UNIVERSITY OF MISSOURI.

COLLEGE OF AGRICULTURE AND MECHANIC ARTS.

Agricultural Experiment Station

BULLETIN NO. 61.

APPLE GROWING IN MISSOURI.

COLUMBIA, MISSOURI.

May, 1903.

Press of E. W. Stephens, Columbia, Missouri.

University of the State of Missouri.

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Agricultural Experiment Station.

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APPLE GROWING IN MISSOURI

By J. C. WHITTEN, Horticulturist.

INTRODUCTION.

For the past ten years the Experiment Station has been conducting definite experiments along the lines of apple growing. At the beginning of this period there were on the Station grounds about twenty acres of bearing apple trees, composed mainly of leading commercial varieties. In addition to the above about ten acres have been planted during the past decade. The latter planting comprises plots of the leading commercial sorts as well as a few trees each of varieties that are comparatively unknown in the State. There are now growing in orchard form, on the Station grounds between 400 and 500 varieties of apples.

The leading commercial apple orchards of the State have been visited and studied. During the past decade the commercial apple orchards of the State have been increased enormously. In the year 1900 these apple orchards comprised over twenty million trees, or one-third more than any other state in the union. Many orchards in the State comprise hundreds of acres and some of them run up into thousands of acres. These commercial orchards, planted in various soils and managed by different men have afforded unequaled oppor-

tunity to compare different conditions and different methods of treatment.

Problems in orchard tillage have proven to be one of the most important lines of investigation which the department has taken up. The value of cultivation in promoting uniformity of growth and fruitfulness, especially in unfavorable seasons has been demonstrated on the Station grounds as well as in some of the larger commercial orchards. The time to begin cultivation in spring, and more important yet, the time to cease cultivating in late summer has been investigated. The best tools to use in cultivating different orchard soils has been given attention. The crops to be grown in an orchard—those which favor or oppose the best development of the trees and maintain the best condition of the soil—have been carefully considered. The effects of allowing orchards to remain in sod and the best treatment of those that must remain in sod are problems that have been studied. The results of these investigations relative to tillage of apple orchards have been published in detail in Bulletin No. 49 and will be merely summarized here.

Experiments in pruning have been conducted on the Station grounds and also in outlying orchards. Perhaps the most important phase of this work has been a comparison of the low, compact head as opposed to the high, open head in this sunny, interior climate, and the general adaptation of methods of pruning to local conditions, varieties, etc. Pruning with different degrees of severity at the time of planting the young tree has been tested and the results reported elsewhere.

Spraying and the general protection of trees from

parasites and other enemies has been investigated during a series of years. The directions herein given on this subject are based upon the results of extensive experiments which have been reported in several bulletins on this subject that have been published by the Station from time to time.

Other phases of apple growing, discussed in this publication, have been and are being investigated by this department. While the results of some of these investigations are not yet ready for detailed and final publication it is thought best to give this summary as a general treatment of the subject. The present activity in orchard planting in the State has resulted in a great many calls upon the Station for information upon this subject and it is hoped that this publication, which briefly covers the problems most enquired about, will meet this demand.

Soil and Location.—Generally speaking apple trees thrive best upon light, well drained land. A gravelly subsoil is preferable to stiff clay. In fact the subsoil is of more importance than the surface soil itself. Hilly broken places are usually better than level, flat areas. Many rugged hillsides along our rivers, too steep for ordinary tillage are excellent for apple orchards. The deep, loamy "loess" soil along our great rivers and some of their tributaries, and the red soils of the broken Ozark region are among the very best apple soils. While some soils are better than others almost any farm in the State is capable of producing a good family orchard that will many times repay for the trouble and expense of growing it. Good drainage to allow the roots to pen-

etrate is more essential than richness of soil, so the less tillable places on the farm may be selected for the orchard.

Where there is opportunity for a choice of slope, the local conditions and varieties to be planted govern somewhat the site that should be selected. Often a northern or eastern slope is to be preferred. On rocky thin soils the northern slopes are usually richer and they stand the drouth better than the southern slope. The buds start later on a northern slope, and are more liable to escape late spring frosts. Other things being equal the fruit is usually higher colored, and it seems to be better flavored on the southern slope. If proper attention is given to the selection of varieties, apples may be grown successfully on any slope if soil conditions are right. Low, damp places should be avoided.

