TOMATOES-

varieties and culture for Alaska greenhouses

D. H. Dinkel horticulturist

Fantastic Hybrid, a new introduction, has proved very satisfactory for summer greenhouse culture in Alaska. High quality, attractive fruit has a good shelf life.

University of Alaska
ALASKA AGRICULTURAL EXPERIMENT STATION
Cooperating with
AGRICULTURAL RESEARCH SERVICE, U. S. DEPARTMENT OF AGRICULTURE

Bulletin 38
March 1966

CONTENTS

SINCE 1949 considerable effort has been expended in finding tomato varieties satisfactory for summer production under glass in Alaska. At the same time needed cultural practices were developed from experience. These studies were focused chiefly on the demands of small, home-operated greenhouses, of which a great number have from time-to-time existed in the State. In late 1965 a large commercial greenhouse, planned for year-round production, started operations in the Kenai Peninsula. Little or no experience has accumulated in Alaska about winter production of fruit in such a structure. Information on adapted summer varieties may or may not prove helpful.

Between 1949 and 1958, the summer performance of 58 tomato varieties was compared in glasshouses at Matanuska and Palmer (1)*. This publication summarizes variety comparisons accumulated then. It also presents more recent evaluations during 1964 and 1965.

Early recommendations. — Findings of early years are listed as total yields, and yields of U.S. No. 1 fruit per plant (Table 1). Because individual plant yields are greatly influenced by spacing in the bed, yields per square foot of greenhouse area are also reported. Data are averages of several years, the number of years each variety was in trial being indicated. Since supplemental heat was not available during all years and length of harvest period differed from year to year (ranging from 56 to 107 days), the values are useful only as guides. Such yields can be compared with variety tests made elsewhere. They provide standards by which growers may predict potential summer yields for their own greenhouses.

The variety Bonny Best served as a standard in all early work. To obtain a meaningful comparison of varieties, the U.S. No. 1 weight of fruit per plant for each year was divided by the U.S. No. 1 weight of Bonny Best fruit. This yearly relationship was averaged for the number of years each variety was in test. It is shown as a "yield index" in the right column of Table 1. Other varieties were tested and rejected for a great number of reasons. These are listed in Table 2.

Recent comparisons. — Variety evaluation was resumed in 1964 to investigate the potentials of several new lines appearing since 1958. The 1964 study was conducted on new soil consisting of Knik silt loam to

*Number in parentheses refer to literature cited.

Table 1.—Tomato varieties recommended (boldface) as a result of measured performance during the period 1949 to 1958, compared to three other varieties that gave promise of large yields, but of inferior quality. LMR indicates those with some resistance to leaf mold.

Variety name	Years tested	Total yield per plant	U.S. No. 1 yields — Per plant	Per sq. ft.	Per plant	Avg. size	Yield index*
	No.	Lbs.	Lbs.	Lbs.	No.	Oz.	
Bonnie Best	7	8.2	6.7	1.8	21.7	4.7	100
Michigan-Ohio Hybrid	**3**	**10.5**	**8.5**	**2.1**	**27.1**	**5.0**	**143**
Burpee Big Early Hybrid	**3**	**9.6**	**8.6**	**2.1**	**22.6**	**6.1**	**138**
Spartan Hybrid	**6**	**9.9**	**8.7**	**2.4**	**25.4**	**5.4**	**125**
Burpee Big Boy Hybrid	**5**	**9.5**	**8.3**	**2.3**	**18.0**	**7.1**	**124**
Michigan State Forcing	1	10.2	7.5	1.9	22.9	5.3	112
Burpee Hybrid	5	7.5	6.9	2.0	18.5	5.6	107
Weibull's Immuna (LMR)	**2**	**8.7**	**6.5**	**1.6**	**22.4**	**3.4**	**106**
Vinequeen (LMR)	**1**	**7.9**	**7.8**	**1.8**	**25.0**	**5.0**	**101**
Vulcan (LMR)	**2**	**8.0**	**7.4**	**1.8**	**30.7**	**3.8**	**95**
Manlucie (LMR)	**2**	**6.9**	**6.7**	**1.7**	**15.9**	**6.7**	**90**
V-121 (LMR)	**2**	**6.6**	**6.0**	**1.5**	**29.3**	**3.3**	**81**

*U.S. No. 1 weight per plant divided by U.S. No. 1 weight of Bonnie Best, the standard, for the number of years the variety was in the test.

which was added pulverized peat moss to improve water-holding capacity and organic matter content. Two pounds of fertilizer (8-32-16 formula) per 100 square feet was applied and thoroughly mixed into the bed with a rototiller. The trial was conducted in a glass greenhouse with automatic ventilation and heat. Temperatures were controlled to within a few degrees of 70°F day and night.

