

Performance of 58

TOMATO VARIETIES

*under greenhouse culture in
Alaska, 1949-1958*

M. F. BABB

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PERFORMANCE OF 58 TOMATO VARIETIES UNDER GREENHOUSE CULTURE IN ALASKA

Tomato variety evaluations herein reported were undertaken to discover those most suitable for greenhouse culture in Alaska. Findings are presented in table 1. They are listed as total yields, and yields of U.S.No.1 grade fruits per plant. Because the individual plant yields are greatly influenced by spacing, yields per square foot of greenhouse area are also reported. Yields per square foot can be compared with results of similar tests made elsewhere. They provide a standard by which potential growers may predict yields that might be grown in their own greenhouses.

Yields alone are not as important in determining the best variety for growing in Alaska as they are for areas where commercial greenhouse culture is a primary objective. In Alaska, there are only a few small commercial greenhouses operated as businesses. On the other hand, there are probably more small home-operated greenhouses in Alaska in proportion to population than in any other part of the United States. Most of these are small structures, where families grow tomatoes, a few cucumbers and other salad crops for home use. Under such circumstances qualities other than yield often determine which varieties are grown. For this reason, brief descriptions are given for some of the more outstanding varieties tested.

Least significant difference values for judging differences in means are listed, except for 1953 when the planting was made only for observational purposes.

Other comparisons are offered by the standard error of the mean (S_x). Degree of freedom for error mean squares ($df(E_{ms})$) are also provided for use with Duncan's multiple range test. An example of this method is given in the evaluation of leaf mold infection in the 1957 test (Table 3).

1949. - The 1949 variety test was accomplished in a bench-type greenhouse. Plants were spaced 17 x 17 inches apart, giving each plant two square feet. Four applications of a 5-10-5 fertilizer were made during the growing season, at the rate of

one pound per 100 square feet. The bench had previously received an application of well-rotted horse manure equivalent to one-fourth of the soil volume.

All plants were pruned to one stem and topped at about six feet. The harvest period extended from August 1 to October 21, or 81 days. The experimental design was a simple lattice, limited to two replication by lack of space.

A general observation concerning this year's test is that individual plant yields were low compared to those of later tests. Yields of U.S. No.1 grade fruits per square foot was normal, or even somewhat above the average. This was due to close spacing, reduced individual plant yields but giving about the same yield per square foot as wider spacings used in later tests.

The variety *Bonny Best* was used as a standard (or check) variety in all comparisons. In this test it yielded an average of 3.8 pounds of U.S. No.1 fruits per plant. To be significantly different from it, other varieties must yield an average of 2.4 pounds more, or 2.4 pounds less. By this standard no other variety was significantly different in individual plant yield.

Similarly an L.S.D. value of 1.2 pounds shows no other variety was better or worse in yield per square foot of space.

The greatest difference between total yield and yield of U.S.No.1 grade was observed in the variety *Danmark*. The greater difference between grades in this case is due

Table 1.- Yields of tomato varieties, 1949 and 1953 to 1958

Varieties	Total	US No. 1			
	yield	Yield	Yield	Fruit	Size
	per	per	per	per	of
	plant	plant	sq ft	plant	fruits
	Pounds	Pounds	Pounds	Number	Ounces
1949 (Harvest period 81 days)					
Northern Hybrid	6.3	5.9	2.9	21.1	4.4
Spartan Hybrid	5.5	5.4	2.7	17.1	5.1
Burpee Big Boy	4.9	4.9	2.5	11.5	6.9
Globe Strain "A"	4.5	4.4	2.2	12.3	5.7
Burpee Hybrid	4.1	4.1	2.1	11.8	5.6
Burpeeana Early Hybrid	4.4	4.1	2.0	17.1	3.8
Bonny Best	4.3	3.8	1.9	14.4	4.3
Morhio	3.7	3.5	1.8	12.5	4.5
Comet	3.8	3.4	1.7	13.1	4.1
Danmark	4.8	3.4	1.7	18.1	3.0
Break O'Day	3.4	3.3	1.7	9.3	5.7
Waltham Forcing	3.8	3.3	1.6	16.5	3.2
Significant difference 5%	-	2.4	1.2	-	-
1953 (Harvest period 74 days)					
Spartan Hybrid	8.4	7.1	1.9	18.1	6.3
Burpee Hybrid	7.8	6.9	1.8	20.0	5.5
Selandia	7.4	6.5	1.7	20.7	5.0
Northern Hybrid	6.6	6.5	1.7	19.9	5.2
Foremost E-21	6.6	6.3	1.7	14.7	6.9
Washington Forcing	7.2	6.1	1.6	19.2	5.1
Trellis Hybrid	8.0	5.9	1.6	19.6	4.8
Bonny Best	6.7	5.7	1.5	15.6	5.8
Ideal Forcing	6.2	4.9	1.3	16.2	4.8
Early Hybrid	6.1	4.9	1.3	13.9	5.6
Comet	6.0	4.7	1.3	15.9	4.7
Waltham Forcing	5.9	4.3	1.1	15.0	4.5
Danmark	5.9	2.8	0.7	10.6	4.2
1954 (Harvest period 107 days)					
Spartan Hybrid	14.9	13.1	3.5	32.1	5.5
Burpee Big Boy	13.7	13.0	3.4	25.0	7.9
Bonny Best	13.8	12.1	3.2	31.1	5.2
Globe A Forcing	12.1	11.2	3.0	24.1	6.7
Burpee Hybrid	12.2	10.9	2.9	27.3	5.3
Globelle Forcing	11.8	10.2	2.7	25.3	5.5

