VARIETY TRIALS FOR AN ORGANIC PRODUCTION OF SWEET CORN, SWEET POTATOES, AND COWPEAS

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ABSTRACT

Organic agriculture has been growing steadily over the past decade in the United States, especially in California, the Midwest, and the Northeast. However, in the southeastern United States, organic production has been hampered by a lack of adapted organic seeds. A study was conducted at the George Washington Carver Agricultural Experimental Station (GWCAES) located in Tuskegee, Alabama with the aim of screening four varieties each of sweet corn [(*Zea mays var saccharata*) Double Standard, Luscious, Silver Queen, Sugar Pearl], sweet potatoes [(*Ipomoea batatas*) Covington, J6/66, NCC-58, TU Purple], and cowpeas [(*Vigna unguiculata*) Brown Sugar Crowder Pea, California Black-eyed Pea, Mississippi Crowder Pea, Pink-eyed Purple Hull Pea]. The experiment was designed as a randomized complete block design with four replications. The crops were preceded by hairy vetch (*Vicia villosa*) which was planted as a cover crop, harvested, and incorporated into soil prior to planting. Results showed that Silver Queen had the highest yield (12.1 Mg ha^{-1}) for sweet corn while Double Standard yielded the least (2.27 Mg ha^{-1}). For the sweet potato varieties, J6/66 has the highest yield (16.7 Mg ha^{-1}) while Covington had the least (6.85 Mg ha^{-1}). For the cowpea yields, California Black-eyed peas had the highest with 4.13 Mg ha^{-1} while Brown Sugar Crowder pea had the least with 1.52 Mg ha^{-1}. These results demonstrated that none of these varieties of sweet corn, sweet potato and cowpea are adapted to organic agriculture in the conditions of the Southeast U.S. This indicates that variety screening is important in promoting organic agriculture in the Southeast U.S. With high costs associated with production, crop yields in organic agriculture need to be optimized if organic farming is to thrive in the southeast.

INTRODUCTION

Sustainable agriculture is the key to healthy living and an ecologically sound environment and it includes organic farming. Current organic farming statistics in the United States shows that progress is being made in many parts of the country; however, Alabama lags behind in the numbers of certified operations and farmland under organic farming. According to statistics, Alabama has one of the least number of organic certified operations in the country with only twelve in 2011; only Delaware (7), West Virginia (5), and Alaska (1) have fewer than Alabama (US ERS, 2013). In 2011, certified organic acreage in Alabama under mixed vegetables was only 7 and 43 compared to 6,360 and 42,511 acres in the U.S. for number of operations with less than 5 acres and more than 5 acres, respectively. The southeast presents some unique challenges to organic production. Rapid mineralization of organic crop residues, disease outbreaks, weed competition, and insect proliferation year round due to the warm climate make it difficult to grow fruits and vegetables without pesticides and fertilizers. Thus, for successful organic farming, research must either develop new crop varieties or screen existing varieties and evaluate their performance under organic management. Thus the objective of this trial was to screen four varieties each of sweet corn, sweet potato, and cowpea for their yields under organic management.

MATERIALS & METHODS

The study was conducted at the GWCAES located in Tuskegee, Alabama (32° 25.96' N, 85° 42.84'W). To homogenize the soil in the experimental field (120 ft. X 180 ft.), Hairy Vetch (*Vicia villosa*) was planted as a cover crop, harvested and tilled into soil. Prior to establishment of the experimental plots, 12 soil core samples were taken randomly at 0-15 cm. The soil samples were mixed together, homogenized, air-dried and ground to pass through a 20–mesh sieve. A sub-sample of the 20-mesh sieved sample was analyzed (Table 1). The experiment was conducted as a randomized complete block design with four varieties of three crops. The varieties were planted in four replications to give a total of 48 experimental units of 15 ft. X 22.5 ft. (CP & SP) and 15 ft. X 45 ft. (SC). Spacing between and within the rows were 3 ft. and 1 ft., respectively. This resulted in five rows of plants per plot with 22 (CP & SP) or 45 plants (SC) per row. All plots were mulched using dry hay between rows. Removal of emerging weeds were conducted as necessary. Two weeks after planting, the sweet corn and sweet potato plots received composted chicken litter and hay grass. Dry cowpea was harvested by hand. Recorded parameters were weight of peas with and without pods. Sweet corn was harvested by hand (all varieties harvested at once). The following parameters were recorded at harvest: number of plants by row, plant height, and height of the first cob above ground. Fresh cob weight was recorded with and without husks. Sweet potato was harvested using a sweet potato digger attached to a tractor. The weight of the roots were recorded at harvest. Roots were then sorted (Canner, US #1, Jumbo, Cull) to determine the percentage of marketable roots.

