a useful guide in making selections because it is based on the experiences of some of the pioneers in these regions.* The extent to which these varieties will succeed in a given locality will depend in a large degree upon the care they are given.

TABLE II.—*Fruit Varieties by Districts*

Kind of Fruit	Variety	Recommended in District				
Summer apples	Duchess	1	2	3	4	5
	Yellow Transparent	1	2	3	4	5
	Anoka	1	2	3	4	5
	Chenango	1	2			
Autumn apples	Wealthy	1	2	3	4	5
	Maiden Blush	1	2	3		
	Fameuse (Snow)	1	2	3	4	5
	Utter	1	2	3	4	5
	Early McIntosh	1	2	3	4	5
Early winter apples	Jonathan	1	2	3		
	Virginia Beauty	1	2	3		
	Grimes	1	2	3		
	Red Delicious	1	2	3	4	
	Golden Delicious	1	2	3	4	
	King David	1	2	3		
	McIntosh	1	2	3	4	5
	Salome			3	4	5
	N. W. Greening			3	4	5
	Turley	1	2	3		
Late winter apples	Winesap	1				
	Black Twig	1	2	3		
	Genet		2	3	4	
	York Imperial	1	2	3		
	Haralson			3	4	5
	Windsor		2			
Crab apples	Whitney	1	2	3	4	5
	Florence	1	2	3	4	5
	Hyslop	1	2	3		
Pears	Sheldon	1	2	3	4	5
	Flemish Beauty	1	2	3	4	5
	Seckel	1	2	3		
	Lincoln	1	2	3		
	Cayuga			3	4	5
	Douglas	1	2	3		
	Kieffer	1	2	3		

* Credit is due Jules Sandoz, Sheridan county, C. Bolles, McCook, C. Hoblitzel, Eustis, and Wm. Spoeneman, Brule, in this connection.

Kind of Fruit	Variety	Recommended in District				
Plums	Omaha	1	2	3	4	5
	Wauneta	1	2	3	4	5
	Underwood	1	2	3		
	Wyant	1	2	3		
	Kaga	1	2	3		
	Lombard	1	2			
	Shropshire Damson	1	2			
	Sapa	1	2	3	4	5
	Opata	1	2	3	4	5
	Compass Cherry				4	5
Cherries	Early Richmond	1	2	3		
	Montmorency	1	2	3	4	5
	English Morello	1	2	3	4	5
Peaches	Russell	1				
	Champion	1				
	Wright	1				
	Crosby	1	2	3		
	Seedlings	1	2	3	4	
Grapes	Concord	1	2	3		
	Moore Early	1	2	3		
	Worden	1	2	3		
	Brighton	1	2	3		
	Niagara	1	2	3		
	Beta		2	3	4	5
	Lucile		2	3	4	5
	Elvira		2	3	4	5
Blackberries	Snyder	1	2	3		
Raspberries (black)	Cumberland	1	2	3	4	
(purple)	Cardinal	1	2	3		
(purple)	Columbian	1	2	3		
(red)	Latham	1	2	3		
(red)	Chief	1	2	3		
Gooseberries	Champion	1	2	3		
	Cary	1	2	3	4	5
	Poorman	1	2	3		
Currants	Perfection	1	2	3	4	
	North Star	1	2	3	4	5
Strawberries (June bearing)	Senator Dunlap	1	2	3	4	5
	Premier	1	2	3	4	5
	Blakemore	1	2	3		
(Everbearing)	Mastodon	1	2	3	4	5
	Progressive	1	2	3	4	5

ORDERING THE PLANTS

Early spring transplanting is best for fruit plants under Nebraska conditions. Fall transplanting usually results in heavy losses particularly in dry cold winters, such as the 1932-33 winter. Nursery stock should be ordered by the middle of March to insure delivery early in April.

Most people prefer a two-year tree for transplanting. Experiments in various states have shown that there is little difference between one and two year old trees so far as the number of years required for the trees to come into bearing is concerned. It is more important to have a good grade of tree whether it is one year old or two years old. Trees older than two years should not be ordered. These oversized trees will not come into bearing sooner than the one or two year trees. The losses in transplanting are much greater for the large trees.

In districts 4 and 5 sunscald is a serious factor. Low headed trees are less likely to be injured by sunscald than are high headed trees. Therefore in these regions it is best to use one year old trees. Two year old nursery trees have had their lowest branches removed to facilitate cultivation in the nursery row. One year trees generally withstand the shock of transplanting better than do older trees. This is another reason why the younger trees are better for regions 4 and 5.