1954 Continued

Northern Hybrid	12.8	10.1	2.7	30.3	4.0
Foremost E-21	10.3	9.1	2.4	20.9	5.6
Selection #1	9.8	8.7	2.3	22.4	5.2
Selection #2	9.9	8.6	2.3	22.7	5.3
Washington Forcing	11.4	8.5	2.3	26.6	4.0
Waltham Forcing	12.1	8.5	2.2	27.5	3.9
Ideal Forcing	11.4	8.3	2.2	25.9	3.9
Marglobe Certified	9.5	8.0	2.1	22.4	4.7
Rutgers	8.6	7.7	2.0	19.4	5.5
Selandia	10.5	7.2	1.9	22.6	3.7
Best of All	10.2	6.7	1.8	21.3	3.6
Danish Export	7.4	1.9	0.5	63.9	1.7
Significant difference 5%	2.1	2.3	0.6	-	-

1955 (Harvest period 101 days)

Burpee Big Boy	13.2	9.4	2.3	20.4	7.4
Michigan-Ohio	13.7	9.4	2.3	29.2	5.1
Spartan Hybrid	11.4	8.3	2.1	24.5	5.4
Livingston Globe	11.4	8.1	2.0	21.1	6.2
Fordhook Hybrid	13.0	8.1	2.0	31.0	4.2
Globe A Forcing	10.7	7.6	1.9	20.7	5.9
Michigan State	10.2	7.5	1.9	22.6	5.3
Clinton Hybrid	9.9	7.3	1.8	21.4	5.5
Northern Hybrid	10.4	6.9	1.7	25.6	4.3
Bonny Best	11.0	6.7	1.7	23.2	4.6
Marhio	9.9	6.6	1.6	22.9	4.6
Tendear	8.6	6.5	1.6	20.0	5.2
Washington Forcing	9.5	6.3	1.6	25.6	3.9
Waltham Forcing	8.7	6.2	1.5	24.7	4.0
Globelle Forcing	9.3	5.7	1.4	18.4	4.9
Kondine's Red	7.8	4.6	1.1	20.1	3.7
Significant difference 5%	2.7	2.1	0.5	-	-

1956 (Harvest period 56 days)

Michigan-Ohio	7.1	5.7	1.4	18.4	4.9
Burpee Big Early Hybrid	6.9	5.6	1.4	16.7	5.4
Fordhook Hybrid	7.3	5.3	1.3	19.5	4.4
Globe A Forcing	5.9	5.1	1.3	15.3	5.3
Burpee Big Boy	6.0	4.9	1.2	13.1	6.0
Burpee Hybrid	5.4	4.5	1.1	14.2	5.0
Stokescross #1	5.4	4.5	1.1	14.6	4.9
Northern Hybrid	6.4	4.4	1.1	17.6	4.0
Moreton Hybrid	5.3	4.4	1.1	14.5	4.9
Bonny Best	5.8	4.0	1.0	13.9	4.6

1956 Continued

Early Hy-Cross Hybrid . . .	5.8	3.8	1.0	14.4	4.2
Early Hybrid	6.0	3.8	1.0	13.8	4.4
Tuckqueen	5.4	3.0	0.8	12.1	4.0
Weibull's Immuna	6.8	2.8	0.7	12.4	3.6
Vagabond	4.9	1.9	0.5	7.6	3.9

