Growing Tomatoes in Illinois

Problems in Producing for Market and Canning

By W. A. Huelsen
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THE ACREAGE of tomatoes grown for canning has increased tremendously in Illinois during the past three years. Most of this increase has occurred in northern and central Illinois, especially in the counties surrounding Chicago. More than fourteen thousand acres were grown in Illinois in 1935 compared with 10,100 in 1934 and 5,400 acres as the 1929-1933 average. Considerable expansion has also occurred in the acreage of market tomatoes, more than 5,000 additional acres being devoted to them in 1935.

Yet this increased acreage has been accompanied by a decline in average yields per acre. Average yields of the cannery crop for the 1929-1933 period were 3.6 tons per acre, .4 ton less than in the tomato-growing state of Indiana. In 1934 the average was only 1.1 tons; the 1935 estimate is 2.5 tons.

Such low yields are not profitable for the farmer, especially when tomatoes are grown on high-priced land in central and northern Illinois. Consequently there is a widespread demand for information on tomato growing in Illinois, and in this publication an effort is made to bring together such information as is available and to interpret it in terms of Illinois conditions. Unfortunately the amount of experimental work dealing with tomatoes in this state, especially in the central and northern sections, has been rather limited, and considerable latitude must therefore be granted for errors in attempting to make practical interpretations of experiments conducted in other states. The difficulties in growing tomatoes as a prairie farm crop may never be entirely eliminated, for it is known that tomatoes frequently behave under Illinois conditions in ways very different from those encountered elsewhere.

DIFFICULTIES OF GROWING TOMATOES AS A PRAIRIE FARM CROP

Comparatively few tomatoes have hitherto been grown in the prairie sections of the Middle West. The largest acreage in the country is in Indiana, most of it south of the Wabash river, but this section is not, strictly speaking, a prairie province, nor does it have the same climate as the open prairies of Illinois. To the west of Illinois the Ozark hill region of Missouri and Arkansas is the most prominent, but here again the region is a timbered one.
In growing tomatoes on the Illinois prairie the plants are compelled to adapt themselves to several conditions which are not met in the tomato-growing regions located east of Illinois, where most of the experimental work has been done. These conditions are:

1. Great fluctuations in temperature, with recurrent hot winds, accompanied by low humidity.
2. Scanty rainfall or at best uneven rainfall during the growing season.
3. Soils high in organic matter with comparatively high levels of available nitrogen.
4. Comparatively slow drainage, often due to more or less plastic subsoils.

Before discussing methods of growing, the relation of these factors to yields should be made clear.

**Blossom Drop Correlated With High Temperature and Hot Winds**

Hot winds and low humidity frequently accompany periods of high temperature in all parts of Illinois.\(^a\) Altho tomatoes are of tropical origin and the plants are extremely resistant to drouth, they do not bear fruits under drouth conditions. Oklahoma experiments\(^b\) show that immature tomato blossoms drop most rapidly during periods of extreme heat and drouth owing to the increase in transpiration (loss of water from the plants); that blossom drop increases in relation to lower humidity; and that because of slow pollen-tube growth the blossoms may be destroyed if weather conditions are unfavorable after pollination has occurred.

As blossom drop was general throughout Illinois in 1934 and accompanied the sudden expansion of acreage, the attention of many growers was forcibly directed to it. It was also severe at the Illinois Station in 1930, 1931, and 1933. Blossom drop results in a serious reduction in crop yields because of the scanty set of fruits and the continued growth of vines, frequently to enormous size.

The grower can have no direct control over hot winds, drouth, and high temperatures. He may, however, secure some protection

\(^a\)In northern Illinois the highest recorded temperature is 112° F. at Ottawa; in central Illinois 112° F. at Hillsboro and Mt. Pulaski; and in southern Illinois 115° F. at Centralia. These temperatures are the extremes, of course, but periods of 95 to 100° F. are encountered almost every year in all parts of Illinois. (U. S. Dept. Agr. Weather Bur., Climatic summary of the United States. Secs. 56-58)

\(^b\)These numbers refer to literature citations on page 28.
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from hot winds by means of windbreaks, from drouth by means of irrigation, and he may lower temperatures in his fields by combining windbreak protection with irrigation.

Stands of timber make the best windbreaks; but if timber is not available, strips of field corn 10 rows or more wide may be grown at intervals across the tomato field, the strips running east and west with a solid block of corn west of the tomatoes. Smith of Oklahoma considers windbreaks of much importance in preventing blossom drop, tho his view is in disagreement with the experimental results of Herron, who assumed that hot winds had little to do with blossom drop.

Topography is also of importance as a means of protection from hot winds, with the northern and eastern slopes offering much greater protection from the prevailing southwesterly winds than those having a southern or western exposure.

Irrigation has been advocated as an aid in controlling blossom drop, tho the results of experiments at the Oklahoma Station comparing irrigated with nonirrigated tomatoes are contradictory. It seems probable, however, that given the proper protection from direct exposure to high winds blossom drop can be reduced by means of irrigation, especially the overhead type, because irrigation reduces soil temperatures, increases local humidity and, of course, increases the available moisture. Combining windbreak protection with irrigation seems to be a logical method of preventing blossom drop.

Combating Drouth

Altho the average annual precipitation in Illinois would seem sufficient to grow tomatoes, the fact is that there is frequently a serious shortage of rainfall in all parts of the state between June 15 and August 15, and so far as soil conditions are concerned the climate becomes essentially semiarid. The tomato grower can, however, avoid the effects of drouth and heat to an appreciable extent by planting early-blooming varieties which set a considerable number of fruits before the weather becomes excessively hot. The fruits of such varieties mature slowly, and no additional blossoms set during hot weather.

