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# Durum wheat – winter pea intercropping is efficient to improve the use of environmental resources in low input farming in the French southern conditions

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## Background and objectives

Intercropping (IC) can improve the use of light, nutrients and water resources and can increase yield and stability compared to sole cropping (4). These advantages of IC are associated with the complementary use of N sources (soil N and atmospheric N<sub>2</sub>) which is of particular interest in low-input conditions (2). The aim of our study was to evaluate the assumption that winter durum wheat-grain legume IC can improve the use of light and natural N resources.

## Material and methods

An experiment was carried out in Auzeville (SW France) in a clayed loamy soil. Three main treatments were compared: *i*) Durum wheat (cv. Nefer) sown at normal density (W-SC); *ii*) Winter pea (cv. Lucy) sown at normal density (P-SC) and *iii*) Durum wheat-winter pea IC, each specie sown at half of normal density (IC). Three fertiliser-N sub-treatments were applied on W-SC and IC from 0 (N0) to 180 kg N/ha (N180). The two species were sown in row-intercropping on Nov., 2005. Crop biomass, LAI and N uptake were measured at various key stages. The percentage of plant N derived from N<sub>2</sub> fixation (%Ndfa) was determined using the <sup>15</sup>N natural abundance method (1).

## Results and discussion

The values of LER were significantly higher than 1 for N0 and N100 (1.23 and 1.19 respectively). This advantage was limited for N180 (LER=1.08) because fertilizer-N increased durum wheat growth and induced a reduction of pea growth due to the light competition. N acquisition of durum wheat was significantly greater in SC than in IC excepted for N0 but was always lower than the whole IC biomass, excepted for N 180. Moreover, %Ndfa was higher in IC than in SC particularly for N0 (93% vs. 67%) due to the strong competition of wheat for mineral-N. Finally, soil inorganic N content at harvest was higher in IC compared to wheat SC for N0 (29 vs. 17 kg N/ha) but was significantly lower than for pea SC (44 kg N/ha) in agreement with results of Hauggaard-Nielsen *et al.* (3).

## Conclusions

Durum wheat-winter pea intercropping seems well adapted to the conditions of Southern France especially in low-input systems. The complementary use of light and N by legume and non-legume crops in IC could be a way to improve the efficiency of N resources use in agroecosystems and to reduce potential N leaching after legumes.

(1) Amarger, N, Mariotti, A, Mariotti, F, Dürr, JC, Bourguignon, C, Lagacherie, B. 1979. Estimate of symbiotically fixed nitrogen in field grown soybeans using variations in <sup>15</sup>N natural abundance. *Plant Soil*. 52: 269-280.

(2) Corre-Hellou, G, Fustec, J, Crozat, Y. 2006. Interspecific competition for soil N and its interactions with N<sub>2</sub> fixation, leaf expansion and crop growth in pea-barley intercrops. *Plant Soil*. 282: 195-208.

(3) Hauggaard-Nielsen, H, Ambus, P, Jensen, ES. 2003. The comparison of nitrogen use and leaching in sole cropped versus intercropped pea and barley. *Nutr. Cycl. Agroecosys*. 65: 289-300.

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