RESULTS

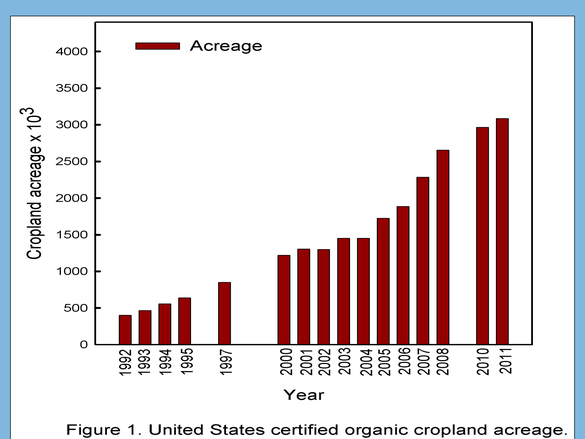

Figure 1. United States certified organic cropland acreage.

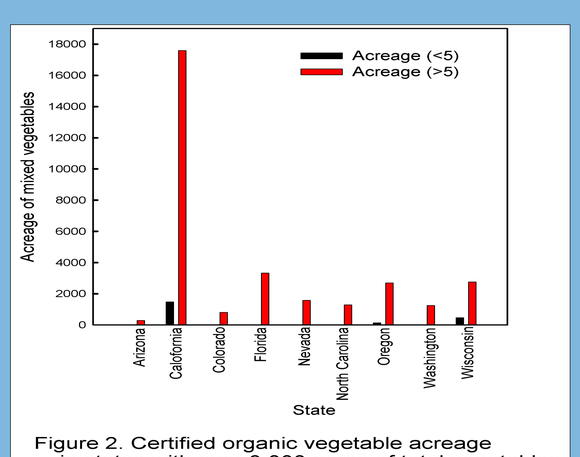

Figure 2. Certified organic vegetable acreage in states with over 3,000 acres of total vegetables.

RESULTS (cont)

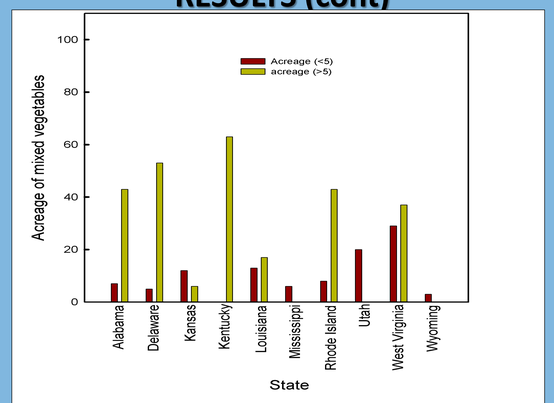

Figure 3. Certified organic vegetable acreage in states with less than 100 acres of total vegetables.

Table 1. Soil physical and chemical properties at the experimental site [Marvyn sandy loam (fine, siliceous, thermic, typic, Paleudult) with less than 5% slope].

