Pear Culture in Michigan
Michigan State University
Cooperative Extension Service
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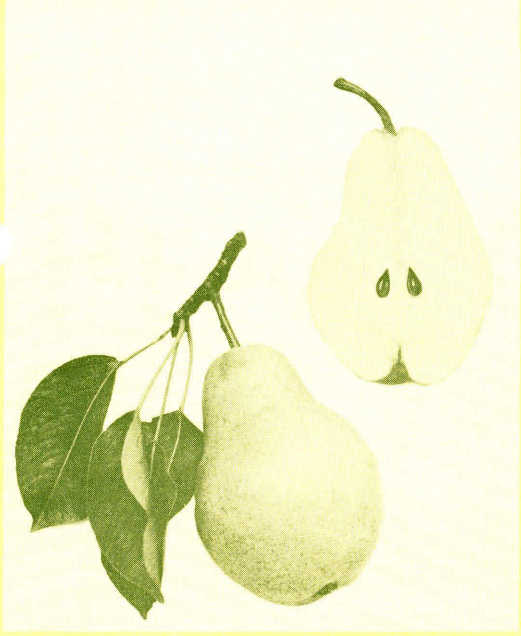

BARTLETT

BOSC

CLAPP FAVORITE

Pear Culture

IN MICHIGAN

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PEAR CULTURE IN MICHIGAN

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MICHIGAN is the leading pear producing state east of the Pacific Coast and it will likely increase future production. Increasing demands for high quality processing and fresh market pears from Michigan have greatly stimulated pear plantings.

ORIGIN

Most common varieties are of the species, *Pyrus communis*, native of the Caspian Sea area, from southeastern Europe to edge of Himalaya Mountains. A few varieties, such as Kieffer, are hybrids of *Pyrus communis* and *Pyrus serotina*, a Japanese pear.

ADAPTABILITY

Climate: Selected varieties are adaptable to all parts of the United States, but fireblight (a bacterial disease) tends to restrict commercial production to dry areas west of the Rocky Mountains and relatively cool areas in the Great Lakes region of the Midwest, New York, and New England.

In Michigan, common pear varieties will do well in most commercial fruit areas as far north as the Grand Traverse region.

MAJOR PRODUCTION AREAS

In 1959-64, the ten leading pear producing states, and their production, were:

California	14,397,000 bu.	Utah	207,999 bu.
Oregon	4,806,000 bu.	Colorado	180,000 bu.
Washington	4,485,000 bu.	Pennsylvania	118,000 bu.
Michigan	1,483,000 bu.	Texas	114,000 bu.
New York	675,000 bu.	Idaho	66,000 bu.

Total U. S. – 26,819,000 bu.

SITE

Pears need good air drainage because:

1. They bloom before apples, yet their blossoms are only slightly more resistant to cold than peach and sweet cherry.

2. Low, sheltered areas of poor air drainage may result in greater susceptibility to fireblight and leaf scorch (heat blight).

Pears are often grown on "poor" fruit sites because of their tolerance for heavier soils. However, they do much better on good sites of high elevation.

SOIL

Pear trees do best on well-drained sandy loams or clay loams with sandy loam to clay loam subsoils. Best suited soils include Miami, Onaway, Hillsdale, Emmet, Metea, Morley, and Nester. However, they may be grown on well-drained clays such as Kent, St. Clair, or imperfectly-drained sandy loams like Locke, Coral, or Metamora.

SUGGESTED VARIETIES

Bartlett – world's leading pear variety and best one for Michigan; only variety that should be planted extensively. *Trees* vigorous, productive, widely adapted to different soils and climates, susceptible to fireblight. *Fruit* medium-large, pyriform (bell-shaped) (Fig. 1)*, attractive yellow, high quality, smooth texture, juicy; excellent fresh or canned. Ripens in late August or early September in Michigan.

Bosc – best commercially suited pollinizer for Bartlett. *Trees* large, vigorous, productive, more spreading than Bartlett, very susceptible to fireblight. *Fruit* medium-large, long tapering neck (Fig. 2), golden color when ripe, overlaid with bronze russet, good dessert quality with smooth texture, juicy rich flavor. Ripens in early October. Keeps well in storage at 30-32° F.