Significant difference 5% 1.0 1.2 0.3 - -

1957 (Harvest period 60 days)

Michigan-Ohio	10.7	10.4	2.6	33.6	5.0
Weibull's Immuna	10.6	10.1	2.5	52.3	3.1
Burpee Big Early Hybrid	10.6	9.8	2.4	27.1	5.8
Spartan Hybrid	10.1	9.7	2.4	33.3	4.7
Moreton Hybrid	9.3	8.9	2.2	28.2	5.1
Fordhook Hybrid	9.9	8.6	2.1	35.3	3.9
Vagabond	8.2	7.3	1.8	37.1	3.2
Stokescross #1	7.6	7.3	1.8	24.1	4.9

Bonny Best 7.7 7.1 1.8 26.8 4.2

Stokescross #4 7.2 6.6 1.7 20.8 5.1

Selandia 7.2 6.4 1.6 29.9 3.5

Vulcan 7.2 6.4 1.6 28.9 3.5

Vinequeen 7.0 6.4 1.6 24.0 4.3

Manalucie 6.4 6.3 1.6 17.4 5.8

Burpee Sunnybrook 6.3 6.0 1.5 18.6 5.2

V-121 6.5 5.9 1.5 30.3 3.1

Significant difference 5% 1.1 1.1 0.3 - -

1958 (Harvest period 80 days)

Early Hybrid	11.8	11.4	2.7	37.0	4.9
Burpee Big Early Hybrid (B)	11.3	10.5	2.5	24.0	7.0
Burpeeana Early Hybrid	10.1	9.6	2.3	33.3	4.7
Burpee Big Boy	9.5	9.2	2.2	20.0	7.4
Faribo Hybrid "E"	9.4	9.1	2.1	25.5	5.6
Winter Smooth Skin	9.3	8.9	2.1	46.3	3.1

Spartan Hybrid 9.4 8.7 2.0 27.3 5.1

Firesteel 9.4 8.6 2.0 23.8 5.8

Faribo Hybrid "SE" 8.8 8.5 2.0 25.3 5.5

Vulcan 8.8 8.4 2.0 32.5 4.1

Vaughan Hybrid 8.6 8.4 2.0 29.8 4.5

Burpee Hybrid 8.1 8.0 1.9 19.3 6.7

Big Early Hybrid (A) 8.8 7.9 1.9 21.5 5.8

Northern Hybrid 8.5 7.8 1.8 31.0 4.0

Vinequeen 7.9 7.8 1.8 25.0 5.0

Bonny Best 8.2 7.7 1.8 27.0 4.5

1958 Continued

Rhode Island Early . . .	7.6	7.2	1.7	25.8	4.4
Faribo Hybrid "M"	7.7	7.1	1.7	20.3	5.7
Manalucie	7.3	7.0	1.7	14.5	7.5
Tuckqueen	7.2	6.9	1.6	26.3	4.3
Improved Crackerjack . .	8.1	6.7	1.6	44.8	2.4
V-121	6.7	6.0	1.4	28.3	3.4
Wiltmaster	6.1	6.0	1.4	20.3	4.8
Stokescross #4	6.2	5.9	1.4	19.3	5.0
Monarch	6.2	5.8	1.4	22.3	4.3
Hot Springs	6.2	5.4	1.3	15.8	5.4
Significant difference 5%	1.6	1.6	0.4	-	-

Other statistical indices of variability for Table 1 data

Year	1% LSD* U.S. No. 1 per sq ft	Total yield S \bar{x}	U.S. No.1 yield S \bar{x}	Degree of freedom (E _{ms})
1949	1.7	-	0.78	11
1954	0.8	0.74	0.82	51
1955	0.7	0.94	0.72	45
1956	0.4	0.36	0.40	42
1957	0.4	0.38	0.38	45
1958	0.5	0.55	0.53	25

to the small size of Danmark fruit, many of which were below the size standard for U.S.No.1 grade.

1953.- In 1953 all tomato varieties were evaluated in a new, bed-type greenhouse on new soil. The planting was largely for observational purposes and so was not designed for statistical analysis of data. Because standard cultural and harvesting methods were employed, the results are presented to supplement

those of later, more formal tests. They are also valuable as showing what results may be expected when growing tomatoes in new greenhouse soil.

