

THE EFFECT OF DEEP BANDING N AND P FERTILIZER ON THE YIELD OF CANOLA AND  
SPRING WHEAT

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This study was conducted to determine if deep banding (Db) of P fertilizer was as efficient as placing P in a band with the seed (Sd). Phosphorus fertilizer (MAP) was deep banded at rates of 0, 10, 20, and 30 kg of P ha<sup>-1</sup> and compared with equal rates applied with the seed (Sd); and with one-half seed placed, one-half deep banded (Sd+Db). The P rates were applied onto the same plots each year in a cropping sequence of canola (Brassica napus L.), four crops of wheat (Triticum aestivum L.) and then canola. Plots were located on a Melfort silty clay soil (Orthic Black Chernozem). In combination with MAP treatments, ammonium nitrate was applied by deep banding and by broadcast-incorporation (Br) to bring the total N application rate to 75 kg ha<sup>-1</sup>.

**Canola**

In the first year of the experiment, seed placement of the P fertilizer on average resulted in a significantly higher grain yield (1.01 t ha<sup>-1</sup>) of canola than deep banding (0.88 t ha<sup>-1</sup>). In the last year of the experiment, canola grain yields for the two placements were not significantly different (1.87 vs. 1.83 t ha<sup>-1</sup>). Analyses with a general linear model (GLM), revealed that the P rate (PR) effect on yields was significant and was significantly influenced by the N placement (NPL) and by P placement (PPL) covariants. By regression analyses (REG) and contrast analyses over all placement methods, the yield response of P fertilizer was quadratic over the years 1981 and 1986 with N fertilizer deep banded, but the over all response was linear with N broadcast (Br) ( $P > F = 0.08$ ). A good response was obtained with seed placement at the heaviest rate of P (Fig. 1) with broadcast N and with a low rate of P with

N deep banded. At the control P rate (PR) ('0' PR), the yield (equal to intercept) was higher with N broadcast than with N deep banded. In general, the application of P fertilizer either by Db or Sd placement of the crop gave a similar yield response with the exception that at low rates of P, Sd placement was better for canola, in the first and driest year of the crop sequence.

### **Wheat**

Over the four years that wheat was grown there was no significant difference in grain yield between seed placed P and deep banded, (2.97 vs. 2.95 t ha<sup>-1</sup>). There was a nitrogen x phosphorus placement interaction, however, (Table 1) in which seed placed P yielded most with N fertilizer broadcast and in which half seed placed x half deep banded yielded best with N fertilizer deep banded. Analyses with a general linear model (GLM), revealed that the P rate (PR) effect on yields was significant and was significantly influenced by the N placement (NPL) and by P placement (PPL) covariants (Figs. 3 and 4). Because of the large plot area, variance of the results was fairly high and analyses of variance showed no significant difference between placement methods except for the previously mentioned interaction.

### **Phosphorus soil tests**

The application of N and P over the six years increased the available P in the soil from 7.5 (control) to 11.8 µg of P g<sup>-1</sup> soil (average of N P treatments with 75 kg N ha<sup>-1</sup>). Again, the general linear model analyses revealed that the P rate effect on available soil P was significantly influenced by the N placement by P placement covariants (Figs. 5 and 6). The variance between the placement methods appears to be the least at the heaviest rates of P applied for broadcast and deep band N placement treatments.

Table 1. The effect of N and P placement interaction on yield of wheat

N Placement	Phosphorus placement			Mean
	Seed	Deep banded	Sd+Db§	
	----- yield in t ha <sup>-1</sup> -----			
Broadcast + incorporate	3.05	2.94	2.87	2.95
Deep banded	2.90	2.96	3.08	2.98
Mean	2.98	2.95	2.98	

\*P x N placement interaction significant at P < 0.05.

§One half seed placed + one half deep banded.

