

Tomato Culture in Missouri

E. J. ALLEN AND T. J. TALBERT



Fig. 1.—A Cluster of Marglobe Tomatoes.

Tomato growing is an important agricultural industry of Missouri. For the four-year period, 1929 to 1932 inclusive, the average commercial acreage was 21,210 acres. The crop is exceeded in acreage and farm value only by potatoes among the truck crops of the State.

The fruit of the tomato serves a wide range of uses. It may be eaten raw, as sliced tomatoes, in salads, or as tomato juice. It may be made into soups, sauce, pickles, catsups, preserves, and its possibilities for use in combination with other foods are only limited by the housewife's creative fancy.

Tomatoes are grown under a great variety of systems. They are almost universally grown in home gardens; in fact, few gardens are so small that there is not room for at least six or more plants. It is surprising how far a very few plants will go in supplying the average family with an abundance of wholesome, fresh fruit.

Commercially, tomatoes are produced by market gardeners, by growers forcing the plants under glass, by the truck farmer, and by producers growing the crop for canning purposes. Market gardeners may be found near any population group, from the smallest towns to the largest cities. The forcing of tomatoes under glass is general over many parts of the State but is most concentrated near the larger cities.

LOCATION AND SOILS

The tomato has a wide range of adaptation to various soil types. With proper care and attention, the fruit will thrive upon any soil suited to the production of farm crops. Most varieties do better on light, sandy, gravelly, or stony soils than on clay, heavy or wet soils. New land is often preferred because of the increased yields and because there are fewer weeds to fight and less cultivation required. In general, a well drained, fairly light, moisture holding, fertile sandy loam is desired.

In Missouri, successful crops have been grown on many different soil types, from heavy bottom lands to the light gravelly soils of the Ozark uplands. Light soils in this state are subject to drought and are hard to keep supplied with organic material, but are generally easier to work and will produce earlier crops. Heavier soils are later and are preferred for the main and canning crops.

Tomatoes will often make a fair crop under adverse conditions and on rather poor land. For this reason a mistaken impression has sometimes obtained that tomatoes do not require a fertile soil. On the contrary, there are few crops as sensitive or responsive to conditions of soil fertility. Instead of planting tomatoes on the poorest land on the farm, the best land brought to a high state of fertility and preparation should be used.

IMPROVING SOIL FERTILITY

By plowing under barnyard manure and such leguminous crops as cowpeas, soybeans, vetch, clover and alfalfa, humus and nitrogen are added to the soil. Non-leguminous crops like, wheat, rye, oats and others may also be plowed under for the purpose of building up the humus content and water-holding capacity of the soil. It is generally just as important to loosen and aerate the soil and in-

crease its water-holding capacity as it is to add fertility in the form of nitrogen.

Short Cropping Systems—(1) Early oats sown for hay may be followed by a cover crop of cowpeas to be plowed under in the fall. Tomatoes may be set the next spring. (2) Early potatoes may be followed by a crop of cowpeas to be plowed under in the fall. As in the first example, tomatoes may be set the next spring. (3) Hairy vetch may be sown on a well prepared and thoroughly compacted seedbed about August 15th, in which case the cover crop should make a good fall and early winter growth and cover the soil thoroughly during the fall and winter. The vetch may be plowed under during the latter part of April or the first half of May. The tomatoes may then be planted as soon after the frost-free date as seems advisable. (4) Cowpeas or soybeans may be planted in rows and cultivated and the crop plowed under in the fall. Tomatoes may be set early in the spring.

It is important that each grower plan a system of crop rotation to fit his own particular conditions. He should remember, however, that if diseases are present in the soil, tomatoes should not be grown oftener than once in six or seven years unless disease-resistant varieties are used. If crops such as potatoes, peppers or egg plant are included in the rotation, the effect is very much the same as an extra crop of tomatoes. This is true because the vegetables mentioned are closely related to tomatoes, and diseases affecting one may affect all.