This soil was a very light sandy loam. To improve its water-holding capacity, an application of pulverized peat moss, at the rate of 25 pounds per 100 square feet was mixed into the bed before the plants were set. In addition, fertilizer (equivalent to an 8-28-16 formula)

was applied at the rate of 2 pounds per 100 square feet. After the plants started fruiting, two side dressings of the same fertilizer were applied at the rate of a half pound per 100 square feet.

Plants were spaced 16 x 34 inches apart in the beds in single, eight-plant plots. They were trained to one stem, and topped at a height of 7 1/2 feet. The harvest extended from July 28 to October 10, or 74 days. While close comparisons of varieties are not possible in a planting such as this, general comparisons of varietal yields with those obtained in subsequent tests are helpful.

Despite a short harvest period, the yields of Spartan Hybrid, Northern Hybrid and others, together with the check variety, Bonny Best, did not greatly differ from those obtained in other tests of similar duration. Although most greenhouse soils are normally expected to improve with age, these results indicate that new soil is not a serious handicap when it is well-fertilized and properly handled.

1954. - During 1954 the experimental design was a randomized complete block with four replications of four plants each. Plants were spaced 16 x 34 inches apart, providing 3.78 square feet of bed area per plant. They were set on low ridges, allowing furrow irrigation between rows. All plants were pruned to a single stem and topped at 7 1/2 feet.

Two pounds of 5-10-5 fertilizer and 25 pounds of pulverized peat moss were worked into the bedding soil before the plants were set.

Three side dressings of half a pound of fertilizer per 100 square feet were applied during the harvest season. Harvest extended from July 12 to October 27 or 107 days.

In this test a difference of 2.3 pounds per plant in yield of U.S. No.1 grade fruit is required to establish significance at the 5 per cent level. By this standard no variety yielded significantly more than the check, Bonny Best. Foremost E-21 and other varieties with still smaller yields may be presumed to have yielded significantly less.

A similar comparison, using the value 2.1 pounds, can be made for total yields per plant. In this comparison, the yield of Waltham Forcing is not significantly less. This indicated that a greater proportion of its fruits were of U.S. No.2 and cull grades.

Danish Export deserves a special note for growers who prefer many smaller fruits rather than fewer large ones. It produced an average of 63.9 fruits per plant. Fruits averaged 1.7 ounces in weight. Their small size places most of them in U.S.No.2 grade, and accounts for the comparatively low production of U.S.No.1's. All of its fruits are exceptionally smooth and uniform in shape. They are preferred to large tomatoes by many Europeans.

1955. - A randomized complete block design compared 16 varieties, set in four replications of four plants each. Management and cultural procedures did not deviate in essential detail from those of the 1954 test. The harvest period extended from July 18 to October 27, for 101 days.

In this test a difference of 2.1 pounds is required to establish significance among varieties in the yields per plant of U.S.No.1 grade tomatoes at the 5 per cent level. From this it is evident that Burpee Big Boy and Michigan-Ohio Hybrid yielded significantly more than the check variety, Bonny Best. Only Kondine's Red yielded significantly less than the check.

Comparing the total weights per plant, a difference of 2.7 pounds is required for significance. Only Michigan-Ohio Hybrid yielded significantly more, while only Kondine's Red yielded less.

Of this test in general it may be noted that although total yields are not greatly inferior to those of the preceding year (1954), yields of U.S.No.1 grade are considerably smaller. Eight varieties (Bonny Best, Burpee Big Boy, Globe A Forcing, Globelle Forcing, Northern Hybrid, Spartan Hybrid, Washington Forcing and Waltham Forcing) are common to the 1954 and 1955 tests.

A comparison of their combined total weights for the two years shows the 1954 yields to be 18.4 pounds greater. A similar comparison of U.S.1 fruits shows a larger difference of 29.6 pounds in favor of the 1954 yields. It is thus evident that in 1955 a considerably greater proportion of total yields were graded into the U.S.No.2, or cull grades, largely for the reasons of blotchy ripening, blossom end rot, "cat-faced" fruits and radial cracking. Because the first of these defects, at least, is commonly associated with high or excessive nutrition (especially with high nitrogen), it is concluded that the accumulation of nutrients in the soil from the previous crop years, plus applications of the current year, were in excess of needs.

