EFFECTS OF FERTILIZER ON YIELD AND QUALITY OF NORLAND POTATOES IN NORTHEASTERN SASKATCHEWAN

H. G. ZANDSTRA, R. H. ANDERSON, AND W. K. DAWLEY

ABSTRACT

Fertilizer combinations designed to study the effects of phosphorus, potassium and sulfur on yield, early tuber yields, and quality of potatoes were tested in each of three consecutive years at two sites in northeastern Saskatchewan. Yield responses to fertilizers varied from 0 to 136 cwt/acre and averaged 73 cwt/acre. Phosphorus fertilizer requirements of potatoes were lower for the Nipawin soil type (0-35 lb P/acre) than for the Melfort soil (35-140 lb P/acre) and were related to available phosphorus levels in the soil.

Fertilizer containing potassium (50 lb K/acre) consistently increased early tuber yields at both sites. Yields of potatoes harvested at maturity were significantly increased by potassium at Nipawin. At Melfort, potassium fertilizer did not increase yields when potatoes were harvested at maturity. Over-fertilization with nitrogen reduced early tuber yields at Nipawin on two occasions.

All fertilizer combinations significantly reduced specific gravity of potatoes, compared to the unfertilized checks. Increasing the rates of phosphorus and adding potassium generally decreased specific gravity. These effects were, however, not significant in the three-year averages. Differences in specific gravity of up to 0.006 were not reflected in overall quality ratings for boiled or baked potatoes.

The addition of sulfur from gypsum did not affect early yield, final yield, or specific gravity at either site.

RESUMEN

Durante tres años en dos localizaciones del noreste de Saskatchewan se han llevado a cabo experimentos con varias combinaciones de abonos cuyo fin era el de estudiar los efectos de fósforo, potasio, y azufre sobre el rendimiento, el rendimiento temprano y sobre la calidad de papas. La reacción del rendimiento varió de 0 a 136 cwt/acre y fue en promedio 73 cwt/acre. Los requerimientos de fósforo fueron más bajos para el tipo de suelo Nipawin (0-35 lb P/acre) que para el suelo Melfort (35-140 lb P/acre) y estaban relacionados a los niveles de fósforo disponible en el suelo.

Abono que contenía potasio (50 lb K/acre) consistentemente incrementó el rendimiento de tubérculos tempranos en las dos localidades. Los rendimientos de papas cosechadas cuando maduras fueron notablemente incrementados con la aplicación de potasio en Nipawin. En Melfort el abono de potasio no incrementó el rendimiento cuando las papas se cosecharon maduras. Demasiado abono de nitrógeno redujo la cosecha temprana de tubérculos dos veces en Nipawin.

Todas las combinaciones de abono redujeron significativamente la

---

1Research Officers in soil fertility, horticulture, and former Research Officer in soil fertility, Canada Department of Agriculture Research Station, Melfort, Saskatchewan. Accepted for publication April 22, 1968.
gravedad específica de las papas en comparación con los controles no abonados. Incrementando las proporciones de fósforo y añadiendo potasio resultó en general en la reducción de gravedad específica. Sin embargo estos efectos no fueron significativos en los promedios de los tres años. La reducción de gravedad específica hasta 0.006 no se reflejó en la calidad de las papas cocidas o fritas.

La adición de azufre bajo la forma de yeso no tuvo efecto alguno sobre rendimiento temprano, rendimiento final, ni la gravedad específica en las dos localidades.

Potato production in northeastern Saskatchewan has expanded in recent years mainly to meet the demand within the Province. The yield of potatoes grown on summer fallow soil in this area compares favorably with that obtained under irrigation elsewhere in the Province due to a reserve of stored moisture, higher average precipitation (16.2"), and lower potential evaporation (19.8").

Until recently, little information was available on the fertilizer requirements of potatoes grown without irrigation in the Canadian prairie region. Results of fertilizer experiments at Lacombe, Alberta (2) indicated yield responses of potatoes to applications of phosphorus and potassium. Three years of preliminary studies at Melfort (4) showed that on a summer fallowed deep black chernozemic soil, the most satisfactory rate of nitrogen fertilizer was 80 lb N per acre. The response to phosphorus applications was variable and responses to potassium applications were small and not significant. On a Dark Gray Wooded soil, yield responses to nitrogen fertilizer occurred up to a level of 160 lb N per acre. The responses to phosphorus applications varied but were generally lower than on the deep black soil. Potassium fertilizer was necessary for maximum production but a response to sulfur was obtained on only one out of four trials.

The effects of fertilizers on potato quality were reviewed by Lujon and Smith (3). Nitrogen and potassium fertilizers generally were found to reduce specific gravity of potatoes. Where phosphorus fertilizers were used the effect on specific gravity was found to be variable. In Manitoba, Teich and Menzies (7) found that fertilizers had little effect on potato quality when compared to climatic and edaphic factors.

Because of the short growing season (97 frost-free days, 30-year average) and the prices obtained for early harvested potatoes, early yields are of considerable importance in this area. In this report, results of further potato fertilization studies are reported.

**Materials and Methods**

Fertilizer experiments were conducted during each of three consecutive years at two sites; at Melfort on a Deep Black Chernozemic Melfort Clay soil and at Nipawin on a Dark Gray Wooded Nipawin loam. Soil samples were taken from all sites in the spring and were analyzed for nitrate nitrogen (1) and sodium bicarbonate extractable phosphorus (6). Fertilizer treatments were based on the results of previous experiments (2) and were formulated to permit a study of the effects of phosphorus, potassium, and sulphur in the presence of adequate nitrogen on yield and quality of potatoes (Table 1). Fertilizer sources for nitrogen, phosphorus, potassium