MANURE

While the tomato requires a fertile soil, it is very sensitive to an unbalanced nutrient condition. For this reason it is usually best to apply barnyard manure to the crop preceding tomatoes in the rotation. Especially is this true of heavier soils where an application of manure may cause excessive vine growth and very few early tomatoes. If manure is to be applied, the application should be made and turned under in the fall. With the present-day scarcity of manure, it should not be necessary to warn against an application of over 15-20 tons per acre.

FERTILIZERS

Commercial fertilizers may be used with marked success for tomatoes on most Missouri soils. Heavy applications on poor soils should not be depended upon to make the crop; rather, the level of soil fertility should be built up over a period of years and then moderate quantities of fertilizers may be applied to meet the production and marketing needs.

Under Missouri conditions phosphates are generally used with profitable returns. On rich soils or on soils where large quantities of barnyard manure have been used, super-phosphate at the rate of 150-300 pounds per acre will tend to check excessive vine growth, result in earlier maturity of fruit, and materially increase yields. On soils of moderate fertility, a complete fertilizer such as a 4-12-4 or 4-16-8 at the rate of 300-500 pounds per acre should prove beneficial.



Fig. 2.—Phosphate fertilizer is highly beneficial for most Missouri soils. The plot on the right received manure only. The plot on the left received manure plus 200 pounds superphosphate.

The fertilizer should be applied in the row and mixed well with the soil before setting out the plants. Where heavy applications are made, the fertilizer should be applied at the side of the row or broadcast, to avoid injury to the small plants. A side dressing of 100 pounds of nitrate of soda per acre applied one month after transplanting is often beneficial. This consists of opening a furrow about two or three inches deep and an inch or so from the main roots of the plants on both sides of the row and of applying the fertilizer in the row and covering it with loose friable soil. The application of lime to tomato ground does not seem directly to benefit the tomato crop but is often indirectly beneficial as a result of its effect on other crops in the rotation.

SEEDS AND PLANTS

The best of planning and management resulting in soil developed to a high state of fertility will be of little use if poor seed or plants are secured. Perhaps no one thing is more essential to a successful crop than securing good seeds or plants from good seed stock. A tomato variety in the hands of a careless seed grower may, after several years, become almost unrecognizable. There are a few growers and dealers of this type. Happily, there are many more reliable and careful seed growers whose products are as represented. Local county agents, teachers of vocational agriculture, good truck growers and the Agricultural Experiment Station will know the better sources of seed and plants.

PLANTING DATES

Planting time for tomatoes will vary with the location within the State. The average dates at Columbia of the latest and earliest killing frosts are April 16 and October 13, giving a growing season of approximately 175 days. (The tomato requires from 150-170 days to mature a crop from seed). Extreme southern and northern parts of the State will vary from these dates approximately ten days.

A desirable tomato plant for setting in the field will be 10 to 12 inches tall, with thick, tough stem and plenty of dark green leaves. Approximately 6 to 8 weeks' time is required to produce a plant of this type from seed. As tomato plants are very susceptible to frost injury, it is well to wait at least two or three weeks after the frost-free date before setting in the field. In Central Missouri this would be about the first week in May. For those who desire extra early tomatoes, plant protectors may be used and the date of setting out plants can be moved up two or three weeks. However, plant protectors will not afford protection for more than two or three degrees below freezing.

To obtain plants for setting during the early part of May, seed may be sown in hot beds about March 1-15. Seed sown in cold frames will not ordinarily grow plants as quickly as in hot beds, so transplanting will be delayed or smaller plants must be set out. Generally, in Central Missouri, seed should not be sown in cold frames until the last two weeks in March. For extreme South Missouri, seed may be sown about 10 days earlier while for the more northern portions of the State seeding should be about 10 days later.

GROWING PLANTS

Tomato plants are grown in several ways. The home gardener may purchase a few early plants from an experienced plant grower. For the mid-season and late tomato crops, the home gardener can easily grow a sufficient quantity of plants by sowing seed in a box and keeping the box in a warm room in the house. After the seed has germinated, it is essential that the small plants receive sunlight and they should be placed in or near a window.

