

The effect of potassium on french bean seed yield and seed vigour

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The vigour of bean seed produced in the Burdekin District is variable with some lines lacking vigour. While harvesting and post-harvesting storage and handling factors have been shown to be important, vigour of hand-shelled seed can also be low (Brouwer and Scott 1979).

As a part of investigations to determine the cause of low vigour in hand-shelled bean seed grown in the Burdekin correlations were sought between the nutrient content of the seed and seed germination and vigour. The water immersion vigour test used involves soaking bean seeds for one hour in distilled water at 100C then germinating them in trays and measuring visual vigour ratings at day 6 and percentage of normal and abnormal seedlings at day 13. This test gives data which correlate well with data from several other vigour tests (Brouwer - pers. comm.). The studies suggested that the potassium concentration of the seed is positively correlated with seedling vigour.

To further investigate this relationship between potassium concentration and seed vigour a glasshouse pot trial was conducted using a sandy loam low in -1 available potassium (16 ppm K) and 10 rates of applied K from 0 to 400 kg K ha⁻¹. The results show that leaf potassium levels, seed yield, visual vigour rating and water immersion germination percentage increased with applied potassium while the percentage of abnormal seedlings decreased rapidly (Table 1). Potassium had no effect on seed size.

TABLE I. Effect of Potassium on Bean Seed Yield and Seed Vigour.

K applied (kg ha ⁻¹)	0	10	20	35	50	75	100	150	200	400
K% in leaf*	.82	.54	1.18	1.20	1.52	1.92	2.20	2.74	2.60	3.90
Yield of seed (g/pot)	3.7	4.8	8.4	11.9	15.6	17.1	24.8	28.3	27.5	28.4
Visual Vigour Rating	2.1	2.2	2.7	3.0	3.6	3.6	3.6	3.9	4.3	3.9
Water-Immersion										
germination %	27	50	68	76	90	82	86	88	89	86
% Abnormal seedlings	43	24	18	15	5	10	5	2	5	6

*Youngest mature leaf at early flowering.

Maximum seed yield was obtained with 150 kg ha⁻¹ of potassium which gave a concentration of potassium in the leaves at early flowering of 2.74%. This is higher than the concentration previously considered adequate for maximum yield and higher than the concentration often found in bean plants in the Burdekin. While maximum germination percentage of water immersed seed was reached at 50 kg ha⁻¹ of K, applications of 150 kg ha⁻¹ of K were required to achieve maximum vigour as assessed by visual vigour rating. The conclusion is that higher rates of potassium are required for high yields and good vigour than were previously considered necessary.

Brouwer, H.M. and Scott, E. (1979). Annual Report of the Bean Improvement Co-operative 33:99.