NITROGEN, PHOSPHOROUS, POTASSIUM, AND COPPER EFFECTS ON YIELD OF SWEETPOTATO

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ABSTRACT: A copper (Cu) 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 Cu at three rates on sweetpotato development. The data from this trial indicates that N-P-K was not needed to enhance the production of US No. 1 or total marketable roots. The addition of Cu by over-the-top application early in the growing season tended to reduce yield. The addition of Cu to this area, although showing a need during soil testing, may have become toxic to the plants.

CITATION: Main, J. L., M. W. Shankle and T. F. Garrett. 2003. Nitrogen, phosphorous, potassium, and copper effects on yield of sweetpotato. Annual Report 2002 of the North Mississippi Research & Extension Center. Mississippi Agriculture & Forestry Experiment Station Information Bulletin 398:252-254.

KEYWORDS: micronutrient, copper, sweetpotato

MATERIALS AND METHODS: A copper (Cu) 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 field that was deemed low in Cu was sampled again in the spring of 2002 to confirm a deficiency. Standard production practices were employed in 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 factors consisted of soil test recommended 50-100-140 lb/ac N-P-K and no N-P-K. Subplot factors consisted of three Cu rates 0.5 lb ai/ac (low), 1.0 lb ai/ac (recommended), and 2.0 lb ai/ac (high). An additional check treatment of no Cu 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 CO_2 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 GER meter to determine reflectance among the treatments (statistical analysis on going). Yield data was collected from 4 m of a single row of each subplot using a small chain type sweetpotato digger 105 DAT. Harvested roots were graded according to the National Sweetpotato Collaborators Group standards. Each grade was weighed, counted, and converted to a bu/ac or root/ac format.

RESULTS AND DISCUSSION: No interactions were found between main and subplot factors at the 95 percent confidence interval. There were no differences in the main plot with or without N-P-K for any yield or root set in the measured grades (Table 1). US No. 1 yield were 409 and 395 bu/ac for no N-P-K and recommended N-P-K, respectively. There were no differences for total marketable yield between the main plots.

There were also no differences found in the number or yield of the measured grades in the subplot Cu treatments (Table 2). Yield was numerically, but not significantly, higher for the non-treated check for US No. 1, canner, and total marketable grades. The recommended rate tended to produce more jumbo roots than the other treatments.

The data from this trial indicates that N-P-K nor Cu were needed to enhance the production of US No. 1 or total marketable roots. The addition of copper to this area, although showing a need during soil testing, may have become toxic to the plants. Further examination of individual soil test and leaf tissue test data is needed to determine if copper toxicity may have occurred.

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

	US No. 1		Canner		Cull		Jumbo		Total Marketable	
Treatments	Bu/ac[Z]	Roots/ac	Bu/ac	Roots/ac	Bu/ac	Roots/ac	Bu/ac	Roots/ac	Bu/ac	Roots/ac
50-100-140 N-P-K	395 a[Y]	19433 a	147 a	19580 a	134 a	9680 a	37 a	806a	580 a	49500 a
0-0-0 N-P-K	409 a	20240 a	166 a	22733 a	160 a	11073 a	20 a	440 a	596 a	54487 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 copper treatments from 3 replications, across N-P-K treatments in 2002.

	US No. 1		Canner		Cull		Jumbo		Total Marketable	
Treatment	Bu/ac[Z]	Roots/ac	Bu/ac	Roots/ac	Bu/ac	Roots/ac	Bu/ac	Roots/ac	Bu/ac	Roots/ac
0 lbai/ac	432 a[Y]	19507 a	177 a	22880 a	148 a	10267 a	6 a	146 a	617 a	52800 a
0.5 lb ai/ac	386 a	17893 a	166 a	20387 a	172 a	11147 a	33 a	733 a	586 a	50160 a
1.0 lb ai/ac	407 a	21560 a	154 a	21120 b	137 a	9680 a	52 a	1026 a	614 a	53387 a
2.0 lb ai/ac	383 a	20387 a	129 a	20240 a	131 a	10413 a	23 a	586 a	536 a	51627 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) ($P \leq 0.05$).