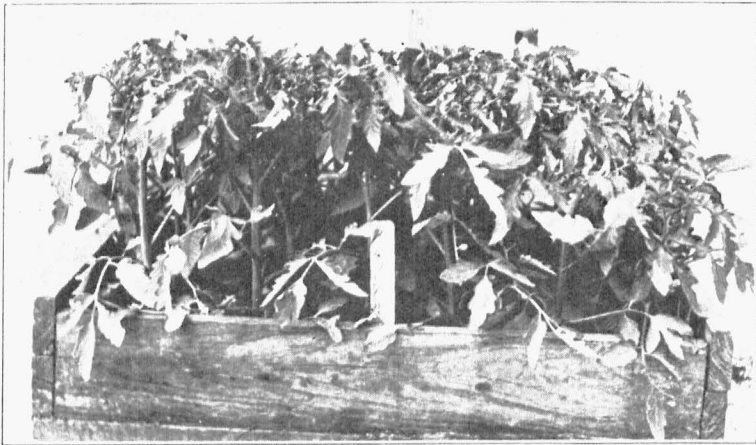


Fig. 3.—Sturdy stocky plants which have been transplanted at least once are ideal for setting in the field.

The market gardener and truck farmer usually desire early tomatoes in order to derive the benefit of early high prices. Unless the plants can be purchased very cheaply, special plant-growing structures are necessary. Greenhouses, of course, are much to be desired. Convenience in culture and better control of temperature and watering are advantages of this type of structure. The disadvantage is the cost of erection and maintenance. Hot beds and cold frames are utilized by most growers.* Hot beds are necessary for very early plants, especially in the northern parts of the State. Cold frames are widely used, however, even though the plants are somewhat later.

Tomatoes for canning are produced as cheaply as possible. Temporary cold frames and open plant beds are utilized. The

*For a complete description of hot beds and cold frames, see Missouri Circular No. 292.

cheapest and simplest method is to sow the seed in open beds after the season is far enough advanced that the plants can grow without protection. This method will produce small hardy plants, easy to transplant, if the plants are thinned sufficiently to avoid crowding in the bed. A better method of growing canning tomatoes is to produce the plants in cold frames protected with cheap muslin cloth. Plants may be produced 2 to 3 weeks earlier by this method, resulting in a longer picking season.



Fig. 4.—Muslin covered plant bed of Elmer Helton, Crane, Missouri.

SOWING SEED

In sowing tomato seed, common practices are to sow the seed thickly, broadcast, or in rows, in a flat, or directly in the hot bed or cold frame. When the plants are 1 to 1½" tall, or with the beginning of the first true leaf, they may be transplanted to other flats or hot bed space, giving from 2 to 3 inches room to each plant. Seed may be sown thinly in the row and no transplanting attempted before setting in the field. The advantages claimed for transplanting the small plants once are that the roots will tend to form in a more compact group and the shock of transplanting will not be so great. Some experimental results have shown greatly increased yields as a result of one or more transplantings before setting in the field. A good soil mixture for the hot bed, cold frame or seed plot is composed of 1 part soil, 1 part sand, and 1 part leaf mould or well-rotted manure.

HARDENING PLANTS

Before setting the plants in the field, it is essential that they be subjected to the process termed "hardening off." By subjecting the plants to lower temperatures and gradually withholding water for a week or ten days before transplanting, they will tend to form a tougher growth. This growth is better able to withstand possible chilling temperatures, drying winds, shortage of water, bright burning sunlight, and the shock of transplanting.

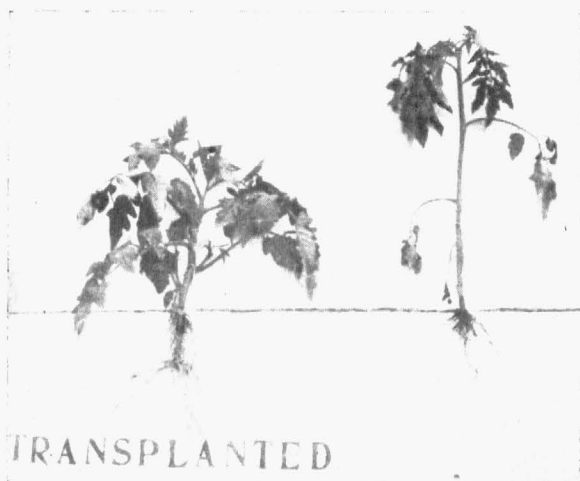


Fig. 5.—The plant on the left was transplanted once. Notice the large root system and stocky stem as compared to the spindly plant on the right which was not transplanted.

