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CANOLA ADVANTAGE

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Fertilizing hybrids – how much is enough?

Other than water, nitrogen (N) is the nutrient that most commonly limits canola production. Canola responds well to applied fertilizer N on most soils, so maximizing the economic efficiency of your fertilizer dollars is important.

Recent studies conducted by an Agriculture and Agri-Food Canada research team including Stu Brandt, Dan Ulrich, Guy Lafond, S.S. Malhi, as well as Potash and Phosphate Institute scientist Adrian Johnston examined the differences in fertilizer use between hybrid and open pollinated (OP) canola varieties.

Analysis of the data across location years showed a significant yield difference between the hybrid and OP varieties, as well as an interaction between the cultivars and their response to applied N. Regardless of the N rate used, the hybrid variety yielded more than the OP variety, indicating better N use efficiency. The yield advantage of the hybrid tended to become larger as the N rate increased, rising from 10% with no N applied to 17% at the two highest N rates (Figure 1). It was also noted that at normal to above normal rates of N, there typically is an economic advantage to hybrids over OP's. Similar research conducted by Westco Fertilizers (Rigas Karamanos) had comparable results (Figures 2 & 3).

The researchers concluded that the trials support the theory that hybrids use nutrients more efficiently. However, to achieve optimum yields, hybrids appear to require more nitrogen than OP varieties. Other studies have indicated that this may not be the case for the other macronutrients including phosphate (P), potassium (K), and sulphur (S). These nutrients are typically required in lower rates than nitrogen, and the improved ability of the hybrids to scavenge and utilize these nutrients appears to allow sufficient uptake. Rates of P, K and S sufficient to optimize the yield of OP varieties seem to be enough for hybrid varieties as well.

Figure 1: N response of hybrid and OP canola (Mean of six location years at Scott, Melfort and Indian Head, SK)

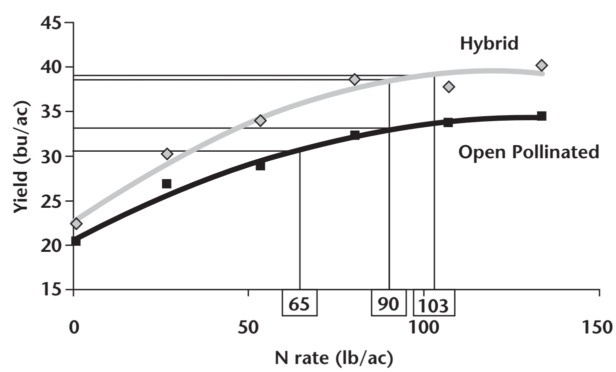


Figure 2: Hybrid vs conventional canola overall (17 site-years)

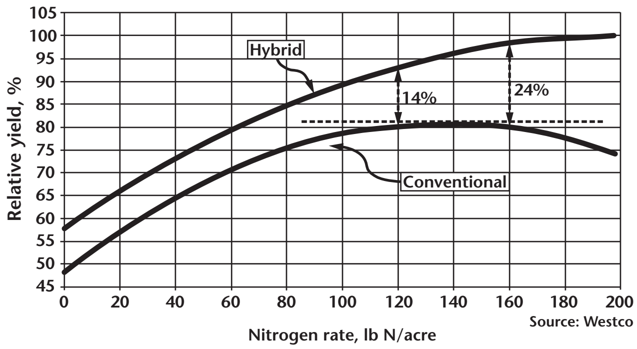
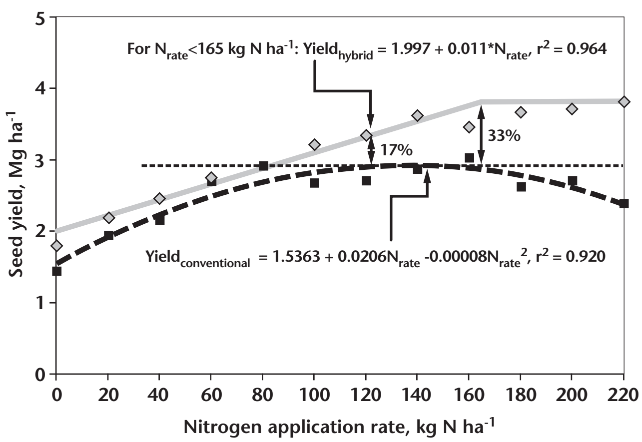