Property	Values
Physical	
Textural class	Loamy sand
H_20 availability, cm/cm	0.05
Silt, g kg^{-1}	187.5
Sand, g kg^{-1}	762.5
Clay, g kg^{-1}	50.0
Chemical	
pH	5.40
Extractable P, mg kg^{-1}	8.00
Extractable K, mg kg^{-1}	23.1
C.E.C., cmol$_c$ kg^{-1}	4.64

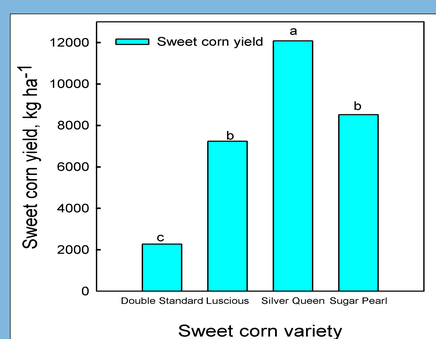

Figure 4. Comparative yields of sweet corn varieties grown under organic management in 2013. Letters indicate significant difference among the varieties at $P < 0.05$.

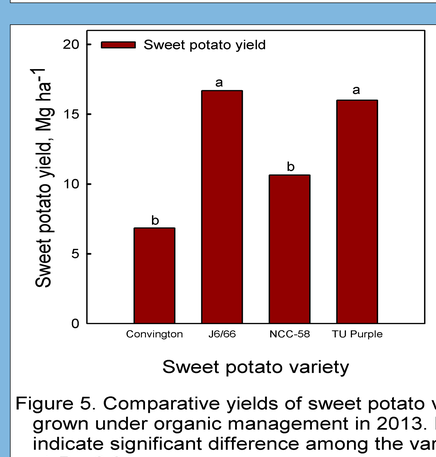

Figure 5. Comparative yields of sweet potato varieties grown under organic management in 2013. Letters indicate significant difference among the varieties at $P < 0.05$.

RESULTS (cont)

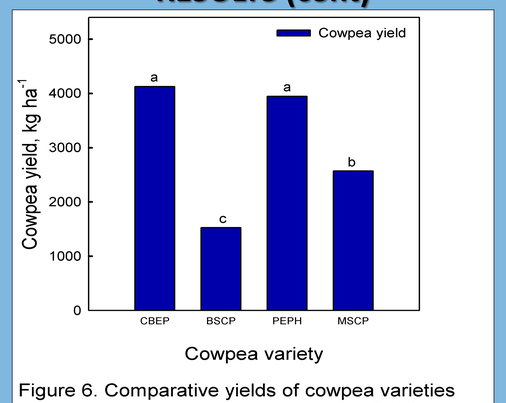

Figure 6. Comparative yields of cowpea varieties grown under organic management in 2013. Letters indicate significant difference among the varieties at $P < 0.05$.

Data obtained from the experiment were analyzed using the MIXED procedure of SAS (SAS Inst., Inc., Cary, NC). When the omnibus F-test indicated statistically significant differences among varieties, the variety means were separated using Tukey's procedure. The level of significance for the experiment was set at 0.05.

1. The sweet corn varieties tested were purchased from Johnny's Selected Seeds. Among these varieties, Double Standard and Luscious were organic varieties while Silver Queen (F1) and Sugar Pearl (F1) were conventional untreated seeds. As shown in Figure 4, Double Standard and Luscious that are organic varieties seem not to be well adapted to organic management in Southeast Alabama. They yielded just over 2,200 and 7500 kg ha^{-1}, respectively and significantly ($P \leq 0.05$) lower than Silver Queen (12,000 kg ha^{-1}). Silver Queen is widely used in Alabama; it is resistant to northern corn leaf blight and stewart's wilt while the organic varieties are not.
2. Among the sweet potato varieties tested, J6/66 and TU Purple produced the highest storage root yields that are significantly ($P \leq 0.05$) greater than those of Covington and NCC-58 (Figure 5). J6/66 and TU purple are varieties developed at Tuskegee University and seem to respond very well to organic management as compared with the other varieties.
3. Seeds of cowpea varieties (Figure 6) used were conventional untreated and purchased in a local store. Among the varieties, CBEP and PEPH peas produced yields that are significantly ($P \leq 0.05$) greater than BSCP (1,500 kg ha^{-1}) and MSCP (2,500 kg ha^{-1}).

REFERENCES

• Greene, C. (2005, November 07). Retrieved from United States Department of Agriculture Economic Research Service: www.ers.usda.gov/datafiles/.../Farmlandlivestockandfarm.xls
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ACKNOWLEDGEMENTS

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