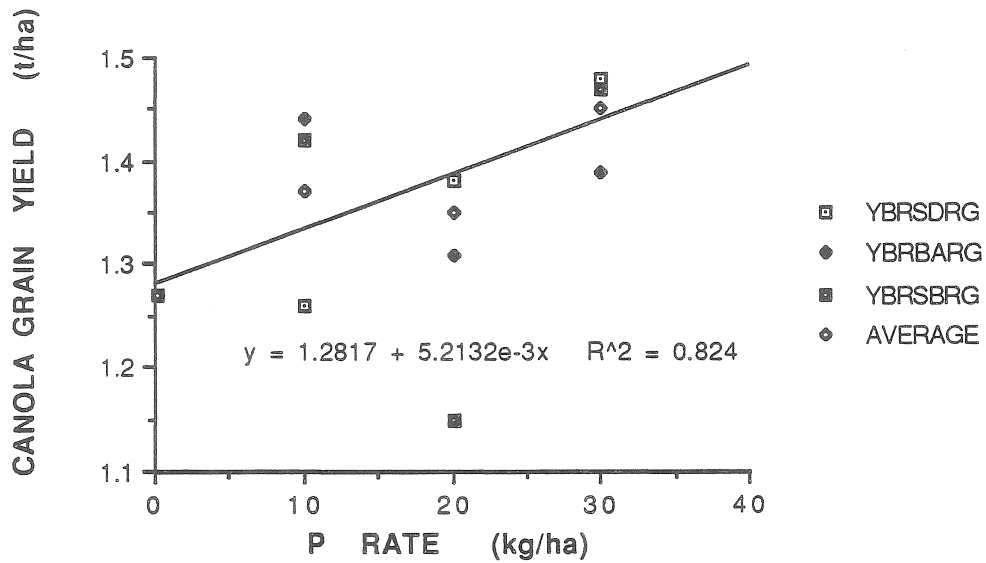


Fig. 1. Canola yield related to P fertilizer applied as seed placed (YBRSDRG), banded (YBRBARG) and one half seed + one half banded (YBRSBRG) with N fertilizer broadcast at 75 kg/ha.

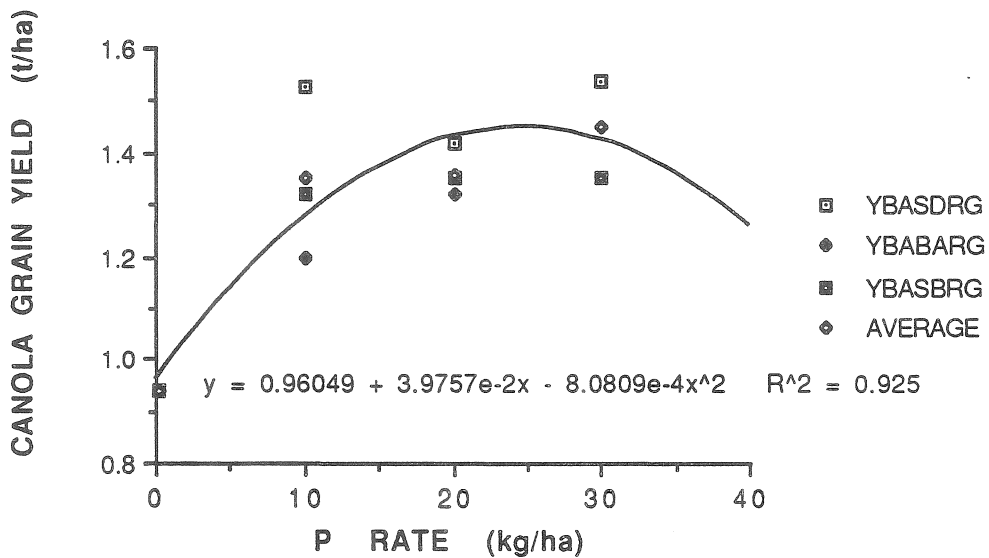


Fig. 2. Canola yield related to P fertilizer applied as seed placed (YBASDRG), banded (YBABARG) and one half seed + one half banded (YBASBRG) with N fertilizer banded at 75 kg/ha.

