Are Oats Responding to Higher Levels of Macronutrients?

There are a substantial number of oat producers that only apply 60 lb N/ac or less. This may be the right thing to do particularly for those that seed oats late or under low yielding conditions; however, recent research using modern varieties of oats suggests that this rate is on the low side. The objective of this project was to demonstrate the response of a modern oat variety to the historically recommended rate of 60 lb N/ac against the more recent recommendation of 90 lb N/ac and to determine the relative importance of combining phosphorus (P), potassium (K) and sulphur (S) with these different nitrogen (N) recommendations in eastern Saskatchewan. The study was conducted at Indian Head, Melfort, Redvers, and Yorkton in 2022.

Applying 90 lb/ac of N was the most economical rate at Indian Head and Melfort. Increasing added N from 17 lb/ac to 90 lb/ac at Indian Head and Melfort increased yield by 34% and 14%, respectively (Table 1). Indian Head site was highly responsive as soil reserves of N were very low (18 lb N/ac). Despite very high residual N at Melfort (104 lb N/ac), this site was also reasonably responsive to added N due to its very high yield potential. At Redvers, 60 lb N/ac was the most economic rate of N which increased yield by 19% compared to the 17 lb N/ac rate. In contrast, the most economical rate of N at Yorkton was only 17 lb/ac. Despite a high yield potential, the Yorkton site was unresponsive to added N, which was likely the result of high reserves of soil N (104 lb N/ac) and hail damage reducing yield potential. While increasing rates of N to 90 lb/ac reduced test weights into the discount range at Yorkton and Indian Head, discounts were not applied to the economic analysis as lower test weight may not have been a reality for producers who may blow more light seed out the back of the combine than what we do with plot work. No significant yield responses to added P, K, or S occurred at any site even though yield potentials were high. However, there were some numeric yield losses when limiting various nutrients that lead to reductions in net returns. An economic response to 40 lb P_2O_5/ac was observed at Melfort despite high levels of soil test P. At Yorkton and Redvers, economic responses to 15 lb K_2O/ac were achieved despite very high soil test K at both locations. At Indian Head, the application of 10 lb S/ac proved economical but the application of P did not despite soils testing low for P.

Table 1. Main effects of levels of PKS and total N on oat yield at multiple locations in 2022. Means for each main effect within a column followed by the same letter do not significantly differ.

Main effect	Yield (kg/ha @ 13.5%)			
	Indian Head	Melfort	Redvers	Yorkton
No Fertilizer[Y]	4178	6065	4394	5385
Levels of PKS (PKS)				
Full rates of PKS (40 lb P_2O_5/ac + 15 lb K_2O + 10 lb S/ac)	5470 a	7189 a	6094 a	5367 a
Sulphur limited-Full rates of PK (40 lb P_2O_5/ac + 15 lb K_2O)	5388 a	7220 a	6121 a	5372 a
Potassium Limited-Full rates PS (40 lb P_2O_5/ac + 10 lb S/ac)	5518 a	7164 a	6017 a	5242 a
Phosphorus Limited-Full rates of KS (15 lb K_2O + 10 lb S/ac)	5410 a	6945 a	6167 a	5530 a
Total Nitrogen (N)				
17 lb/ac	4538 c	6600 c	5443 b	5379 a
60 lb/ac	5681 b	7238 b	6498 a	5268 a
90 lb/ac	6121 a	7551 a	6358 a	5487 a

[Y]No fertilizer check is for reference and is not part of statistical analysis.

In conclusion, the application of 90 lb N/ac can be the most economical if soil reserves of N are low (<30 lb N/ac) or the yield potential of oats is very high. Lodging was not a substantial problem in this study, but producers must still consider this risk based on their own field experience. Responses to P, K, S were variable and would not have always been predicted based on soil test results. The response of oats to added N was not influenced by the level of P, K and S.

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