There is also the possibility of some change in grading standards, but since blotchy ripening had not previously been encountered to any considerable extent, it would seem that high nutrition was the most probable cause of differences. This conclusion was further supported by excessive vigor displayed by all plants, and a profusion of suckering. Most varieties were severely infected with leaf mold late in the season and this, too, may have also reduced yields.

1956.- Fifteen varieties were again evaluated in a randomized complete block design, with four replications of four plants each. A 3-12-6 fertilizer was applied at the rate of 6 pounds per 100 square feet of bed space, before the plants were set. This is a somewhat heavier application than is now recommended. In combination with a rather high residual supply in the soil, it may have had a depressing effect on the yields. An unavoidable delay in setting the plants in the house, and the early onset of cold weather cut down the harvest period to 56 days, from August 23 to October 18. This is only about half of the harvest period for the two preceding years.

In this test 1.2 pounds per plant was found to be a significant dif-

ference between yields for the U.S. No.1 grade. Thus Michigan-Ohio Hybrid, Burpee Big Early Hybrid and Fordhook Hybrid all yielded significantly more than the check, Bonny Best. Weibull's Immuna and Vagabond gave significantly less.

In total yields per plant, using the value 1.0, Michigan-Ohio Hybrid, Burpee Big Early Hybrid and Fordhook Hybrid yielded significantly more than Bonny Best, and none significantly less.

Although leaf mold was severe on most varieties during the latter season, it was noted that Weibull's Immuna displayed little injury from the disease. Vagabond also seemed highly resistant.

1957.- Sixteen varieties were evaluated in a 4x4 lattice design with four plants per plot. All of the plants were spaced 18 x 34 inches apart, pruned to one stem, and then topped at 7 1/2 feet.

Soil tests showed a high residual nutrient content from previous cropping, so no fertilizer was applied prior to planting, but a starter solution was used in setting. Later in the season, soon after the first fruit set, an 8-24-12 fertilizer was applied at the rate of 3 pounds per 100 square feet of bed space. A single side dressing, at half of the above rate, was made later in the harvest period. It proved to be excessive, as shown later by abnormal vegetative growth. The harvest extended from August 9 to October 8, or 60 days.

A difference in the yields of 1.1 pounds of U.S.No.1 grade fruits per plant is required for significance at the 5 per cent level. From this, it is evident that six varieties (Michigan-Ohio, Burpee Big Early Hybrid, Weibull's Immuna, Spartan Hybrid, Moreton Hybrid and Fordhook Hybrid) gave significantly more than the check variety, which was Bonny Best. Burpee Sunnybrook and V-121 yielded significantly less. The same six varieties also produced greater total yields per plant but none gave significantly less.

High incidence of leaf mold in plantings of the previous two years,

and losses reported by many private growers from its effects, led to the inclusion of six leaf mold resistant varieties in this test. These were V-121, Vinequeen, Vulcan, Manalucie, Vagabond, and Weibull's Immuna. (Vagabond was subsequently withdrawn from the trade by its originators in favor of Vinequeen). Yield records were kept on these varieties and are included in table 1. An evaluation of their resistance to leaf mold (Cladosporium fulvum) is presented in Table 3.

1958.- This planting was made somewhat as a confirmation of previous tests. It contained several varieties from former years, and a few varieties new to the series. Because of the large number involved, they were planted in complete randomized blocks, with only two replications of four plants each.

Plants were spaced 18" x 34", pruned to one stem and topped at 7 1/2 feet. An 8-28-16 fertilizer mix was

applied at the rate of 1 1/2 pounds per 100 square feet and worked well into the bed before the transplants were set. A subsequent sidedressing at half this rate was made later in the fruiting season. Harvest extended from August 1 to October 20, for 80 days.

In this test a difference of 1.6 pounds of U.S.No.1 fruit per plant is required for significance at the 5 per cent level. Only three varieties (Early Hybrid, Burpeeana Early Hybrid and Burpee Early Hybrid) yielded significantly more than the check variety, Bonny Best, whereas V-121, Wiltmaster, Stokescross # 4, Monarch and Hot Springs yielded significantly less. Practically the same comparison holds true for total yields per plant, except for the variety V-121, the yield of which was significantly less. There was an almost total absence of leaf mold in the greenhouse this year, and so no further evaluation of resistance could be made.

RECOMMENDED VARIETIES

Burpee Big Early Hybrid.- This variety is attractive to many home growers for its large, firm-fleshed fruits, its earliness of maturity and high yields. Its average total yield for the three years it was under test was 9.6 pounds per plant, of which 8.6 pounds were of U.S.No. 1 grade. Average fruit weight was 6.1 ounces. Fruit size was somewhat variable, but well-maintained during the entire season.