Plants such as raspberries and grapes (cut to within 2 or 3 inches of the ground at transplanting time) may be transplanted in the fall with safety provided the soil about them is soaked and a small mound of dirt is placed over the cane that is left.

WHEN SHIPMENT ARRIVES

Upon arrival of the shipment the bundle should be opened and the plants examined. If they are shrivelled from excessive drying or discolored from freezing or heating, the shipper and the transportation company should be notified immediately, so that proper adjustments can be made.

The plants should be set out immediately if possible but if they are to be held for a few days they ought to be unpacked immediately and placed in a cool cellar and the roots covered with wet burlap sacks or they should be heeled in out of doors. If a cellar is used as a storage place the trees should be sprinkled with water every two or three days. If it is deemed advisable to heel them in out of doors, the following method is used: Select a well drained location. Dig a trench two feet deep and wide enough to freely admit the roots. Place the roots in the trench with the tops in an inclined position. Cover the roots and half or more of the tops with moist dirt. The plants may be held in this way until they are to be set out in their permanent places.

SOIL PREPARATION

The land which is to receive the fruit plants should be rich enough to enable them to make a satisfactory growth. Thin, worn out soils usually prove disappointing both in plant growth and in fruit production. Such soils may be made suitable for the fruit plants by growing and incorporating a green manure crop, such as red clover or sweet clover. Or well rotted manure may be applied to the soil in the fall at the rate of 30 to 40 tons per acre and then plowed just before winter weather sets in. New land or land that has been in sod is very good but fall plowing is desirable in this case also. In western Nebraska under dry land conditions summer fallowing the year previous to planting is desirable. Another good plan, where moisture is the limiting factor, is to mark out the rows in the fall with a lister.

PLANTING

Most fruit plants do best if transplanted early in the spring soon after the frost is out of the ground. Late planting is never as satisfactory as is early planting. Follow a definite planting plan showing where the different kinds and varieties are to be placed. The area should be measured and stakes driven where the trees are to be planted.

SETTING TREES

The hole that is to receive the tree or plant should be large enough to permit spreading the main roots in a normal way. In moving trees from the cellar or heeled-in position, precautions should be used to prevent undue drying out of the roots. The roots may be wrapped in wet gunny sacks until ready for planting. Another good plan is to haul them to the orchard site in a barrel partly filled with water. They are removed one at a time as needed for planting. Broken roots and unusually long ones are cut back.

The following procedure is generally followed in setting the trees:

1. Several shovels full of loose moist top soil are spread out in the bottom of the hole.
2. The tree is set two or three inches deeper than it stood in the nursery. Cherry trees are never set deep enough to cover the place where the tree was budded or it will tend to sprout from the roots.
3. The lowest permanent branch is placed on the southwest side.

4. The tree is leaned slightly to the southwest to counteract the tendency to grow to the northeast.
5. The roots are covered with 2 or 3 inches of rich, moist, top soil and this firmly tramped. Then 3 or 4 inches of soil are added and the tramping repeated.
6. Finally the upper 2 or 3 inches of soil is left loose to permit absorption of water.
7. If the soil is unusually dry, add a pailful of water before applying the last 2 or 3 inches of loose soil.

SETTING SMALL FRUITS

The method of planting small fruits is essentially the same as for the trees. Strawberries, however, should be set so that the crown of the plant is even with the surface of the ground. If set too deep, the bud will decay; if not deep enough, the plant dries out and dies.

PRUNING AND TRAINING *

Newly transplanted trees and plants should be pruned soon after they are set out. In digging trees from the nursery, at least two-thirds of the root system has been left in the ground. If all of the top is left on the trees at transplanting time and an unfavorable growing season is encountered, the loss of trees will be heavy. Trees that are heavily pruned following transplanting are much more likely to survive the shock.

There is another good reason for this pruning. Most well grown nursery trees have 6 or 8 side branches arising from the trunk in a space of 8 or 10 inches. Half that number if properly selected, will suffice to build a desirable type of a tree.

Apples and Pears.—One year trees are cut off 30 to 36 inches from the ground just below a bud on the southwest side of the leader. In western Nebraska where low headed treees are preferred, the leader is cut off 18 inches from the ground.