In a normal season such as 1932, when there was a fairly generous rainfall during the growing season, the yield characteristics of tomato varieties were quite different than in an abnormally hot and dry summer.
season such as 1934. These differences are shown in the following table, where Early Baltimore, a new early-blooming type, and Illinois Pride, a new late-blooming type, are compared with Marglobe, a variety classed as medium-early in maturity under eastern conditions. No

**RANGE OF MATURITIES IN THREE VARIETIES OF TOMATOES IN A GROWING SEASON HAVING NORMAL RAINFALL AND ONE OF DEFICIENT RAINFALL, URBANA, ILLINOIS**

(Identical strains were used both years)

<table>
<thead>
<tr>
<th>Variety</th>
<th>Percent* of total crop of U. S. No. 1 and U. S. No. 2 grades picked in each period</th>
<th>Total tons per acre of U. S. No. 1 and U. S. No. 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early Baltimore</td>
<td>5.7</td>
<td>10.1</td>
</tr>
<tr>
<td>Marglobe check</td>
<td>4.0</td>
<td>11.4</td>
</tr>
<tr>
<td>Illinois Pride</td>
<td>4.8</td>
<td>11.2</td>
</tr>
<tr>
<td>Marglobe check</td>
<td>4.8</td>
<td>9.2</td>
</tr>
<tr>
<td></td>
<td>1934—Deficient rainfall</td>
<td></td>
</tr>
<tr>
<td>Early Baltimore</td>
<td>......</td>
<td>......</td>
</tr>
<tr>
<td>Marglobe check</td>
<td>......</td>
<td>......</td>
</tr>
<tr>
<td>Illinois Pride</td>
<td>......</td>
<td>......</td>
</tr>
<tr>
<td>Marglobe check</td>
<td>......</td>
<td>......</td>
</tr>
</tbody>
</table>

*Percentages represent averages of five replications except for Illinois Pride and its checks, which represent ten replications.

essential differences in the range of maturities of the three varieties occurred under the normal rainfall conditions in 1932 and total yields were also strikingly alike (see table). In other words, under normal conditions in Illinois, almost any good variety will produce a favorable yield, a tendency which has been repeatedly noted at the Illinois Station.

In contrast, a notable difference in the behavior of the three varieties under the drouth conditions of 1934 is shown by the data in the table. The early-blooming Early Baltimore variety produced much larger total yields than either Illinois Pride or Marglobe. The two latter varieties grew excessively large vines, but Early Baltimore did not. Thus between August 16 and September 30, Early Baltimore produced 37.9 percent of its total crop, in contrast with Marglobe, which produced only 15.9 percent, and Illinois Pride, 14.0 percent. Early Baltimore, thru its ability to bloom and set fruit early in the season, was able to escape the full effects of the drouth. That it also
was rather severely affected by drouth later on, however, is shown by its great decrease in yield between September 16 and 30, but the decrease was not any greater than for Illinois Pride or Marglobe.

These results parallel very closely the actual experiences of tomato growers. There is a distinct tendency in central and northern Illinois to avoid later blooming varieties such as Marglobe and Greater Baltimore and to substitute early blooming types such as John Baer, Pritchard, Bonny Best, Early Baltimore, and Prairiana. Varieties with sparse foliage such as Earliana are not, however, very successful, owing to their early defoliation and the danger of sunscald.

In southern Illinois varieties such as Marglobe and Illinois Pride, which are late maturing and have large vines, are usually planted in preference to the small-vined early types because the latter fail to grow enough foliage to protect the fruits from sunscald. It should be understood that in southern Illinois late varieties usually bloom much earlier in the season than they do farther north, and therefore are probably as effective in avoiding blossom drop as the early varieties in central and northern Illinois.

In addition to selecting an early variety, the Illinois grower may avoid the effects of drouth to some extent by any other means which promotes early setting of fruits, such as applying commercial fertilizers, using vigorous and well-grown plants, setting as early as possible, and preparing the ground thoroughly.

Many Illinois Soils Not Adapted to Tomato Growing

The dark-colored prairie soils typical of central and northern Illinois are not generally recommended for tomatoes. Such soils often produce extremely large crops of tomatoes when there is ample rainfall combined with moderate temperatures, but in adverse seasons the yields are very low and maturity is extremely late. The factors which limit the yields on dark-colored prairie soils are failure of blossoms to set and excessive growth of vine.

No detailed study of tomatoes grown under such conditions has ever been made, but it is known that excessive vine growth is associated with high nitrogen levels in the soil. During protracted periods of light rainfall, the available nitrogen salts in the soil may build up to dangerously high levels, with the result that when a few showers fall, as they usually do after August 15, these nitrogen salts go into solution and are utilized by the plant. A runaway vine growth may be the result, and few or no fruits can be produced when excessively large amounts of nitrogen are available to the plant. A con-
dition such as this prevailed throughout central and northern Illinois in 1934, and many growers harvested no tomatoes at all.

The only prairie soils which can be tentatively recommended are those with a rolling topography where most of the dark-colored surface soil has been washed away, leaving the lighter-colored subsoil more or less exposed. If this subsoil is plastic and poorly drained, as it often is in certain parts of the state, it may not be suitable for tomatoes, which require good drainage. These eroded soils are almost invariably more or less depleted and will need phosphorus and potash, but this disadvantage is counterbalanced by the decreased danger of excessive nitrogen accumulation.

From repeated observation it appears that tomatoes grow well on the yellow, gray, and yellow-gray silt loams which are found near streams and rivers throughout central and northern Illinois. Such soils were originally in timber and as a rule are well drained. When sufficient organic matter and nutrients are supplied to these soils, good tomato crops can be grown.

In southern Illinois the soils are usually lower in fertility than those farther north and the problems are different. Nitrogen does not ordinarily reach high levels in these soils in drought periods and phosphorus and potash are deficient. Several surveys have indicated that the well-drained reddish yellow, yellow-gray, and gray silt loams in southern Illinois will produce good tomato crops if organic matter and fertilizers are added. The deep loess soils along the larger rivers appear to be well suited for tomatoes. Alluvial soils also seem to be suitable if the extremely heavy and very sandy types are avoided.

Relation of Drainage Problem to Type of Soil

Owing to the wide fluctuations in rainfall during the growing season, a good tomato soil must be well drained but at the same time it should have a high water-holding capacity. The water-holding capacity of many soils can be increased by the addition of organic matter and by proper working. Coarse sands have a very low water-holding capacity and are droughty. In fine clay loams the colloidal content is high and the water-holding capacity correspondingly high, but aeration is poor. For these reasons extremely sandy soils and heavy clays should be avoided as unsuitable for tomatoes.

The importance of the proper relationship between drainage and available soil moisture cannot be overemphasized in tomato growing, but it is impossible to determine in advance of the season what combination will produce the best yields of tomatoes. A number of tomato
growers in southern Illinois, for example, locate a part of their acreage on rather heavy clay loams and the rest on better drained types. The high water-holding capacity of the clay loams combined with their slow drainage assures the growers of large tomato crops in years of extreme drouth, but a crop failure is almost certain when any considerable amount of rain falls during the growing season. Some of the largest yields ever observed by the author were grown on well-fertilized but poorly drained, tight, drab clay loam in southern Illinois during the drouth year of 1930.

One of the most successful tomato growers in Cook county, Illinois, raises large crops of tomatoes every year on a dark-colored silt loam, very high in organic matter originally and heavily manured, which has a water table constant at only 4 to 5 feet below the surface. This soil is an old lake bottom underlain by quicksand, and the flat it is well drained. The high water table gives the tomatoes an abundance of moisture and results in unusually high yields and high quality fruits.