The character of the native forest trees indicates to some extent the fitness of the land for apple culture. Where the nut trees, sugar maple, poplar, papaw, linn or sumach thrive, apples usually do well. The larger and finer the growth of these native trees the stronger the indication that an orchard will thrive there.

Varieties.—Among the leading varieties in the commerical orchards of the State are, Ben Davis, Gano, Jonathan, York, Missouri Pippin, Winesap, Grimes, Clayton, Ingram and Rome Beauty. Other sorts like Jenet, Payne's Keeper, Huntsman and Mammoth Black Twig are sometimes profitable. Ben Davis and Gano, two varieties that are very much alike, are the leading commercial sorts. These two varieties are more largely grown in Missouri than all other sorts combined. In most localities experienced growers rec-

ommend planting at least half the orchard to these varieties. The trees bear heavily and the fruit ships better than almost any other sorts, and they are among the best cooking apples. Their quality, however, is not the best. They are remarkably cosmopolitan, succeeding well in all parts of the State.

Next to these two sorts the Jonathan is perhaps the most popular general commercial variety. It is of the richest red color and of the highest flavor. It is productive throughout the State. The Jonathan ripens earlier than the Ben Davis or Gano, and is not so good a keeper. In cold storage, however, it will keep perfectly until late winter or early spring, and as a dessert fruit it is one of the best for this state.

The York is unexcelled in size, quality and appearance as a commercial variety. In some parts of the state it produces well. It is a splendid keeper and is gaining in popularity, particularly in certain sections of Missouri. It is one of the most profitable varieties to grow on the "loess" formation along the Missouri river hills. It has the fault of scalding somewhat if kept either too cold or too hot in storage.

Grimes is unexcelled in quality and has a rich yellow color. It is neither a strong grower nor a heavy bearer except in certain localities. It is one of the finest dessert fruits, brings the highest price in the market and where it thrives well is very profitable.

The Missouri Pippin is planted commercially to some extent. It is of good color but not the best in quality. It is one of the earliest to come into bearing and perhaps on account of this characteristic and the tendency to overbear, the fruit tends to be small sized

after the first few crops. A small portion of this sort in the orchard will be profitable in some localities.

The Winesap is of good color and good flavor as well as one of the best keepers. In some localities it is undersized and not of sufficient vigor and productiveness. Generally speaking it ranks as one of the commercial varieties in this state.

The Clayton has not been so largely tried over the state as those previously mentioned, but it is of good size, good flavor, is one of the best keepers and is gaining in popularity. In a few localities it has already shown itself to be a very profitable sort.

Ingram is one of the best keepers and of fair quality. Generally speaking it is more profitable in the southern part of the state than in the northern. In one section of southwest Missouri it is one of the most profitable varieties. It is particularly adapted to soils which are too low and cold for the best development of other sorts.

It is well to bear in mind that some of the above varieties are cosmopolitan in their adaptability to conditions, while other are to be especially commended only for certain soils and localities. Ben Davis, Gano and Jonathan are generally well adapted to all soils, slopes and localities in this state. Winesap and Mammoth Black Twig do best on northern slopes. York and Rome Beauty succeed well on a southern slope. Jenet, Ingram and Rome Beauty are among the best to select for moderately low land. They blossom late and they are seldom killed by late frosts.

When selecting varieties for a commercial orchard it is of the highest importance that one study the varie-

ties already growing in the locality, especially in similar soils and where the altitude and other conditions are the same. More information may be gained in this way than by any printed list. A commercial orchard should contain from three to six leading sorts, and these may generally be selected from the varieties discussed above.

For a home orchard the main planting should be of the commercial varieties just mentioned, considering that they are usually good keepers and will supply the family needs throughout the winter. In addition a few trees each, of some earlier sorts should be included to give a succession of fruit from early summer until the late ones are ripe. Such varieties as, Yellow Transparent, Early Harvest, Red Astrachan, Sweet June, Red June, Rambo, Lowell, Maiden's Blush and Chenango Strawberry make a good general list.