Seed was planted March 18, "pricked" into 4-inch plastic pots March 26, then transplanted to greenhouse ground beds on April 6, in a randomized complete block design with 4 replicates. Plants were spaced 16 x 34 inches in 4-plant plots, trained to one stem, and topped at 7 1/2 feet. After the plants started fruiting, two side-dressings of a half pound of 8-32-16 fertilizer per 100 square feet were applied.

Harvest extended from July 1 to October 7, or 99 days. Fruits were harvested when pink ripe, weighed and graded. Leaf mold was not observed in the house. *Fusarium* and *Botrytis* rots were also at a minimum. Differences between means were compared by applying Duncan's Multiple Range Test.

In 1965 the same bedding soil was again planted, after again adding more pulverized peat moss and two

pounds of 8-32-16 fertilizer per 100 square feet. Seed was planted March 23, plants "pricked" into 4-inch plastic pots April 1, and transplanted to the ground beds on April 17. Plants were spaced as in 1964, with a similar randomized complete block design. Side-dressings of a half pound of 8-32-16 fertilizer per 100 square feet were applied June 2 and June 23, and 1 pound per 100 square feet on July 8. Greenhouse air temperatures were maintained near 70°F day and night. The harvest extended from June 20 to September, or 89 days. Diseases were not evident.

The heavy side dressing on July 8 was an attempt to raise soil fertility and soluble salt content to a point where some varieties might respond unfavorably in both yields and poorer quality.

Table 3 reports total yields, yields of U.S. No. 1 fruit per plant and per square feet of area, and mean weight of U.S. No. 1 fruit for 1964 and 1965, by varieties. During 1964 the yield of U.S. No. 1 fruit was not significantly different for Burpee Big Boy, Michigan-Ohio Hybrid, Bonny Best, Fantastic Hybrid, Weibull's Immuna and Stokescross No. 1. Within this group, however, there was from 0.2 to 0.8 pounds difference in yield per square feet representing from 9,000 to 35,000 pounds of U.S. No. 1 fruit per acre.

Again in 1965 the recommended varieties (Tuckcross O, Weibull's Immuna, Fantastic Hybrid and Michigan-Ohio) differed significantly in yield of U.S. No. 1 fruit per plant only from Burpee Hybrid, Burpee Big Boy, and Delicious. Although yields again differ between

Table 2.—Rejected tomato varieties, evaluated for summer greenhouse production in Alaska (1949-1958) but found unsatisfactory in growth habit, yields, fruit quality, or other characteristics.

Best of All	**Foremost E-21**	**Selandia**
Break O' Day	**Globe A Forcing**	**Selection No. 1**
Burpee Sunnybrook	**Globe Strain "A"**	**Selection No. 2**
Burpeeana Early Hybrid	**Globelle Forcing**	**Stokescross No. 1**
Clinton Hybrid	**Hot Springs**	**Stokescross No. 4**
Comet	**Ideal Forcing**	**Tendear**
Danish Export	**Improved Crackerjack**	**Trellis Hybrid**
Danmark	**Kondine's Red**	**Tuckqueen**
Early Hybrid	**Livingston Globe**	**Vagabond**
Early Hy-Cross Hybrid	**Marglobe Certified**	**Vaughan Hybrid**
Faribo Hybrid "E"	**Monarch**	**Waltham Forcing**
Faribo Hybrid "M"	**Moreton Hybrid**	**Washington Forcing**
Faribo Hybrid "SE"	**Morhio**	**Wiltmaster**
Firesteel	**Northern Hybrid**	**Winter Smooth Skin**
Fordhook Hybrid	**Rutgers**	

Table 3.—Tomato varieties recommended as a result of performance during the 1964 and 1965 summers. Recommended variety names are printed in boldface.

