NITROGEN MINERALIZATION FROM POTATO SLUDGE

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Introduction

Disposing of potato sludge from Malheur County's only potato processing plant has been an ongoing problem. While potato waste products are an excellent cattle feed, the nutritional value of potato sludge is low, making it a poor feed. Land application by shanking directly into the soil has been tried, but the cost has made it economically unfeasible. Land applying sludge to the soil surface can be done economically with manure application equipment over a wider time frame than was available for shanking methods. The feasibility of this approach to the problem along with a limited approval from the Oregon Department of Environmental Quality has made this application method worth pursuing. Two questions that have arisen are: 1) How much sludge can be applied without endangering ground water? 2) What is the nitrogen release curve, and how does it match up with crop nitrogen use requirements? This is the second year of this study.

Materials and Methods

An analysis of the potato sludge indicated a total Kjeldahl nitrogen content of 10,100 ppm. Based on the nitrogen release rates of other organic materials, it was postulated that about 30 percent of the total nitrogen would convert to available nitrogen during the initial growing season. A typical commercial fertilizer application for crops grown in Malheur County would range from 150 - 200 pounds of nitrogen per acre. In order to achieve this amount of nitrogen from sludge, it was estimated that 25 tons of sludge would need to be applied.

25 tons sludge = 550 lb total N

[*.3 (estimated release %) = 151 lb of available N]

On May 15th, two application rates of sludge (25 and 50 tons/ac) were used in the trial. Eighty-nine pounds of soil from a Malheur Experiment Station field was collected and thoroughly blended in a portable cement mixer. Twenty check samples were taken, then potato sludge was added at a rate to equal 25 tons/ac and 20 samples were then taken. Additional sludge was added at a rate to equal 50 tons of sludge per acre and 20 samples were taken.

Each sample was poured into a small plastic bag that held about 1 pound of soil. One end of the bag was heat sealed prior to filling the bags. After filling, the bags were tied with nylon fishing line. The 20 filled bags of each treatment were divided into groups of

four to make four replications. Four bags of each treatment were buried eight inches deep in the field. This allowed for four replications of each treatment to be dug up and analyzed in May, June, July, August, and September.

The buried plastic bags created a closed micro climate that approximates a field without allowing leaching or anaerobic denitrification to occur.

Results

The nitrogen mineralization going on in the soil itself was compared with the nitrogen mineralization occurring when 25 and 50 tons/ac of potato sludge were added (Figure 1). Over the five-month period, the soil released 230 lbs N/ac. This number is consistent with mineralization studies conducted at the Malheur Experiment Station.

A comparison was made of the nitrogen released from the potato sludge after subtracting the soil contribution (Figure 2). The 50 ton/ac sludge rate released about three times as much nitrogen as the 25 ton/ac rate. The total nitrogen release of 152 lb N/ac from the 50 ton/ac rate would be adequate for most crops grown in Malheur County. The 57.2 lb/ac nitrogen released from the 25 ton/ac rate would require supplemental nitrogen for most crops. The 1996 sludge released less nitrogen than in 1995 when 110 and 254 lb N/ac was released from the 25 ton/ac and 50 ton/ac rates, respectively.

Figure 1. Comparisons of mineralization in the soil compared with two rates of potato sludge and soil. Ontario, OR. 1996.

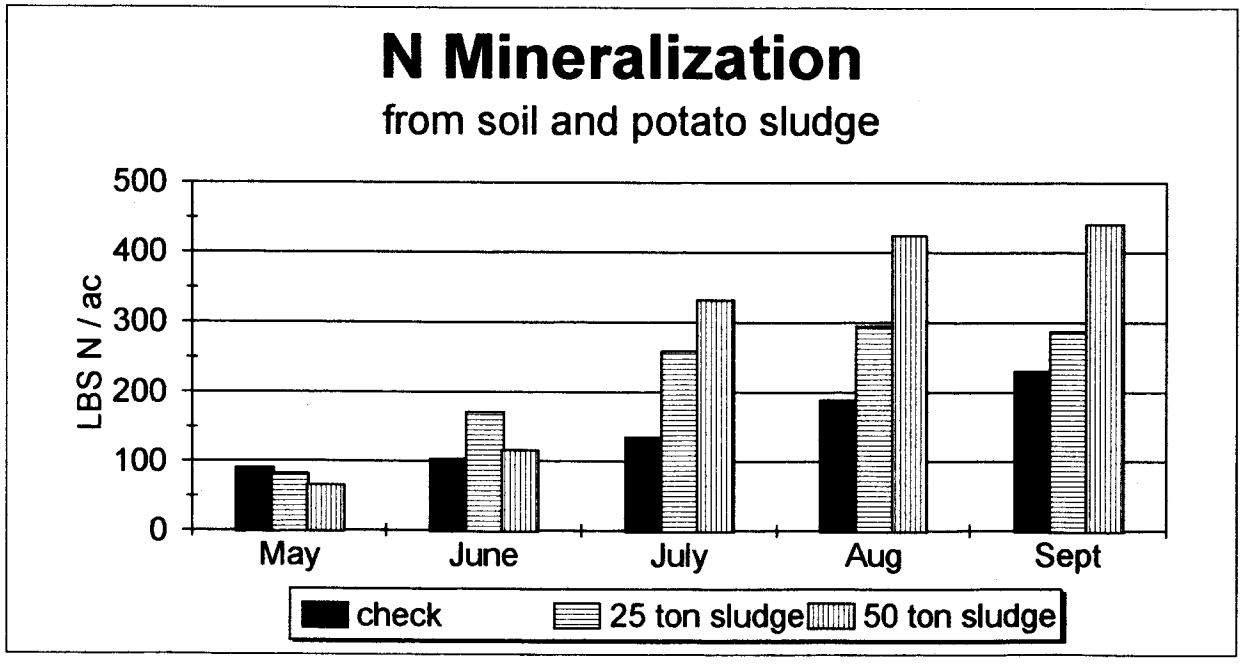

Figure 2. Comparisons of nitrogen released from the potato sludge after subtracting the soil contribution. Ontario, OR. 1996.