Two year old trees have three or more side branches and one or more leaders. Leave only one leader, preferably a strong one that leans slightly to the southwest and cut the others off close to the trunk. The height at which the side branches are left depends somewhat on the location in the state. In eastern Nebraska the lowest limb should be about 2 feet from the ground and preferably on the southwest side of the tree to protect the trunk from sunscald. The next branch should be on one of the other sides of the

* A brief outline is given here. Extension Circular 1260 goes into more detail.

tree and 6 or 8 inches higher up on the trunk. If a third branch is left, this one should be on one of the remaining sides and 6 or 8 inches higher on the trunk than the second branch. All other branches are cut off close to the trunk. In central western Nebraska the branches should be lower down on the trunk to avoid danger from sunscald. The one on the southwest should be 8 to 12 inches from the ground. Then all the branches that were left on the tree are cut back, the side branches to 14 or 16 inches and the leader to 24 or 28 inches. During the next two or three years the aim in pruning is to develop the scaffold or main branches on the trunk in such a way that they will be mechanically strong enough to hold up under strong winds and heavy crops of fruit. The modified leader type of tree seems to meet the needs in Nebraska. This type consists of a single trunk 6 to 7 feet long with 7 to 9 main side

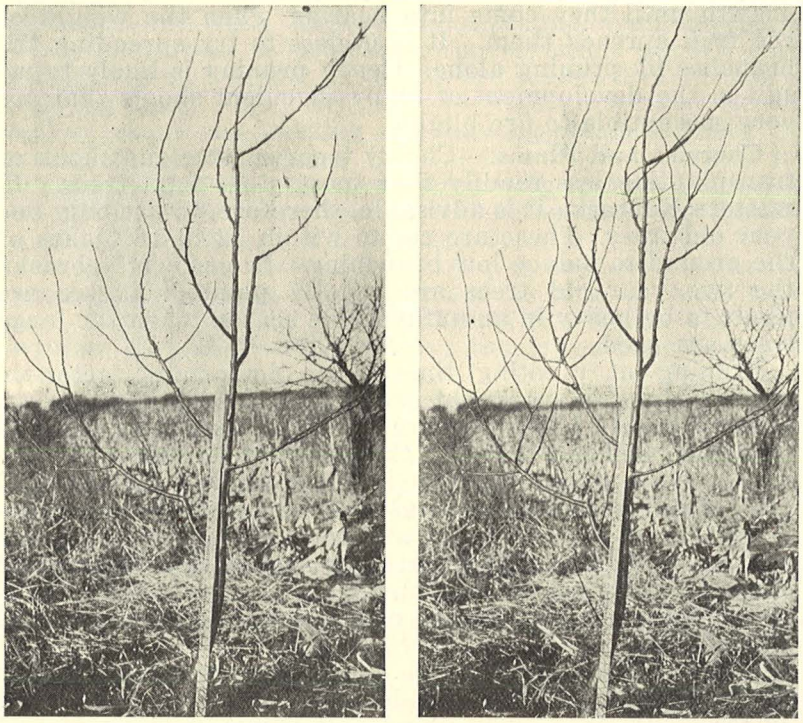

FIG. 2.—A four-year-old apple tree before and after pruning. Pruning consists primarily of the removal of surplus branches in the center of the tree. Note the fine distribution of scaffold branches.

branches arising from it. These main branches or scaffold branches should be so spaced on the trunk, that there is a distance of at least 4 or 5 inches between each two where they join the trunk. Where two branches are on the same side of the tree there should be 18 or 20 inches between them.

Crossing branches, suckers, and branches that grow toward the center of the tree should be removed. Never head back the side branches after the first year unless it is necessary to induce branching or to hold back certain branches to retain proper balance.

Heavy pruning should not be tolerated in a young orchard since it tends to maintain the trees in an excessively vegetative state and this delays the bearing. After the trees have come into bearing the pruning can be increased without serious danger.

Pear trees are generally very upright in their habit of growth until they come into bearing when the weight of the fruit spreads them. It is useless to try spreading the branches by pruning alone. Heavy pruning is likely to result in the development of many succulent shoots that are very susceptible to fire blight.

Cherries and Plums.—Cherry trees survive the shock of transplanting less readily than most other fruit trees. In western Nebraska it is advisable, therefore, to use only one year old trees. These are cut to within 12 to 18 inches of the ground to induce low branching. In eastern Nebraska the two year old trees are usually planted. Losses are likely to be heavy in an unfavorable season when the large trees are used.

Pruning at planting time is an important factor in getting the two year old trees established. Well grown nursery trees of this age are likely to have 8 or 10 side branches. All but three of these should be removed. Be sure to leave one, low down on the southwest side to help protect the trunk against sunscald. The next two branches should be on the northwest and southeast spaced at intervals of six inches. The northeast side of the tree is left open to assure proper development of the leader. The ends of the branches on a young cherry tree should not be cut off.