Clapp Favorite – early variety suitable as pollinizer for Bartlett. *Trees* vigorous, productive, but extremely susceptible to fireblight. *Fruit* medium-large, pyriform, but shorter than Bartlett (Fig. 3). Fruit good dessert quality, sweet, juicy, granular at core. Ripens rapidly and flesh softens quickly, must

*Fruit photos, pages 4-5, from *Pears of New York* by Hedrick.

be picked while quite firm. Ripens 2 weeks before Bartlett. Not good for storage or shipping.

Flemish Beauty – good variety for northern colder areas of Michigan. *Trees* vigorous, productive, very hardy, susceptible to fireblight and scab. *Fruit* medium-large, roundish, thick necked (Fig. 4), yellow with red blush; has good dessert quality, smooth, spicy flavor. Ripens 10 days after Bartlett.

Kieffer – poor quality pear, but fairly resistant to fireblight. *Trees* vigorous, productive, widely adapted to soil and climatic variations and fairly resistant to fireblight. *Fruit* medium-large, oval, narrowing at both ends, dull red blush (Fig. 5); flesh granular and coarse (potato-like), poor dessert quality, good only for processing. Ripens in mid-October (40 days after Bartlett).

Seckel – small, sweet pear for home use. *Trees* quite productive, but come into production late, quite resistant to fireblight. *Fruit* small, pyriform, skin dull-brownish yellow with red blush (Fig. 6); when fully ripe has excellent quality, smooth flesh, juicy, spicy. Ripens well on tree in mid- to late-September.

VARIETIES FOR LIMITED OR TRIAL PLANTINGS

Anjou – principal storage pear for winter dessert use, grown extensively on West Coast, not generally suggested for commercial plantings in Michigan. *Trees* vigorous, productive, susceptible to fireblight. *Fruit* medium large, oval shaped with slightly unequal sides, short stem (Fig. 7), yellowish green, slightly russeted skin; excellent dessert quality after several months storage; flesh buttery, juicy, sweet. Ripens in late September.

Comice – considered by many as the best dessert quality pear; however, not suggested for commercial plantings in Michigan because of narrow adaptability of trees and fruit. *Trees* have rather exacting soil and climatic requirements, do best in certain areas of West Coast. *Fruit* medium-large, yellow with golden blush (Fig. 8), buises easily; superb quality, flesh fine, melting, extremely juicy. Usually stored and gift packed for "holiday" trade. Ripens in late September.

Max-Red Bartlett – a bud mutation of Bartlett; similar to Bartlett in *tree* characteristics, fruit size, shape, harvesting time, etc. *Fruit* quality good, skin color-cranberry red. Makes an attractive tray pack when rows are alternated with regular Bartlett.

Maxine – only fair in quality, but quite resistant to fireblight and may substitute for better quality varieties where fireblight is severe problem. *Trees* very vigorous, productive. *Fruit* large pyriform, thick neck, bright yellow; flesh coarse, mild flavor, fair quality for fresh use or processing. Ripens in late September.

Moonglow – a blight resistant variety introduced in 1960 by USDA. *Tree* upright, vigorous. *Fruit* large, soft flesh, moderately juicy, flavor mild, subacid, rated good. Ripens 2 weeks before Bartlett.

Magness – blight-resistant, introduced in 1960 by USDA from Seckel Sdlg x Comice. *Trees* vigorous, spreading, thorny, does not produce good pollen so must be interplanted with at least 2 other varieties if all are to produce fruit. *Fruit* medium size, short pyriform shape, greenish with light russet, flavor sweet, aromatic, good quality. Will store 2 to 3 months. Ripens a week after Bartlett.

POLLINATION

All common varieties are self-unfruitful when grown in Michigan; they require cross-pollination. Pollination can be accomplished by planting two rows of Bartlett and one row of the pollinizer. Or, one can limit the number of pollinizers, 1 pollinizer for 8 Bartlett trees planting according to the following diagram: (Bartlett = X; Pollinizer = O).

X X X X X X
X O X X O X
X X X X X X
X X X X X X
X O X X O X
X X X X X X

ROOTSTOCKS

Most pear rootstocks are seedlings of Bartlett (*Pyrus communis*). This stock is vigorous and adaptable in a wide range of soils. It will tolerate a certain amount of drought and excessive soil moisture. The seeds for propagation are readily available from processing plants. Like its parent, the seedlings are susceptible to fireblight.

Old Home variety is quite resistant to fireblight and is sometimes used as a rootstock. It should not be used as a body stock because of its susceptibility to "stem pitting" virus.