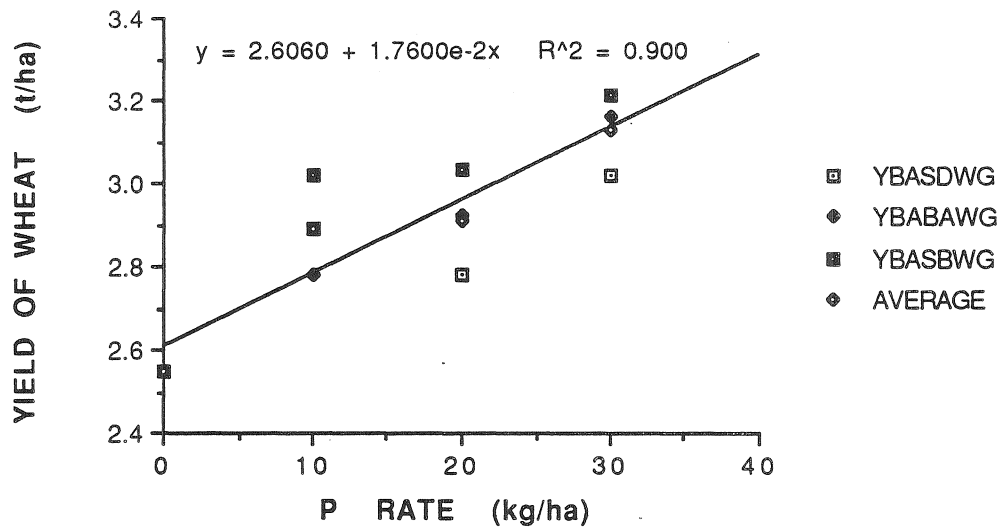


Fig. 3. Wheat yield related to P fertilizer applied as seed placed (YBASDWG), banded (YBABAWG) and one half seed + half banded (YBASBWG) with N fertilizer banded at 75 kg/ha.

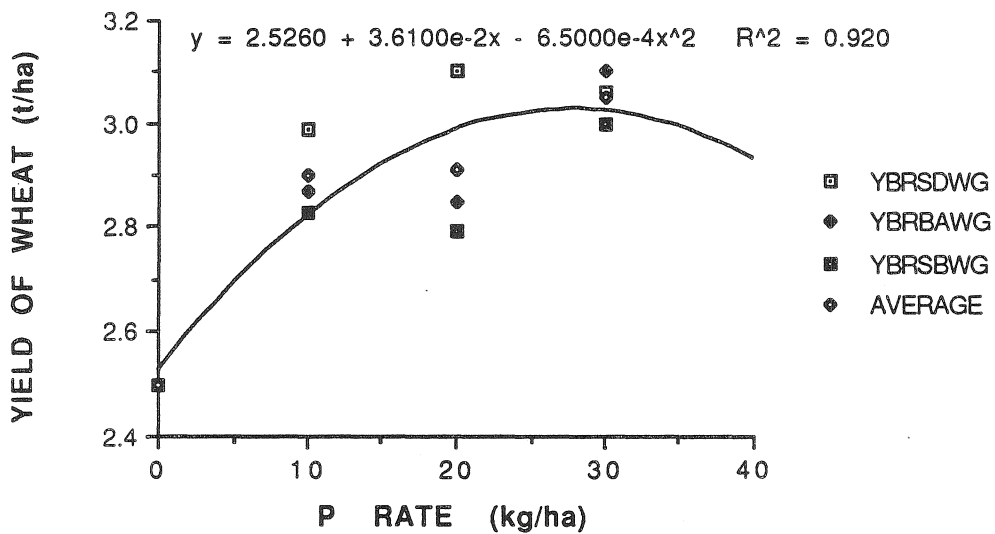


Fig. 4. Wheat yield related to P fertilizer applied as seed placed (YBRSDWG), banded (YBRBAWG) and one half seed + one half banded (YBRSBWG) with N fertilizer banded at 75 kg/ha.

