Responses of russet burbank potatoes to applied nitrogen

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Russet Burbank is a new. late maturing potato cultivar with excellent baking and processing qualities. Little data exists on the yield potential and nitrogen (N) requirements of Russet Burbank compared to Kennebec (the latter is the current. main cultivar grown for processing) in South Australia.

Methods

The experiments had a half replicated factorial design with two cultivars x five levels of N (O to 500 kg N per ha) x two spacings x two levels of phosphorus and two levels of potassium at five sites in commercial crops in South Australia. Certified seed pieces were planted in Spring 1983 and harvested in Autumn 1984.

N as ammonium sulphate was banded at planting at 0. 100, 200, 300 and 400 kg N/ha. A further 100 kg N/ha was applied at early tuber set only to treatments that received N at planting. Retiole samples were taken as described by Jones and Rainter (I) at early tuber set, mid and late season to monitor nitrate N levels which were measured by the method of Heanes (2).

Results and Discussion

Russet Burbank (RB) produced significantly less total yield compared to Kennebec (K) at each of the 5 sites. Over all sites total yield was reduced by 22% for Russet Burbank compared to Kennebec (39.8 compared to 50.3 t/ha).

Significant responses to N were recorded at 4 of the 5 sites by both cultivars. At the most responsive site over 50 per cent of the total variation in yield of each cultivar could be explained by the amount of N applied.

For RB: $Y = 23.12 + 0.20\ N - 0.00029N^2$ ($R < 0.001$) $100R^2 = 61.4$
For G: $Y = 39.28 + 0.27\ N - 0.00046N^2$ ($P< 0.01$) $100R^2 - 52.7$

where Y = total tuber yield (t/ha) and N = applied nitrogen (kg N/ha). Maximum total yield of tubers for Russet Burbank and Kennebec occurred when 345 and 293 kg N/ha respectively were applied.

Tuber yields were significantly related to petiole nitrate N levels for data pooled over 5 sites, but considerable variation exists around these relationships.

For RB: $RY = 1.42 + 55.91\ EPN - 10.09\ EPN^2$ ($P.(0.01)$ $100R^2 = 23.2$
For K: $RY = -84.38 + 138.02\ EPN - 27.62\ EPN^2$ ($P.(0.001)$ $100R^2 = 61.0$

where RY = relative total tuber yield (i.e. (plot yield/maximum yield per site) x 100) (%) and ERN = early tuber set petiole nitrate N (%). Preliminary results suggest that for maximum yield nitrate N levels at early tuber set of 2.77 and 2.50% (dry weight basis) are required by RB and G, respectively.

Further work is planned to examine reasons for variability in the above relationships and to define more accurately minimum "critical" nitrate N levels for maximum yield and quality at different growth stages at a range of sites.

1. Jones, P.J. and Painter, C.G. 1975. Univ. of Idaho, College of Agriculture, Current Information Series No. 240.

2. Heanes, D.L. 1982. Plant Anal. 13 (10), 803-818.