Dwarf pears are propagated on Angers quince rootstock (commonly called Quince A, B or C). Quince A is the least dwarfing and most compatible. Many varieties, including Bartlett, are incompatible with quince, so the trees are double worked. A compatible intermediate variety, Old Home or Hardy, is budded to the quince stock; then the desired variety is budded to the intermediate variety.

Dwarf pears are NOT suggested for commercial plantings because the quince roots are very susceptible to fireblight, more susceptible to winter injury than seedling pears, and not as adapted to variation in soils and drainage as pear roots.

Japanese pear (*Pyrus serotina*) and other Oriental pears, (*P. ussuriensis*) were used as rootstocks on the West Coast many years ago. Their use has been discontinued because varieties propagated on them were more susceptible to "blackend" (a physiological disorder). Furthermore, many orchards on Oriental pear roots have had a "decline" problem. Many such orchards in the west have had high tree losses and these have been replaced.

PLANTING THE ORCHARD

Orchards should be planted in the spring, since fall-planted trees are more subject to winter injury. Trees should be planted deep enough so that bud union is (1) below ground level for seedling rootstocks, (2) 1 to 2 inches above ground level for dwarf rootstocks, or (3) 2 to 4 inches below ground level for Quince A/Old Home Interstem union.

PLANTING DISTANCES	NUMBER OF TREES REQUIRED PER ACRE
18 x 20 feet	121
20 x 20 feet	108
18 x 24 feet	100
20 x 24 feet	90
20 x 28 feet	77

Some growers plant trees 10 x 18 feet or 12 x 18 feet. After 10 to 12 years every other tree in the 10- or 12- foot spacing is removed, leaving a permanent spacing of 18 x 20 or 18 x 24 feet.

TRAINING AND PRUNING

Good training and regular pruning are as necessary with pears as with other fruit trees, if they are to bear good crops of acceptable size fruit over a long life. When pear trees are allowed to simply grow with little or no training or pruning they develop a great mass of competing and interfering branches. As the trees get older, each branch in turn develops many fruiting spurs, each competing for needed nutrients, moisture and sunlight (Fig. 9, p. 6). Such a tree becomes "spur bound" with little new growth, often poor fruit set and usually small fruit.

Pears can best be trained to a modified leader system. At maturity a well trained pear tree may have 5 to 8 scaffolds along a central axis and the tree should be not more than 15 to 18 feet high. The major scaffold branches should be wide angle; however, since pear trees are not as subject to crotch splitting as most other fruit trees and because good wide-angle branches are often difficult to develop in pears, this is not as important as with peaches, cherries or apples. The following suggestions are one of several ways to train pear trees.

YOUNG TREES

At planting time head small, poorly branched trees to 3-foot high whip. With large trees, one or two well-spaced scaffold branches may be left on the tree. The first branch should be about two feet above the ground. These and future scaffolds should be 6 to 12 inches apart. Head the leader 18 to 24 inches above the point of origin of the top scaffold. If necessary, the scaffolds should be headed back so that the tip of the scaffold is a foot or more below the tip of the leader. This will help keep vigorous scaffolds from overgrowing the leader, thus forming a two or three leader tree.

Summer pinching during the first 2 to 3 years can be most helpful in directing the growth of young pear trees. Once or twice during early summer the tips of unneeded or undesirable shoots can be pinched out, thus directing more growth into the leader and the chosen scaffold branches. Also, the growth of a scaffold which is "overgrowing" the leader can be reduced by pinching. Pinching may be beneficial in that it strengthens the shoots left untouched and reduces the pruning necessary during the following winter, but the complete removal of growing shoots (summer pruning) is not suggested, since these young trees need as much leaf surface as possible to provide maximum growth of tops and roots. All pruning (where cuts are made) should be done during the dormant season from December to April.

Second year to bearing – prune only enough to continue the training and proper balance of the leader and scaffolds. Keep the leader dominant, but head it back if necessary to "force out" new lateral growth for needed scaffolds. Thin out and remove unneeded, close, sharp-angled scaffolds. Head back or cut out fast growing laterals which will overgrow leader, resulting in multi-leadered trees (Figs. 10, 11, pp. 6, 7). Keep the individual scaffolds in balance by thinning out or heading back. At the same time remove suckers, shoots, and spurs from main trunk of tree and from first foot of each scaffold. This will prevent easy entrance of fireblight disease into critical areas of tree's structural system. At full bearing a total of 5 to 8 scaffolds is sufficient but more than this number is NOT undesirable with young bearing trees. The young tree may appear too thick but it will open up considerably as it comes into bearing and the upright scaffolds are pulled out by the weight of fruit.* Heavy

*Scaffolds of pear trees may be pulled down by weights or by tying branches from adjacent trees to each other, thus forcing them into a semi-horizontal position. This will increase fruit spur development and thus result in earlier bearing. Spreaders may likewise be used in young trees to help develop wider angle crotches. The practical feasibility of these practices depends upon the labor availability and other cultural considerations of the individual grower.

