



Agronomic benefits of black medic cover crops

CATEGORY [agronomy](#) | August 30, 2022

A long-term study at Indian Head, Saskatchewan evaluated the effect of medic on grain yield, N and P of flax, wheat and oats with three different N treatments. Overall, medic had the greatest impact on crop productivity at the low N rate of 20 per cent compared to high N rates.

Cover crops can enhance plant diversity in cropping systems, but generally the Canadian Prairies lack sufficient heat and water resources to support fall cover crop growth. In these short season zones, underseeding legumes such as alfalfa or clovers with grain crops has proven to be a successful crop option. Although little information is available, there is interest in including black medic, *Medicago lupulina*, a self-seeding annual legume crop as an underseeded cover crop in rotation to fix nitrogen (N) and potentially increase the availability of N during the growing season.

The objectives of this long-term study conducted at Indian Head, Saskatchewan were to document the growth of medic within a continuously cropped grain based no-till cropping system and to measure the effect of medic presence on the yield and quality performance of flax, wheat and oats under three different N fertilization treatments. Experiments were also conducted to determine the effect of medic on soil water availability in spring as well as crop water use efficiency, and to determine the influence of medic on soil N and P status.

Long-term field experiments were established in 2003 in a no-till cropping system with seed and fertilizer applied in a single pass. The experiments included a wheat-oat-flax rotation established on

plots with and without black medic cover crop. Black medic was seeded once at a rate of 17.8 lbs./ac (20 kg/ha), together with oat seeded at a rate of 15 plants/ft² (150 plants/m²), and then self-regenerated from seed in the soil in subsequent years.

The treatments also included comparison of three rates of N at 20, 60 and 100% of recommended N rates for each crop. Weeds were managed to balance medic growth and seed set, with herbicides containing clopyralid used to control medic on the non-medic plots and no herbicide containing clopyralid used on medic plots. Herbicide products with chlopyralid will significantly damage the black medic.

Greatest benefits at low N rate

Research results over the 10 years of the study showed that at the low 20 % N rate, medic increased grain yield by 14%, grain N and P and water use efficiency (WUE). However, the yield benefits were not significant at the higher rates of N at 60 and 100%. Medic also produced the most biomass at low N rates, with biomass levels typically double at 20% N compared to 100% N. As N rates increased, black medic biomass consistently decreased.

Overall, the benefits of medic including crop productivity improvements were almost always observed with the low N rate experiments compared to high N rates. However, medic also consistently increased the level of soil available P, which extended to the 12 to 24 inch (30 to 60 cm) soil depth in the 100 per cent N rates compared with the lower N rates. This suggests that medic roots may influence P cycling, and a future investigation of the mechanisms that the medic cover crop uses to increase P is warranted.

Of the three crops, oats appeared to be best adapted to growing in a low N, medic intercropping environment. Medic also increased spring soil water and WUE in oat stubble. Growing a black medic self-regenerating cover crop would likely be most effective for low N and organic no-till farming systems.

This research was made possible by the financial support of the Western Grains Research Foundation, and Agriculture and Agri-Food Canada.

W.E. May, R. McConachie, M. Entz (2022). Self-regenerating *Medicago lupulina* cover crop provides agronomic benefits at low N. *Agronomy Journal*. Open Access: <https://doi.org/10.1002/agj2.21089>

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