Plum trees are pruned like cherries except that the ends of the laterals and of the leader are cut back as in the case of the apple tree. The Sapa and Opata varieties (sand cherry crosses) are naturally bush-like and should not be trained to make trees. They bear on the one year wood as do peaches. For this reason they must be pruned heavily

each year or they are likely to over bear and succumb to winter injury. Some plum varieties like Waneta and the Compass cherry are likely to produce weak crotches. In selecting branches for the scaffold choose only those branches that have well developed shoulders where they unite with the trunk.

Peaches and Apricots.—Under Nebraska conditions these two fruits are less likely to produce consistently than are those mentioned previously. The wood and fruit buds of the peach are generally killed when the winter temperatures go below –15° F. Apricot wood is more hardy but the flower buds are about as tender as are peach buds. Occasionally we do have mild winters following which good crops are produced. Many farm owners have adopted the practice of growing their own peach and apricot trees from pits. A good plan in this connection is to plant them around the vegetable garden particularly on the south and west. If they do not produce fruit they serve a useful purpose in protecting the vegetable garden from strong summer winds. The pits are placed in a furrow at canning time. They are covered with an inch or two of soil to permit the freezing and thawing action to break the seed coat. In the spring the soil is worked back into the furrow so that the pits are covered with four or five inches of soil. As the young seedlings develop they are thinned out so that there is a tree every four or five feet. The young trees are allowed to develop branches close to the ground rather than being trimmed as most orchard trees are. A more or less dense hedge is the result. In some winters the snow will drift over the lower branches, protecting the buds from winter injury. Sometimes such peach hedges will produce fruit when the peach trees in the orchard are a total loss. Following a severe winter such as 1932-33 the trees are cut back to within four or five feet of the ground to stimulate the growth of low branches. Apricots may be treated in the same manner as peaches, or they may be developed as trees in which case they are trained like plums or cherries.

If peach trees and apricot trees are desired in the orchard it is best to give them a place by themselves rather than to mix them in among the other trees. The fungicides generally used on apples, pears, cherries and plums will injure the more tender foliage of peaches and apricots. It is virtually impossible to keep the spray from drifting to adjoining trees if the least wind is stirring.

CULTIVATION

During the first five or six years the orchard should receive clean cultivation. Fruit trees make practically all of their growth by the middle of July; therefore it is particularly important that growing conditions are favorable during this period. Weeds should not be tolerated previous to that time since they rob the trees of needed moisture. In addition they attract dangerous insects like the Buffalo tree hopper which feeds on these weeds and grasses early in the summer and in August the adult females lay their eggs in the young succulent branches. When the egg punctures are numerous they stunt the growth by interfering with the proper sap flow.

The space between the tree rows may be disked two or three times before the middle of July; or intercrops that require regular cultivation may be used like vegetables and field corn. Crops that require extremely late stirring of the ground should not be chosen since late cultivation may induce the trees to make a late growth which may be injured by early freezes. This is particularly true of peaches and plums. If the orchard is in low, rich ground, it is a good plan to fall seed the tree rows at least, to winter rye or to oats.

After the trees have reached the age when they should begin to bear it may be advisable to seed the space between the rows to red clover or sweet clover. If the top soil is rather poor or it is underlaid with a fairly heavy clay subsoil, sweet clover will be advantageous. It, however, removes more moisture than does red clover and this may be a drawback in some sections. Korean lespedeza is being tried in the southeast section of the state and shows promise of being well adapted as a low growing leguminous cover crop for orchards.

Blue grass is not to be tolerated in an orchard except where the trees can secure an abundance of water either by irrigation or subirrigation. On steep hillsides where blue grass has become established, strip cultivation is a practice worth following. Alternate middles are disced the first year until the blue grass has been killed and these seeded to a legume the next spring. The following year the remaining middles are similarly treated.

Under western and central Nebraska conditions, the cover crops would remove too much moisture to be practical. Here either clean culture or straw mulching must be practiced. Clean culture has a tendency to destroy the humus and this must be replaced by applications of well

rotted manure. The straw mulch * method has proven very practical in these regions. It should not be started until the trees have become deeply rooted, however, or there is danger of having the trees uprooted in a strong wind. Mulches have a tendency to harbor field mice and these little rodents will girdle fruit trees in winter when their food supply is limited. Such damage may be guarded against by placing a small tin can containing a few grains of poisoned wheat close to the trunk. Another precaution that should be taken where the orchard is mulched is to plow or disc around it in the fall to prevent fires from creeping into the mulch.