Figure 1. Bartlett, the world's leading pear and the best variety for Michigan.

Figure 2. Bosc, the best commercially acceptable pollinizer for Bartlett.

Figure 3. Clapp Favorite, an early variety of good quality for home or local use, and a good pollinizer for Bartlett.

Figure 4. Flemish Beauty, a good variety for northern colder areas of Michigan.

Figure 5. Kieffer, resistant to fireblight, but of generally poor quality.

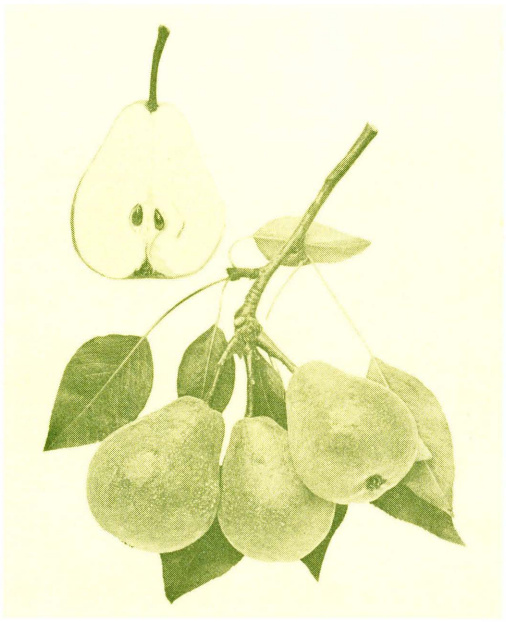


Figure 6. Seckel, a small sweet pear for home use.

Figure 8. Comice, of exceptional dessert quality but trees are not generally adapted to Michigan.

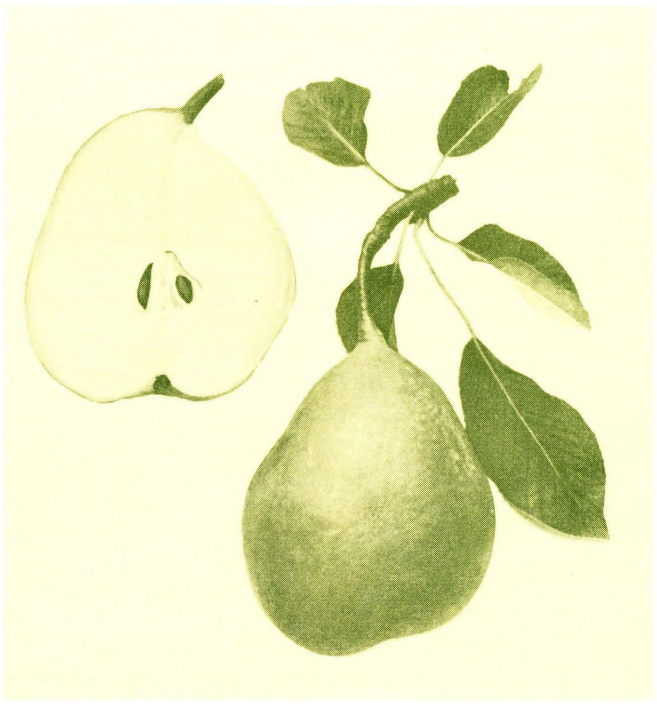


Figure 7. Anjou, the principal storage pear for winter dessert use, but not generally suggested for commercial plantings in Michigan.

Figure 9. Poorly trained tree with multiple scaffolds or leaders arising at same point.

pruning of young trees to keep them open will only delay bearing and possibly increase fireblight problems. As the tree comes into bearing and slows down in growth, the degree of pruning may be increased to remove extra scaffolds and to keep the tree vigorous and fruitful.