**FERTILIZERS FOR TOMATOES**

As applications of commercial fertilizers may reduce yields instead of increasing them on certain soil types and under certain conditions, the reasons for which are not understood, it is quite impossible at present to make general recommendations of specific fertilizer analyses. Neither is it advisable for the grower to use commercial fertilizers until experiments have convinced him that it pays to apply them.

The first step in successful tomato production should be to practice what is known as the Illinois system of permanent fertility. This means that soil fertility should be built up by means of liming and the use of manure and legumes in the crop rotation. Rock phosphate is needed on most Illinois soils and on many potash is required in addition. All these amendments are necessary in order to supply the minimum requirements of most crops. However, vegetables grown on an intensive scale may require what is known as a “luxury consumption” of plant nutrients in order to give the maximum yields. “Luxury consumption” simply means that if more than the minimum plant-food requirements are available, the remaining portion becomes a luxury for the plants. Vegetable growers often find it profitable to feed their crops large quantities of nutrients, and the aim of most vegetable fertilizer experiments is to show the grower how he can obtain the maximum yields at the lowest cost.

Tomato fertilization depends, therefore, on whether a permanent soil fertility program is being followed or whether the soil is in a
depleted condition. In the first instance the question is whether it is advisable to apply any amendment in addition to the permanent fertility system. In the second the grower wants to know what he can substitute for the permanent system in order to secure maximum yields.

A number of Illinois tomato experiments throw some light on these questions. In early experiments by Lloyd at Anna, Illinois, on yellow silt loam, manure was the most important amendment in tomato production, as indicated by the six-year summary of yields:

<table>
<thead>
<tr>
<th>Flats per acre</th>
<th>Pounds per acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check, no treatment</td>
<td>337.5</td>
</tr>
<tr>
<td>Manure</td>
<td>541.5</td>
</tr>
<tr>
<td>Manure, limestone</td>
<td>610.0</td>
</tr>
<tr>
<td>Manure, limestone, bone meal</td>
<td>642.8</td>
</tr>
</tbody>
</table>

The reader will perceive that yields kept on increasing the more closely the permanent system of fertility was approached. When a cover crop of rye and vetch was plowed under in addition to the manure, limestone, and bone meal, no further increase in yield was noted. However, when the cover crop was substituted for the manure in this treatment, the yields were very little more than the check.

Additional tests by Lloyd on dark silt loam of the prairie type at Urbana gave very similar results, as the following six-year averages in pounds of marketable tomatoes per acre show:

<table>
<thead>
<tr>
<th>Pounds per acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check, no treatment</td>
</tr>
<tr>
<td>Manure</td>
</tr>
<tr>
<td>Manure, limestone</td>
</tr>
<tr>
<td>Manure, limestone, bone meal</td>
</tr>
<tr>
<td>Manure, limestone, bone meal, potash</td>
</tr>
</tbody>
</table>

Potash, it is obvious, was not needed in this experiment. Cover crops also reduced the yields of tomatoes in all the combinations in which they were tried.

Recently Lloyd and Lewis completed a series of tomato fertilizer experiments which were conducted on dark silt loam of the prairie type at Des Plaines, Cook county, Illinois. These are the most comprehensive tests of tomatoes thus far made in Illinois. The most profitable treatment was 10 tons of manure plus 800 pounds of superphosphate. Rock phosphate and bone meal were not so effective as superphosphate. Of the non-manure treatments, the most significant was 1,000 pounds of 4-8-6 per acre. While 20 tons of manure alone produced about as good a yield as the best of the other treatments, Lloyd and Lewis conclude that it is more profitable to use half as much manure and supplement it with phosphorus. The average yields of
marketable tomatoes in pounds per acre and the acre-value of the increase less the fertilizer cost for the most significant treatments are given below:

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Yield in pounds per acre</th>
<th>Increase over adjacent check</th>
<th>Value less fertilizer cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manure, 20 tons</td>
<td>43,530</td>
<td>17,020</td>
<td>$102.00</td>
</tr>
<tr>
<td>Manure, 10 tons, plus 500 pounds 4-8-6</td>
<td>43,760</td>
<td>17,250</td>
<td>114.57</td>
</tr>
<tr>
<td>500 pounds 6-8-6</td>
<td>43,250</td>
<td>18,320</td>
<td>120.83</td>
</tr>
<tr>
<td>2,000 pounds rock phosphate</td>
<td>40,230</td>
<td>17,090</td>
<td>106.70</td>
</tr>
<tr>
<td>800 pounds 16% superphosphate</td>
<td>45,190</td>
<td>22,050</td>
<td>154.31</td>
</tr>
<tr>
<td>500 pounds bone meal</td>
<td>37,560</td>
<td>12,370</td>
<td>72.80</td>
</tr>
<tr>
<td>500 pounds bone meal, 200 pounds muriate of potash</td>
<td>42,310</td>
<td>18,410</td>
<td>117.58</td>
</tr>
<tr>
<td>No manure 1,000 pounds 4-8-6</td>
<td>42,460</td>
<td>17,530</td>
<td>127.14</td>
</tr>
</tbody>
</table>

These three Illinois experiments, located in southern, central, and northern Illinois respectively, show remarkable uniformity in results. In all three sections manure is without doubt the most important material needed in growing tomatoes. The value of adding some form of phosphorus is indicated in each of the three tests. Cover crops do not seem to be an adequate substitute for manure.

Manure and phosphorus are, of course, essential parts of a permanent soil fertility program. A tomato grower following this program will probably find it advisable to apply the manure directly to the tomatoes rather than earlier in the crop program. If he has no definite fertility program, he should apply ample quantities of manure supplemented with phosphorus.

Extensive fertilizer tests using a large number of fertilizer ratios have not been conducted in Illinois, and it is impossible, therefore, to state whether a specific fertilizer analysis can be successfully substituted for manure and phosphorus or would give additional increases in tomato yields if added to them.

Other experiment stations have carried on numerous fertilizer experiments with tomatoes, but since in Illinois commercial fertilizers are known to give highly erratic responses and often cause injuries when used with other crops, it is scarcely feasible to give positive recommendations at the present time. It is true that in northeastern Illinois tomato growers are using rather diverse analyses applied in several different ways. On the basis of experiments with other crops, it is quite probable that an optimum analysis for tomatoes will range somewhere between two to three parts of phosphoric acid to one of
potash except on sands and muck soils deficient in potash. Analyses 0-12-6, 0-16-8, and 0-20-10 are examples of 2:1 ratios, while 0-16-6 and 0-15-5 are 3:1 ratios, or quite close to it.