If the plants are grown in cold frames or hot beds, more and more ventilation should be provided until the sash or covering is entirely removed both day and night for several days before transplanting. Water should be applied only when necessary to stop severe wilting of the plants. The management of plants grown in greenhouses is much the same, although it is difficult to attain the same low temperatures available to the plants in smaller structures, and they need to be moved outside to harden off.

CULLING PLANTS

Transplanting provides an opportunity for selection of the best plants and for discarding small, spindling or malformed ones. Only the best should be used. A well-grown plant is an important part of a profitable crop.

PREPARING GROUND FOR PLANTS

Before setting out the plants, every effort should be made to put the ground in good condition. If the land has been fall plowed, (and this practice is recommended in most cases), a firm and compact seed bed is obtained. The soil should be thoroughly worked so that all clods are broken up and all weeds destroyed. Every minute spent in working the soil before transplanting will mean a saving of time in cultivating later, and, in addition, will give the plant a much better opportunity to grow well. The better the condition of the soil, the more plant food will be available.

TRANSPLANTING TO THE FIELD

The plants should be taken up with as much dirt as possible adhering to the roots. Where they have been transplanted and spaced in the hot bed or cold frame, they may be cut out and lifted with comparatively small disturbance to the roots. Blocking off the plants by cutting squares about each a few days before setting in the field is recommended. Plants that are grown in pots or paper bands may also be transplanted with little root disturbance. Handled in this way, they should continue to grow without appreciable checking. When the plants are pulled, all the fine root hairs and portions of the larger roots may be left in the ground. The plant then must grow new root hairs before moisture can be taken in. If temperatures are high and there is a drying wind at the time of setting, they may wilt beyond recovery. Small pulled plants may be set with a transplanting machine. Larger ones with potted or blocked soil should be set by hand in a furrow or in a hand-made hole.

The depth to set the plant will vary with its size. However, all sizes should be planted well down in the soil. A tall slender plant, if not placed deep in the ground, may be snapped off by the first gust of wind. A depth ranging from 3 to 6 inches should prove satisfactory for most plants.

The soil should be carefully firmed about all transplants and no air spaces left near the roots. Where only a small number of plants are to be set out and the soil is dry, it is advisable to water each as it is set. Setting out with water is not so feasible with large numbers of plants unless some irrigation system is available. The most favorable time for transplanting to the field is late evening or on a cloudy day, preferably when the soil is quite moist. The plants should be well watered before being removed from the plant bed.

SPACING

Spacing in the field will vary considerably. Soil fertility, variety, method of pruning, and staking must be considered. Untrained plants may be spaced 3 x 4 feet to 4 x 6 feet as the soil fertility increases. If they are staked and pruned to one or two stems, they may be spaced 2 to 3 feet apart in rows 3 to 4 feet apart. The following table will show the number of plants required per acre for various planting distances:

Planting distances	Plants required per acre
2 x 3	7260
3 x 3	4840
2 x 4	5445
3 x 4	3630
4 x 4	2722
3 x 5	2904
4 x 5	2178
4 x 6	1815

An ounce of seed germinating 95% should produce approximately 2000 plants.

CULTIVATION

Cultivation should be frequent as the plants are growing, and the first one should be given soon after the plants are set in order to loosen the soil that has been packed during transplanting. Early cultivations may be fairly deep, but, as the plant increases in size and the roots fill more of the soil space, the depth should be decreased. After the plant has fairly well covered the ground, cultivation should stop.

Timeliness in cultivation is essential. Weeds should not be allowed to get a start. Working the soil as soon as possible after rains aids aeration with resultant release of plant foods. If a drought should set in, a mulch formed soon after the last rain would help considerably in conserving moisture. On heavier soils, this is particularly true. If the ground is well supplied with organic materials or humus, cultivations may be made much sooner after rains.

