THE EFFECTS OF HUMIC ACID DERIVATIVES ON THE YIELD AND QUALITY OF KENNEBEC AND SEBAGO POTATOES

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Abstract

The partial substitution of humic acid derivatives for fertilizer did not improve yield, specific gravity or boiling, chipping and storage quality in Kennebec and Sebago potatoes in Ontario.

Resumen

La sustitución parcial de derivados del ácido húmico por fertilizante no mejoró el rendimiento, la gravedad específica o la calidad de hervido, de "chipping" y de almacenamiento en papas Kennebec y Sebago en Ontario.

Introduction

Eighty percent of Ontario’s potato production is on soils described as coarse-textured and low in organic matter (4). Thus reports from the southern United States (6) that an organic additive to inorganic fertilizers was improving the yield and quality of some horticultural crops in that area suggested that this material might be of use in Ontario. Benefits claimed from the use of the material, known as “Aqua Humus”, on potatoes included higher yields and better chip color (3).

Materials and Methods

“Aqua Humus” or humic acid derivative (HAD) is derived from Leonardite, an organic deposit found in Wyoming and resembling soft brown coal. Soluble extracts of humic, fulvic and ulmic acids represent 38 percent of the product by volume and are combined with a 12-9-6 fertilizer (6).

HAD was brought to the authors’ attention in 1963 by Hostess Foods Ltd., Cambridge, Ontario, who had obtained some for trial by their contract potato growers. A quantity was made available for testing. Instructions for its use were to substitute 200 lb (91 kg) of HAD for whatever fertilizer was being used, mixing it with the remaining fertilizer and banding
the mixture at planting time. Analysis of the material revealed the following percentage composition: — P₂O₅-0.4; K₂O-12.4; Na-.005; Mg-.013; SO₄-4.6 and Cl-1.5. Soluble salts were 53,100 micromos and the pH 7.3.

A soil test at the Horticultural Research Station, Cambridge indicated that 150 lb/A (168 kg/ha) of N, P₂O₅ and K₂O were required. The soil was a Fox sandy loam, pH 6.8, organic matter one percent and very well-drained. Check plots received 1500 lb/A (1680 kg/ha) of 10-10-10 and the treated plots received 1300 lb/A (1456 kg/ha) of HAD. Sebago and Kennebec potatoes were planted in four-row plots, 30 ft (9.1 m) long in a randomised split-plot design with four replicates in this and all subsequent experiments. The two centre rows of each plot were harvested for yield and samples taken for specific gravity determination and for evaluating boiling quality.

Irrigation was applied whenever the soil moisture dropped to 50 percent of field capacity.

The experiment was repeated in 1964 and 1965 exactly as before, except that in 1964 the fertilizer required was 120 lb/A (134 kg/ha) of N, P₂O₅ and K₂O and in 1965 the requirement was 80 lb/A (90 kg/ha) of each nutrient. A three-year rotation of oats, alfalfa and potatoes was being practised at that time, which, together with varying locations within the field, resulted in this improvement in the nutrient status of the soil.

The remainder of the harvested material was placed in the regular storage of Hostess Foods Ltd. and kept at 15°C and 95% RH. Beginning in mid-December and continuing until early February, samples were withdrawn each week and tested for chipping quality.

No further work was planned but in 1966 the manufacturers of “Aqua Humus” heard of this work and made some suggestions for further experiments. Arrangements were made with a local fertilizer plant to blend HAD into the fertilizer as called for by soil test and the mixtures were formulated using urea as the N source, diammonium phosphate for the P₂O₅ and potassium sulfate for the K₂O. Aqua Humus concentrate (8-0-0) plus HAD was added as required, in which case the urea was reduced accordingly.

In 1967 the following management treatments were used with (i) fertilizer with HAD and (ii) fertilizer without HAD.

a) fertilizer broadcast and disced in at planting
b) fertilizer banded at planting
c) fertilizer banded 30 days before planting.

Kennebec potatoes were planted at three locations with the above management practices and the following treatments:

1) Alliston—Alliston sandy loam, pH 5.8, O.M. 2.7%
   500 lb/A (560 kg/ha) 16-8-8-16 (HAD)
   500 lb/A (560 kg/ha) 16-8-8-0