The question is often raised concerning the addition of commercial nitrogen to tomatoes, especially when it is desired to stimulate growth early in the season. The work of Lloyd and Lewis in Cook county, Illinois, shows that it is unprofitable to use nitrogen except where phosphorus is also applied. Experimental results in Illinois, especially with sweet corn, show that the use of nitrogen in mixed fertilizers is likely to reduce crop yields. Therefore the grower should be cautious in buying mixed fertilizers containing nitrogen, as tomato yields may be reduced in a similar manner.

No direct evidence is available concerning the effect of top- or side-dressed nitrogen salts on tomatoes. On sweet corn in Illinois side-dressed nitrate of soda is profitable only when used in addition to certain broadcasted mixtures containing phosphorus and potash. Elaborate tests applying several nitrogen salts at various times in the season in addition to a hill-dropped analysis—namely, 100 pounds of 0-16-6 per acre—show that the yields of sweet corn are not increased by means of side-dressed nitrogen salts. In Indiana extensive tests with field corn show that top and side dressings of various nitrogen salts give highly erratic responses. While none of this evidence bears directly on tomatoes, it is important because it shows that nitrogen salts must be used very cautiously in Illinois, and that fertilizer recommendations which are very satisfactory in eastern states do not necessarily apply in this state.

Applying Fertilizers

If the grower decides to apply commercial fertilizers, there remains the problem of how much fertilizer to use and the method of application. Recent experimental work seems to indicate that the most efficient manner of application is around the plant. For tomatoes this means applying the fertilizer by hand and covering it with a cultivator. Sowing the fertilizers in strips seems to be less efficient because of the wide spaces between the plants and the necessity of using more fertilizer to attain the same results since the roots cannot utilize all the fertilizer until late in the season, owing to the wider area covered. Broadcast sowing of mixed fertilizers is not recommended for similar reasons.

The amount of fertilizer to apply depends on the method of application, the distance between the plants, and the analysis used. Heavy
fertilizer applications close to the plant may prove to be worse than none at all. In a large number of fertilizer experiments with sweet corn, applications heavier than 100 pounds per acre around the hill gave erratic responses. It is doubtful, therefore, whether applications around the tomato plant which are heavier than 200 pounds per acre would be advisable. With tomatoes planted 5 x 5 feet, this amount means that each plant would receive a little more than 2 ounces, obviously a heavy application. If a high-analysis fertilizer such as 0-20-10 is used, probably not more than 150 pounds per acre is needed. Fertilizer salts are extremely toxic to practically all kinds of plants if they come into contact with the roots. The degree of toxicity seems to be related to the solubility of the salt, and since high-analysis fertilizers are the most soluble, extreme care should be used in applying them to avoid contact with the plant. All fertilizer salts should be applied so that they do not come into contact with the plant or its roots. Placing the fertilizer in a ring around the plant and then covering with a cultivator seems to be a good practice.

On soils having impervious subsoils, such as Elliott Silt Loam and Clarence Silt Loam, commercial fertilizers should be used only on a limited scale until the grower is certain that he is deriving some benefit. No tomato fertilizer experiments have been conducted on such soil types but numerous sweet-corn experiments have shown that commercial fertilizers stimulate plant growth sometimes to an extraordinary extent and yields are almost always lower than on adjacent untreated areas. Since excessive vine growth in tomatoes must be avoided, fertilizers should be used very cautiously on soil types having impervious subsoils.

**SOIL PREPARATION**

A well-prepared soil is the first essential for successful tomato growing. In a dry spring it is difficult to secure a good stand of plants even on a well-worked soil, but if the soil is cloddy, plant setting becomes an almost hopeless task.

It is easier to get the soil into good shape with fall plowing than with spring plowing. If crop residues are to be plowed under, fall plowing allows them to decay before spring. Sods other than legumes should also be fall-plowed in order to reduce cutworm injury.

Spring-plowed ground dries out very rapidly even if the physical condition is good, and unless watered heavily the plants are apt to wilt badly when set on such soil. Spring plowing is poor practice where plants are set by machine, as the trash which is turned under has no
chance to decay and may interfere with the transplanter. Manure plowed under in the spring decays very slowly if rainfall is deficient and may interfere with the capillary rise of the soil moisture. Plants do not start well in such soils. Plowing under cover crops in the spring is not recommended for Illinois conditions.

Substituting a spring-plowed cover crop for manure, in experiments by Lloyd\(^6\) in Union county, Illinois, reduced the yields of tomatoes considerably, and the use of a cover crop in addition to manure did not prove to be advisable. In later experiments at Urbana, Illinois, Lloyd\(^7\) showed that spring-plowed cover crops almost invariably reduced the yields.

On Elliott Silt Loam and on Clarence Silt Loam, both of which have plastic and more or less impervious subsoils, the plowing under of considerable quantities of organic matter, such as sweet clover in the spring, has seriously reduced the yields of sweet corn. There is a possibility that tomatoes may suffer in a like manner. Fall plowing on these soil types seems to be preferred.

Deep plowing is preferable to shallow plowing. It is difficult to set plants deeper than the plow sole even by hand, and with a transplanter it is almost impossible. Deep setting in a dry spring, such as 1934, is an absolute necessity.

Roots of transplants must reach moist soil if they are to live. Any practice which increases the moisture-holding capacity of the soil at transplanting time will save the grower a great deal of trouble.

**RAISING, HANDLING, AND SETTING PLANTS**

In Illinois the growing of tomato plants is usually limited to the truck grower. The cannery grower receives his plants from the factory, and most of these are southern grown. Until a few years ago there was considerable prejudice against southern-grown tomato plants. These objections were sometimes well merited because poor strains of seed were used and, owing to careless handling and packing, frequently plants arrived at their destination in poor condition.

In recent years the situation has changed considerably and high-quality southern-grown plants are now competing very successfully with home-grown plants. This is especially true where such plants are distributed by canners who, in many instances, supply the seed, contract directly with the growers, and supervise the packing and shipping operations. Such plants usually reach the grower in good condition. It then becomes necessary for the grower to handle them properly and plant them quickly.
Value of Transplanting

There are many methods of growing plants in common use, and it is commonly believed that transplanting is especially beneficial because better root systems are produced. Loomis\textsuperscript{10}\* investigated the problem very thoroughly and concluded that transplanting in itself is not beneficial. He found that transplanting in the very early seedling stage did not injure the plants particularly, but later transplanting was more or less injurious depending on how well the crop was adapted to withstand root disturbance.

Loomis\textsuperscript{10}\* observed that transplanting increased the amount of branching in the roots, but this was merely a temporary effect. In fact any previous treatments which the plants may have had were more or less masked by the degree of disturbance which the roots received when they were set in the field. Thus the increased branching would be of little value if most of the roots were broken off in the process of setting the plants in the field.