It is of less importance to give directions for selecting an orchard for home use than it is for market because in the former case the grower should suit the taste of himself and family and those varieties should be grown, while in the latter case the most profitable varieties for commercial purposes are restricted to a few varieties.

Previous Preparation of Land.—This subject is more fully discussed in bulletin No. 49 from this station on the Cultivation of Orchards. Brief directions may be given here, however.

Where new woodlands are to be cleared and planted it is best to clear the land and plant the apple trees the following spring. The clearing may be begun any time

after August first. It is best to cut the stumps as low as possible; none being left higher than one-half their diameter. This allows working the ground well as the implements will pass over the low stumps where they would catch on higher ones.

After the land is cleared it may be plowed at any time that it is workable before the time comes for setting the trees in early spring. Where the nature of the soil will permit a turning plow should be used, plowing as close to the stumps as possible. A heavy A. harrow with teeth long and heavy enough to slide over the low stumps is usually employed for fining the land after plowing. Where the land is too rough or stony to use a turning plow a "Single-Shovel" or "Bull Tongue" with standing coulter to cut the roots is often used.

Old farm land that has been long in cultivation should be plowed as deeply as practicable and harrowed well. If the land lacks humus or is subject to washing a crop of cowpeas or clover should be grown and plowed under before planting the orchard.

Many rugged hillsides that are too stony to plow or cultivate may be profitably planted to apples. A small circle can be cultivated around each tree with a hoe, pick or grubbing hoe and the rest of the ground seeded to clover or eventually allowed to grow up to bluegrass. The growth between the trees should be frequently mowed down the first few years until the trees are well established, then it may be either mowed or in some cases pastured. Where orchards are allowed to stand in sod enough of the grass or clover should be left on the ground to make a good mulch. It should never be pastured too closely. Trees managed in this

way on steep rocky places often do as well as cultivated trees do on larger areas. They have perfect drainage and their roots anchor themselves deep among the rocks so that cultivation is less essential than it is on some other soils.

After land is properly plowed and harrowed the tree rows are usually marked out with a team and marker of some kind. A single shovel or other tool may be used. On small areas a chain may be dragged by a man to mark it. In large areas dead furrows are sometimes opened in check rows across the ground which assists materially in digging the holes for the trees. Wherever a tree is to stand four furrows have been turned out, thus nearly digging the hole for the tree.

There is no stated distance apart at which trees should be planted. Perhaps the most common distance is to plant the trees twenty-five feet apart each way in check rows. At this distance it requires about seventy trees to plant an acre. This, in my judgment, is the best distance to recommend. Some plant thirty feet apart and then plant a tree of such variety as Missouri Pippin between these running north and south. This makes the trees fifteen feet apart one way and thirty feet apart the other. When the permanent trees need the room the temporary ones should be cut out. Planting temporary trees or "fillers" is not generally to be recommended, however. The grower usually allows them to stand too long, not having the courage to cut out young trees in their prime.

Selecting Trees.—Two-year-old apple trees are usually best for planting. Correspondence with the leading orchardists shows that more than three-fourths of them prefer two-year-old trees. In the station grounds where we have planted trees of various ages for a good many years the two-year-olds have universally given the best results, considering the expense of handling, the subsequent care they need, etc. A few growers prefer large one-year-old trees but they generally admit that these require more careful cultivation for the first year or two to get them established. Occasionally a grower prefers three-year-old trees. If carefully taken up with a good root system and planted near by so they are not handled much, three-year-old trees may be transplanted so they will do well. If dug with an ordinary nursery tree digger so that the root system is cut quite short, and are packed and shipped, three-year-old trees are liable to give unsatisfactory results.

Other things being equal it is best to secure trees from your home nurserymen. They generally know what varieties will succeed best in your neighborhood and can give many special cultural directions and other valuable advice. The nurseryman should be a kind of horticultural educator in his community. In selecting home grown trees one is not liable to introduce insects or diseases which are not already in the neighborhood. Again, one can have the opportunity and advantage of visiting the nursery and selecting the trees he wants. One should plant straight symmetrical and vigorous trees but not necessarily the largest ones. Avoid badly forked trees or those that are headed at a wrong height.

