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.

Literature Cited

1. Komarova, R. A. 1970. Trudy po Prikladnoi Botanike, *Genetike i Selektsic 1970 42 (3):201-206. (Hort. Abstr. 42:136. 1972).*

2. Hartmann, H. D. 1969. Zum Anbau von Schnittlauch. (The cultivation of chives.) *Gemuse 5:239-240. (Hort. Abstr. 40:483. 1970).*

3. Heinze, W. and H. Werner. 1971. Fruhtreiberei von Schnittlauch (Early forcing of chives.) *Gemuse 7:245-246 (Hort. Abstr. 42:476. 1972).*

4. Thompson, H. C. 1949. Vegetable crops. McGraw-Hill, New York. 611 pp.

5. Waters, W. E., W. Llewelyn, C. M. Geraldson and S. S. Woltz. 1973. The interpretation of soluble salts procedures as influenced by salinity testing procedure and soil media. Proc. Trop. Region Amer. Soc. Hort. Sci. 17:397-405.

6. Wilson, J. D. and O. K. Hedden. 1967. Responses of vegetables to repeated yearly applications of nematicides to muck soil. *Ohio Research Bull. #1000.*

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,*

published in London in eleven parts from 1730 to 1748, referred to the wild pumpkin of Florida (1). William Bartram, the Philadelphia botanist who, at the request of Dr. Fothergill of London, started out in 1773 to "search the Floridas, and the western parts of Carolina and Georgia, for the discovery of rare and useful productions of nature . . . ", wrote, "In the month of March, 1774, I sat off from Savanna, for Florida. . . It is very pleasing to observe the banks of the river [St. Johns] ornamented with hanging garlands, composed of varieties of climbing vegetables . . . It is exceedingly curious to behold the wild Squash* climbing over the lofty limbs of the trees; its yellow fruit, somewhat of the size and figure of a large orange, pendant from the extremities of the limbs over the water." In an asterisked footnote, he identifies this squash as *Cucurbita peregrina.* During the same voyage, he visited an Indian settlement where "Squashes (*Cucurbita verrucosa*)" were cultivated along with corn, beans and other crops (12).

In 1913, John K. Small found near Lake Okeechobee what he believed to be the same wild gourd or pumpkin of the early chroniclers and he wondered if this plant (later identified as *Cucurbita okeechobeensis* Bailey) might be the primitive form of the pumpkin cultivated by the Florida aborigines and by their successors, the Muskogees and Miccosukees [Mikasukis] (8). In 1917, after again visiting the same area, he wrote: "An interesting vine, apparently confined to the Okeechobee region is a gourd . . . It is a high climber, has large, yellow flowers and produces great quantities of globose fruits about the size of a baseball. The fruits are usually mottled green and white, and hang in large numbers from the trees on which the vine climbs." (7). In 1930, he described the fruit more precisely as being 2-3/4 to 3-1/2 in. (7 to 9 cm.) wide, "bright-green, usually flecked with whitish or darker-green spots and often longitudinally banded, with a hard, woody rind covering a white flesh." (9)

Erwin and Lana, of the Iowa Agricultural Experiment Station, in their article on the Seminole pumpkin in 1956, seemed to favor Small's speculations. They quoted their collaborator, Robert Mitchell, who had "worked intimately with the Miccosukees for upward of half a century," as stating: "The Muskogees are employed more or less by the white man and do grow the cultivated varieties, as stated by Bailey. The same is true of some of the younger families of the Miccosukees who live near the border of their reservation. Such is not the case with their camps in the remote interior of the Big Cypress Swamp. Here they grow only the primitive Seminole pumpkin . . . they have consistently adhered to a definite type as their pumpkin." The fruits Mitchell collected for the Iowa station were "small, about five inches [12.7 cm.] in diameter, globular, slightly furrowed, skin a light buff, flesh orange red, and texture fine-grained." Erwin and Lana were of the opinion that the varieties of *C. moschata* grown in Guatemala "find their prototype in the Seminole pumpkin of the Florida Everglades" despite discoveries of specimens of rind, seeds and peduncle of *C. moschata* in Cliff Dweller ruins of the period 1,500-2,000 B. C. in the southwestern United States (2) and a carbonized peduncle of *C. moschata* in pre-Columbian mounds in Guatemala (dated about 900 A. D.). Vestal suggested a Central American origin for *C. moschata* and southward extension to Peru (where seeds were found in an ancient tomb) and northward with corn (13).

