Energy considerations forecast changes in Florida's fresh vegetable production. Shifts in production patterns, more effective utilization of energy (and other) resources, reductions of wastage and inefficiencies, a renewed emphasis on productivity, increased markets for some vegetables, and other changes will occur.

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CHIVES PRODUCTION AS AFFECTED BY FERTILIZER PRACTICES, SOIL MIXES AND METHYL BROMIDE SOIL RESIDUES[1]

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Abstract. **Varied levels of N and K_2O were applied as weekly liquid applications to container-grown chives plants in several soil mixtures in a greenhouse experiment to determine a desirable range of these nutrients for the production of chives leaf tissue. The results expressed on the basis of plant bed area indicate that 14 to 28 pounds per acre per week of each N and K_2O is a desirable range of fertilization. Much higher levels, above 56 pounds, resulted in yield reduction and excess fertilizer salts accumulation in the soil. Soil and tissue analyses of field samples together with data from the experimental containers indicate that 1500-2500 ppm salts in the soil solution by the saturated paste technique (5) is a desirable range for chives production. Yield was benefited by amendment of virgin Myakka fine sand with 25% by volume peat. Residues from methyl bromide fumigation appeared toxic to chives in terms of fresh weight yield. Addition of simulated residues as methyl alcohol and potassium bromide resulted in the inference that the methyl radical residue from methyl bromide was much more toxic than the bromide residue. Persistent undissociated methyl bromide is not excluded since it would obviously be a toxin.**

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Chives *Allium schoenoprasum* Linn. are grown in Florida on a limited basis as a very intensive commercial crop. Home gardeners occasionally grow chives in Florida and the United States as a whole whereas they are widely grown as perennials in Europe (4) where chopped leaves are used as seasoning. The plant grows in thick tufts and produces very small, oval bulbs. Chives are propagated by seeds, division of clumps and bulbs.

Komarova (1) concluded that chives are unsuitable for forcing for green production in glasshouses on a year-round basis. Heinze (3) stated that forcing of chives in pots was successful only when the bulbs had been lifted sufficiently late (e.g., the end of October) to be well supplied with nutrient reserves and when bulbs were water-treated starting at 104°F and falling to below 78°F in 16 hours. Warm (74-78°F), then cooler (59°F) forcing temperatures were much better than continuously cool.

Hartman (2) applied calcium and ammonium nitrate to chives in the glasshouse at the rate of 67, 134, 201, and 268 lbs/acre of fertilizer material in either one full or 4 split doses. The young chives were salt-susceptible, and the higher rates were tolerated only when sufficient roots had developed. Yields rose with increasing fertilizer rates, and split applications were superior to a single application.

Data were also collected by Hartman (2) on chive bulb production. Cutting of leaves during the growing season increased the number of daughter bulbs but decreased the yield by weight. The development of daughter bulbs was improved

Table 1. The effects of fertilization and soil mix on fresh weight yield of chives, grams per clump and average number flowers per clump.

Fertilization[z] Treatment number	Lbs N and K_2O per acre weekly	Soil I[y] g	Soil II g	Soil III g	Means g
		May 8 harvest			
1	0	6.0	16.2	16.4	12.9
2	28	8.6	20.6	26.6	18.6
3	14	8.4	20.2	16.4	15.0
4	28	5.8	18.8	10.8	11.8
5	56	3.4	18.4	13.8	11.9
6	112	2.4	8.2	11.4	7.3
MEANS		5.8	17.1	15.9	
LSD, 5%	Soils menas = 3.4; Fertz. means = 2.0				
		May 31 harvest			
1	0	3.1	2.3	3.5	3.0
2	28	2.4	4.0	6.7	4.4
3	14	1.7	6.3	9.0	3.7
4	28	2.1	7.7	7.3	5.7
5	56	1.5	7.6	7.1	5.4
6	112	0	2.1	2.5	1.5
MEANS		1.8	5.0	6.0	
LSD, 5%	Soils means = 1.2; Fertz. means = 0.6				
		No. flowers per clump, May 8			
1	0	2.8	3.5	6.8	4.4
2	28	2.5	3.2	3.0	2.9
3	14	1.9	4.4	1.6	2.7
4	28	2.2	3.4	2.6	2.7
5	56	0.9	2.6	2.0	1.9
6	112	0.4	2.4	1.0	1.3
MEANS		1.8	3.3	2.8	
LSD, 5%	Soils means = NS; Fertz. means = 2.0				

[z]N and K_2O furnished by NH_4NO_3 and KNO_3 except treatment 2 was fertilized with 20-20-20 containing minor elements.