Variety name	Total yield per plant	U.S. No. 1 yields— Per plant	Per sq. ft.	Per plant	Average size	Yield July 1-21
	Lbs.	Lbs.	Lbs.	No.	Oz.	Lbs.
1964 (Harvest period 99 days)						
Burpee Big Boy	17.5a	16.4a	4.3	33bc	7.9a	3.5bc
Michigan-Ohio Hybrid	15.8a	15.4a	4.1	42b	5.9bc	2.4c
Bonny Best	15.1ab	13.7ab	3.6	44b	5.0de	4.5ab
Fantastic Hybrid	14.6ab	14.2a	3.8	43b	5.3de	3.1bc
Weibull's Immuna	14.5ab	14.1a	3.7	67a	3.4f	5.6a
Stokescross No. 1	13.8b	13.3ab	3.5	43b	4.9e	4.0abc
Fairob Hybrid "M"	12.1b	11.0ab	2.9	31c	5.8bcd	2.8bc
Fireball	8.6c	7.7c	2.0	27cd	4.6e	4.5bc
Starfire	8.6c	7.0c	1.9	18d	6.3b	3.2bc
1965 (Harvest period 89 days)						
Tuckcross O	13.5a	12.0a	3.2	38b	5.1b	4.6a
Weibull's Immuna	13.5a	12.1a	3.2	55a	3.5b	4.1ab
Fantastic Hybrid	13.2a	11.8a	3.1	36bcd	5.2b	3.2abcd
Tuckcross K	13.2a	10.3ab	2.7	35bcde	4.7b	4.1ab
Michigan State Forcing	13.1a	11.2ab	3.0	33bcdef	5.4b	1.5de
Avalanche	13.0a	9.2ab	2.4	26efg	5.8b	3.1abcd
Purdue Line No. 42	12.5a	10.8ab	2.9	27defg	6.5b	1.8cde
Michigan-Ohio Hybrid	12.4a	10.9ab	2.9	31bcdef	5.6b	2.7cde
Floradel	12.3a	10.3ab	2.7	29bcdefg	5.9b	1.3de
Ohio WR-3	12.2a	10.5ab	2.8	30bcdefg	5.7b	3.4abc
MoCross Supreme	11.8a	8.8ab	2.3	33bcdef	4.3b	3.4abc
Tuckcross W	11.7a	9.0ab	2.4	37bc	3.9b	3.4abc
Delicious	11.5a	3.7c	1.0	5h	11.2a	2.0cde
Ohio WR-7	11.4a	10.2ab	2.7	26efg	6.3b	2.5bcde
Burpee Hybrid	10.7a	8.2b	2.2	27defg	4.8b	2.5bcde
Luscious Lady	10.6a	8.8ab	2.3	25fg	5.7b	2.3cde
Burpee Big Boy	10.4a	8.2b	2.2	20g	6.7b	2.1cde
Purdue Line No. 32	10.3a	9.1ab	2.4	28cdefg	5.2b	1.7cde

Means not having a common letter are significantly different at the five per cent level.

recommended varieties, the differences are not statistically significant. The generally lower yields in 1965 (as compared with 1964) are attributed in part to excessive fertilizer and in part to much less solar en-

ergy. Reduced yields in 1965 resulted from fewer fruit per plant rather than from a reduction in fruit size.

The higher level of fertilization in 1965 was especially excessive for certain varieties. Burpee Big Boy, generally one of the highest yielding varieties, was one of the most affected. Also adversely influenced by the July 8 side dressing were Ohio WR-3, Ohio WR-7, Burpee Hybrid, Michigan State Forcing, Avalanche, MoCross Supreme, Luscious Lady, Delicious and Tuckcross K. Both fruit quality and shelf-life were reduced. The quality and shelf-life of Fantastic Hybrid, Tuckcross O, Michigan-Ohio and Weibull's Immuna were least affected by the higher fertilization rate.

LEAF MOLD RESISTANCE

Data could not be obtained on leaf mold (*Cladosporium fulvum*) resistance during 1964 and 1965 because of a general lack of infection in the greenhouse. Since leaf mold is often severe in home greenhouses where supplemental heat is not available, results from early work are summarized below (1).