PRUNING AND STAKING

Tomatoes may be trained to poles cut from brush, or to commercial split stakes. The poles and stakes should be large enough to carry the vine to the desired height, the stem being loosely supported with twine or raffia at regular intervals on the stake. All laterals on the vine should be removed as they appear, unless one or two are left to provide two or three stems to the plant. It is customary to top the vine at some desired height, usually from 4 to 6 feet from the ground. All the plant's energy is then put into

growing and maturing the fruits that have set on the main stem. General experience has shown that staking and pruning tend to increase earliness and to give larger, cleaner fruit. Yield per plant is decreased but total yields due to closer spacing of plants remain about the same.

The Missouri Agricultural Experiment Station found in 1928 on staked and unstaked tomatoes that slightly greater yields were obtained on staked tomatoes and a much greater percentage of No. 1 fruit. For staked tomatoes, 88% of the total yield graded No. 1; for unstaked tomatoes, only 58.5% grade No. 1. This was a wet year and the tomatoes on the ground rotted badly. The added expense of stakes, additional plants per acre, and the increased labor of tying and pruning counteract the apparent advantages of staking.

MULCHING

Tomatoes in home gardens are often mulched, usually with straw. This is not practical on a large scale but may well be practiced by the home gardener or, possibly, the market gardener. Mulching saves cultivation and keeps the vines and fruit from coming in contact with the soil, thereby reducing the amount of spoiled fruit. Mulching is especially valuable during dry seasons as it helps to conserve moisture and seems to lessen the amount of blossom end-rot which is prevalent during dry periods.

HARVESTING

The tomato fruit is highly perishable and tender. Care must be taken at picking time to obtain fruit at the proper stage of maturity. If the fruit is too ripe when picked, it will spoil before getting to the consumer. For most Missouri markets the fruit is picked when showing from 60-85% color. It will probably be necessary to pick every day in order to reduce the chances of having soft or overripe fruit. When tomatoes are shipped to distant markets, the fruit is picked either at the "green wrap" stage or at the "turning pink" stage. A few growers in Buchanan, McDonald, and Newton counties ship green wraps to western states.

Tomatoes for canning are generally picked at the full ripe stage as the fruit is ordinarily canned and processed within 24 hours of delivery to the canning platform. In many states where tomato canning is a well-organized industry, very definite grades are established and growers are paid according to grade. Color cards illustrating the degree of ripeness necessary for each grade are used by the inspectors. Generally, a tomato must show about 90% of the surface to be colored and to be free from injury and

disease before being graded as a No. 1 canning tomato. Careful handling of the picked fruit is essential. A bruised tomato deteriorates rapidly and may injure the sales value of an otherwise attractive basket of fruit.

MARKETING

Uniformity in size, shape and color adds to the attractiveness of a sales package. A uniform high quality pack will maintain prices and an easy sale; while an indiscriminate lot of green, ed into a box or soiled basket, will receive little or no consideration.

Market baskets, crates and the round bushel basket are often used by Missouri growers in marketing fresh tomatoes. Other types of containers are available. Clean new baskets or crates should be used, especially when the product is to be placed on the retail market in the original container.

There are many ways in which the grower may market his tomatoes. Commission houses and cooperative marketing associations dispose of a large part of the crop. Growers may sell directly to produce merchants or retailers. Some have built up regular routes and deliver and sell tomatoes and other produce from door to door. Others have established roadside markets and the consumer calls for produce at the home. Local conditions and the inclination of the grower will determine which one of these or other market systems is to be used.

VARIETIES

Every tomato grower should keep well informed in regard to varieties. Constant attempts are being made by individuals, state experiment stations, and seed companies to improve tomato varieties and to develop new and better types. New and improved varieties bearing the approval of the better producers and the Agricultural Experiment Station may be much better adapted to the grower's need than the variety or type that has been grown.