Dr. John Gifford, formerly Professor of Forestry and Conservation, University of Miami, was interested in the Chassahowitska River shown on 1839 and 1856 maps of Florida. He wrote: "The same name was used by the Indians for a swamp in Hernando County. *Chassa-howitska,* Dr. William A. Read of Louisiana State University says, means 'hanging pumpkin', *chassi* meaning pumpkin and *witska,* hanging loose." In the early 1900's, Dr. Gifford observed the manner in which the Indians grew their pumpkin—"by planting it at the butt of a tree which had been deadened. The vines climbed up the tree and into the branches. It was a curious sight to see an old oak tree laden with hanging pumpkins." He added that, on visiting

Fig. 1. An oblong-fruited Seminole pumpkin plant flourishing on the ground between avocado trees. Two pear-shaped fruits are from an adjacent plant. The recurved vine tip is characteristic of Cucurbita moschata Poir.
Photo by Julia Morton

an island in the southern part of the Everglades, he saw that the center of the island was covered with live oaks which had been girdled. Large numbers of pumpkins grew from the branches.

Quoting him again: "This pumpkin is small, hard, and greenish, and in general it does not look very promising. Nevertheless, it really has the best flavored flesh of any pumpkin I have ever tasted . . . The pumpkin was the Seminole's favorite fruit, always hanging from the tree limbs, protected by its hard shell and its height above the ground . . . Often it is necessary to cut the pumpkin open with an axe and shell out the inside as we do the coconut . . . the Indians thought well enough of us to give us each a pumpkin. I planted the seeds in my garden and raised fine pumpkins for several years, even though I did not grow them on trees." (3).

In a recent letter to John G. DuPuis, Jr., Margaret DeVane Melton, survivor of an old Florida family, stated: "The first time I visited the Indians with my brother, Albert DeVane, . . . the 'Peepo' pumpkins were growing everywhere, climbing up the tall cypress trees, which Billie Bowlegs said were for the 'coons." (5).

Dave Thigpen, who grew up at Felda, between Immokalee and LaBelle, told me that his and other pioneer families planted the Seminole pumpkin on high ground. The vine would climb oak trees and continue to grow right out over the marsh on willow and "buttonwood" [buttonbush]. It reseeded itself and grew all over the hammock back of the Indian reservation. He confirms that one oblate type had a shell so hard they used to cut it open with a hatchet (10).

In view of the fact that growing the vine on trees seems a practice peculiar to the Florida Indians, and considering its irresistible urge to climb, its sturdiness and self-perpetuation, together with the great variation in hardness of rind, size, form and color, I can't help wondering if the Seminole pumpkin may not be a hybrid between *C. moschata* and the wild Okeechobee gourd, or at least occasionally accidentally crossed with it. Some I have seen are wholly or partially striped with green or white or both. And some that I have tried to eat have a strange, unpleasant flavor, totally unlike that which I admire and recommend. In Small's article, *The Okeechobee Gourd,* he said that "another pumpkin . . . *Pepo moschata*" was also common around Lake Okeechobee and in many other places, its presence indicating, usually, a former Indian camp site (9). There has been, therefore, ample opportunity for interbreeding.

Fig. 2. Grasping tendrils and adventitious roots enable the Seminole pumpkin vine to spread over a large area.
Photo by Julia Morton

Description

The Seminole pumpkin is a coarse, herbaceous vine with hairy stems climbing by means of tendrils and producing adventitious roots at the nodes on vigorous runners. The tip of the vine is recurved. Leaves are alternate, dark-green, to 10 in. (25 cm.) wide, strongly cordate at base, broadly heart-shaped, usually with a prominent lobe on either side of the bluntly pointed apex; deeply veined; covered with bristly hairs which may irritate skin as do those of okra. Flowers are buff-yellow, to 4 in. (10 cm.) long and wide, funnelform, with 5 pointed lobes having incurving margins. Male and female flowers are visited by honeybees for nectar and the male also for pollen. Fruit is variable in form; may be nearly round, oblate, oval, oblong or pear-shaped, sometimes with a curved neck; ranges in size from 5 in. (12.7

