

NITROGEN, PHOSPHOROUS, POTASSIUM, AND BORON AFFECTED YIELD OF SWEETPOTATO

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ABSTRACT: A boron (B) nutrient trial was conducted at a producer location (Danny Clark Farm) on a Faulkner silt loam soil in Northwest Chickasaw County, Miss. The trial was developed to compare recommended N-P-K to no N-P-K and B at three rates on sweetpotato development. The data from this trial indicates that N-P-K is needed to enhance the production of US No. 1 and total marketable roots. The addition of boron by over-the-top application early in the growing season boosted canner yield while the highest rate reduced the yield of the cull grade.

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KEYWORDS: micronutrient, boron, sweetpotato

MATERIALS AND METHODS: A boron nutrient trial was conducted at a producer location (Danny Clark Farm) on a Faulkner silt loam soil in Northwest Chickasaw County, Miss. Soil nutrient content in the trial area was determined by previous grid sample soil tests in 2001. An area of the that was deemed low in B was sampled again in the spring of 2002 to confirm a deficiency. Standard production practices were employed in the all areas of the field with the exception of fertilizer and insecticide. Field preparation included disk, chisel plow, disk, and hip. The trial was designed as a split plot randomized complete block design with three replications. The main plot factor consisted of soil test recommended 50-100-100 lb/ac N-P-K and no N-P-K. The subplot factor consisted of three boron rates 0.7 lb ai/ac (low), 1.4 lb ai/ac (recommended), and 2.1 lb ai/ac (high). An additional check treatment of no boron was included for comparison.

Planting occurred on June 6 and all treatments were applied on June 17, eleven days after transplanting (DAT). Soil samples were taken prior to treatment application from each main plot (data not shown). Main plot treatments were applied by hand to the assigned plot areas. Subplot treatments were applied over-the-top using a three-row backpack CO₂ sprayer. All treatments were incorporated using a Liliston rolling cultivator. At each of the three leaf sampling periods 40, 61, and 88 DAT, thirty leaves from fifth leaf below the last unfolded leaf were taken from each subplot for analysis (data not shown). At each date, hyper-spectral data was taken from the 350 to 1000 nm wavelengths with a hand held spectroradiometer to determine reflectance among the treatments (statistical analysis on going). A single row of each subplot was harvested with a small chain type sweetpotato digger 105 DAT. Harvested roots were graded according to the

National Sweetpotato Collaborators Group standards. Roots were then weighed, counted and converted to a bu/ac or number/ac format.

RESULTS AND DISCUSSION: There were no interactions between the main and subplot factors at the 95 percent confidence interval. There were differences in the main plots for US No. 1 yield and root set as well as total marketable yields (Table 1). US No.1 yield ranged from 402 bu/ac for recommended N-P-K to 234 bu/ac for no N-P-K application across the four treatments. The number of US No. 1 root set was also higher for the recommended N-P-K rate. Total marketable yield was increased by the recommended fertilizer application by 178 bu/ac over the non-fertilized treatment.

There were also differences found in the number and yield of canners, and the yield of the cull grades in the subplot treatments (Table 2). Canner yield and root-set was higher, 198 bu/ac and 27911 roots/ac, for the 2.1 lb B/ac rate as compared to the check, 137 bu/ac and 19521 roots/ac. The recommended 1.4 lb B/ac rate had a higher cull grade yield than the high 2.1 lb B/ac rate.

The data from this trial indicates that N-P-K is needed to enhance the production of US No. 1 and total marketable roots. The addition of Boron by over-the-top application early in the growing season boosted canner yield while the highest rate reduced the yield of the cull grade. Observations of root appearance were not collected so the reason for cull grade yield decline is not understood.

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Table 1. Sweetpotato mean yield and root set from 3 replications of N-P-K, across boron treatments in 2002.

Treatments	US No. 1		Canner		Cull		Jumbo		Total Marketable	
	Bu/ac ^Z	Roots/ac	Bu/ac	Roots/ac	Bu/ac	Roots/ac	Bu/ac	Roots/ac	Bu/ac	Roots/ac
50-100-100 N-P-K	402 a ^Y	20570 a	172 a	22425 a	136 a	10325 a	32 a	645 a	591 a	49060 a
0-0-0 N-P-K	234 b	14439 b	156 a	22425 a	172 a	11697 a	6 a	161 a	413 b	47300 a

^Z Bu/ac= # of 50 lb bushels per acre.

^Y Means within a column followed by the same letter are not significantly different by Fishers' protected least significant difference (LSD) ($P \leq 0.05$).

Table 2. Sweetpotato mean yield and root set among boron treatments from 3 replications, across N-P-K treatments in 2002.

Treatment	US No. 1		Canner		Cull		Jumbo		Total Marketable	
	Bu/ac ^Z	Roots/ac	Bu/ac	Roots/ac	Bu/ac	Roots/ac	Bu/ac	Roots/ac	Bu/ac	Roots/ac
0 lb ai/ac	315 a ^Y	16133 a	137 b	19521 b	153 ab	11132 a	40 a	733 a	494 a	43267 a
0.7 lb ai/ac	331 a	18231 a	169 ab	24684 ab	163 ab	11293 a	0 a	0.0 a	500 a	49280 a
1.4 lb ai/ac	280 a	15972 a	152 ab	24200 ab	178 a	11616 a	16 a	293 a	448 a	47373 a
2.1 lb ai/ac	347 a	19683 a	198 a	27911 a	123 b	10003 a	20 a	440 a	566a	52800 a

^Z Bu/ac= # of 50 lb bushels per acre.

^Y Means within a column followed by the same letter are not significantly different by Fishers' protected least significant difference (LSD) ($P \leq 0.05$).