Planting.—In planting the holes should be dug deep enough and broad enough to accommodate the natural spread of the roots. We often hear it recommended to dig very large deep holes, to fill them with miscellaneous materials and then plant the trees. If the tree is to be planted on the lawn where grass grows it is perhaps well to dig a large hole in order to kill the grass roots for a considerable space about the trees. In planting in the commercial orchard, however, where the soil is to be tilled the general plowing and tillage fits the entire land for the best growth of the tree so that especially large holes are not necessary. When the tree is to be set it should be held in the hole so its largest branches are extended towards the south or southwest in order to shade the trunk from the sun. It should be set as deeply as it stood in the nursery and should stand straight. It should also be in line with the other trees in the row so the row will be straight. The trees should be set firmly and no air spaces should be left about the roots. To accomplish this the shovel should be shaken in throwing in the earth so as to scatter it among the roots instead of putting it into the hole in compact masses. The trees should also be shaken up and down until the earth should begin to cover well the roots in order that the soil may be worked well into all the crevices. As soon as the earth is put into the hole tramp it firmly with the foot so that it will be left firm from the bottom up. If one tries filling the hole full and then tramping, the earth will not be firm at the bottom and the roots will dry out. An inch of loose soil should be spread around the tree to prevent baking of the soil.

It is usually best to set trees in early spring, but if

the land is moist and other conditions favorable they may be set in autumn. If the soil and atmospheric conditions are favorable autumn planting has the advantage of getting the work out of the way instead of delaying it until the more busy months of spring. If the autumn is very dry, however, it is usually advisable to delay planting until spring, as transplanted trees under these circumstances are liable to dry out and suffer during winter.

Pruning. At the time of planting the root system of young trees should be pruned just enough to remove any mangled or broken roots; to make a smooth instead of a ragged wound and to shorten long or straggling roots to six or eight inches in length. It is better to cut off part of a long root than to double it up in the hole at the time of planting. It has been advised in prunning large roots to hold the tree in the hand with the top downward so that the wound will be made on the lower surface of the root. Experiments at the station, however, have shown no advantage in this method over that of cutting from the top downward so that the wound occurs on the upper surface of the root. The essential point is that the soil should come in close contact with the wound in which case the wound callouses and emits new roots regardless of the position of the wound. The side branches or limbs above ground should be shortened somewhat to balance the reduced root system, but a straight central trunk or leader should be maintained. Figure 1 shows a good two-year-old tree before pruning, and figure 2 shows the same tree properly pruned for setting. If a tree is forked one side of the fork

should be cut to a few inches in length. Figures 3 and 4 illustrate a forked tree before and after pruning. If limbs occur below the head (place where the trees should

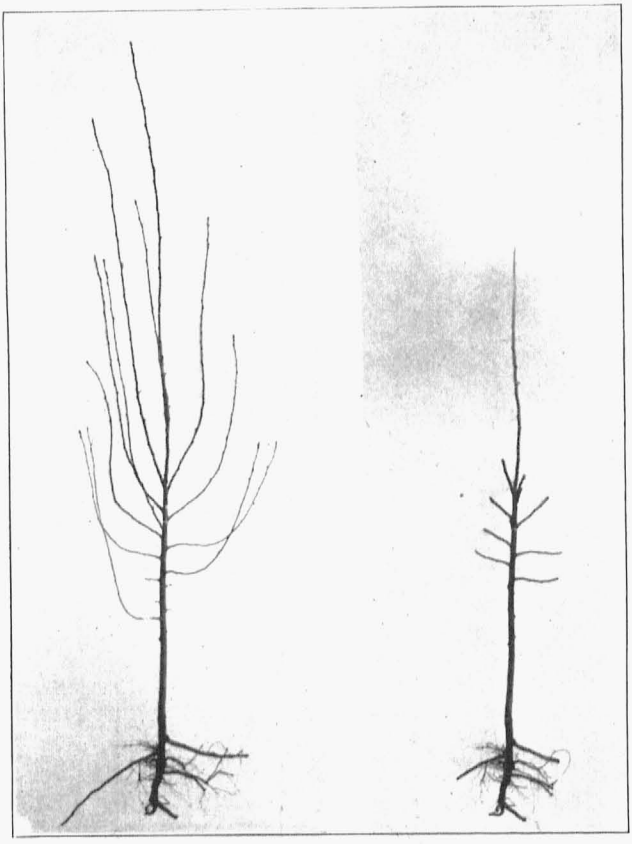

Fig. 1. Fig. 2.

branch) they should be cut off as close to the trunk as possible, unless they are so large that the cut will make a dangerous wound, when they should be shortened to

a few inches in length to prevent their making much growth, and the stubs remaining should be removed entirely the next season.