During 1957 a study was conducted to evaluate varieties for production and fruit quality. Included were varieties resistant to leaf mold. These were planted to evaluate the effects of this disease on production, providing it should become epidemic as in 1955 and 1956. Normal cultural practices were followed and yield records were collected.

Table 4.—Evaluation of leaf mold infection by Duncan's mulitiple range test (1)

Variety name	Average rating
V-121	1.00 a
Vinequeen	1.00 a
Vulcan	1.00 a
Manalucie	1.07 a
Vagabond	1.07 a
Weibull's Immuna	1.66 ab
Selandia	2.75 bc
Michigan-Ohio	3.19 bcd
Burpee Sunnybrook	3.44 bcd
Stokescross No. 4	3.50 cd
Spartan Hybrid	3.57 cde
Stokescross No. 1	3.66 cde
Fordhook Hybrid	3.79 cde
Bonny Best	3.88 cde
Burpee Big Early Hybrid	4.07 de
Moreton Hybrid	4.25 e

Ratings not having a common letter are significantly different at the 5 per cent level.

Natural infection by leaf mold was severe on all non-resistant varieties by August. The damage was evaluated using numerical values of 1 to 5, with 1 indicating no infection, and 5 severe damage. These data are presented in Table 4.

None of the resistant varieties (V-121, Vinequeen, Vulcan, Vagabond, Manalucia, or Weibull's Immuna) showed any appreciable damage from leaf mold. Weibull's Immuna appeared to be infected by the fungus at numerous places on the leaves, but the fungus did not

continue to develop and no sporulation was evident.

Evaluations were based entirely on visual observations of the gross effects of the disease on the host. These observations included not only the degree of infection (numbers of lesions) but also necrosis and chlorosis of tissues outside the limits of the lesions. Varieties of the susceptible group showed significant differences. Extent of damage caused by leaf mold indicates that degrees of tolerance exists, even in those varieties generally considered completely susceptible. Any actual differences in susceptibility between the last ten varieties shown in Table 4 is doubtful.

Susceptible varieties fall into two general groups. Fordhook Hybrid, Stokescross No. 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 No. 4 and Spartan Hybrid sustained somewhat less injury though severely infected.

RECOMMENDED VARIETIES

Michigan-Ohio Hybrid. — One of the best for greenhouse culture in Alaska, its fruits are medium to large, 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, which in many other varieties causes uneven and blotchy ripening. With mid-season maturity, total yields during 1964 and 1965 averaged 14.1 pounds per plant (13.1 pounds of U.S. No. 1). Average fruit weight was 5.7 ounces. A weakness of this variety is a tendency for radial cracking in the fruit. Plants 7 1/2 feet tall produced an average of 7 hands. Each had 5 to 6 fruit on the fourth hand in both 1964 and 1965.

Plants are vigorous, though not excessively large. Mottling and rolling of leaves, common to most varieties in Alaska, was average. This variety's greatest defect—from the stand point of the home grower without supplemental heat — is its susceptibility to leaf mold. Though showing less damage than some other varieties (Table 4), it should not be grown where the disease is known to occur.

Tuckcross O. — Tested only one year in Alaska, it was the highest yielder in 1965. Tuckcross O is one of the leading forcing varieties in southern latitudes. Its fruits are uniformly medium large, globe shaped, with a deep red color. The earliest variety on trial in 1965, Tuckcross O is recommended because of its early, total and high quality yield of attractive fruit. Fruit picked when red ripe still maintain a good shelf life. Total yield was 13.5 pounds per plant

(12.0 pounds of U.S. No. 1 fruit). Average fruit weight was 5.1 ounces. Plants are vigorous and sturdy. Tuckcross O resists leaf mold and *fusarium* wilt infections. It is therefore adapted to both home greenhouse culture without supplemental heat and also to commercial, heat-controlled greenhouse production.

Fantastic Hybrid. — This variety, a recent introduction, was tested for two years. It is recommended because of its high yield of attractive, high quality, red fruit that ripens evenly and has good shelf life. Average fruit weight was 5.3 ounces. Fruits have thick walls and firm flesh, and are of excellent flavor. This variety has shown the least susceptibility to blotchy ripening of any variety tested. Quality is excellent even under conditions of high fertilization. Total plant yields averaged 13.9 pounds (13.0 pounds of U.S. No. 1 fruits). Average fruit weight was 5.3 ounces.