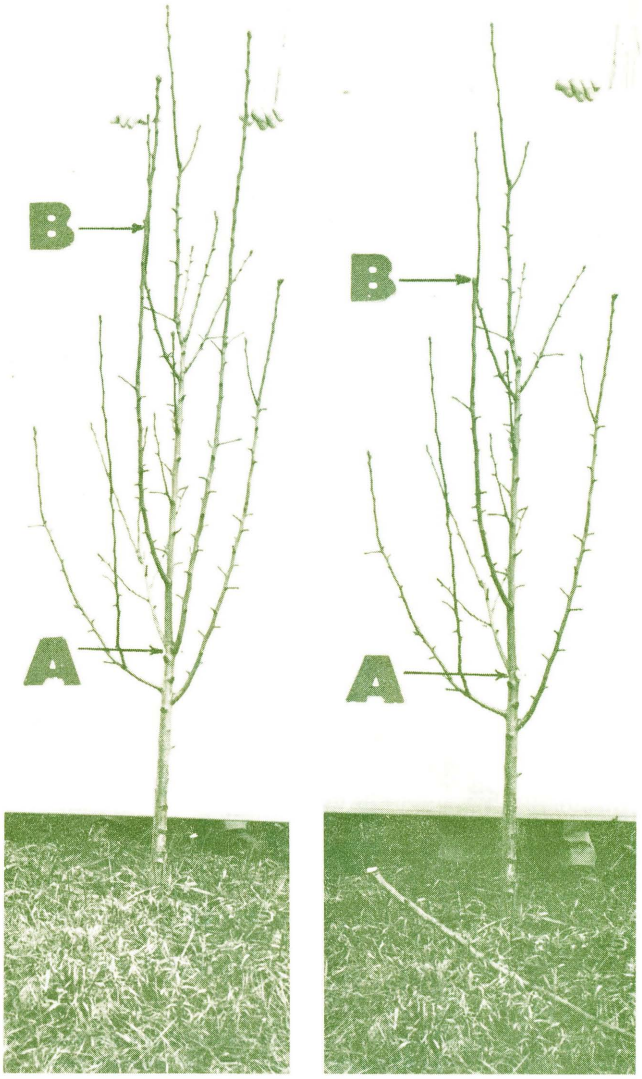
BEARING TREES

Trees which have been properly trained and regularly pruned need only a light periodic thinning out to continue good sunlight and spray penetration and to improve fruit size and quality.

Older bearing trees which have not had regular pruning should be pruned enough to remove thick and interfering branches, old, unproductive spurs, and dead wood (Fig. 12). Such pruning will stimulate new shoots and spurs for better bearing and larger fruit (Fig. 13).

Trees which are more than a desired height (usually 14-18 ft.) can be "topped" by cutting leader (top) back to strong lateral scaffold at more desirable height. Usually considerable suckering takes place at point of large cut. The suckers should be removed in subsequent prunings. There will be less "suckering" if the cut can be made into 3 to 4 year old wood of 1 to 2 inches in diameter which is usually about 6 feet below the tree top of a 10 or 12 year old tree (Fig. 14, p. 7).

Figure 10. Three-year old tree before (left) and after (right) pruning. Fast growing laterals should be removed (A) or headed-back (B) to keep them from over-growing leader, thus developing multi-leadered tree.



PRUNING AND FIREBLIGHT

Heavy pruning which stimulates excessive growth can make trees more susceptible to fireblight. But pruning is also the major means for fireblight control. All blighted twigs and branches should be pruned out during the winter. Cuts should be made 4 or more inches below the edge of each canker, or back to the next lateral. If this pruning is done before March 15, there is little danger of spreading the blight.

Summer cutting and breaking out of blighted twigs and branches often may save trees, but extreme care must be taken to prevent spread of the blight organisms. Cuts should be made a foot or more below the canker edge and tools disinfected after each cut. "Water sprouts" and "suckers" should also be removed during early summer from the lower parts of the scaffolds, the main trunk, and the ground area around the trunk to eliminate tender terminals susceptible to blight infection.

Figure 11. (Top). Five-year-old tree with "double leader" developing near top (arrow). Thin out and balance. Before (left), after (right).

Figure 12. Old tree with excessive number of branches, dead wood, and old unproductive spurs.

Figure 13. Properly pruned pear branch with adequate spurs for heavy bearing and new shoots for future production.

Figure 14. Ten-year old tree before (left) and after (right) "topping". Cut down to wood of 3 to 4 years of age to prevent excessive suckering.