In one experiment Loomis\textsuperscript{10}\* showed that tomato plants grown in paper pots gave consistently larger early and larger total yields than plants grown in flats because in the former instance roots were disturbed considerably less when the plants were set in the field. Loomis also showed that plants grown from seed sown directly in the pots were just as good as those transplanted once or twice.

These and similar experiments are of importance to the grower as they show that an early transplanting does no harm but that late transplanting is not advisable because of the root disturbance. Transplanting seems, therefore, to be merely a means of saving space, and the practice of repeated transplanting in order to prevent the plants from becoming spindly is not recommended, even tho a new root system develops just below the surface of the soil every time the plant is reset a little deeper. Such secondary root systems are claimed to be beneficial because the "plant will stand up better and the new roots will develop along the stem."\textsuperscript{18}\* The experiments of Loomis\textsuperscript{10}\* show clearly that transplanting has a retarding effect; and under the circumstances it is difficult to see how a secondary root can be especially beneficial since it will develop only when the original root system ceases to function properly.

Hardened and "Frost-Proof" Plants

The practice of hardening plants is an old tradition and practically all the older writers regarded well-hardened plants as one of the basic essentials of successful crop production. Modern experimental
work, however, indicates that hardening is injurious. A comparison of tender and hardened tomato plants by Crist** showed that the tender plants gave larger yields early in the season, but that as the season progressed the differences between the two became progressively smaller, until at the end the two lots gave practically identical total yields. Hardening checked the growth of the tomato plants, as shown by the smaller early yields, and considerable time was required before they recovered.

Well-hardened plants are usually believed to be more resistant to cold and are often advertised as "frost-proof." Experiments by Rosa** showed that any treatment which materially checks plant growth also increases resistance to cold. In hardy species like cabbage and related plants hardiness increases in proportion to the degree in which growth is checked, but in tender species, such as tomatoes, hardening increased the cold resistance to such a slight degree that for practical purposes there was no apparent difference.

**Care of Plants Before Transplanting to the Field**

Tomato plants should not be allowed to wilt before or during transplanting. If they cannot be set at once upon receipt by the grower, the bundles should be loosened and the roots dipped into a puddled solution of liquid mud. The mud coats the roots and prevents them from drying out rapidly. The tops must not be wetted. The puddled plants may be repacked rather loosely in boxes or in baskets which are covered with dampened burlap bags. A good storage space will be a cool, damp cellar or basement.

When plants are to be held longer than 24 hours, heeling-in or trenching is advisable. A suitable trench consists of a furrow about 6 inches deep plowed or dug out in a cool shady spot. The plants are lined out thinly and the roots covered with soil. It is advisable to water thoroly. Vigorous plants will send out new roots within 24 hours.

Plants must not be exposed to the sun any more than necessary during setting. Wilted plants are difficult to set and the percentage surviving is very low.

**Date of Setting in the Field**

Ordinarily the best time to set tomato plants will be the earliest date when they will stand a reasonable chance of escaping a late spring frost. In Illinois this time varies from April 25 to May 30, depending on the section of the state.

A number of experiments in eastern states show that the highest
yields are usually obtained from the earliest plantings. Under Illinois conditions early setting is advisable because the plants will set at least some fruits before hot weather causes blossom drop. Once the plant has entered well into the reproductive, or fruit-bearing cycle, further vine growth is usually inhibited and high nitrogen levels in the soil later in the season are not likely to stimulate vine growth to the point where it becomes excessive. Varieties such as Earliana which bloom very early in the season rarely produce large vines under Illinois conditions. On the other hand most of the excessive vine growth is confined to late-blooming types such as Marglobe, Stone, and Greater Baltimore.

Methods of Field Setting

Tomatoes are set in the field either by hand or by machine. Each system has certain advantages and neither is capable of entirely replacing the other. The one best adapted for each grower will depend upon a number of factors and, therefore, no general recommendations can be given.

Mechanical plant setters are economical to use where a large acreage is to be set. The rows must be long, as frequent turning may require more time than the actual setting and in addition it is impossible to set close to a fence row. The field must be fairly level, as plant setters tend to slide downhill and it is difficult to follow a straight row. The ground should be well prepared and free from clods and trash. As the shoe of the setter will not go deeper than the plow sole, deep plowing is essential. The setter will plant in check rows, but not very accurately, and many growers do not even bother to try to check. The machine has the great advantage of watering the plants and, therefore, the percentage of survival is likely to be higher than in hand setting without watering.

The transplanting machine is limited to use with one type of plant—namely, the seedling which has practically no soil adhering to the roots. Where the grower is setting potted or blocked plants, both of which require careful handling in order to preserve the soil around the roots, hand methods are advisable. Hand setting is also preferable where the plants are longer than 12 inches. Even with a deep shoe, such as is furnished on special order with certain planters, it is impossible to set deeper than 5 or 6 inches. A deep shoe increases the draft materially, and even a heavy team will have difficulty in pulling the load.

There are numerous variations in the practice of hand setting. Small seedlings are often set with a regular dibber, or with a dibber made from a “D” shovel handle sharpened at one end. Potted or
blocked plants are set with a spade or a trowel. Occasionally the grower will plow furrows, but this is a practice which is not recommended because of the loss of moisture from the soil.

In dry years or when high winds are persistent, plants are sometimes set in the bottoms of holes dug with a spade. The holes are merely deep enough so that the top of the plant is level with the surface of the soil. This practice seems to give a great deal of protection and was used successfully in the dry spring of 1934.

Under average conditions in Illinois watering is necessary, especially when the plants have no soil adhering to the roots and are set by hand. The plants may be watered as soon as they are set, but this is wasteful, as much of the water runs along the surface instead of seeping in. Some growers scoop out a little dirt from around the plants, making a depression to retain the water. Later dry soil is hoed around the plant. Other growers scoop out holes with a hoe and fill them with water just before the plants are set. This seems to be the most efficient practice as the roots are then set in mud and, under ordinary conditions, not more than a half pint of water is required for each plant.

**Conditions for Setting**

Plants should not be set when the ground is either too wet or too dry. "Mudding in" tomato plants may seem to be desirable because no watering is necessary and the percentage of survival is high. The objections are that the soil is badly puddled, especially around the roots and, while the plant may survive, it may be retarded as the roots will find it difficult to grow in a hard ball of packed soil which is too close to the plant to be broken up with the cultivator.