Figure 3: Comparison of overall yield obtained for hybrid (8 site-years) to that of conventional (6 site-years) canola cultivars based on applied N rates



R.E. Karamanos, T.B. Goh and D.P. Poisson, 2005. Nitrogen, Phosphorus and Sulfur Fertilization of Hybrid Canola. Journal of Plant Nutrition, 28, 1145 - 1161

Producers growing hybrid varieties need to carefully examine their fertilizer budget. If budgets do not allow for high N rates, then a potential option would be to switch to an open pollinated variety. Hybrid varieties need approximately 30 lb/ac more N than OP varieties to optimize their yield potential. The yield advantage of a hybrid variety over OP varieties may be reduced if N rates are decreased. Also, when looking at reducing applied N rates, one must understand where fertilizer applications will place each field on the fertilizer response curve. If you are near the top as far as yield and fertility, you may be able to slightly reduce N application rates with little impact on yield. However, if a field is lower on the response curve, reducing N rates can result in larger yield losses (Figure 2).

Westco developed an N Return Calculator to assist in demonstrating how small changes in N rate can affect yield response and net returns. Data in Table 1 is derived from the following assumptions:

1.) Cost of urea = $450/T
2.) Expected canola price = $6.00/bu
3.) Seed costs = $6.50/lb for hybrid; $3.85/lb for open pollinated
4.) Soil residual N = 30 lb/ac
5.) Typical canola N rate = 60 lb/ac of added N

Table 1: Variety and N rate interactions on low end of N response curve

Variety & added N rate (lb/ac)	Yield increase over 0 N	Net return ($/ac)
Hybrid + 60	14.1	31.42
Hybrid + 40	11.7	25.67
Open pollinated + 60	13.5	27.69
Open pollinated + 40	12.7	26.14

When typical N application rates are on the lower end of the N response curve, reducing N application rates by 20 lb/ac can reduce hybrid yield increases and net returns. In contrast, the difference in yield increase for open pollinated varieties is smaller, and there is only a $1.55 reduction in net return. Also note that when cutting N rates to 40 lb/ac, the net return for the open pollinated varieties is higher than that for the hybrid varieties. When input budgets are limited, it may be more economical to grow a good open pollinated variety.

Data from the other end of the N response curve provides a much different picture. Table 2 is derived from the following assumptions:
1.) Cost of urea = $450/T
2.) Expected canola price = $6.00/bu
3.) Seed costs = $6.50/lb for hybrid; $3.85/lb for conventional
4.) Soil residual N = 30 lb/ac
5.) Typical canola N rate = 100 lb/ac of added N

Table 2: Variety and N rate interactions on high end of N response curve

Variety & added N rate (lb/ac)	Yield increase over 0 N	Net return ($/ac)
Hybrid + 100	17.8	35.71
Hybrid + 80	16.2	34.77
Open pollinated + 100	14.8	17.85
Open pollinated + 80	14.5	24.93

When typical N application rates are at the higher end of the N response curve, reducing N application rates by 20 lb/ac affects hybrid varieties differently than open pollinated varieties. Hybrid yields and net returns are still rising at this end of the N response curve, but at a lower rate. Increases in open pollinated yields at this end of the N response curve are minimal and net returns are actually decreasing as there is not enough additional yield to compensate for the increased N cost. Reducing N application rates at the high end of the N response curve has minimal negative impact for the hybrid varieties, while there is a net positive impact with the open pollinated varieties. Also note the hybrids produce the greatest overall net returns, and spread in net returns vs. the OP varieties, at this end of the response curve.

When input budgets are not limited, it may be beneficial to spend more money on hybrid varieties and apply the necessary N to maximize yield and profits.

Canola Council of Canada
400-167 Lombard Avenue
Winnipeg, MB Canada R3B 0T6

www.canola-council.org
Contact the Canola Council at
(204) 982-2100 or admin@canola-council.org