Undersowing oilseed rape with various crop mixtures: what benefits for farmers?

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Oilseed rape (OSR) is the first oilseed produced in Switzerland. It is well adapted to the Swiss climate and is considered as an important crop. Its production is intensive with high fertilization and crop protection. However, in Switzerland, nitrogen fertilization is limited within the farm and the will to reduce phytosanitary treatment led to new subsidies for crop management without herbicides, insecticides or fungicides.
Intercropping OSR with various living mulches was tested as a solution to reduce fertilization and pesticides. Various mixtures, consisting of frost-sensitive or frost-tolerant, legumes or non-legume species, were tested on farm since 2011. Weed cover and yield were registered during 6 years. An additional experiment in a split plot design was set up to assess the impact of these associations on pest damages and nitrogen nutrition. The plants were grown with no insecticide and only the control plots were treated with herbicide. Fertilization level were either "normal", calculated with the "*réglette azote*", or reduced.
The variability among years was large for all the measured parameter, and the differences among treatments were seldom significant. Competition between OSR and additional species resulted in lower OSR biomass in winter, but this was compensated in spring, and did not lead to any yield reduction. Adult flea beetles caused slightly more damages on the cotyledons and the first leaves of sole OSR, but no significant difference could be found among treatments for the amount of larvae per plant, more related to the total OSR biomass in autumn.
Finally, the reduction of nitrogen fertilization did not result in significant yield loss in most years. However, our data showed that the yield gap between high and low fertilization was generally reduced when OSR was sown with companion plants, especially when the mixture consist of a majority of legumes.

Growing OSR as a sole crop or with companion plants led to very similar yields. In most years, undersowing allowed OSR to reach satisfactory grain yield in spite of pesticides and fertilization reduction. In the practice, this technique is booming in Switzerland, promoted by the agricultural policy. Nevertheless, more knowledge is still needed to define long term benefits of undersowing, and propose a better adapted management system.

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