FERTILIZER INJURY TO POTATOES AS AFFECTED BY FERTILIZER SOURCE, RATE AND PLACEMENT

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Abstract

To investigate fertilizer injury to potatoes under field conditions, a three year study from 1979 to 1981 was undertaken in Central New York. The study was carried out on a well drained Howard gravelly silt loam; pH 6.6-6.8 with high organic matter (6.1-6.4%) and cation exchange capacity (CEC) of 13.4-14.9. When applied at a normal rate equivalent to 1,685 kg/ha of 10-15-15-1.2 the blended fertilizer containing urea N did not significantly reduce the tuber yield compared to ammoniated fertilizer and blended fertilizer containing ammonium nitrate (AN). However, when it was placed in contact with the seedpiece, the urea delayed emergence and early growth of the plant. Fertilizers containing urea-diammonium phosphate (DAP) and urea-triple superphosphate (TSP), applied at higher than normal rates and placed in contact with the seedpiece, significantly delayed emergence and reduced tuber yield.

Resumen

Con el propósito de investigar el daño causado por fertilizantes en condiciones de campo se llevó a cabo un estudio en la parte central de Nueva York entre 1979 y 1981. El estudio se realizó en un suelo de buen drenaje, tipo Howard, franco-arcilloso con grava; pH 6.6-6.8, con alta materia orgánica (6.1-6.4%) y una capacidad de intercambio de cationes (CIC) de 13.4-14.9. Cuando aplicado a una dosis normal equivalente a 1,685 Kg/ha de 10-15-15-1.2 de mezcla de fertilizante conteniendo N-Urea no redujo significativamente el rendimiento de tubérculos comparado con fertilizante amoniaco y mezcla de fertilizante conteniendo nitrato de amonio. Sin embargo, cuando fue colocado en contacto con tubérculo-semilla, la urea retardó la emergencia y el desarrollo temprano de la planta. Fertilizantes conteniendo urea—fosfato diamónico y urea superfosfato triple, aplicados, aplicados a dosis mas altas que lo normal y colocados en contacto con el tubérculo semilla retardaron significativamente la emergencia y redujeron el rendimiento.
Introduction

It is a common practice in the Northeast to band all fertilizer when potatoes are planted. There have been occasional reports that banded fertilizer containing urea and/or DAP injured potatoes. Urea and DAP injury to potatoes was documented experimentally in some reports (1, 2, 4, 7, 8) but not in others (3, 5). Injury to the potatoes was explained largely by ammonia toxicity which caused growth retardation, poor root development, and yield reduction (1, 4). This study examined the extent of this injury in Central New York.

Materials and Methods

The study was carried out on a Howard gravelly silt loam at the Agway Farm Research Center in Tully, New York from 1979 to 1981. Soil analyses showed the pH at 6.6-6.8, P$_{2}$O$_{5}$ from weak Bray extraction was 238-278 kg/ha, K$_{2}$O was 215-350 kg/ha, CEC 13.4-14.9, and organic matter content was 6.1-6.4%. The soil was well drained. Weather conditions for the three years were normal for the area. From May to September about 2,000 growing degree days (base 10°C) accumulated each year and rainfall was in the range of 430-460 mm. The crop was not irrigated.

Experiment 1.—Comparison of ammoniated and blended fertilizers at two rates of application," 1979.

A randomized complete block design with 8 replications was used for this study. The fertilizer sources for the study included ammoniated 10-15-15-1.2 and blend urea-DAP-muriate of potash (MP)-sulfate of potash magnesia (SPM), urea-TSP-MP-SPM and AN-DAP-MP-SPM. The two rates were equivalent to 1,685 and 3,370 kg/ha of 10-15-15-1.2. The 10-15-15-1.2 ammoniated product is a homogeneous granulated fertilizer in which all the phosphorus is present as either mono-ammonium phosphate (65%) or dicalcium phosphate (35%). Nitrogen structure includes 17% of nitrogen as nitrate, 79% as ammonium and only 4% as urea. This product is comparable to many ammoniated homogeneous fertilizers that have been used as starter or row fertilizer for many years with excellent results due to their very low content of urea and/or diammonium phosphate. The combination of sources, rates and two no-fertilizer controls constituted the 10 treatments for the study. The 1,685 kg/ha of 10-15-15-1.2 is a commercial rate used by local growers. The controls were used to double check the requirement of fertilizer for potato production in the test area.

To increase the likelihood that fertilizer injury would occur, fertilizers were applied in contact with the seedpiece in the furrow at planting. Size B tubers of the cultivar Superior were planted at 50,600 seedpieces/ha. The crop was planted on June 9 and tubers were harvested on November 1, 1979. Each plot had three rows 9.14 m long, spaced 0.86 m apart. Only the center