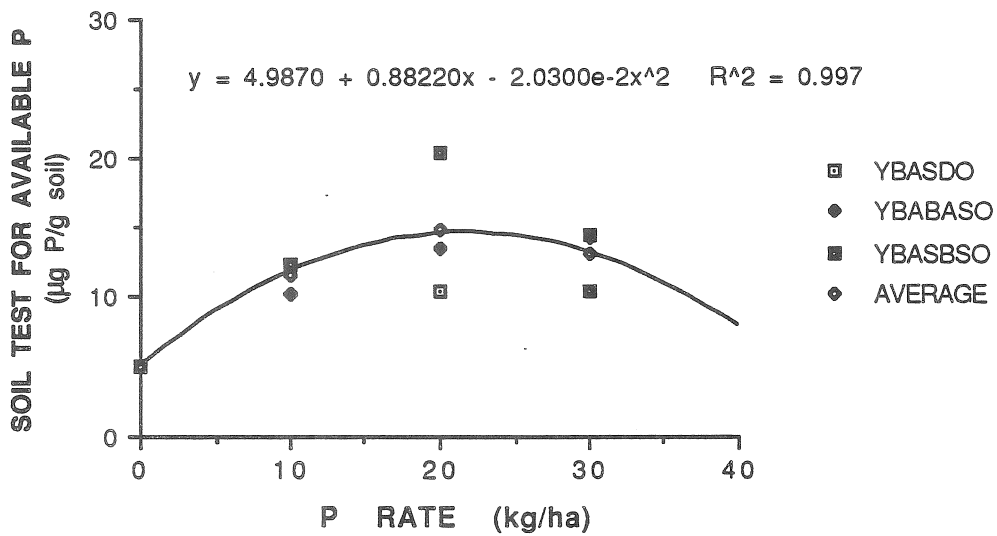


Fig. 5. Soil test for available P in relation to P fertilizer applied as seed (YBASDO), banded (YBABASO) and one half seed + one half banded (YBASBSO) with N fertilizer banded.

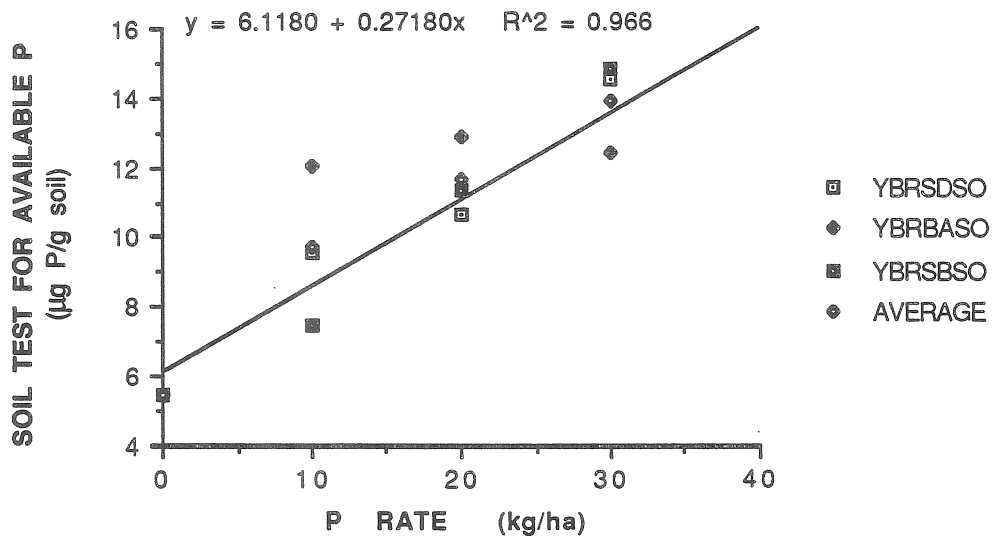


Fig. 6. Soil test for available P as related to P fertilizer applied as seed placed (YBRSDSO), banded (YBRBASO) and one half seed + one half banded (YBRBSO) with N fertilizer broadcast.