FERTILIZATION

Young fruit trees seldom require special fertilization where the soil is suitable for vegetable or field crops, provided weeds and grass are kept down by cultivation until the middle of July. After they have been bearing several years, however, they may require additional fertility to keep them in that state of vigor which will tend to promote annual fruiting. If barnyard manure is available, this should be applied at the rate of 30 tons per acre every two or three years. The best time to apply it is in the fall. It should not be piled up around the trunks of the trees, however. Most of the feeding roots are far out from the trunk. Therefore if the manure is spread out under the outer branches it will accomplish the most good. If manure is not available, nitrate of soda or ammonium sulfate may be used. These materials are generally applied in the spring as the buds swell. The usual rate per tree is one-fourth pound for each year of the tree's age. Where legumes have been disced in there will be little need for either manure or commercial fertilizer for a year or two.

SPRAYING †

Insects and diseases are so common in most sections of the state that it is almost hopeless to try to raise fruit without spraying. The home orchard usually contains several different kinds of fruit and different varieties of each. The spraying directions given in Nebraska Station Circular 36 specify the proper time for the different fruits. This may be confusing to some who wish to spray all of their trees at the same time. Experience has shown that

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* August Gingenbach, north of Eustis, has practiced straw mulching the last eight years with fine success.

† For further details see Circular 36, Spraying Tree Fruits.

the best general control for tree fruits is secured when the applications are timed according to the proper development of the winter varieties of apples.

THINNING

Plums, peaches, apples, and pears have a tendency in some years to set a very heavy crop of fruit. If all of this fruit is left on the tree the trees may be forced into alternate bearing. Sometimes heavily loaded trees break down under the weight of the fruit. In extreme cases the trees are so expended that a hard winter may kill them. Thinning the fruit overcomes most of these difficulties. Furthermore, thinning improves the color, flavor, and size of the fruits that remain. Where the fruits touch one another they are likely to be bruised. In the case of the stone fruits those touching one another are likely to be infested with brown rot and in the case of apples and pears the codling moth larvae find an easy entrance at these points.

As a rule thinning is done soon after the June drop. When the work is put off until August the beneficial effects are not as great as when done late in June or early in July. Thinning may be done either with special narrow pointed shears or it may be done with the fingers. In the latter case the stem of the fruit is grasped between the thumb and the first finger and the fruit is pushed off with the middle finger. Plums and apricots are thinned so that there is a space of about three inches between fruits; peaches are thinned to five or six inches; apples and pears to six or eight inches. In thinning, the blemished fruits are removed wherever possible.

RODENT CONTROL

Rabbits, mice, and pocket gophers cause heavy losses each year by girdling fruit trees. These losses can be prevented almost entirely if precautions are taken in time.

Rabbits attack young trees, particularly when the ground is covered with snow. Wire wrappers are most satisfactory since they give protection for several years. Twelve-inch width poultry netting with one-inch meshes is commonly used. This is cut into 18-inch lengths and placed around the young trees with the frayed edges at the top and bottom. Galvanized mosquito netting is also used with success. A cheaper method but one that must be repeated each fall is to tie corn stalks around the trunks.

Mice do most of their damage at the crown of the tree in the winter when the natural food supply is cut off by snow and sleet. A good precaution to take is to remove all weeds and other trash from around the tree trunks in the

fall. The mice are not likely to build their nests close to the trunk when this is done. If runways are noticed in the hoed area, a few grains of poisoned grain may be thrown into them or the poisoned grain may be placed in a small tin can set near the trunk.

Pocket gophers cut off large roots and occasionally girdle the trunk under ground. Poisoned bait may be dropped into their main runway or gopher traps may be used to dispose of these rodents.

SMALL FRUITS

Such fruits as strawberries, raspberries, currants, gooseberries, and grapes can be grown under a wide range of conditions. They require very little room as compared with the tree fruits. They come into bearing quickly and the plants are inexpensive and easily grown. They deserve to be grown for home use more generally than is the case at present. They may be set at the border of the vegetable garden where they are readily accessible and where they may be irrigated in periods of drouth. Currants, gooseberries, and raspberries may be grown in the orchard, particularly while the trees are coming into bearing. Grapes may be used on the garden fence or they may be grown on an arbor instead of the purely ornamental vines.

STRAWBERRIES

Strawberries are grown either in hills or in matted rows. The hill system is more tedious to maintain, but it results in good yields of high quality berries. The plants are set a foot apart and the rows two to three feet apart. The runners are kept cut off thruout the life of the plants.

