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Increased N availability in winter oilseed rape by intercropping annual frost sensitive legume crops

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Background:

Winter oilseed rape (WOR) is a profitable crop with continuous increased acreage also in organic production. Organic WOR is subject to a large pressure of insect pests and available soil mineral N in early growth stages is of great importance for high yields. Intercropping (IC) WOR and legume crops (LCs) may increase functional biodiversity as well as providing N in early spring.

Objective:

To develop a concept to improve N management in organic WOR by IC annual legume crops and to assess the influence of IC on the prevalence of insect pests and weeds. Also, to provide a basis for selecting appropriate LCs and the best technique for establishing WOR and legume crops in different regions of Sweden.

Methods:

Three field trials were seeded in August 2021. Row distances 12.5 cm and 50 cm were used, and the LCs; faba bean (FB), blue lupin (BL), common vetch (CV) and a clover mix (CM; Egyptian clover, Persian clover and squarrose clover) were seeded simultaneous with WOR. Legume crops were seeded after the first hoeing in one wide treatment in south Sweden. N-uptake was determined by cut outs in late autumn in LCs and WOR, in early spring and at BBCH 69 in WOR. Injuries of cabbage stem flea beetle were assessed in autumn and early spring.

Results:

N-uptake during late autumn in LC was significantly highest in FB at all experimental sites, whereas N-uptake in the CM was lowest. The uptake in CV and BL was intermediate at two sites and BL was equal to FB at one site. N-uptake in WOR was highest at the site where soil mineral N content (SMNC) was high, whereas for the sites with low SMNC, N-uptake was low and significantly highest in treatments with the sole WOR crop. N-uptake in late April showed similar results, whereas the cut outs at BBCH 69 showed significantly lower N-uptake in WOR intercropped with FB compared to CM at one of the sites. Neither adult damage in autumn nor number of CSFB larva per WOR plant in spring differed between the LC treatments, but there were more larvae per plant with wide RS.

Conclusions:

N-uptake varied between sites and reflect the development of LC during autumn. The time point for seeding in autumn is critical for the growth of WOR and LC to reach its full potential. LCs with robust growth such as FB and BL might compete with WOR for light during autumn. The results indicate that LCs are most beneficial in environments with low levels of N. The result regarding CSFB indicates that LC have a limited potential to reduce crop damage, but more studies are needed especially considering that the pest pressure was limited overall in the fields. Special attention must be paid to the prevalence of soil-borne diseases infecting the roots of LCs during autumn and is investigated in a separate study.