It is very difficult indeed to set plants in extremely hot weather or when heavy winds are blowing. Under such conditions the percentage of plants lost is very high and the survivors may suffer a severe check. If setting in dry or windy weather is necessary, it is advisable to do the work during the cool part of the day, either early in the morning before ten o'clock or late in the afternoon. Planting at night will prove to be profitable when conditions are adverse. The principle to be followed in such cases is quite simple. If wilting can be delayed for 12 hours, the plant will ordinarily survive.

Resetting, that is replacing dead plants, is often neglected by the grower, who thereby is likely to sacrifice part of his yields. If the loss does not exceed 5 percent, the value of resetting is questionable because so small a loss will probably cause no noticeable decrease in yield. If more than 5 percent of the plants are missing, the plants
should be reset as soon as possible. Since it is difficult to water such plants unless the water is carried around the field by hand, a favorable time, such as a cloudy day, should be chosen for resetting and only good plants used.

In the event losses are as high as 40 percent or more and the grower has used a machine, the proper procedure becomes a matter of judgment. Sometimes it will be expedient to disk up the whole field and plant over again rather than to reset the missing plants by hand. The course to follow will depend on the weather, the time of the year, and the comparative speed of the alternatives.

**Planting Distances**

Planting distances in Illinois vary tremendously. In some sections of southern Illinois plants are set 3 x 3 feet and in central Illinois sometimes as far apart as 8 x 8 feet. These variations suggest that there are fundamental difficulties in determining the proper planting distances. Three factors seem to be involved in determining the rate of planting: the variety, the soil, and the season.

The small-vined types such as Earliana, which are seldom subject to excessive vine growth, need less room than the late large-vined Stone or Greater Baltimore. It is relatively simple to determine the proper planting distance for early tomatoes because soil seems to be the dominant factor. On a fertile soil early varieties produce a vigorous vine growth and they must be planted *farther apart* than on a poor soil where vine growth is restricted. Thus for Earliana and similar varieties on a highly fertile soil 4 x 4 feet might be rather close planting, while for a poor southern Illinois soil 3 x 3 feet might be too far apart.

Competition and mutual protection must be considered in determining planting distances. If a crop is planted too closely, competition is excessive and the yield suffers. If planted too far apart, the plants do not protect each other and are excessively exposed to the weather. Yield again suffers. This relationship can be illustrated by the results of extensive experiments with sweet corn at Urbana, Illinois. Planting sweet corn at the rate of one kernel per hill gave lower yields than planting at the rate of six per hill even in a very dry season. The thinly planted sweet corn was fired much worse, indicating that excessive exposure was more injurious than excessive competition.

Two late-maturing tomato varieties planted on a depleted dark silt loam fertilized with 500 pounds of 0-16-6 per acre, at Normal, Illinois, in 1931, show how yields were reduced by planting too far apart in a season when excessive vine growth was not a factor. Entirely
different results would most likely be obtained during a season when vines grow excessively large.

<table>
<thead>
<tr>
<th>Planting distance, feet</th>
<th>Marglobe Tons per acre</th>
<th>Greater Baltimore Tons per acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 x 4</td>
<td>20.34</td>
<td>13.90</td>
</tr>
<tr>
<td>5 x 5</td>
<td>18.32</td>
<td>13.62</td>
</tr>
<tr>
<td>5 x 6</td>
<td>25.23</td>
<td>(no data)</td>
</tr>
<tr>
<td>6 x 6</td>
<td>9.45</td>
<td>7.46</td>
</tr>
<tr>
<td>6 x 7</td>
<td>9.08</td>
<td>8.41</td>
</tr>
</tbody>
</table>

It is obvious that these tomatoes required between 20 (4 x 5) and 30 (5 x 6) square feet per plant in 1931, but it is impossible to generalize from these limited data. The experiment was not continued.

Seasonal variations in temperature and rainfall are just as important as soil. When rainfall is well distributed, excessive vine growth is somewhat limited and closer planting on all soils is better. Because of the variability of seasons, however, and the interlocking factors of soil and variety in determining planting distance, it is obvious that strictly definite directions cannot be given. However, the following recommendations are submitted as a general guide for the grower:

**Type of soil**

<table>
<thead>
<tr>
<th>Varietal group</th>
<th>Type of vines</th>
<th>Yellowish and grayish timber soils</th>
<th>Dark prairie types</th>
<th>Alluvial types</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earliana</td>
<td>Small</td>
<td>3 x 3</td>
<td>4 x 4</td>
<td>4 x 4</td>
</tr>
<tr>
<td>Pritchard</td>
<td>Bushy</td>
<td>3½ x 3½</td>
<td>4 x 5</td>
<td>4 x 5</td>
</tr>
<tr>
<td>Bonny Best</td>
<td>Medium</td>
<td>3½ x 3½</td>
<td>4 x 5</td>
<td>4 x 5</td>
</tr>
<tr>
<td>John Baer</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Greater Baltimore</td>
<td>Large</td>
<td>4 x 5</td>
<td>5 x 5 to 5 x 6</td>
<td>5 x 6</td>
</tr>
</tbody>
</table>

**CULTIVATION**

Under Illinois conditions the number of cultivations which are required to control weeds will usually be sufficient to keep the soil in a good state of tilth. Shallow cultivation is preferable to deep cultivation. Until very recently most publications recommended "frequent shallow cultivation" without questioning its value or its necessity. In recent years the whole question of cultivation has been studied and the general conclusion has been reached that cultivation is essentially a weed-killing operation and the maintenance of a soil mulch is of very little importance.

Thompson in experiments in New York investigated the value of soil mulch. In one series of experiments a soil mulch was maintained by cultivating once a week with a wheel hoe and in another series there was no soil mulch and the soil surface was scraped with a hand hoe only when weeds appeared. The results of six years' work
with tomatoes show that both methods of cultivation gave almost identical yields. Soil mulch is supposed to conserve moisture in the soil, but in these experiments the soil moisture was higher in the cultivated (soil mulch) plots only about two-thirds of the time.

The only work on cultivation in Illinois is on field corn by Wimer and Harland\textsuperscript{20}, who established certain principles which most likely apply to other crops as well. Morrow and Hunt began cultivation experiments as early as 1888 and found there was no advantage in cultivating more frequently than is necessary to destroy weeds and, further, that shallow was preferable to deep cultivation. As this was so contrary to popular belief the experiments were repeated by Wimer and Harland\textsuperscript{20} and they also found that the highest yields were obtained when no cultivation was given beyond keeping down the weeds by means of scraping with a hoe. Even shallow cultivation was not as good as scraping with a hoe. They also found that in a dry season less and not more cultivation is preferable. Wimer and Harland\textsuperscript{20} conclude that cultivation should be as shallow as possible and that its function is simply to destroy weeds. On soils which crack badly cultivation may be necessary to fill in the cracks. They state that a dry crust on top of the soil is probably just as effective in reducing evaporation of soil moisture as is a granular mulch and if such a dry top layer forms promptly after a rain, cultivation is not needed.

