



Maximizing economic return in oats

CATEGORY [agronomy](#) | *March 10, 2020*

A nitrogen fertilizer rate of 89 lbs. N/ac provided the most consistent economic returns when oat prices were between \$2.50 and \$3.00 per bushel. Fungicide application did not provide a benefit at any N application rate.

In an effort to maximize yield and quality, some oat producers are pushing nitrogen (N) rates higher and using a fungicide for disease control even when disease intensity is low. The two objectives of this study were to evaluate the effect of fungicide application and N rate on the grain yield and quality of oat in Saskatchewan, and to provide growers with information on the economic benefits of these inputs.

The two-year study was conducted at Melfort and Indian Head, Saskatchewan in 2012 and 2013 and published in *Agronomy Journal* in February 2020. The fungicide treatments included a control, pyraclostrobin (Headline) and propiconazole + trifloxystrobin. (Stratego). The fungicides were applied after the flag leaf had fully emerged at Zadoks 45.

Eight N rates of 4.5, 18, 36, 53, 71, 89, 107, 125 lbs./ac (5, 20, 40, 60, 80, 100, 120, and 140 kg/ha) were applied to each fungicide treatment. All fertilizer was side banded during seeding and placed approximately 1 inch (2.5 cm) to the side, and 2 inches (5 cm) below the seed. Monoammonium phosphate (MAP) (11-52-0-0) was applied at 20 lbs./ac (23 kg P₂O₅/ha), with fertilizer N adjusted to account for the N in the MAP.

The residual soil N level in the soil in the fall prior to seeding at Indian Head was 10 lbs. N (NO_3^-)/ac (11 kg N/ha in 2012, and 29 lbs. N/ac (33 kg N/ha) in 2013. At Melfort the residual levels were 32 lbs. N/ac (36 kg N/ha) in 2012, and 29 lbs. N/ac (32 kg N/ha) in 2013.

The white milling oat variety Triactor was seeded into canola stubble with no-till drills. Triactor is currently one of the highest yielding oat varieties with very good lodging resistance, and is moderately resistant to crown rust but susceptible to stem rust.

Little response to fungicide application

In both years, crown rust was not observed at Melfort and at very low levels at Indian Head. Leaf spot disease on the flag leaf slightly increased with higher N rates but remained below 4% when averaged across sites. Once the N rate reached 71 lbs./ac changes in the leaf disease rating were very small.

The application of a fungicide reduced leaf disease on the flag leaf at two locations where slightly higher levels of leaf disease occurred. For example, at Melfort in 2012, leaf disease was reduced from 4.35% of leaf area to 2.96% with Headline application and 3.23% with Stratego.

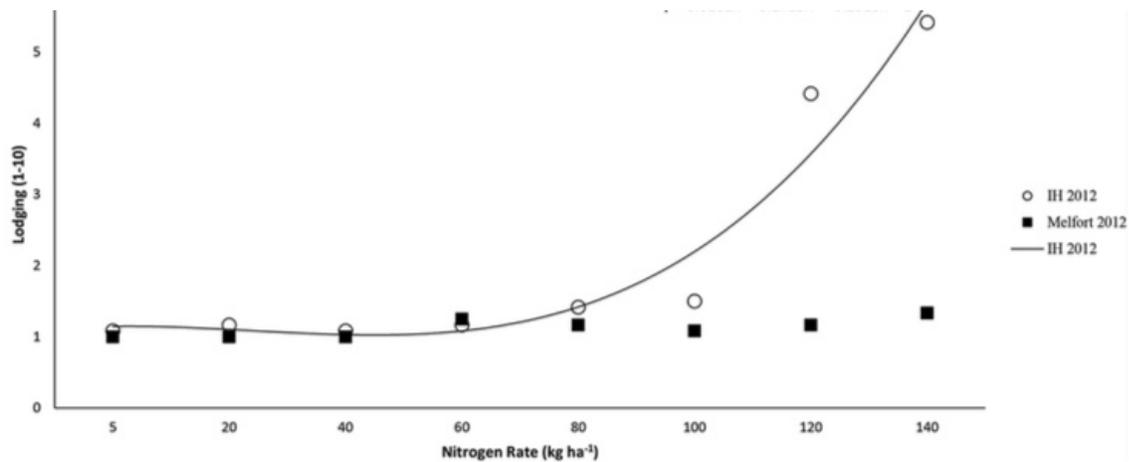
Yield responded to increasing N rate but not fungicide application

Three site-years had curvilinear increase in oat plant height as N rate increased and one site had a linear increase in height.

Only the first year's trial was assessed for lodging. At Indian Head, lodging remained relatively low at less than 2 out of 10 but spiked upwards at N rates above 89 lbs. N/ac reaching approximately 5 out of 10 on the lodging rating scale. At Melfort, lodging remained consistently low at around 1 out of 10 at all N rates. Lodging was not affected by fungicide application.