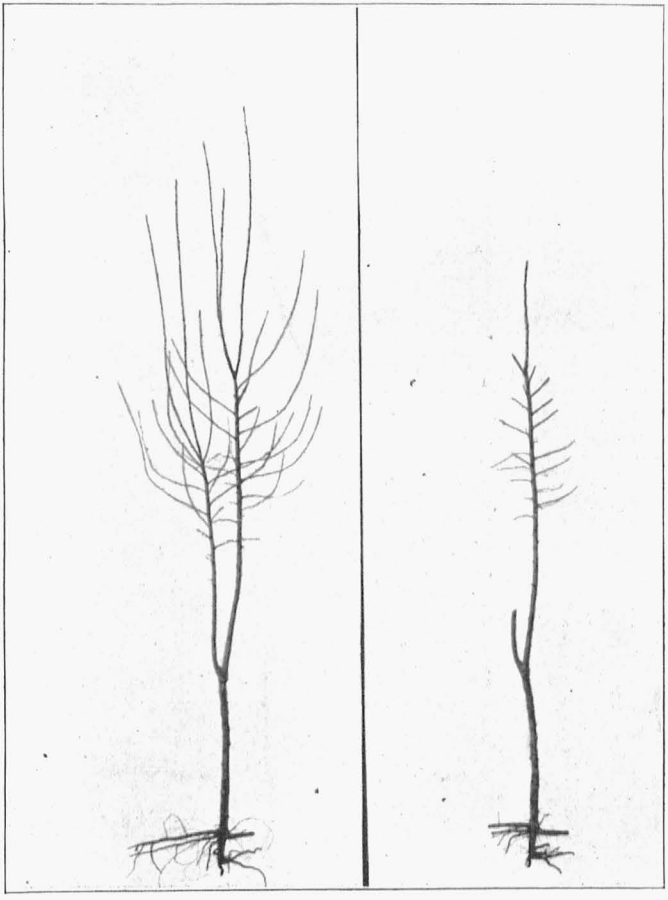

Fig. 3. Fig. 4.

One-year-old trees that have not branched after transplanting will throw out a few branches near their

tops, thus forming heads at that height. To prevent their heading too high they may be cut off about six or eight inches above the height at which it is decided to have the heads formed.

As a rule low heads are preferred in this section. Some extensive apple growers prefer to head heir trees as low as one foot from the ground, while others still advocate the old method of heading them high enough so a team can walk under the branches. The majority prefer to head their trees about two feet above the ground. The tendency is towards lower rather than the higher heads formerly recommended.

In view of the frequent discussions as to the question of severely pruning both root and top at the time of transplanting fruit trees it may be well to state here that the station has quite thoroughly tested this method in comparison with the ordinary method of pruning. This work was done by Mr. N. O. Booth, Assistant Horticulturist. While the experience of several station men, as well as some practical fruit growers indicates that under certain conditions this severe pruning may be practiced with success Mr. Booth's experiments at this station fail to justify our recommending it under our conditions. Many of the practical fruit growers who have tried it in this state prefer the ordinary method of pruning at the time of planting.

The subsequent annual pruning of apple trees is a matter of considerable importance. Most of the pruning is usually done during the winter. The fruit grower usually has more time at command in winter than in summer. Judicious pruning may be done at almost any season, however, except perhaps during the short period

when the trees would bleed in spring, and it is highly desirable to remove dead, broken, injured or diseased parts whenever they occur.

Those in this state who prune usually prune too much rather than too little. Others make an equally serious mistake of pruning none at all. While some pruning should be done annually the aim in this climate should be to make strong, compact, dense heads rather than open ones. More pruning should be done during the first few years while the trees are being shaped than later.