A selection of varieties for the home garden would include Earliana, Bonnie Best, Break O'Day, Marglobe, Stone and Ponderosa. A good list for the market grower and trucker could be selected from Earliana, Break O'Day, Bonnie Best, John Baer, Chalks Early Jewel, Pritchard, Marglobe, Greater Baltimore and Improved Stone. The following varieties have been used for the canning crop: Break O'Day, Bonnie Best, Chalks Early Jewel, Marglobe, Greater Baltimore and Stone. The Stone, however, is used most extensively in the canning districts of Missouri.

For convenience, the following table of varieties suited to various types of tomato growing is given. The varieties are listed in order of maturity—from early to late. They may not all be satisfactory to every grower for the purpose suggested. Inquiry among neighboring growers and from the Agricultural Experiment Station may be necessary to determine the ones best suited for individual needs.

Variety	Color	Shape	Shipping qualities	Productiveness	Days to mature from transplanting
Earliana	Red	Rough Flat	Poor	Light	66
*Break O'Day	Orange red	Globe	Good	Medium	70
Bonnie Best	Red	Globe	Fair	Medium	74
John Baer	Red	Globe	Fair	Medium	74
Chalks Early Jewel	Red	Globe	Fair	Medium	75
*Pritchard	Red	Slightly flattened	Fair	Medium	75
*Marglobe	Red	Globe	Excellent	Heavy	80
Greater Baltimore	Red	Slightly flattened	Good	Heavy	82
Livingston's Globe	Pink	Globe	Good	Heavy	84
Improved Stone	Red	Flattened	Good	Heavy	86
Ponderosa	Pink	Rough flattened	Good	Heavy	90

*Disease resistant varieties.

SAVING SEED

Some growers may desire to save their own seed for future crops. This practice, however, is not recommended except to careful individuals. To save seed, several outstanding vines should be selected during the season. These should be marked by stakes and the fruit allowed to mature fully before picking. The fruit of the selected vines should, of course, show the characteristics that the grower desires, such as earliness, large prospective yield, quality and vigor of plant. A small portion of the seed from each vine should be kept and planted separately the next year. Yield records or observations should show which selection should be retained for future seed production. Constant observation and selection will be necessary to maintain the desirable properties of the strain.

The seed is obtained from the ripe tomato by cutting the fruit in half, squeezing out the pulp and seeds into a container, and adding some water. The pulp separates from the seed and rises to the top along with light immature seed, and is poured off when the seed is washed. After careful washing, the seed is dried and stored in a dry clean place.

DISEASES

Many sections in Missouri have suffered heavy losses due to tomato diseases. There are several of these which concern the home gardener and commercial grower. A description of the more common diseases and suggestions for control follow:

Fusarium Wilt.—This disease is reported in many sections of the State. It is caused by a fungous organism known as *Fusarium Lycopersici*. The organism is found in the soil where infected plants have been grown and may live there several years before the soil is safe for another tomato crop. Entrance in the plant is made through the roots. The disease attacks the tomato plant at all stages of growth. Seedlings grown on infected soil may wilt and die before being transplanted. When disease-free plants are set in infected soil, the symptoms may not appear until later in the season. Most commonly the plant will show symptoms at the time the first few clusters of fruit are developing.



Fig. 6.—Tomatoes grown on wilt-infested soil. The two rows on the left were Bonny Best and the two on the right Marglobe. The Marglobe yield was three times greater than that of Bonny Best.

The start of the disease is indicated first by an upward rolling of the leaves followed by wilting and yellowing. The symptoms are first noted on the lower leaves, later advancing upward. After entering the plant through the roots, the fungus progresses upward through the stem by way of the water conducting tubes. The breaking down and obstructing of the conducting tubes by the fungus result in shutting off the water supply, with consequent wilting. If the stem of a diseased plant is split, brown discolored

streaks will be noted in the tissue. A cross section of the stem will show the discoloration in the form of a dark ring.

