

Is oilseed rape mixed cropping an efficient solution to reduce nitrogen fertilization, weed development, and damage caused by insects ?

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AIM

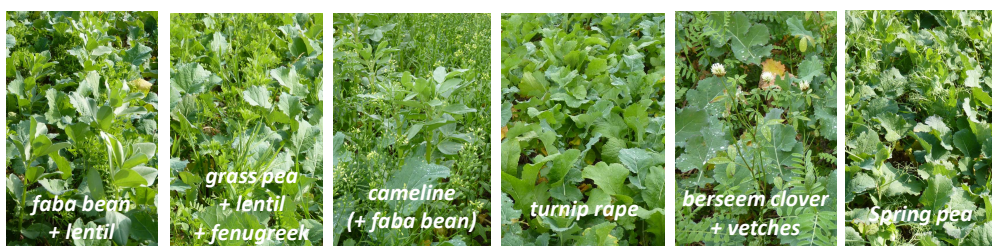
Environmental impacts of agriculture are an increasing concern that requires the transformation of crops practices.

- Spring legumes properties : nitrogen fixation, plant growth, plant architecture
- Spring cruciferous properties : allelopathy, crop, trap crop

may reduce nitrogen fertilization and pesticide applications on winter oilseed rape (WOSR) when these crops are mixed with WOSR during autumn.

MATERIAL and METHODS

➤ 6 main mixtures with WOSR compared to WOSR as sole crop

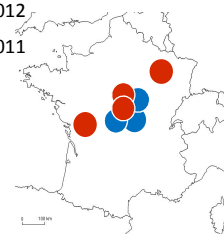


➤ Crop management of 'Mixed cropping' WOSR

- Associated species destroyed by frost
- Reduction mineral nitrogen fertilization : -30kg/ha
- Reduction herbicide and insecticide applications

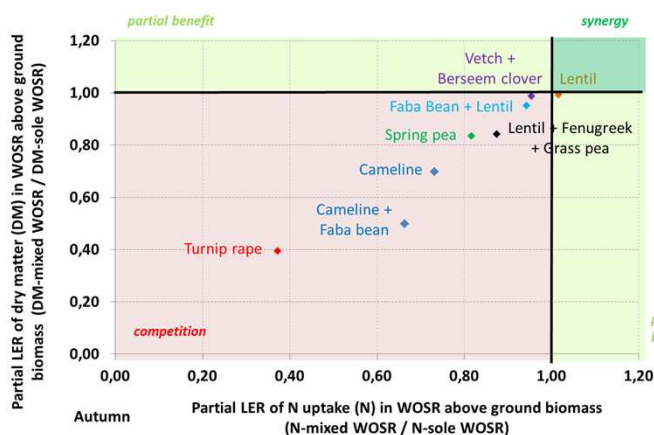
➤ 7 trials (3 Fisher design randomized replications)

- 2011/2012
- 2010/2011



RESULTS

➤ Autumn establishment : Competition – Mutual tolerance – Synergy ? (Dunnett tests, WOSR sole crop = control)



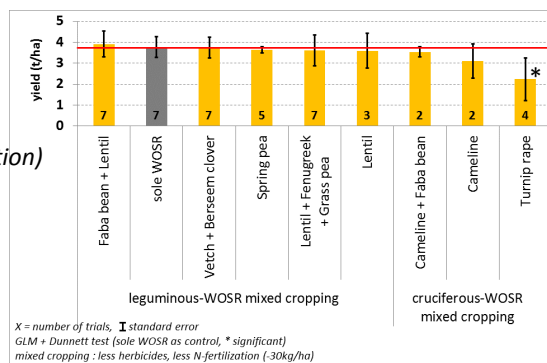
LER = land Equivalent ratio (Willey, 1979)

- Turnip rape and Cameline + Faba bean are competitive mixed crops on both WOSR biomass and N-uptake during autumn.
- Spring pea and Cameline only reduce WOSR biomass.
- Other associations present no competitive co-existences with WOSR. Moreover these associated crops present from 28 to 45 kg/ha of N-uptake.

➤ WOSR Yield comparison : Low input mixed versus conventional sole

Similar yield (except for turnip rape) despite :

- a low input crop management (less herbicides, less N-fertilization)
- a reduced WOSR development during autumn with some associated crops.

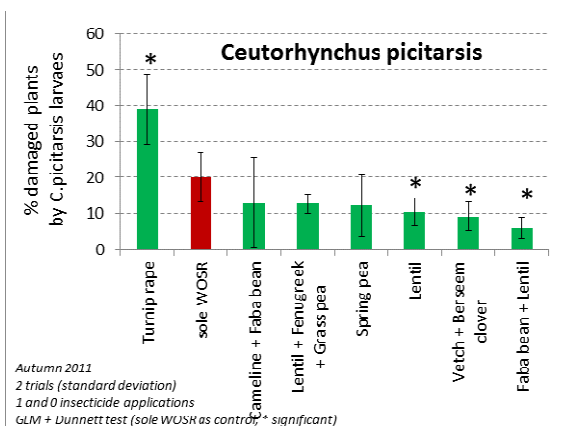


X = number of trials, I standard error
GLM + Dunnett test (sole WOSR as control, * significant)
mixed cropping : less herbicides, less N-fertilization (-30kg/ha)

➤ Autumn insects behavior disturbances ?

Some mixed crops reduce or increase these insect damages

Hypothesis :
the new canopy architecture disturbs insects'
- Perception ?
- Feeding ?
- Reproduction ?



CONCLUSIONS

- A promising solution to design a low input WOSR management without yield losses. However to obtain these results, mixed cropping have to be wisely chosen.
- ➔ A functional traits approach should be a perspective to understand and to spread this innovative solution in various cropping systems.
- N-fertilization reduction (-30kg/ha) let promise benefits on energy costs reduction and greenhouse gas emissions.
- Further trials must be carried out to tests assumptions on insects disturbances mechanisms before reducing insecticides.
- No results on weed control through these experimentations.