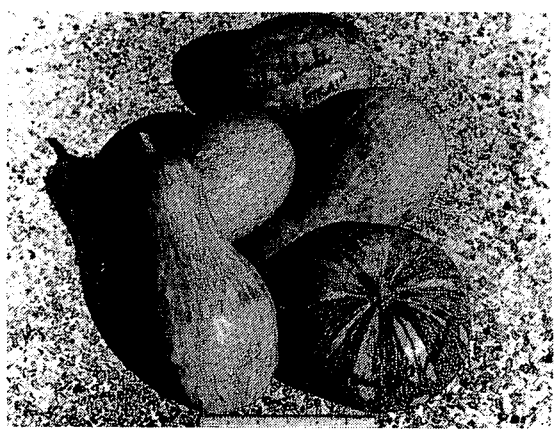

Fig. 3. Three forms of Seminole pumpkin—the oblong or oval 'Hardy' strain at the rear; the oblate 'Ingram Billie' in right foreground, curiously streaked with dark-green.
Photo by Julia Morton

cm.) wide or long, to 1 ft. (30 cm.) or more in width or length. Some specimens are more or less distinctly ribbed. Fruits of different form may occur on the same plant. Large fruits weigh 6 to 8 lbs. (2.7 to 3.6 kg.). Skin color is usually yellow-buff or dull-orange, often with pale or whitish spots or streaks; some fruits are partly or largely striped with green or green-and-white. Flesh is thick, orange to reddish-orange, succulent, usually of rich, winter-squash flavor, varying in sweetness. Seeds are white with a distinct, yellowish margin when dry; oval, nearly flat, 5/8 in. (16 mm.) long.

Experimental Cultivation

In June of this year, I visited John DuPuis' Bar D ranch, east of Port Mayaca, to see an experimental planting of Seminole pumpkins in an avocado grove.

Seeds of what he terms the 'Hardy' type (a usually oblong pumpkin grown and distributed by Laymond Hardy) and the 'Ingram Billie' type (an oblate, ribbed pumpkin grown by the Indians of the Big Cypress area), were planted in pots in September 1974. The plants were put in the ground when 4 weeks old, between the avocado trees in 4 rows of the grove, 20 plants per row. The avocado trees had received fall fertilization. At the time of transplanting, each pumpkin vine was fertilized with 3 "Gro-Mo" pellets (20-20-20). During dry weather, the grove was irrigated with overhead sprinklers keeping moisture level adequate. The pumpkin plants grew vigorously, runners extending along the ground for 15 or 20 ft. (4.5 or 6 m.), heading for the trees and attempting to climb them but finding no foothold, and generally, in disappointment, detouring around the base. Encountering a low fork in a tree trunk, a runner would leap over and through it and continue along the ground on the other side. In one case, where Virginia creeper was ascending an avocado trunk, the pumpkin vine attached itself to the Virginia creeper and had climbed up a few feet. The tendency to climb was conspicuous. One runner had hopefully clambered up a 5-ft. (1.5 m.) specimen of the common weed, *Parthenium hysterophorus* L.; another had completely shrouded a small *Citrus* tree at the end of a row of avocados.

The fruits began maturing in mid-February and 200 had been picked. The vines were still fruiting and 40 mature fruits were counted on June 7. There were many uncounted juveniles and some newly opened flowers.

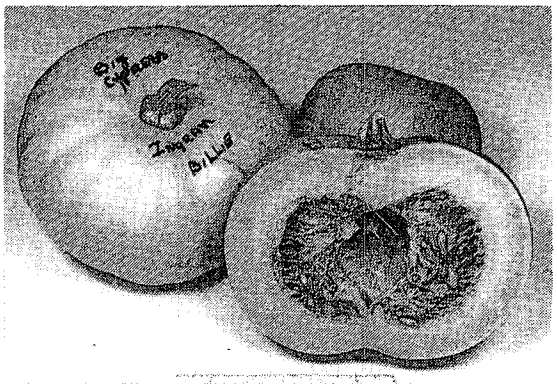

Fig. 4. This 'Ingram Billie' pumpkin, raised from seed obtained from the Big Cypress area, is a fine orange-yellow, with thick, reddish-orange flesh.