A rotation of crops which brings tomatoes to the same land only once in 6 or 7 years is effective whenever practical. When tomatoes must be grown oftener on the same ground, disease resistant varieties should be used. Several worthwhile varieties such as Marglobe (see varieties) have been developed which have a relatively high degree of resistance. However, none of these are completely immune and an exceedingly hot dry unfavorable growing season will result in a greater percentage of plants of the resistant varieties dying of wilt. A grower who has not been troubled with tomato wilt should take every precaution to prevent its introduction to his soil. This disease is commonly introduced by buying diseased plants that were grown on infected soil.

Septoria Leaf-spot.—This leaf spot, sometimes spoken of as “blight”, often gives much trouble in rainy seasons. The disease affects the lower leaves first, causing small gray spots with black borders to appear, followed by drying and dropping of the leaf. The disease advances upward until the plant is considerably defoliated. The loss of leaves may cause scalding of the fruit. The loss of leaf area will reduce the food manufacturing power of the plant so that the tomatoes will not mature properly. The organism responsible for Septoria leaf-spot is *Septoria lycopersici*. The disease may be checked by using clean soil in the plant bed, by spraying the small plants with a 2-3-50 Bordeaux and the large ones in the field with a 3-4-50 mixture at intervals of 10 days or 2 weeks. Cleaning up and burning old vines and leaves after each crop, deep fall plowing, and crop rotation, will aid in reducing losses.

Mosaic.—This is a virus disease which is characterized by crinkled mottled areas of light and dark green on the leaves. The fruit of badly infected plants is malformed, yields are cut in most cases, and if infection takes place before the flowers develop the fruit may be a total loss. Infected plants should be removed and destroyed, as the disease is easily spread by insects, pruning tools, or by handling infected and unhealthy plants. In the greenhouse each plant should be carefully inspected before any pruning is done.

Blossom End-rot.—Blossom end-rot is a non-parasitic disease and is caused by a lack of sufficient moisture for proper development of the fruit. Cultural practices that conserve moisture such as mulching or greater spacing will help control this disease. Irrigation at proper intervals will assist materially in eliminating blossom end-rot.

INSECTS

Tomato Worm.—This insect is a large greenish worm often called the tobacco worm. It may be controlled by spraying with $1\frac{1}{2}$ pounds of arsenate of lead in 50 gallons of water or Bordeaux mixture. If the sprays are applied as soon as injury is observed, they will be more effective. The arsenate of lead is combined with Bordeaux when the fungous diseases are to be controlled. Equal parts of air slaked lime and dry arsenate of lead dusted on the plants should also prove effective. Hand picking and destroying the worms is feasible in small plots.

Fruit Worm.—This worm is very destructive in some seasons. The worms bore into the green and ripening fruit and are especially damaging to half-grown green fruit. All affected tomatoes should be destroyed when picked, as this helps to eliminate later broods. Since the insect is the corn-ear worm, a few rows of sweet corn planted on successive dates near the tomato crop should be effective in trapping the worm. The wormy corn should be gathered and destroyed. A spray or dust of lead arsenate just after the first fruits have set will greatly help in control of the pest.

Blister Beetle.—Severe damage may be done by these beetles, sometimes called "old-fashioned potato beetles," because of their appearance in large numbers. The beetles feed on the plant foliage and may strip it of leaves in a very short time. They may be driven from a field by starting at one side, beating a brush limb against the soil near the beetles and shaking the vines, working gradually to the other side of the plot. Straw or dead grass may be placed here and when the insects have entered it, they may be destroyed by setting fire to the litter. Applications of arsenate of lead at the rate of 3 to 4 pounds to 50 gallons of water will also help control the beetles.

Cut Worm.—Cut worm damage may be severe in cool weather. The small plants are cut off at the ground level. The advance of warm weather usually brings a halt in the activities of the worm. However, conditions may be such that the cut worms will do considerable damage to tomato plants. The best remedy is the use of poisoned bran broadcast very thinly along the tomato rows late in the evening just before dark. To prepare the poisoned bran, mix 6 pounds of bran and 4 ounces of white arsenate or Paris green. Then mix one pint of molasses and the juice and rind of two lemons, add to the bran and poison the molasses flavored with lemon juice and mix thoroughly after which the mash is ready for use.