Mottling and rolling of leaves, common to most varieties in Alaska, was relatively light, and confined mostly to the lower portions of the plants. Its greatest defect from the standpoint of the home grower is its susceptibility to leaf mold. It should not be grown where this disease is known to occur.

Burpee Big Boy Hybrid.- Though not generally recommended, this variety is rather commonly grown in private greenhouses in Alaska where leaf

mold is not a factor. In many respects it resembles the previous variety, but is about a week later in maturity. Its fruits also averaged an ounce more in weight. Perfect fruits weighing 12 or more ounces were not uncommon.

All plants were exceptionally vigorous and large. This is a disadvantage where grown in low-roofed small houses. The variety is susceptible to leaf mold. "Catfaced" fruits are rather common.

Michigan-Ohio Hybrid.- This variety is considered one of the best for greenhouse culture in Alaska. Its fruits are medium to large in size, remarkably smooth, and uniform in size and shape. They have thick walls and firm flesh of excellent flavor. The fruit ripens uniformly even under conditions of high soil nutrition causing uneven, blotchy ripening in many other varieties. With early to mid-season maturity,

total yields averaged 9.7 pounds per plant and 8.1 pounds of U.S.No.1 grade. Average fruit weight was 5.3 ounces.

Plants are vigorous, though not excessively large. Leaves show only average rolling and mottling. This variety's only serious defect is a susceptibility to leaf mold. Though showing less damage than some other varieties (table 3), it should not be grown where the disease is known to occur.

Spartan Hybrid.- This variety ranks among those recommended for greenhouse production in Alaska. Total plant yields averaged 10.6 pounds, with 8.7 pounds of U.S.No.1. Average fruit weight was 5.4 ounces. Fruits are attractive in shape and color. They displayed only a small degree of blotchy ripening.

Plants were vigorous, average to light in leaf mottling and rolling, which was largely confined to the lower portions of the plants. Spartan Hybrid was second-early in maturity. Aside from being susceptible to leaf mold, perhaps its greatest failing was the somewhat high production of "catfaced" fruits, and lack of firmness in their outer walls. Some critics consider its flavor to be rather acid, or lacking the richness of the preceding varieties.

Manalucie.- This variety was tested only two years. It is recommended because of its resistance to leaf mold, and for the smoothness, uniformity and quality of its fruits. Average yield for the two years was 6.9 pounds per plant, and 6.7 pounds of U.S.No.1 grade. Average fruit weight was 6.7 ounces.

Plants were vigorous, but easily trained to one stem, and had rather short internodes. Leaf rolling and mottling was slight, and on lower portions of the plants. Rated as almost entirely free of leaf mold, it is about two weeks later maturing than Big Early Hybrid.

V-121.- This was placed on the list of the recommended varieties mainly because of its resistance to leaf

mold. Fruits are rather small, averaging 3.3 ounces, and were rather irregular in shape, and frequently rough at the stem and yields averaged 6.6 pounds per plant, and 5.9 pounds for U.S.No.1 grade. It was midseason in maturity. Plants were vigorous, dark green in color, and free from leaf mold.

Vinequeen.- Like the preceding variety, this one is recommended for greenhouse culture in Alaska largely because of its resistance to leaf mold. It is somewhat superior to V-121 in yield, and in size and in smoothness of fruit. Total yields averaged 7.5 pounds per plant, with 7.1 pounds of U.S.No.1 grade. Average fruit size was 4.7 ounces.

Midseason in maturity, vines are exceptionally large and vigorous. It might be troublesome in small, low-roofed greenhouses except for its rather short internodes. Vinequeen showed complete resistance to leaf mold.

Vulcan.- This is the third in the series of medium to small-fruited, leaf mold resistant varieties. Its fruits averaged 3.8 ounces in weight, slightly larger than those of V-121. They were rather rough around the calyx end, and many were uneven or blotchy in ripening. Total yields averaged 8.0 pounds per plant, of which 7.4 pounds were of U.S.No.1 grade. It is midseason in maturity.

The vines were only medium in vigor and showed considerable leaf rolling and mottling. There was no evidence of leaf mold. Vulcan is another variety recommended where this disease is a factor.