SOIL MANAGEMENT

Good soil management should (1) maintain or improve soil "tilth" of the orchard, (2) eliminate competition from weeds and grass early in the growing season to assist optimum growth of trees, (3) be compatible with fertilizer practices to insure good tree growth, and (4) ease other cultural operations, including harvesting.

In most Michigan pear orchards, these objectives probably can best be obtained by various types of sod or sod-mulch programs. Native or planted grasses, such as bluegrass, fescue, or orchard grass are usually preferable to legumes. The sods can be grown in strips between the tree rows or over the entire orchard floor. The areas under the tree spread, however, should usually be kept free of grass and/or weed growth until late summer to insure adequate tree growth and fruit size. This can be done by cultivation, chemical weed control, and/or mulching. The areas left in grass should be mowed several times during each season to reduce moisture loss from the soil by the grass.

Chemical Weed Control is particularly well-adapted to pear orchards in sod. Applications of simazine plus amitrole-T or diuron plus amitrole-T, applied in the spring when the grass is 4 to 6 inches tall, will eliminate competition of most weeds and grass until mid- to late-August. The reduction of grass competition and apparent stimulation of the trees by the herbicide chemicals may also reduce the amount of nitrogen that need be applied to the trees. If the trees were growing adequately before using any chemical weed control, you might reduce the amount of nitrogen applied about 25 percent the first year.

Weed control chemicals, as such, do not make pear trees more susceptible to fireblight. However, combinations of practices, including chemical weed control, clean cultivation, heavy fertilizer applications, and/or heavy pruning that result in excessive tree growth may increase fireblight susceptibility. Thus, it is important to consider all practices when one is altered.

Mulching under the trees, alone or in combination with chemical weed control, is a valuable orchard practice. It helps control erosion, provides nutrients and organic matter, increases potassium availability, improves soil structure and tilth, increases water penetration and moisture availability, and helps control weeds. Disadvantages of mulching include: high labor requirements needed to apply mulch, added danger of fire and mice damage, and scarcity of mulching material.

Straw, hay, or similar materials make good mulches for pear trees. Enough should be applied to cover the area under the tree spread to a depth of 4 to 5 inches. If clean, non-spoiled material is used, extra nitrogen fertilizer will be needed during the first year or two to assist in initial decomposition of the mulch. After that, the amount of nitrogen needed may be less than on non-mulched trees.

FERTILIZERS

Nitrogen is the only nutrient that needs to be applied regularly to pear orchards. Bearing trees need sufficient nitrogen to insure good growth (8 to 12 inches) per year, optimum production (400 to 600 bushels per acre), and satisfactory fruit size (2¼ inches and up). But too much nitrogen may result in excessive growth and increased fireblight. The actual amount to be applied depends on past tree growth and performance, and changes in other cultural practices. This can best be determined by good grower judgment with the aid of leaf analysis.

As a general guide for initial application, the following can be used:

Year of planting – apply no dry commercial fertilizer around newly planted trees. They may be mulched or "manured."

Second year to bearing – apply nitrogen fertilizer in amounts to supply 2 to 3 oz. of N per year of tree age; apply in late fall or early spring.

Bearing – apply ½ to 2 pounds of N per tree, depending on size and vigor of tree.

The kind of nitrogen to apply should be chosen on the basis of cost of actual nitrogen and ease of application. Ammonium nitrate is most commonly used, but other sources are equally satisfactory when used in quantities to provide an equal amount of nitrogen. No differences in tree growth (early or late) have been found between nitrogen materials if they are applied in late fall, after leaf drop, or early spring.

Some pear orchards in Michigan may respond to occasional applications of potassium. The need for potassium can best be determined by leaf analysis. Potash may be applied in the fall or spring and in relatively large amounts (200 to 300 pounds of K_2O per acre) so that repeat applications will not be necessary for 3 to 5 years or more. The most common patassium fertilizer is muriate of potash (60% K_2O). Other sources appear to give equal response, so selection might best be based on cost.

Other nutrient shortages have not been generally found in Michigan pear orchards; however, the possibility of future deficiencies of phosphorus, calcium, magnesium and some minor elements should not be overlooked. The best way to determine a need for these before a deficiency occurs is by leaf analysis.