Photo by Julia Morton

Leaves on old stems that had borne fruits were dying back but the tips of these stems were growing vigorously and extending over the ground. Along the support-seeking runners held up by grass or weeds, there were occasional slender, white adventitious roots. Apparently the new runners are capable of taking root and continuing to spread even though the plant dies down at the base. John DuPuis says that one vine grew for 5 years in his father's grapefruit grove and covered about 4 acres (1.6 hectares). At any one time, there would be 400 to 500 pumpkins in all stages of development.

Charles Pierce has written that in 1873-74 his Uncle Will planted a number of hills of Indian pumpkin on the north end of Hypoluxo Island where "the ground was covered with a thick growth of wild morning-glories. Ten years later, pumpkins were gathered from vines that were growing in this same field of morning-glories; the pumpkins had never been replanted; they had seeded themselves and kept on growing from year to year." In contrast, the Cuban 'Calabaza' (which is a thin-skinned form of *C. moschata*), when planted at the DuPuis ranch under the same conditions as the Seminole pumpkin, produced one crop of fruits and died.

Pest Resistance; Disease Susceptibility

The pumpkin vines at the DuPuis ranch showed no insect damage. The fruits were not molested by raccoons, rabbits nor birds. Charles Mahannah has observed elsewhere that cows do not eat the vine (4).

A volunteer plant which sprang up in June and covered a wire fence adjoining John DuPuis'

office at 6045 N.E. 2nd Ave., Miami, became severely afflicted with a disease identified by Dr. Robert McMillan, University of Florida, Agricultural Research and Education Center, Homestead, as gummy stem blight caused by *Mycosphaerella citrullina*. Suddenly, during a rainy two-week period, the leaves on a 60-ft. (18.2 m.) or more stretch of the vine became splotched with yellow, wilted, turned brown and died, while the younger, vigorously growing portion continued to extend along the fence and up to and over the roof of the building. The blight can be controlled by spraying with Benlate, 1 tbsp. per gal. (3.7 liters). There was some powdery mildew present but Dr. McMillan said this was a minor problem.

Keeping Quality

The uninjured Seminole pumpkin can be kept at ordinary Florida temperatures for several months or an entire year if in a dry place with good ventilation. Dave Thigpen says that pioneers piled the pumpkins in sheds and used them all year around for food and as feed for hogs and cattle. In 1974, I kept one in my kitchen with no air-conditioning from June 1 to Thanksgiving Day with no sign of deterioration.

Culinary Uses

Dave Thigpen relates that his family and neighbors used old wax myrtle wood to make

Fig. 5. Gummy stem blight suddenly affected the leaves on 60 ft. (18.2 m.) or more of this vine during a two-week period in August.

Photo by Julia Morton

Fig. 6. The older portion of the vine on the fence at the left is afflicted with gummy stem blight, while new, vigorous growth is spreading over the roof in the foreground.

Photo by Julia Morton

cooking fires and put whole pumpkins in the coals to roast (10). Mrs. Melton saw the Indians cooking pumpkins "in an iron skillet on an open fire (a very slow fire), stirring occasionally and adding some kind of spices." She was given some to eat and found it delicious. Her own preferred method of preparation is cutting open, removing seeds, applying butter and brown sugar and baking. She also grates the raw flesh and eats it mixed with raisins (5). Mrs. DuPuis steams the quartered fruits and serves with brown sugar or various other garnishes. I find the Seminole pumpkin naturally sweet enough and when baking it apply only butter, salt and pepper. Dr. Gifford praised it as pie-filling (3), as does Mrs. Melton (5). The Seminoles save their surplus for times of scarcity by cutting the fruits into strips and drying them. The dried pumpkin, ground to a meal, is made into bread (3). Pumpkin bread was being sold by Seminoles at a recent Hialeah fair.

Apart from the mature fruits, the Seminole pumpkin affords two other appealing vegetables. The very young, pale-green, still tender fruits, from which the flower has just fallen, are cooked, mashed and seasoned with salt and pepper. The flavor is slightly reminiscent of eggplant or globe artichoke, but, to my taste, superior to either of these. John DuPuis says that his mother served these frequently. At the DuPuis ranch, I enjoyed also the surplus male flowers dipped in batter and fried, and I have never had better fritters.