Weibull's Immuna.- This variety was developed in Sweden for resistance to leaf mold and ability to set fruits at rather low temperatures. These tests showed both objectives were achieved to a high degree. The fruits were somewhat small by U.S. standards, averaging 3.4 ounces for the three years it was tested, but they were smooth, satisfactorily firm-fleshed and usually had either three or four locules per fruit. It yielded an average of 8.7 pounds

per plant, with 7.1 pounds of U.S. No.1 grade. It is early to mid-season in maturity, in season, with Michigan-Ohio and Bonny Best.

Plants are vigorous and produce rather light green leaves. Some leaf mold lesions were found on the leaves, but these did not spread

and seemed to have little, if any, effect on yield. It can be recommended for greenhouse culture in Alaska, especially where leaf mold is a factor, and where it is difficult or impossible to supply supplemental heat in the early spring or in late fall.

FERTILIZER PRACTICES

A fertilizer study was conducted in 1958 to discover the response of tomatoes to varying rates of nitrogen and potash, applied to greenhouse soils. The test design was a 2² factorial, with two varieties in a split-plot arrangement.

The two varieties were Michigan-

Ohio Hybrid and Weibull's Immuna. These were selected as contrasting in fruit size, susceptibility to leaf mold, and in tolerance to low temperatures for fruit setting. The rates of nitrogen application were 41 and 82 pounds per acre. Potash was spread at 68 and 136 pounds.

Table 2. - Response of tomatoes to different rates of nitrogen (N) and potash (K = K₂O), 1958

Variety	N ₀ K ₀	N ₁ K ₀	N ₀ K ₁	N ₁ K ₁	Average	L.S.D. 5%*
Means for total yield/pounds per plant						
Weibull's Immuna	8.95	8.58	8.37	9.17	8.77	1.73
Michigan-Ohio	7.45	7.89	6.81	7.14	7.32	
Average	8.20	8.24	7.59	8.16	--	
Means for U.S. No. 1/pounds per plant						
Weibull's Immuna	8.28	8.14	8.04	8.76	8.31	1.82
Michigan-Ohio	7.25	7.57	6.57	6.87	7.07	
Average	7.77	7.86	7.31	7.82	--	
Means for U.S. No. 1/pounds per square foot						
Weibull's Immuna	2.07	2.04	2.01	2.19	2.02	0.46
Michigan-Ohio	1.81	1.89	1.64	1.72	1.77	
Average	1.94	1.97	1.83	1.96	--	
Means for U.S. No. 1/number fruits per plant						
Weibull's Immuna . . . . .	.36.08	37.92	36.96	38.29	37.31	6.13
Michigan-Ohio . . . . .	.21.83	22.63	19.46	20.96	21.22	
Average . . . . .	.28.96	30.28	28.21	29.63	--	
U.S. No. 1/weight of fruits in ounces						
Weibull's Immuna	3.66	3.43	3.46	3.23	3.45	
Michigan-Ohio	5.32	5.35	5.39	5.24	5.33	
Average	4.49	4.39	4.43	4.24	--	

*Least significant difference

These treatments and rates are summarized as follows:

Treatments	Pounds/acre	Formula
N ₀ K ₀	41-203-68 . .	4-28-8
N ₁ K ₀	82-203-68 . .	8-28-8
N ₀ K ₁	41-203-136 . .	4-28-16
N ₁ K ₁	82-203-136 . .	8-28-16

The varieties were planted in the greenhouse in alternate rows of 8 plants each. A treatment plot consisted of four rows, of which the outer two served as buffers and the inner two on which data were taken. Thus the two varieties were directly compared in each treatment. Three replications were involved.

Fertilizers were spread and well worked into the soil before transplants were set. Plants were spaced 18x 32 inches providing four square feet per plant. They were pruned to one stem, and topped at 7½ feet. Watering was facilitated by shallow, permanent furrows between the rows. Table 2 presents the data.

Analysis of the results shows that Immuna exceeded Michigan-Ohio in total yields, but the difference between them in production of U.S.

No.1 grade fruits per plant and per square foot was not significant. This difference in proportionated grade-out was caused by the smaller fruit size of Immuna, many of which failed to meet the arbitrarily set weight limit of the U.S.No.1 grade although otherwise remarkably free of defects.

Immuna also exceeded Michigan-Ohio in number of U.S.No.1 fruits per plant, with an average of 37.3 as compared with 21.2. The average fruit weight for Michigan-Ohio was 5.3 ounces, as compared to 3.5 ounces for Immuna.