Foliar sprays of urea are sometimes helpful as a supplement to ground applications of nitrogen; how-

ever, urea sprays cannot be depended upon to supply the total nitrogen needs of pear trees. In some West Coast areas, foliar sprays of boron have been helpful in correcting boron deficiency and improving fruit set. However, since boron deficiency has not been found in Michigan pear orchards, boron as foliar sprays or ground application should not be used unless leaf analysis shows a definite need. Foliar sprays of other materials, including various "complete mixtures", have not been found useful for pears. In fact, they sometimes cause injury and are usually prohibitive in cost.

FRUIT THINNING

Small-sized fruit has often been a major problem in Michigan. Small pears (2 inches in diameter and under) cannot be profitably sold on the fresh market or to processors. Usually, the best assurance of continued good yields with adequate fruit size is to follow good cultural practices, including annual pruning, sufficient applied nitrogen, and weed control. However, during seasons of heavy fruit set and/or inadequate moisture, fruit thinning may be needed.

Hand thinning, on a commercial basis, is usually impractical because of labor costs and time required to adequately thin a tree. Chemical thinning, using naphthaleneacetamide (Amid-Thin), is probably the best method for the commercial thinning of pears in Michigan. Application should be made approximately 7 to 10 days after petal fall at a concentration of 25 to 50 ppm, depending on tree vigor and amount of thinning desired. Trees low in vigor will thin more easily and will be injured more readily than those in high vigor. Bartlett appears to be more difficult to thin and is less sensitive to leaf injury than Bosc or Clapp Favorite. Chemical thinning may also result in more consistent annual bearing of pears as has been observed with apples.

But, growers should use chemical thinning in their own orchards on a limited basis until they have evaluated the response in relation to tree vigor, varietal differences, and fruit size desired and obtained.

INSECT AND DISEASE CONTROL

Fireblight, the major pear disease, requires a diligent program of (1) good cultural management to keep the tree healthy and productive but not overvigorous, (2) careful pruning out of fireblight cankers to remove sources of infection, and (3) well timed and coordinated spray programs to protect the new blossoms from infection by the fireblight bacteria and to control fireblight-spreading insects.

Other disease and insect pests that need to be controlled in Michigan orchards include: pear scab, leaf blight (Fabraea), pear psylla, tarnished plant bug, codling moth, plum curculio, European red mite, 2-spotted mite, pear leaf blister mite, and pear rust mite.

Adequate descriptions and control suggestions of diseases and insects are beyond the scope of this publication. Therefore, the following Michigan State University Extension publications are suggested for detailed information on disease and insect control:

Extension Bul. 154, Fruit Spraying Calendar
Extension Folder E-608, Pest Control Program for Home Grown Fruit

HARVESTING AND HANDLING

WHEN TO PICK:

Most pear varieties, including Bartlett, should be picked while they are still firm and before marked ripening occurs. Pears left to ripen on the tree are of poor quality since they often develop stone or grit cells and the inner flesh becomes soft and discolored. The proper maturity for picking may be determined by (1) a change in fruit ground color from a dark green to light green or yellowish green, (2) ease of fruit stem separation from the spur with an upward twist of the fruit, (3) decrease in fruit firmness (This varies with growing conditions and variety, but Bartletts are usually ready for harvest when testing 17 to 21 pounds with standard Magness tester using a 5/16-inch plunger tip), (4) corking over of lenticels, (5) desirable fruit size and shape, and (6) decrease in starch and astringency.

RIPENING:

Most pear varieties will ripen in a few days if held at 60 to 70° F. with high relative humidity (85 to 90 percent). Faster ripening can be induced for storage fruit by warming them in a warm water bath (70 to 72° F.) for an hour or so. The Anjou variety differs from others in that they will ripen normally at low temperatures. Dr. S. W. Porritt of the Summerland, British Columbia Research Station recently found that Anjous ripened at temperatures of 32° to 50° F., and that they required a period of cold storage prior to ripening.

STORAGE:

Pears that are to be stored should be moved quickly from the orchard into storage. The best storage temperature for all varieties is 30 to 32° F. with high relative humidity, about 90 percent. Bartletts can be kept in refrigerated storage up to 8 to 10 weeks, after which they must be ripened at 60 to 70° F. Those showing a yellow color while still in storage may fail to ripen or soften upon removal. Bosc can be stored for 3 to 3½ months, Anjou for 5 to 6 months.

Other Publications on Fruit

Extension Bulletin E-509 – Peach Culture in Michigan (for commercial growers)

Extension Bulletin E-521 – Growing Strawberries in the Home Garden

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