One of the first considerations is to aim to maintain a straight, central trunk or leader if possible. A branch near the center of the tree should be selected for the leader and kept in the ascendency by pruning all other branches that tend to outgrow it. If forks occur in this leader one side of the fork should be severely cut back in order that the other side may be retained as a leader. Figure 5 shows a tree properly shaped with straight central leader. Trees growing in this way are not likely to split down when heavily loaded with fruit. Figure 6 shows a bad fork which is liable to spread and split the tree when carrying a heavy crop of fruit. This might have been avoided by removing two of the branches when they were small.

The symmetry of the tree should be maintained by cutting back any branches that grow too far to one side. If branches crowd each other and rub severely enough to cause injury one should be cut out to avoid interference. If branches are numerous enough to crowd each other severely some may be removed. It is seldom, however, that thinning is desirable in this climate.

There is more danger of opening up holes in the head of the tree and letting in too much sunlight to scorch the trunk and main limbs than there is of leaving the

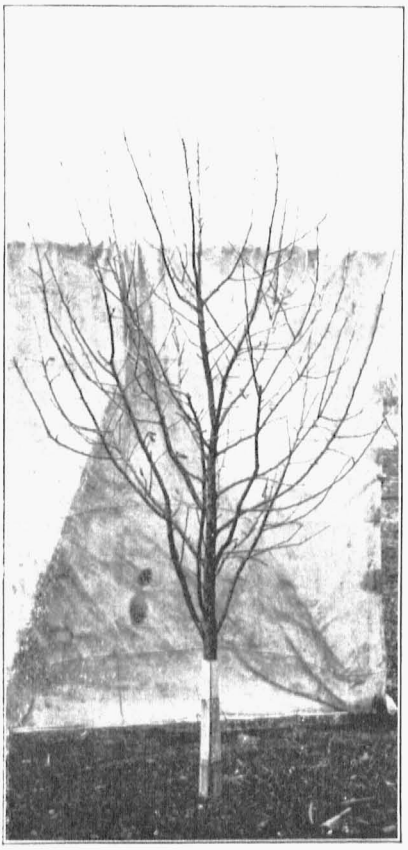

Fig. 5.

branches too thick. Where the upright growing limbs of young trees appear to be very dense they will usually be weighted down by the first heavy crop of fruit, suffi-

ciently to open up the head of the tree. Whenever there is doubt as to whether a branch should be removed it is perhaps safer to leave it than remove it. Water sprouts, which are the bane of some fruit growers existence, will not usually form in trees if the tree-head is maintained

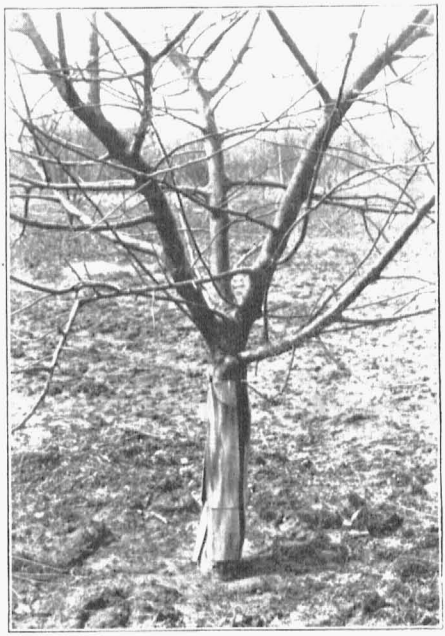

Fig. 6.

in this way. Water sprouts are oftener an indication of too much pruning than too little.

It may be observed in almost any orchard in this section of the country that the branches on the north side of the trees tend to outgrow those on the south side. The influence of the sun and hot winds from the south and southwest seems to be too strong for the best de-

velopment of the branches. The trunk and main limbs often suffer from these causes. This uneven growth in the sides of the tree is more marked in some varieties than in others, but is more or less observable in all. It will be understood from this that the pruning may be more severe on the north side than on the south side of the trees. It is frequently advisable to shorten the northern branches somewhat. In removing surplus branches it is often safe to cut one from the north side when a similar branch should not be removed from the south side. Particular care should be taken to encourage the maximum growth of southern branches while the northern may be cut more severely without damage. In this connection some growers advocate setting the tree so that it will lean toward the southwest. This plan is finding few advocates during recent years as the branches of the tree grow in the same direction even though the trunk leans and this results in an upright head on an inclined trunk which is undesirable.