Plants are vigorous, though not excessively large. Leaves show only mild rolling and mottling. Fantastic Hybrid is not reported to be leaf mold resistant. Plants produced an average of 8 hands per 7 1/2 feet of height ,and had 6 to 7 fruits on the fourth hand.

Weibull's Immuna.—Developed in Sweden for resistance to leaf mold and ability to set fruit at low temperatures, tests in Alaska confirm that both objectives were achieved to a high degree. Later tests show that it is also one of the best varieties for summer production in heated glass houses for this latitude. First and second respectively in early yield in 1964 and 1965, it has an average total yield of 14.0 pounds per plant (13.1 pounds of good flavored, red U.S. No. 1 fruit). This variety's greatest fault is its somewhat small fruit size by U.S. standards. Average fruit size was 3.5 ounces.

Plants are early in maturity and produce about 8 hands per 7 1/2 feet of height, with an average of 10 fruit on the fourth hand.

OTHER VARIETIES

Burpee Big Boy Hybrid. — Though not generally recommended, this variety is rather commonly grown in home greenhouses in Alaska where leaf mold is not a factor and where large fruit are desired. Perfect fruit weighing 12 or more ounces are not uncommon. Yields are high with an average total yield in 1964 and 1965 of 14 pounds per plant (12.3 pounds of U.S. No. 1 fruit). Fruit size is variable with an average weight of 7.2 ounces.

All plants are exceptionally vigorous and large. This variety is susceptible to leaf mold. "Catfaced" fruits are rather common. The variety is late in maturing and does not withstand high rates of fertilization necessary for top yields.

Burpee Hybrid. — Although not recommended, it is grown to some extent in greenhouses in Alaska. Yields are less than for many varieties, with an average total weight of 10.7 pounds of fruit per plant (U.S. No. 1 weight of 8.2 pounds).

This variety does not withstand heavy rates of fertilization necessary for highest yields. With high soil nutrition, fruit were blotchy ripening, watery, and of poor flavor and texture. "Catfaces" are not uncommon. A fair yield of attractive, red fruit are obtained where highest yields are not demanded. It is susceptible to leaf mold.

Ohio WR-7 and Ohio WR-3. — These pink fruited forcing varieties are not grown in greenhouses in Alaska, nor were they rated high in test here. The total yield of WR-7 in 1965 was 11.4 pounds per plant (10.2 pounds of U.S. No. 1 fruit). The total yield of WR-3 in 1965 was 12.2 pounds per plant (10.5 pounds of U.S. No. 1 fruit). Fruit were soft and did not ripen well at high rates of fertilization.

Michigan State Forcing. — This variety is grown in other climates and areas successfully. Here the quality was less than desired. Evaluations of fruit of this variety showed poor shelf life and low quality. Total yield was 13.1 pounds per plant (11.2 lbs. of U.S. No. 1).

SUMMER CULTURE

The following suggested summer tomato program is based on experience gained over the years in research studies at Palmer. It is designed primarily to exploit long spring and summer days when a minimum of supplemental heat is needed. Suggestions are similar for both plastic and glass covered structures. They are based on planting in ground beds rather than benches. Beds give more head room and ease the watering chores.

Soil preparation. — Add well-rotted manure or other organic material (peat, muck, rotted straw, or saw dust) up to 100 tons per acre. For the small home greenhouse, this is roughly the equivalent of a three-inch layer over the ground bed. Organic material not decomposed will require additional fertilizer, especially nitrogen and phosphorus. Mix this organic material thoroughly with the mineral soil, to a depth of about 12 inches.

Fertilizer should be applied before planting. The amount and kind required depends upon the amount of manure and the amount and nature of other material added. The more manure, the lower should be the initial fertilizer application rate. If undecomposed organic matter is used, apply 5 pounds nitrogen (N) and 10 pounds of phosphorus (P_2O_5) additional per ton of material used. Lucas et al (2) have shown that a 100-ton crop of tomatoes will re-

move 350, 105 and 580 pounds per acre of nitrogen, phosphorus (P_2O_5), and potassium (K_2O) respectively.