Conclusion

The Seminole pumpkin deserves a place in the home garden, is fast-growing, requires little care

and provides an abundance of wholesome food for use throughout the year.

Literature Cited

1. Catesby, Mark. 1730-43 and 1748. The Natural History of Carolina, Florida and the Bahama Islands. (10 parts & appendix). London.
2. Erwin, A. T. and E. P. Lana. 1956. The Seminole Pumpkin. *Econ. Bot.* 10(1):33-37.
3. Gifford, John C. 1945. Living By the Land. Glade House, Coral Gables, Fla.
4. Mahannah, Charles, Jr. Personal communication. June 26, 1975.
5. Melton, Margaret DeVane. Personal communication to John G. DuPuis, Jr., Sept. 19, 1974.
6. Pierce, Charles W. 1970. Pioneer Life in Southeast Florida. Univ. of Miami Press, Coral Gables, Fla.
7. Small, John K. 1918. Botanical Exploration in Florida in 1917. *J. N. Y. Bot. Gard.* 19:279-290.
8. ————. 1922. Wild Pumpkins. *J. N. Y. Bot. Gard.* 23:19-23.
9. ————. 1930. The Okeechobee Gourd. *J. N. Y. Bot. Gard.* 31:10-14.
10. Thigpen, Dave. Personal communication. June 7, 1975.
11. True, David O. (Editor). 1945. Memoir of D°. d'Escalante Fontaneda Respecting Florida (1575). Translated from the Spanish with Notes by Buckingham Smith (1854). Glade House, Coral Gables, Fla.
12. Van Doren, Mark (Editor). 1928. The Travels of William Bartram (reprint of Bartram's Travels through North and South Carolina, Georgia, East and West Florida, 1791). Dover Publications, New York.
13. Vestal, Paul A. 1938. *Cucurbita moschata* found in Pre-Columbian mounds in Guatemala. *Bot. Mus. Leaflet*, Harvard Univ. 6(4):65-69.

ETHEPHON AS A DEFOLIANT FOR POTATOES[1]

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Abstract. **Ethephon, at concentrations from 4,000 to 16,000 ppm, paraquat, or dinoseb applied to Wauseon and Sebago cultivars of potatoes 7 or 14 days prior to harvest resulted in complete defoliation and vine kill. Yields from the highest level of ethephon and dinoseb treatments were significantly lower than check treatments. All vine kil ing significantly reduced the specific gravity of tubers, and the reduction was greater when treatments were applied 14 days as compared with 7 days before harvest. Ethephon treatments affected carbohydrate metabolism of tubers by causing greater sugar content and lower starch content. Results of compositional analyses bring into question the advisability of the practice of vine killing of potatoes prior to harvest.**

Potatoes are grown and harvested in Florida when environmental conditions generally are conducive to continuing growth of the plant. Tubers from such plants are considered to be susceptible to skinning damage and subsequent weight loss and other adverse effects on quality. Vine killing is suggested as a means of maturing the tubers and permitting the skin to "set" thereby avoiding this damage (6, 9, 12). Removal of vines to prevent clogging the equipment also is of benefit to mechanical harvesting. Vine killing may be accomplished by mechanical means such as mowing or "roto beating," burning with a flame, or with chemicals (9).

Hall (6) found that skinning was reduced by delaying harvest, i.e. digging 105 days after planting rather than after 100 or less days. He found also that skinning was reduced more by vine killing and that vine killing 14 days before harvest was more effective than killing 7 days before harvest. Rowberry and Johnston (12) reported widespread opinions that slow killing of vines is desirable to permit maximum translocation of sugars from the leaves to the tubers. However, their data showed a reduction in specific gravity of tubers between vine killing and harvesting.

Chemicals used for vine killing have included sodium arsenite, petroleum solvents, and other herbicides such as ametryne and paraquat (9). Ethephon [(2-chloroethyl)phosphonic acid] has been used extensively as a ripening or senescence inducing chemical (4, 14). It also has been used in low concentrations at early stages of growth for other possible hormonal effects (7, 8). There do not appear to be any reports of its use to hasten the maturation of potatoes or for their defoliation.

Materials and Methods

Potatoes were planted at the ARC, Hastings on January 1974. A split-split-plot design of application time, chemical treatment, and cultivar was

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