



# Pea-barley intercropping for the control of weeds in European organic cropping systems

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This study aimed to determine levels of weed control in pea-barley intercrops compared with their respective sole crops, under contrasting soil and climate conditions in Europe, using two intercropping designs.

## MATERIALS AND METHODS

Field experiments were set up in 2003, 2004 and 2005 at five sites throughout Europe: Denmark (DK-Taastруп), United Kingdom (UK-Reading), France (FR-Thorigné d'Anjou), Germany (GE-Kassel) and Italy (IT-San Marco Argentano).

Spring pea and barley were sown at optimal density in sole crops (P100 and B100 respectively), in substitutive (P50-B50) and additive (P100-B50) intercrops. Crops were grown under organic conditions, without mechanical weeding after sowing. A fallow treatment was included to assess weed potential.

Crop and weeds were hand harvested at the beginning of pea flowering and at crop maturity. Dry Matter (DM) and N accumulation were determined. Soil N was calculated as (total N - N derived from fixation).

## RESULTS

*Chenopodium album* (UK, FR, GE, IT), *Cirsium arvense* (DK, GE, IT), *Stellaria media* (DK, FR, GE), *Matricaria* spp. (DK, GE) and *Sinapis arvensis* (DK) were visually determined as the main weed species.

Weed dry matter was significantly lower in barley sole crop and in intercrops than in pea sole crop at all experimental sites and at both harvests, though crops were tested in the presence of different weed species and varied weed biomass according to site (Fig 1). No difference was found between the substitutive and additive intercropping designs.

Differences in the degree of weed control between crop treatments were already visible at pea flowering at each site and increased until maturity in DK, UK and IT (Fig 1).

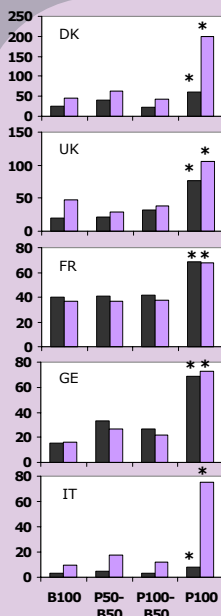


Fig 1. Weed dry matter in  $g \cdot m^{-2}$  at the beginning of pea flowering ■ and at maturity ■ (n=3 years x 4 rep) \* Significant difference at P=5%

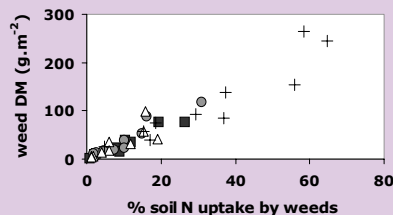


Fig 2. Weed dry matter at maturity as a function of the proportion of soil N uptake by weeds (n=4) in B100 ■ P100 + P50-B50 ● and P100-B50 ▲

Weed biomass reduction compared with fallow plots averaged 70% in P100 and around 90% in B100 and the intercrops.

Weed N accumulation data showed similar trends to those of weed biomass.

Weed dry matter was moreover strongly related to the proportion of soil N uptake by weeds (Fig 2).

## CONCLUSION

- ⇒ **Intercrops were as efficient as barley sole crop at reducing weeds and more efficient than pea sole crop.**
- ⇒ **The higher plant population density in the additive compared with the substitutive intercrop did not enhance competitive ability against weeds.**
- ⇒ **The importance of soil N in crop competition with weeds was highlighted in this study:** since barley sole crop and the intercrops were more efficient at capturing soil N than pea sole crop, soil N was relatively more available for weed growth in pea sole crop.