Oil Seed Radish and White Mustard as Nitrogen Catching Intercrops in Sugar Beet Rotations

Åsa Olsson, Anita Gunnarsson and Lars Persson, NBR Nordic Beet Research foundation

The study was financed by the Swedish Farmers Foundation for Agricultural Research, SLF

Introduction

Oil seed radish (OSR) and white mustard (WM) are very effective in catching nitrogen, also from deep soil layers. OSR and WM are approved as nitrogen catching crops by the Swedish Board of Agriculture, provided that they are sown before 20 August and are left to grow until 20 October.

The aims of these practical trials were to compare undersown intercrops and intercrops sown after cereal harvest regarding establishment and growth, soil mineral (N_{min}; NH_4^+, NO_3^-) and potential net N mineralization from above-ground plant material year one.

Materials and methods

5 practical strip trials on 5 different fields:

2005: 2 trials with OSR sown after harvest, +/- 50 kg N.
2 trials with WM, undersown and sown after harvest, 0 kg N.

2007: 1 trial with OSR, 1 trial with WM, undersown and sown after harvest, 0 kg N.

Sowing of WM 21 July, 2 weeks before harvest of the winter wheat.

20 September 2005. WM sown after cereal harvest 20 August and undersown 21 July.

Above-ground plant material from 0.1 m^2 rings were analyzed for C and N (Dumas, % of dry matter).

N_{min} samples were taken from the 0.1 m^2 rings and analysed for NH_4^+ and NO_3^-.

The amount of N and C in above-ground plant material was calculated as:
kg dry matter/ha * total N or C in % of dry matter.

Potential net N mineralization year one was estimated as:
above-ground plant material in kg N/ha – (kg C/ha * 0.26/10).
Humification coefficient 0.26 and C/N = 10 for humus (Ref 1, Ref 2).

Results and conclusions

Oil Seed Radish
Dry matter for undersown OSR and OSR sown after harvest, 0 kg N, was almost the same (approx. 1 ton/ha). 50 kg N to OSR sown after harvest doubled the dry matter to approx. 2 ton/ha.

20 October 2005. Unfertilized (left) and fertilized (right) *OSR sown after harvest 2 September. Fertilization of OSR with 50 kg N doubled the dry matter, height and ground coverage.*

N_{min} in the 0–60 cm soil layer after an OSR intercrop was on average 9 kg N, regardless of fertilization and/or sowing time.

Potential net mineralization of fertilized OSR sown after harvest 2005 was 49 kg N year one, of unfertilized OSR sown after harvest 17 kg N.

Intercrops must be sown as early as possible in the Nordic climate to develop enough roots and plant material to be able to catch N. Sowing after peas is a good way to assure that the plants get an early start and N from the pea crop. OSR plant sown 7 August after peas.

White mustard
The amount of dry matter for undersown and unfertilized WM was 2.3 to 3.0 ton/ha (above-ground plant material), for WM sown after harvest slightly less, around 1.8 ton/ha.

N_{min} in the 0–60 cm soil layer after undersown WM was on average 17 kg N and 23 kg N for WM sown after harvest.

Potential net mineralization of N for WM varied between the sowing times, trials and years. The variation may be caused by different temperatures and weather during the autumn and developmental stage of the WM.

References

1. Gunnarsson, A., Lindén, B., Gertsson, U. 2008. Residual nitrogen effects in organically cultivated beetroot following a harvested/green manured grass-clover ley. J. Plant Nutr. 31:1355-1381.
2. Kolenbrander, G.J. 1974. Efficiency of organic manure in increasing soil organic matter content. Transactions, 10th International Congress of Soil Science, II: 129-136.

NBR Nordic Beet Research foundation, Borgeby Slottsväg 11, SE-237 91 Bjärred
E-mail: asa.olsson@nordicbeetresearch.nu

NBR Nordic Beet Research