[y]Soil I = methyl bromide treated compost; Soil II = field soil; Soil III = field soil amended with 25% German peat.

Table 2. The effects of fertilization and soil mix on soil pH and soluble salts[z] May 10.

Fertilization[y]		Soil I		Soil II		Soil III	
Treatment No.	lbs N and K_2O/A/WK	Salts, ppm	pH	Salts ppm	pH	Salts, ppm	pH
1	0	1300	4.7	1300	6.6	2000	5.5
2	28	2400	5.0	1900	6.3	1900	5.2
3	14	3100	4.8	2500	6.4	2700	5.3
4	28	3500	5.1	2600	6.4	3600	4.9
5	56	4900	5.2	3300	6.0	4400	5.1
6	112	10000	5.2	10300	5.2	6600	5.1

[z]Soluble salts were determined by the saturated paste technique (5).

[y]N and K_2O furnished by NH_4 NO_3 and KNO_3 except treatment 2 was fertilized with 20-20-20 containing minor elements.

by a larger planting distance but the maximum yield per unit area was obtained with a spacing of 1.25 sq. in. per plant. Fertilization had a greater effect than spacing on weight of bulbs produced.

In the present research two experiments were undertaken to obtain information on fertilizer requirements, salt and methyl bromide residue tolerance relative to the commercial production of this specialized crop in Florida.

Materials and Methods

In the first experiment chive plants growing in clumps were obtained from a commercial grower and divided into individual plantlets which were set 6 per 6-inch plastic pot on February 1. Three soil mixes were used: soil I consisted of methyl bromide treated compost soil, soil II was a field soil (Myakka fine sand) which had been limed and fertilized in regular culture for several years, and soil III was prepared by mixing 25% by volume of German peat with the same field soil as in soil II. Soil solution bromide was determined on methyl bromide treated soil using an Orion specific ion electrode. These pots were placed in the greenhouse and fertilized weekly with 20-20-20 plus minors soluble fertilizer at the rate of 0.23 grams per pot (14 lbs/ a equivalent each N, P_2O_5 + K_2O) to establish uniform growth. By March 22, plants had become well established into medium sized clumps of commercially accepted quality. Differential fertilizer treatments were initiated March 23 and the treatments are shown in Table 1. Each treatment was replicated 4 times.

Leaves and any flowers that developed were harvested May 8 and leaves alone were harvested May 31. Total Nitrogen and potassium content was determined on the leaves harvested May 31. The first harvest was delayed somewhat to permit observation of any relationship between flower development and cultural methods.

In the second experiment methyl alcohol and potassium bromide were added to the soil in pots of chives to determine the effect of these sources of the methyl radical and bromide ion on the growth of chives relative to potential toxicity of methyl bromide soil fumigant residues. Six chive plants were grown in each 6-inch plastic pot of steamed composted Myakka fine sand soil and fertilized weekly with 0.18 g soluble 20-20-20 containing micronutrients. Methyl alcohol and potassium bromide were added in 50 ml water per pot in 1 or 2 weekly applications and leaves were harvested 5 weeks after the first addition at which time foliar growth was obviously affected by certain treatments. Each treatment was replicated 4 times.

Results and Discussion

Soil mix I produced much lower yield in both harvests than the other soils. A likely explanation is that methyl bromide residue from a high rate (4 lbs/cu yd) of fumigation was toxic. It is known

Table 3. Effect of fertilization and soil mix on nitrogen and potassium contents of chives foliage harvested May 31.

Fertilization[z] Treatment No.	lbs N and K_2O/A/WK	Soil Mix 1 N, %	Soil Mix 1 K, %	Soil Mix 2 N, %	Soil Mix 2 K, %	Soil Mix 3 N, %	Soil Mix 3 K, %
1	0	4.1	3.1	2.8	2.4	3.8	3.1
2	28	6.4	4.0	5.0	5.0	5.7	4.9
3	14	6.6	4.8	4.7	4.4	5.1	4.4
4	28	7.0	5.9	4.6	4.7	5.5	4.8
5	56	7.2	4.7	5.9	6.2	6.0	5.3
6	112	-	-	7.4	5.1	8.0	6.5

[z]N and K_2O as NH_4, NO_3 and KNO_3 except treatment 2 was fertilized with 20-20-20 plus minor elements.

that onions are sensitive to bromine residues (5) and would not be surprising if chives, a close botanical relative, are similarly intolerant of bromine residues. Methyl bromide treated soil compost analyzed for bromine in a saturation extract, was found to contain 326 ppm Br. Leaching the compost with 1X, 2X and 4X volumes of water lowered bromine to 89, 36 and 23 ppm from the original level. Soil mix I had lower pH levels (Table 2) which might have been a factor in producing lower yields, however, soil II also had low pH values which did not seem to reduce yields.