The above caution against thinning the limbs too much should not be construed to mean that apple trees should not be pruned. The orchard should be gone over each year and all trees pruned that require it. A surplus branch should be removed while it is young so that the wound will be as small as possible. A little pruning each year is better than to allow the trees to go without pruning for several seasons and then remove a great deal of wood all at once. If a neglected orchard is to be pruned the surplus branches should not all be removed at one time as this may let in too much sunlight on limbs or trunks that are accustomed to shade.

Cultivation. Apple trees should be given clean culture the same as corn or other hoed crops. It is well to begin cultivation early in the spring to air out the ground, stimulate early root growth and let the spring rains down in to the subsoil where the water will be stored for use during the hot, dry months of summer. It is a mistake to allow the land to lie hard and crusty in spring simply because weeds are not growing, and in this way allow the washing off of the rains over the surface when they should be stored in the subsoil below. In most cases the soil may be turned with the plow, but in some cases it is desirable to use a cutaway harrow, disk or other tool. The later cultivation should be shallow so as not to dry out the soil too deep during summer. A crust should not be allowed to form on the ground, but a loose dust mulch maintained on the surface. This is the best kind of surface mulch to retain the moisture in the soil. Cultivation should cease early enough for the wood to ripen for winter. The exact time varies according to different conditions. If the trees are carrying a heavy crop of fruit or if the autumn is dry the ground should be kept in good tilth until September. If the season is favorable for late growth of the trees cultivation may cease in July. Sometimes a drouth in July or August will cause uncultivated trees to shed their leaves and almost become dormant in late summer and then burst into almost a springlike growth when autumn rains come. This autumn growth should be avoided by giving the best cultivation during any midsummer drouth that may occur so that the trees will not cease growth until the normal time in autumn.

While clean culture during a part of the season is

highly desirable it is not advisable to allow the orchard to go very many years without plowing in some kind of plant growth to prevent the land from losing humus. In young orchards it is also often desirable to grow some kind of crop between the trees to help pay for their cultivation until they come into bearing.

Crops of almost any kind that can be cultivated may be grown between the trees. Corn is a good crop for large orchards on rich soil for the corn can be managed in large areas. Small fruits or garden vegetables are suitable for small orchards. One should never sow grain or a crop that can not be cultivated for at least part of the season in the orchard. Cowpeas is one of the best orchard crops for this state especially on thin soils. If they are sown in drills and cultivated for a time it is better for the trees, but cowpeas sown broadcast in June after the orchard has been well cultivated in spring, are better than most other crops even if the other crops are given continuous culture. Cowpeas or soybeans are an excellent crop to plant in drills next to the trees when corn is planted in the middle between the rows. Two rows of peas next to the trees and four rows of corn in the center make a good planting. If fed to hogs this affords a mixed ration which is said to be superior to one kind of feed alone.

More detailed results of several years experience in orchard cultivation have been published in bulletin No. 49 from this station.

Diseases. Several bulletins setting forth the results of spraying for orchard diseases have been published from this station. It may be briefly stated here

that apple trees should be sprayed with the Bordeaux mixture just before the buds burst in spring; just before the flowers open, as soon as the blossoms are gone and twice at intervals of ten to fourteen days subsequently. This will do away with most of the scab and skin blotch and other fungous diseases. The Bordeaux mixture is made by combining four pounds of lime and four pounds of copper sulphate with fifty gallons of water. The lime should be slacked and mixed with twenty-five gallons of water. The copper sulphate should be dissolved by suspending it in a sack so it will just touch water in a tub. The four pounds of copper sulphate should be mixed with twenty-five gallons of water and then poured into twenty-five gallons of lime water. This mixture should be strained through excelsior, clean straw or other strainer so it will not clog the nozzle and it will then be ready for use.