Thompson\textsuperscript{15} found that cultivation often results in loss of moisture during critical periods, and at other times it conserves moisture when less moisture would be desirable. Cultivation is not advisable after a light rain because practically all the moisture may be lost before it has time to penetrate the soil.

The grower must not interpret the results of these experiments too literally. Cultivation is necessary for all crops planted in rows. In truck growing, however, there seems to be a tendency to overdo cultivation in the belief that in some manner the crop is receiving benefits. Cultivation, no matter how shallow, disturbs the roots and such disturbance retards the plant. It is the soil which is being cultivated—not the crop—and any benefit which the crop derives will be by means of improved soil conditions, and this benefit will have to be greater than the injury the crop receives because of root disturbance.

**STAKING AND PRUNING**

Staking and pruning are practices not recommended for Illinois conditions unless the grower has, by means of trial, demonstrated that under his particular conditions these practices pay. Experimental re-
results differ slightly but show no consistent advantages for staking and pruning to offset the tremendously increased costs of growing.

Tomatoes are staked primarily to keep the fruit from contact with the soil, thus reducing the danger of decay, but staking has never been widely adopted in Illinois. It is claimed that staking increases the total yield per acre, the percentage of fancy tomatoes, and the size of fruits and earliness of maturity. However, there is considerable uncertainty whether the Illinois grower will derive any particular advantage from staking. Staking and pruning are known to increase blossom end rot, and recent experimental work indicates that they also cause an increase in cracking. In Illinois it is always dangerous to remove any part of the foliage because exposure of the fruits to the sun usually prevents them from developing a bright color, and if the weather becomes hot, sun scald usually appears.

The experimental work on pruning does not lend much encouragement to the grower to follow this practice. In experiments in New York state Thompson found that only when the number of pruned plants per acre was more than double the number of unpruned ones did the pruned plants produce as large a yield per acre. These results are in accord with the work in many other states, including that of Lloyd and Brooks conducted in Union county, Illinois, and at Urbana. Working in Arkansas, Watts found that total yields were markedly and consistently reduced by pruning in proportion to the severity of the pruning. Pruning did not increase the early yield, and in fact actually reduced the total acre-yields, in spite of the fact that there was a decrease in sun scalding on trained plants. He concludes that "labor spent in heavy pruning serves no good cause, and may result in reduced yields." Thompson found that pruning gave a slight increase in the percentage of first-grade fruits, but this was counter-balanced by increased cracking, blossom end rot, and sun scalding on the pruned vines. However, pruned plants gave larger early yields.

**HARVESTING AND GRADING**

Since shipment of tomatoes to distant markets in the form of fancy packs is not important in Illinois, the problem of harvesting and grading is one of adaptation to local market requirements. Local markets want ripe tomatoes, and therefore harvesting and grading standards for market become almost identical with the requirements of tomato canners. There is probably a tendency for local market tomatoes to be picked slightly greener than cannery tomatoes. The sales
value of tomatoes is determined by color, size, and freedom from cracks and other blemishes.

**Color**

In unfavorable seasons tomatoes frequently fail to develop good color, altho there is considerable varietal difference in this respect. The red color in the flesh of a tomato is due to the pigment lycopersicin, and the difference between red and pink tomatoes is simply in the skin color. Red tomatoes have a yellow skin due to the presence of carotin, and pink tomatoes have a colorless skin.

The red pigment, lycopersicin, fails to develop properly when temperatures are either too high or too low. Poorly colored tomatoes are usually encountered after prolonged hot weather or late in the fall when the weather is cool. In Illinois slow ripening and poor color development are also often associated with excessive vine growth. It is not known whether the poor color development is due to the high nitrogen associated with excessive vine growth or to the lower temperatures prevailing late in the season.

The relationship between the amount of foliage, type of soil, and tomato color and grade has been studied by Gaylord and MacGillivray in Indiana. They found that a soil fertile enough to develop foliage adequate for protection against strong sunlight was essential to produce a high percentage of No. 1 tomatoes, and that sandy soils in Indiana quite consistently gave lower grade tomatoes than black soils and clays.

Tomato color may be controlled to a considerable extent by the grower. Careful selection of a field that is protected from hot winds and has sufficient fertility to grow proper-sized vines, and attention to correct distance of planting in the field will aid in protecting the fruits so that normal color development is possible.

**Size**

Early-maturing fruits are usually the largest in size, according to repeated observations made at Urbana. The size usually tends to decrease as the season advances. In certain seasons, however, when there is a gap in production due to blossom drop, renewal of fruiting is accompanied by increased size and better quality of fruit.

**Grade Factors**

Official grading has become an integral part of growing tomatoes for the cannery. No attempt will be made to explain the grading sys-
tem in detail, as this is always done by the cannery field men before the picking season starts. However, many growers do not seem to understand the factors which determine grades. These are mainly degree of ripeness as determined by color, and freedom from blemishes, including cracks, rots, molds, and other injuries. Size also enters into consideration, but is a flexible factor varying with the season.

According to experiments by Gaylord and MacGillivray, the sequence of ripening takes the fruits thru all the grades. Tomato fruits first grade as culls and U. S. No. 2's because of greenness; then when perfectly ripened, as U. S. No. 1's; and then as the fruits recede in quality because of overripeness, they grade U. S. No. 2, and finally as culls again because of decay. In their experiments tomatoes remained in the U. S. No. 1 condition an average of 6.5 days, the exact time varying with the season from only 2.4 days to 9.6 days. After this period the fruit remained in U. S. No. 2 condition for an average of only 1.9 days, with not much seasonal variation. There was apparently no relation between the length of time the tomatoes remained as U. S. No. 1's and the time they remained as U. S. No. 2's after the No. 1 period. However, the number of days they remained in U. S. No. 1 condition in the field was directly related to the percentage of U. S. No. 1's, the tomatoes from the best fields remaining in good condition the longest. The tomatoes ripening early in the season graded better than those ripening later. Color changes became slower as the fruits approached No. 1 grade. Ripening, as determined by color, tended to slow up materially as the fruits reached the highest grade.

Interpreted in a practical way the work of Gaylord and MacGillivray means that the grower should not be in too much of a hurry to pick his tomatoes. Green tomatoes are graded down very severely, and there is no excuse for picking them since it is obvious that they will eventually reach the U. S. No. 1 grade if the grower will wait. Tomatoes usually remain in No. 1 condition long enough to give the grower a fair chance to pick them, although waiting too long is also disastrous because tomatoes remain in the No. 2 stage less than two days before becoming culls.