FIG. 3.—Strawberries in matted, mulched rows.

The matted row system is more commonly used. Here the plants are set 18 inches apart in rows three to four feet apart. The runners are trained in rows about 10 to 12 inches wide.

Strawberry plants are usually set early in the spring so that plants may develop from the runners before the hot weather comes. In planting be sure to have the crowns on a level with the surface of the soil. Deeper planting may result in rotting of the crowns and shallower setting may let the roots dry out. Any flower stems that appear the first summer should be removed. The production of fruit on newly set plants delays the formation of runner plants. However, everbearing varieties may be allowed to produce fruit late in the fall of the first year.

During the first summer the ground should be thoroly cultivated to keep down weeds and maintain the soil in a mellow state to encourage the establishment of runner plants. The runners are kept in a row 12 to 14 inches wide rather than allowing them to root into the entire space between the rows. In the fall after the ground freezes the rows are covered with clean wheat straw to a depth of four or five inches. This mulch keeps the frost in the ground and prevents injury to the plants from alternate freezing and thawing. In the spring as soon as the plants begin to force out new leaves under the mulch they are uncovered, the excess straw being raked into the middles.

After the fruit has been harvested rake off the mulch and if leaf rollers or leaf spot are present, mow the leaves and burn them. Then hoe out or plow out all old plants and most of the young ones, leaving a strip of plants six or eight inches wide at one side of the matted row. The soil is thoroly pulverized and fertilized with well rotted manure to encourage plant formation. The following year this process is repeated, leaving a strip of plants on the opposite side of the row. In this way a strawberry bed will produce good crops for four or five yeears.

Pests. Leaf rollers, white grubs, and leaf spot are the principal pests of strawberries. The sanitary measures suggested in the previous paragraph will usually keep down leaf rollers and leaf spot. Occasionally, however, severe outbreaks occur in spite of these precautions and spraying must be resorted to. Bordeaux mixture together with lead arsenate applied at the time the first flowers appear, will control these pests. Spraying in cases like this is insurance that pays big dividends. The white grub (the larvae of the June bug) does its damage to the fleshy crown of the plants. Late fall plowing, leaving the land rough, helps to kill

those already in the soil. In the spring lead arsenate may be distributed over the surface at the rate of one pound to 100 square feet. This is raked into the soil and remains effective during the life of the bed.

Varieties.—The Dunlap is the most popular June bearing variety for general home planting. Blakemore and Burrill are two productive sorts that are firmer than Dunlap and have proven themselves adapted to eastern Nebraska conditions. The Progressive and Mastodon are the two most popular everbearing sorts.

CURRANTS AND GOOSEBERRIES

These two fruits can be grown thruout the state. They do not require winter protection but are injured in summer by hot, dry winds. Therefore avoid southern exposures in selecting a site. They may be used in foundation or border plantings instead of ornamental shrubs. Currants and gooseberries are easily propagated from cuttings or by rooted shoots from well established plants. The cuttings are made in the fall. They should be eight to ten inches long, of well ripened shoots of the present season. These cuttings may be planted in the fall or they may be tied in bundles and stored over winter in sand in a cold place and planted early in the spring. In planting cuttings be sure to place them in the soil down to the uppermost bud. Plant them in good soil in a protected place and water them in periods of drouth. The second year the plants may be set in their permanent places. Space them five or six feet apart. Fertilize the soil about them every year or two with barnyard manure; prune away all canes over three years old; spray for the currant worm with lead arsenate, at the rate of two tablespoons per gallon of water at the time they are in bloom; and they will give a good account of themselves at harvest time.

RASPBERRIES

There are three types of raspberries—the red, the black, and the purple. The red raspberry makes new plants by producing suckers; the black and the purple raspberries root at the tips of the new shoots. The hardiest and most satisfactory for home planting is the black raspberry, particularly the Cumberland variety. It requires no winter protection but in central and western Nebraska winter shade is essential to keep the canes from blistering. Wm. Spoeneman of Brule in Keith county has had good success with the Cumberland when set among his fruit trees. Others have found it desirable to provide shade artificially

with corn stalks. However, there is more danger of rabbit injury in the latter case. The plants are set four feet apart in rows seven or eight feet apart. The first year the new shoots are allowed to grow as they will. The following spring the canes are cut back about 2½ feet from the ground. When the new canes have developed to a height of 2½ feet, the tips are pinched off to develop laterals. After the old canes are through fruiting they are cut off at the ground but they are allowed to remain where they are for three or four days. In this way the new canes are ex-