A suggested fertilizer rate per acre is 80 pounds nitrogen (N), 320 pounds phosphorus (P_2O_5) and 120 pounds potassium (K_2O). This is about two pounds of 10-20-20-or 8-32-16 fertilizer per 100 square feet of bed. Additional sidedressings are required for maximum yields. Time of application depends on plant growth. Three sidedressings, each a fourth of the above, will generally be adequate, starting shortly after the first fruit is set. Where heavy rates of fertilization are used on the same greenhouse soil year after year, fertilizers without chlorides and sulfates and low in nitrates are recommended, to avoid excess salt accumulation. Such fertilizers are mono-ammonium, di-ammonium and mono-potassium phosphates, and ammonium and potassium nitrates.

Planting and spacing.—Plant tomato seed from 4 to 6 weeks prior to the time you want to transplant them into the greenhouse beds. Seed directly into pots, or transplant young seedlings into pots shortly after emergence. Space plants in greenhouse beds 15 to 18 inches apart, in rows three feet apart and water thoroughly.

Watering.—Water young plants in ground beds infrequently, reducing the interval between irrigations as the plants grow larger. Full grown plants may require twice weekly watering during warm sunny periods.

Temperature and humidity. — Temperatures from 70 to 80°F are desirable for day, and 60 to 65°F for night. During cloudy days, slightly lower day temperatures are recommended. Heat and ventilate to keep the humidity below 90 per cent. This practice helps control fungus diseases.

Pruning and training. — Lateral shoots should be removed as they emerge. Train the vine on strong string tied to a strong overhead support 7 to 8 feet above the bed. Tie the lower end of the string to a stake or around the base of the plant. As the plant grows, twist the stem around the string. The plant can be lowered a bit as it reaches the top of the overhead support, thus allowing more clusters per plant.

Pollination. — Tomatoes in the greenhouse must be pollinated artificially. Pollination is most easily and effectively obtained by a battery or electric powered vibrator. Pollination of tomatoes by "fruit setting" sprays have depressed fruit set in Alaska, and caused injury to the young growing portions of the plant. Fruit clusters should be pollinated at least three times each week.

Insect and disease.—All common insect and disease pests from other regions can be a problem in Alaska

because of the tropical conditions of the greenhouse. The best protection is diligently avoiding the introduction of insects and diseases. Grow your own plants. Do not bring house plants into the commercial greenhouse as they can be serious sources of contamination. If contamination occurs, consult your local plant pathologist and entomologist for the latest and most effective controls. Tobacco mosaic is spread in the greenhouse from the use of tobacco. Do not permit smoking in the greenhouse. Wash hands thoroughly after smoking and before handling tomatoes.

SUMMARY

Where leaf mold disease can be ignored or controlled, Michigan-Ohio, Tuckcross O, Fantastic Hybrid, Weibull's Immuna and Burpee Big Boy Hybrid are recommended as the best tomatoes for summer greenhouse culture in Alaska.

Where leaf mold is common, resistant varieties such as Tuckcross O and Weibull's Immuna are recommended.

On new greenhouse soils, heavy applications of manure or other organic matter and an application of two pounds (or pints) of an 8-32-16 or 10-20-20 fertilizer for each 100 square feet of bed 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 sidedressed two or three times with the above fertilizers, applying half to three-quarters of a pound (or pint) per 100 square feet of bed. Continued heavy applications of fertilizer to greenhouse soils year after year require fertilizers low in sulfates and chlorides to avoid excess salt accumulation.

Spacing of 18 x 34 inches, or 16 x 36 inches, are best for plants pruned to one stem.

Pollination is most easily and effectively insured by an artificial vibrator or by gently tapping all flower clusters at least two or three times each week with the hand or a small stick such as a pencil. "Fruit setting" sprays have depressed fruit set in Alaska, and have injured plants where applied to rapidly growing, tender tops.

Avoid introduction of disease and insect pests.

LITERATURE CITED

1. Babb, M. F., 1959. Performance of 58 tomato varieties under greenhouse culture in Alaska, 1949-1958. Bulletin 28, Alaska Agri. Expt. Station.

2. Lucas, R. E., S .H. Wittwer, and F. G. Teubner, 1960. Maintaininng high soil nutrient levels for greenhouse tomatoes without excess salt accumulation. Proc. Soil Sci. Soc. of Amer. 24:214-218.