After-Season Ripening

Many growers find it profitable to pick green tomatoes when there is danger of killing frost and store them until they ripen. Some meet with considerable success, others with consistent failure. Since all growers are left with considerable quantities of green tomatoes in the fall, there is frequent demand for information on the subject.
The points which are not well understood are: (1) the effect of low temperatures on the fruits; (2) the stage when they should be picked; and (3) the proper method of ripening.

It is generally believed that tomatoes which are cooled to low temperatures, but not frozen, will fail to ripen properly. Diehl shows that exposures to a temperature of 32° F. for periods of 1 to 4 days had no effect on the ability of the fruits to ripen, but if the exposure was extended to 8 days the fruit broke down instead of ripening. Wright et al found, however, that tomatoes exposed to temperatures of 32 to 36° F. for periods of 5 to 8 days would ripen, but the rate of ripening was slower than for fruits not exposed.

Diehl further observed that fruits picked in the turning stage reacted in the same manner as green fruits and, in fact, the area showing red actually increased in size while the fruit was exposed to 32° F. He found that the freezing point for both green and red tomatoes is close to 30.5° F., with some variation between varieties. Green tomatoes which were actually frozen would not ripen later.

Wright et al in later work exposed tomatoes to temperatures as low as 25° F. for periods of 18 to 21 hours, and subsequently these ripened normally. They also observed that mature green tomatoes picked just before a frost in the field ripened in storage more rapidly and developed less decay than those picked the day after a frost.

The stage when green ripe tomatoes should be picked has been studied by Sando who found that size of fruit is no indication of ripeness. The number of days from bloom is the only certain indication, maturity being dependent on age, not on size. Sando divided tomatoes into four stages of ripeness; namely, green, turning, pink, and red ripe. He found that tomatoes picked green and allowed to ripen exposed to air and light differed in flavor and slightly in composition from vine-ripened fruit. Tomatoes picked green were slightly more acid and contained less total sugar. In artificially ripened tomatoes the ripening process, while conforming in general to vine ripening, nevertheless failed to bring the fruits to the same degree of ripeness. In tomatoes which were picked at the turning stage, the ripening process compared much more favorably with vine ripening and the fruits were superior to those picked green. Sando concluded therefore that tomatoes to be ripened in storage should be picked as mature as possible, but that green tomatoes will turn red if properly stored.

Wright et al show that tomatoes picked at the turning stage ripen almost normally when stored at 50° F. Storage at 40° F. prevented ripening at almost any stage of immaturity. The tests showed
that the lowest temperature at which ripening with good color and flavor developed was 55° F. The ripening rate increased very materially when temperatures ranged from 60 to 70° F., and Wright recommends these temperatures for fall ripening. Temperatures higher than 70° are not recommended because of the rapid increase of decay. For storing firm fully ripened tomatoes Wright recommends a temperature of 55° F.

**VARIETIES FOR USE IN ILLINOIS**

Most of the varieties used in Illinois have originated in the east and not many of them, therefore, are suitable for the vastly different conditions encountered in the prairie states. Canners who have factories located in several sections of the United States have had difficulty in finding a variety that is especially suitable to their particular localities, as tomatoes are more highly selective than is generally realized. In contrast with tomatoes it is easy to secure locally adapted types of field and sweet corn, for these two crops are largely cross-pollinated and consequently show a high degree of variability. Tomatoes, however, are largely self-pollinated, and even when crossed, it is quite impossible to secure a wide range of variations from which the most suitable strains can be selected.

The choice of tomato varieties for most sections of Illinois is further narrowed by the necessity of choosing varieties resistant to Fusarium wilt. This disease is likely to be serious in any tomato-growing section of Illinois. The grower will also have to determine whether he wants an early or a late variety. In making his selection he cannot depend very much on seed catalog descriptions or on variety tests in other states, for performance in Illinois may be quite different. Marglobe, for instance, is rated as a medium-early type in the east, but in Illinois it is usually among the latest varieties.

The characteristics of a desirable variety for Illinois seem to be: (1) resistance to Fusarium wilt; (2) sufficient foliage to protect the fruits from the sun; (3) ability to develop good red color in hot weather; (4) profuse blooming; (5) early blooming to escape blossom drop in hot weather; (6) freedom from cracking; and (7) rapid ripening of the fruits. No varieties in existence meet all these requirements, but a few meet the most important ones.

**Varieties Resistant to Fusarium Wilt**

*Early Maturing*

**Break O'Day** (light red). Not recommended, poor color.
GROWING TOMATOES IN ILLINOIS

**Early Baltimore** (red). A new introduction by the Illinois Agricultural Experiment Station; very promising in northern and central Illinois. Vine growth is not excessive even on dark-colored soils.

**Glovel**. Performance in Illinois unknown.

**Prairiana** (red). A new introduction by the Illinois Agricultural Experiment Station. Vine growth is never excessive; bred particularly for dark-colored soils. Not recommended for soils of low fertility.

**Pritchard** (red). Among the most successful of the earlier varieties, but apt to develop a yellowish red fruit. Vine growth not usually excessive.

**Rutgers** (red). Should be used with caution, as its performance thus far in Illinois has not been promising.

**Late Maturing**

**Illinois Pride** (red). A new introduction by the Illinois Agricultural Experiment Station, very promising in southern and central Illinois. Very large, red, solid fruits, good yields, but subject to excessive vine growth on dark-colored soils.

**Marglobe** (red). Extensively used, but not very successful owing to its slow blooming, bad cracking, and tendency toward excessive vine growth.

**Marhio** (pink). A pink selection of Marglobe, with same objections as listed for Marglobe.

**Varieties Susceptible to Fusarium Wilt**

**Early Maturing**

**Bonny Best** (red). Very susceptible to foliage diseases and usually loses its foliage, causing fruit to be damaged by sun scald.

**John Baer** (red). Similar to Bonny Best but tends to hold foliage a little better.

**Late Maturing**

**Beauty** (pink). Low yielder. Should not be used if market will accept a red tomato.

**Globe** (pink). Less satisfactory than Beauty.

**Greater Baltimore, Indiana Baltimore, Stone, and Matchless** (red varieties). Late maturing, subject to excessive vine growth. All practically identical in appearance under Illinois conditions and equal in yield.

There are numerous other varieties of tomatoes, but none of them has proved superior to those listed. New introductions should be tried cautiously until their value is established.
LITERATURE CITED


Most of the above publications are recent enough to be in print and nearly all of those published by state experiment stations can be obtained free of charge by writing to the stations issuing them.