When lodging occurred at Indian Head the test weight also dropped which indicates that growers have to take into account the risk of lodging in their fields when deciding on a N rate. The researchers suggest that if test weights are well above the level required by millers a grower may have more tolerance for lodging than growers that usually have test weights at a level close to that required by millers.

Response of lodging to increasing N rate



Source: May et al. 2020

Oat yield was highly responsive to increasing fertilizer N at low rates but less responsive to higher N rates. For example, the 18 lbs./ac N rate yielded 144 bushels/ac while the 89 lbs. N rate yielded 174 bushels/ac and the 125 lbs. N rate yielded 177 bushels/ac.

An application of Headline fungicide increased grain yield at one out of the four site-years, and decreased grain yield at one out of the four site-years. An application of Stratego had no effect on grain yield. In this study at the low levels of leaf disease, fungicide was not warranted and would have resulted in a negative economic return.

At three site-years, there was a small linear decrease in test weight as the N rate increased but the decrease was so small that the decrease would not have lowered the acceptability of the oat to the milling industry. The fourth site year had test weight under 41.7 lbs./bu (240 g/0.5 L) at all N rates, with the minimum test weight acceptable to most oat millers is 40.7 lbs./bu (235 g/0.5 L).

Fungicide applications showed no significant differences in test weight.

Target 89 lbs. N per acre for most consistent economic return

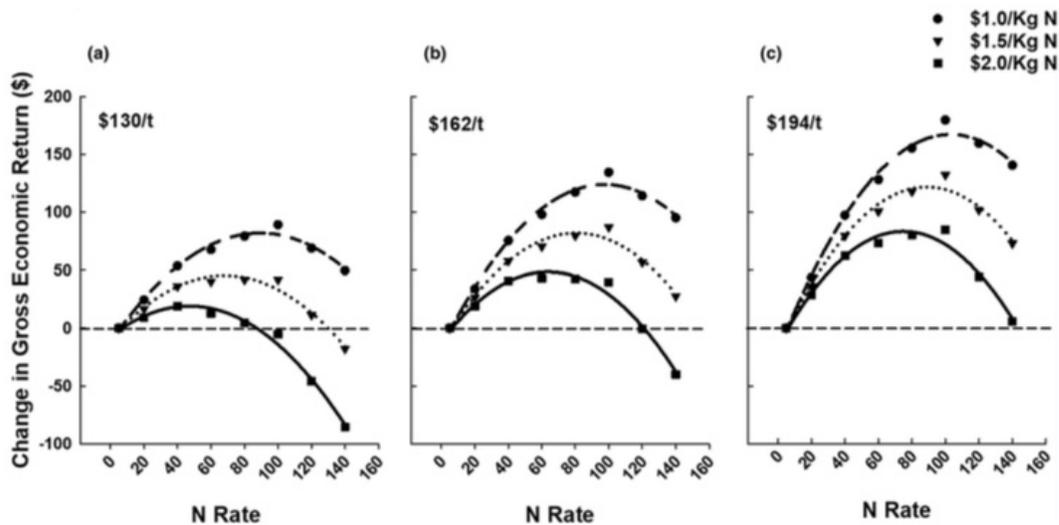
To increase the understanding of the impact of N rate on the financial return to producers a simple economic analysis was conducted.

The change in gross return [grain yield × crop price – (N rate × N price)] was calculated at three oat prices, \$2.00, \$2.50 and \$3.00/bushel, (\$130, \$162, and \$194/t) and three N fertilizer prices, \$0.45, \$0.68 and \$0.91/pound (\$1, \$1.5, and \$2/kg).

The 4.55 lbs. N/ac rate was used as the base return for each oat price by N price combination.

At \$2.00/bu, the N rate that maximized economic return was very sensitive to the price of N fertilizer ranging from 36 to 89 lbs. N, depending on N fertilizer cost. As the crop price increased the optimum N rate was 89 lbs. N/ac except when fertilizer N cost \$0.91/lbs. when the optimum N rate was 53 to 71 lbs. N/ac.

Change in gross returns compared to 5 kg N ha⁻¹ as the nitrogen (N) rate increased at three grain prices and three nitrogen prices



Source: May et al. 2020

In conclusion, the results indicate that using an N rate of 89 lbs. N/ac provided the most consistent economic returns when the crop price was between \$2.50 and \$3.00 per bushel. There was no beneficial interaction between fungicide and N rate for growers using higher N rates.

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May WE, Brandt S, Hutt-Taylor K. Response of oat grain yield and quality to nitrogen fertilizer and fungicides. *Agronomy Journal*. 2020; 1–14. <https://doi.org/10.1002/agj2.20081>