Effects of Soil Amendments on Crusting, Seedling Emergence and Yields of Onions, Tomatoes, and Peppers

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ABSTRACT

Studies were carried out at the Safford Agricultural Center using some soil amendments as anti-crusting agents. The results are promising in terms of improved stands on soils subject to crusting. Additional research is needed in order to determine proper rates which will reduce crusting without being toxic to the emerging seedlings.

INTRODUCTION

Obtaining a satisfactory stand is one of the most perplexing of problems encountered with some soils. Crusting is one aspect of obtaining a good stand with soils containing high amounts of silt, clay and exchangeable sodium. Saturation of beds by irrigation water or rainfall accentuate the problem of crusting.

A number of commercial anti-crusting agents have been shown to be effective, as well as some of the commonly used amendments and fertilizers, such as gypsum, sulfuric and phosphoric acids. These materials may act to flocculate the soil and remove exchangeable sodium, as in the case of gypsum and acids. Acids can also result in a vesicular structure due to the formation of carbon dioxide bubbles which form from the reaction of acid with lime in the soil. In these trials a commercial aluminum sulfate material (Boligrow) was compared with gypsum and sulfuric acid as anti-crustant materials. Three different crops were direct-seeded, stands were counted and yields were measured.

METHODS

The study was carried out at the Safford Agricultrual Center on a Pima clay loam soil. A preplant application of 330 lbs of 16-20-0 plus 100 lbs of urea were broadcast and listed into the beds. Onions 'cv. Inca' at a rate of 124 seeds per 10 ft of row; tomatoes 'Castle Red' at 157 seeds per 10 feet of row; and a commercial variety of chili peppers at 77 seeds per 10 feet of row were planted on 20 March, 1986 with a Planet Jr. Amendments of gypsum, sulfuric acid, and Boligrow were applied over the bed after planting using eight replications of each treatment.

The study was carried out with two water qualities; water from the local well (EC_w = 2.3 or about 1600 ppm soluble salts) and from the Gila River EC_w = 1.15 or about 780 ppm soluble salts).

Stand counts were taken at weekly intervals for three weeks after emergence. Tomatoes were harvested for yields on 24 July and 10 August; peppers were harvested 24 August; and onions on 28 August. Some of the plots were later split for fertilizer trials, so final yields were not meaningful in terms of the initial amendment treatments.

RESULTS

Tomatoes produced more seedlings when treated with gypsum with both river and well water. The least response was with the Boligrow II and the high rate of sulfuric acid. With the high rates of acid and aluminum sulfate, excess salts accumulated on the surface above the seed and caused burning of the seedling and loss of stand. Yields were also higher with gypsum when irrigated with well water and lowest with acid and Boligrow. With

river water, gypsum also produced the highest yield , followed by the low rate of sulfuric acid. Both Boligrow treatments produced the lowest yields.

Onions did not show any response to amendment applications for either water with respect to stand counts. With well water there was a significant difference, with gypsum and sulfuric acid I and II producing the highest yields. There was no significant effect of the amendments when river water was used.

Chili peppers responded to the amendments in the case of well water but not for river water. Stand counts were highest for the gypsum, sulfuric acid and the Boligrow polymer, with yields following the same pattern. With the river water, all stands were relatively low, but the same treatments produced the higher stands. No yield effects were found with the river water.

Table 1. Stand counts of tomatoes and peppers as affected by soil amendments applied over the seed, Safford, 1986.

Treatment*	Stand Counts No./plot	
	Well Water	River Water
	----------tomatoes------	
Control	61.1	49.1
Boligrow I	40.5	38.6
Boligrow II	16.6	15.3
Sulfuric I	44.4	53.1
Sulfuric II	34.1	30.6
Gypsum	69.3	66.1
	----------peppers--------	
Control	4.6	16.6
Boligrow I	4.5	12.6
Boligrow P	5.0	13.4
Polymer	10.6	22.0
Sulfuric I	10.6	14.9
Gypsum	13.0	21.4
	----------onions---------	
Control	124	131
Boligrow I	123	121
Boligrow II	116	117
Sulfuric I	124	129
Sulfuric II	113	121
Gypsum	126	129

** Rates are as follows: Boligrow I, 1000lbs/A; Boligrow II, 2000lbs/A; Sulfuric acid I, 500lbs/A; Sulfuric acid II, 1000lbs/A; Gypsum, 830lbs/A, Polymer of aluminum sulfate, 500lbs/A, Boligrow plus polymer, 1000lbs/A.*