To simplify the work the copper sulphate may be dissolved in large quantities (say one pound to each gallon of water) and four gallons of this solution may be used for each fifty gallons of the Bordeaux mixture. The lime also may be slacked in large quantities and the equivalent of four pounds of dry lime used for each fifty gallons. The lime water and copper sulphate solution should not be put together until they are to be used. It should also be remembered that they should not be mixed too strong but that half of the water should be added to each before mixing. For canker-worm, codling moth and other biting insects, five ounces of Paris Green or London Purple may be added to each fifty gallons of Bordeaux mixture at the time these insects appear. For borers the trunks of the trees may be

wrapped with paper, corn stalks, mosquito netting or wooden veneer wrappers. These wrappers also keep off rabbits and protect the trunks of the trees from sunscald. It is fair to state that some growers have reported injurious results from the use of wooden wrappers. We have used them for years on some of the trees of the station orchard, and have sen them used in many of the largest orchards in the state, and have observed no injurious effects from their use where they have been kept loose on the trees so as not to allow them to prevent proper growth.

Picking and Packing. The time to pick apples depends upon the variety and the character of the season. Apples which are picked early usually keep better than those which are picked late. Early picked fruit has a tendency to shrivel and become tough from loss of moisture. It also lacks color. If allowed to stand on the trees longer the apples take on a better color but are more liable to rot in storage. It should be borne in mind, however, that if apples are picked moderately early they will continue to color up after being gathered. It is usually best to pick them as early as possible without their being liable to shrivel after the picking, even though their best color has not been reached. For general storage the mistake of picking too late more frequently occurs than that of picking too early. If apples are to be stored in the ordinary cellar they should be picked earlier than if they are to be put in cold storage, for the reason that in the cellar the breaking down processes of the fruit goes on much more rapidly during

winter than it does in the low temperature of cold storage buildings.

Certain varieties should be picked earlier than others. Generally speaking those which ripen earliest should be gathered first and the latest keepers should be the last to be taken from the trees. The Jonathan for instance usually should be picked a month earlier than the Ben Davis. The Jonathan and York should be picked before they have reached their full color which is usually sometime in September. Grimes Golden should be picked when the earliest specimens begin to assume their yellow color and when their seeds begin to turn black. Ben Davis and Gano are usually gathered in October when they have taken on good color, and the later keepers like Ingram, Jenet, Winesap and Clayton may be allowed to remain upon the trees even a little later.

In gathering apples they should be handled so as to receive as few bruises as possible. They should never be shaken or knocked from the trees but picked singly, in the hand, placed in one-half-bushel baskets well padded with burlap and handled as little as possible before they are finally put in the barrels or boxes. Every apple should be picked with the stem on. It is as much a part of the apple as the skin itself. Pulling out the stem leaves a wound in the cavity of the apple where bacteria and germs of decay find a convenient breeding place. Not only should all bruises of the skin be avoided but the natural waxy cover of the apple should, so far as possible be retained intact.

A cool place in an open shed or under the shade of trees should be selected for the packing. Apples should

be cooled as much as possible before they are put into barrels. If barreled up and put in storage hot they are very liable to decay badly before the mass becomes cooled through.

In barreling two layers of apples should be placed with stems towards the head in the bottom of the barrel, the last apple in each layer being of such size as to wedge the layer tight. Other apples may then be carefully put in. The apples should be very frequently shaken down in to place by lifting the barrel up and down and shaking it sideways so that during the filling process the fruit will be packed as tight as possible. When the barrel is nearly full two more layers of headers should be placed in so the last layer will stand about one inch above the chime of the barrel. The clamp should then be adjusted, and the head pressed down into place to retain the fruit tight in the barrel. If fruit is loosely packed so that it will move about during shipment or handling the apples become bruised and rot badly. After filling, the barrels should be placed where they will cool off as quickly and thoroughly as possible and never be piled in large masses during hot days.

Ordinarily two or three grades of apples are made. In some cases the very finest specimens are selected, double-wrapped in tissue paper and packed in bushel boxes or barrels to catch the highest prices in the market. In places where Jonathan, Grimes Golden and York are grown it is highly desirable to pack the select portion of the product into boxes and put in cold storage and sell for high prices in late winter or early spring.

The majority of the apples, however, should be sorted into first and second grades and barreled. Those

which are not suitable for packing may go into the evaporator.

In barreling apples the packing should be uniform throughout. It is a mistake to put fine fruit in the ends of the barrel and fill up the center with culls. Only sound specimens should be barreled. One soft or rotten fruit often being capable of causing nearly the entire barrel to decay.