The best fertilizer treatment in the first harvest was number 2, a completely soluble fertilizer. Results from continued cropping, however, indicated that for continued cropping a lower level of fertilization as in treatment 3 would be adequate. The optimum range appears to be between 14 and

Table 4. Effect of potassium bromide and methyl alchol on fresh weight leaf tissue production by chives.

Treatment[z] No.	Addition	No. weekly applications	Chives yield total (grams)
1	None, control	-	60.1
2	0.01 mole KBR	1	66.4
3	0.01 mole KBr	2	27.5
4	0.01 mole CH_3OH	1	45.8
5	0.01 mole CH_3OH	2	15.5
6	0.01 mole KBr + 0.01 MCH_3OH	1	44.6
7	0.01 mole KBr + 0.01 MCH_3OH	2	0.7
LSD, 5% level			12.6

[z]Representing potential methyl and bromide residues from 0.8 lb methyl bromide per cu yd (treatments 2, 4 and 6) and 1.6 lb methyl bromide (treatments 3, 5 and 7). Amounts per 6-inch pot.

[y]Most of the plants in this treatment died.

28 pounds of N and K_2O per acre per week. Data in Table 1 suggest that early complete fertilization at a higher rate may be desirable but that later weekly applications may be made at a reduced level to avoid fertilizer accumulation.

The chives crop does not appear to be highly salt sensitive but it is not salt tolerant in terms of the present study. Data in Table 2 compared with those in Table 1 indicate that salts above 5000 ppm as determined by the saturated paste technique (5) will most likely reduce yields. The 1500-2500 ppm soluble salts in the soil solution appears to be associated with good production without excess use of fertilizer and with lowered risk of decreased yields that might occur with fluctuating soil moisture levels at high salts contents.

Foliar analyses of chive leaves (Table 3) indicate that satisfactory growth of chives can be expected with nitrogen and potassium content in the range of about 4.5 to 5.0% for either element. Tissue from plants grown on soil I had higher nitrogen contents which may represent an accumulation because of the slow growth in this fumigated mix. This situation did not exist for potassium content of the foliage for soil mix I.

Single applications of potassium bromide (Table 4) were not toxic, however, two applications reduced yield considerably. Methyl alcohol reduced yield in every case. The general impression from Table 4 is that potassium bromide is less toxic than methyl alcohol. The reconstruction of methyl and bromide residues in this experiment are but a step toward obtaining supporting information for an apparent toxicity of methyl bromide fumigation residues. The methyl bromide molecule may be the principal culprit. Methyl radical via methyl alcohol may have a toxic action not related to methyl residues from fumigation. It is interesting, however, that this compound should possess a high degree of phytotoxicity. The total amounts of methyl alcohol used were 0.32 and 0.64 grams per 6 inch pot.

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THE STURDY SEMINOLE PUMPKIN PROVIDES MUCH FOOD WITH LITTLE EFFORT

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Abstract. **A mainstay of Florida Indians and early settlers, the Seminole pumpkin is botanically identified as a form of Cucurbita moschata Poir., the species embracing the Cushaw or winter Crookneck squashes. It will spread over the ground, drape a fence or climb trees; needs to be fertilized only at planting time; requires no protection from insects. The fruit, variable in form and size, is hard-shelled when mature and keeps at room temperature for months, is excellent baked, steamed or made into pie. The Indians sliced, sun-dried and stored surplus pumpkins. Very young, tender fruits are delicious boiled and mashed; the male flowers excellent dipped in batter and fried as fritters. Thus, the vine produces three totally different vegetables. This is an ideal crop for the home gardener. The portion of the vine which has borne will die back but vigorous runners, which root at the nodes, will keep on growing, flowering and fruiting, yielding a continuous supply.**

The earliest known indication of wild gourds in Florida appeared in the *Memoir* of Hernando d'Escalante Fontaneda who was a captive of the Indians and recorded his experiences when restored to Spain in 1575. Translators suggest that the place name, *Tocobaga* (or *Tocobaja*) in his notes signifies a place where gourds grew (8). Mark Catesby, in his renowned work, *The Natural History of Carolina, Florida and the Bahama Islands,*