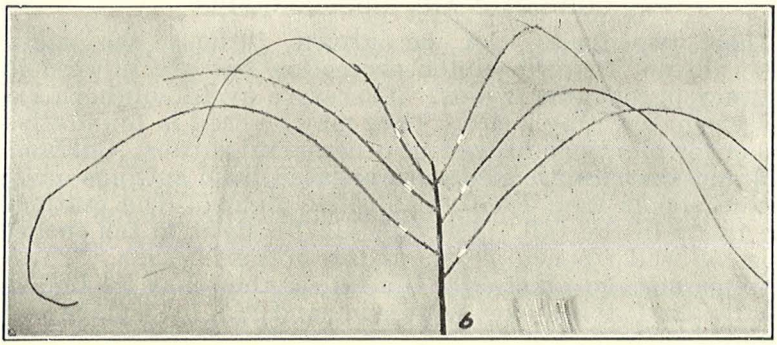

FIG. 4.—Summer pinching of black raspberries promotes strong fruitful laterals. The following spring these are cut back as shown.

posed gradually to the sun and blistering of the new canes is prevented. The following spring the weak canes are cut off at the ground leaving five or six strong ones per hill. The laterals on these are cut back to seven or eight inches.

Raspberries like a rich loam soil that holds water well. Every two or three years they should be given a liberal application of well rotted manure. Where straw is available it may be used as a mulch to conserve moisture and keep down weeds.

The worst pest of the black raspberry is anthracnose, a disease of the bark which girdles the canes and causes them to dry up in early summer. Satisfactory control of this disease may be secured by spraying with lime sulfur solution at the rate of one to ten of water applied as soon as the first leaf appears on the terminal buds. Just before the flowers open up a second application of lime sulfur is given; this time at the rate of one gallon to forty gallons of water.

The purple raspberries are treated exactly like the black raspberries. The two most common varieties used are

Columbian and Cardinal; but neither of these is as hardy as the Cumberland black raspberry. The red raspberries are the least hardy of this group. Furthermore, their habit of suckering is objectionable. The Latham is the most promising variety at present but it is claimed that the variety Chief is hardier tho the berries are smaller and not quite as high in quality.

The plants are usually set in rows, being spaced three feet apart in the row and the rows seven or eight feet apart. The soil between the rows is thoroughly cultivated to destroy weeds and suckers. The suckers that come up in the row are left until spring when they are thinned so that there is one healthy cane every six inches in the row. These are tied to a trellis consisting of two wires, the lower one a smooth wire about 20 inches from the ground and the upper one a barbed wire about 3½ feet from the ground. The red raspberry canes are not pinched off in midsummer nor are the tips cut off in spring. Winter protection is a paying operation. This usually consists of bending all the canes in one direction and staking them down. Then a few inches of soil is thrown over them either by plowing toward the row from both sides or this covering is done with a spade. In the spring the canes are uncovered, straightened up and tied to the upper trellis wire. After the fruit is harvested the old canes are cut off but here again the removal of the canes is delayed three or four days to avoid blistering the canes.

Fertilization and mulching as discussed under black raspberries is recommended for red raspberries also.

GRAPES

Grapes are about as popular as strawberries in the home fruit garden, particularly in the eastern half of the state where the Concord can be grown successfully. Farther west the Concord cannot be grown without winter protection and the Beta is more popular. Grape vines may be planted along the border of the garden and trained on the fence. They may be trained on supports along buildings or they may be used to cover arbors. However, if high quality fruit is desired it is better to plant them at the edge of the garden and train them on a trellis. In the southeastern part of the state they will do well on almost any site but where winter injury is more common a south or southeast slope is best. If such a slope is not available it is advisable to provide protection on the north and west against cold dry winter winds.