Differences in N and K₂O fertilizer rates did not give differences in total or commercial yields, number of fruit per plant or weight of individual fruits. This failure of the plants to respond to different levels of nutrition can be attributed to the general high level of fertility of the soil before the fertilizers were applied. This conclusion is supported by soil tests made at that time, and also by later tests, which indicated that there was no lack of either nitrogen or potassium at any time.

LEAF MOLD RESISTANCE

Although the 1957 study was to evaluate varieties for production and fruit quality, several leaf mold resistant varieties were also planted. These were to evaluate the effects of leaf mold (Gladosporium fulvum) on production providing the disease should become epidemic as in 1955 and 1956. Normal cultural practices were followed, and yield records were collected.

By August, natural infection by leaf mold was severe on all non-resistant varieties. An evaluation was made at this time of the damage done to each variety, using numerical values of 1 to 5, with 1 indicating no infection, and 5 severe damage. The data are presented in table 3.

None of the resistant varieties (V-121, Vinequeen, Vulcan, Vagabond, Manalucie, nor Weibull's Immuna) showed any appreciable damage from leaf mold. A possible exception was Weibull's Immuna. This variety appeared to have been infected by the fungus at numerous places on the leaves, but did not continue to develop and no sporulation was evident.

Evaluations used in this study were based purely on visual observations of the gross effects of the disease on the host. These included not only the degree of infection (numbers of lesions) but also of necrosis and chlorosis of tissues outside the limits of the lesions.

There were statistically significant differences between varieties

Table 3.- Evaluation of leaf mold infection by Duncan's range test

Varieties	Average rating
V-121	1.00
Vinequeen	1.00
Vulcan	1.00
Manalucie	1.07
Vagabond	1.07
Weibull's Immuna	1.66
Selandia	2.75
Michigan-Ohio	3.19
Burpee Sunnybrook	3.44
Stokescross #4	3.50
Spartan Hybrid	3.57
Stokescross #1	3.66
Fordhook Hybrid	3.79
Bonny Best	3.88
Burpee Big Early Hybrid	4.07
Moreton Hybrid	4.25
Significant difference	
5% . . . . .	.0.015
1% . . . . .	.0.020

of the susceptible group. Extent of damage caused by leaf mold indicates that degrees of tolerance exists, even in those varieties generally considered completely susceptible. Whether there is any actual differences in susceptibility between the last ten varieties shown in table 3 is questionable.

On the basis of the gross effect of the disease, the varieties fall into two general groups. Fordhook Hybrid, Stokescross #1, Bonny Best, Burpee Big Early Hybrid, and Moreton Hybrid not only showed a high degree of infection but also severe injury to the plants. Selandia, Michigan-Ohio Hybrid, Burpee Sunnybrook, Stokescross #4 and Spartan Hybrid comprise a group which sustained somewhat less injury, even though severely infected.

SUMMARY

➔ Where leaf mold disease can be ignored or controlled, Burpee Big Early Hybrid, Michigan-Ohio Hybrid and Spartan Hybrid are recommended as the best tomato varieties for greenhouse culture in Alaska.

➔ Where leaf mold is common, resistant varieties such as Manalucie, V-121, Vinequeen, Vulcan or Wiebull's Immuna are recommended. Resistant varieties are usually later and yield less fruit than the above-listed hybrids.

➔ On new greenhouse soils, an application of $1\frac{1}{2}$ pounds or pints of an 8-28-16 or 10-20-10 fertilizer for each 100 square feet of bed or bench space is recommended. On old greenhouse soils heavily fertilized in previous years half of this quantity is usually sufficient.

➔ After plants start fruiting they may be side dressed once or twice with the above fertilizers, at the rate of $\frac{1}{2}$ pound or pint per 100 square feet of bed or bench area. Heavier applications may cause excessive growth and poor ripening of fruit.

➔ Spacings of 18 x 34 inches or 18 x 36 inches are best for plants pruned to one stem. Where leaf mold is common wider spacing (24 x 36 or 30 x 36 inches) helps keep the foliage dry by promoting improved circulation around all plants. Spores of leaf mold fungus germinate poorly in dry, warm conditions.

➔ Pollination is most easily and effectively obtained by gently tapping all flower clusters two or three times each week, with the hand or a small stick such as a pencil. So-called "fruit setting" sprays have depressed fruit set in Alaska, and have injured plants where applied to rapidly growing, tender tops.