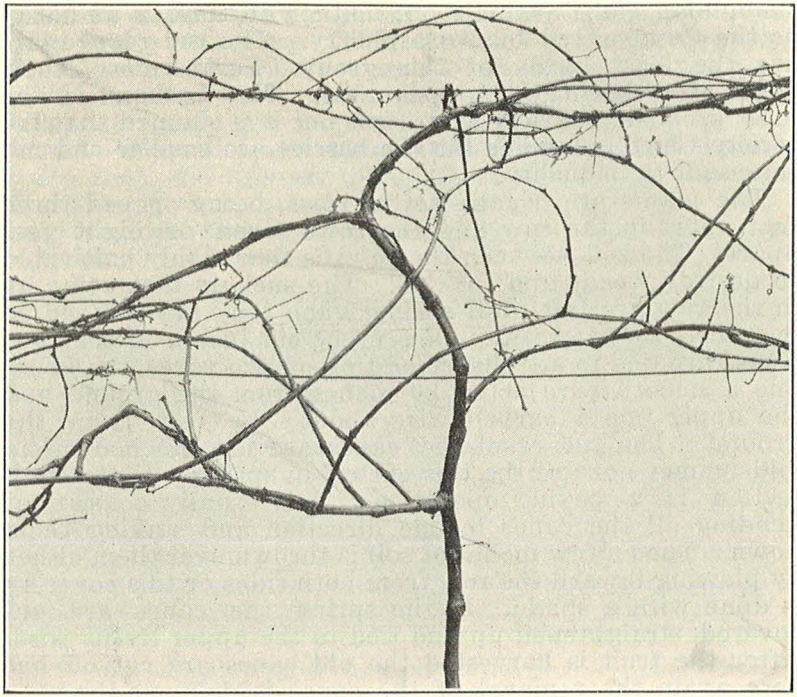

FIG. 5.—A vigorous unpruned plant 4 years old. Heavy annual pruning insures thrifty fruiting canes for next year's crop.

Grapes * are usually propagated from cuttings of last year's wood. They are made in the fall after the leaves have dropped. Well matured canes are cut up into pieces about a foot long. These are tied in bundles and stored in moist sand in a cool place until early spring when they are set out in the garden. The cuttings are planted four inches apart with the uppermost bud at the surface of the ground. The second spring these plants may be transplanted to their permanent places. Grapes are generally set out eight or ten feet apart in rows ten feet apart. The top is cut back to one cane having two or three buds on it.

During the first year the vines are allowed to trail on the ground. It is desirable to have one strong cane from each plant; therefore, early in the growing season the vines are pruned so that there is only one vigorous shoot left. The next spring these are tied to the trellis and cut

* For more details on grape growing, see Extension Circular 1257, Grape Growing in Nebraska.

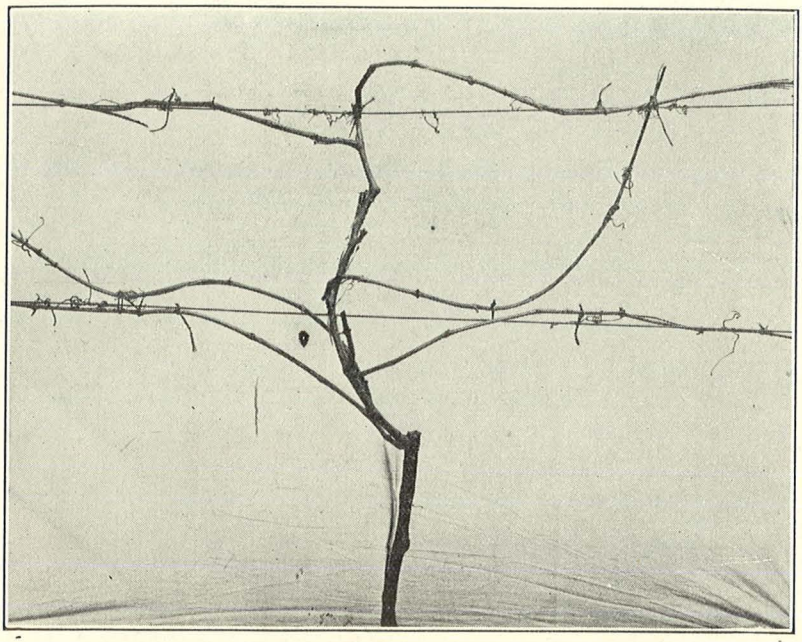

FIG. 6.—Vine shown in Fig. 5 after pruning. Six canes originating close to the trunk have been left and these shortened to 8 or 10 buds. Note also the renewal spurs which insure production of fruiting wood near the old trunk.

off at the top trellis wire. Weak plants are cut back to two or three buds once more. In the fall of the first year the canes should be covered with dirt to protect them from winter injury and rabbit injury.

During the second growing season the vines produce fruiting canes from the trunk cane. The next spring these are reduced in number to four or six, depending on whether two or three wires are used and trained as shown in Figure 5. The following spring six good fruiting canes are selected that originate close to the trunk from the canes left the previous season. The others are cut off. (See Figs. 5 and 6.) The fruiting canes that were left are shortened to from six to ten buds, depending upon the vigor of the vine, the more vigorous vines being given the greater number of buds. The Beta variety is given eight or ten fruiting canes with ten to twelve buds each.

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