

# 'Durum wheat - winter pea intercropping' efficiency depends on nitrogen availability and wheat cultivar



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OBJECTIVES

- **Nitrogen acquisition** is often a major concern, particularly in low input systems where mineral N is a **limited resource**.
- Intercropping (IC) can improve the use of environmental resources (light, nutrients and water) resulting in **yield and quality advantages compared to sole cropping** (SC) (e.g. Willey, 1979).
- No reference on winter crops IC was available, despite winter crops seems more adapted to Southern Europe conditions.
- *Aim of our study: Evaluate the assumption that Durum wheat – Winter pea intercropping (IC) is more efficient than sole crops (SC) by:*
  - Understanding competition between durum wheat and winter pea for different wheat cultivars
  - Analysing the consequences of N availability on the performance of IC (grain protein, yield and species proportion)

CONCLUSIONS

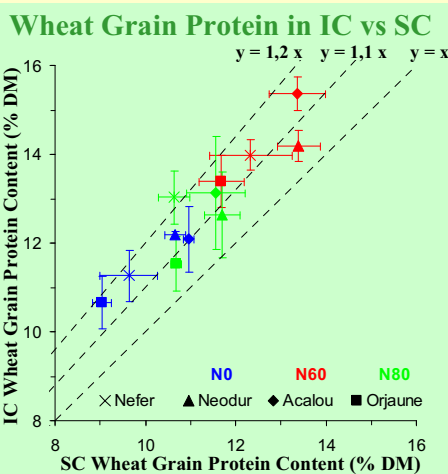
- The '**Durum wheat - Winter pea intercropping**' seems well adapted to the Southern France conditions because it allows:
  - A better use of N resources (and light) during early spring growing season due to the complementarities of the 2 species
  - A higher grain protein concentration of durum wheat at harvest
- IC advantages were greater for the unfertilized treatment **confirming the interest of intercropping in low-input farming**
- Choices in N supply and wheat cultivar depend on the target of the intercrop. Two directions are possible:
  - Increasing N availability and/or choosing a tall wheat cultivar that could increase wheat proportion
  - Reducing N supply and/or choosing a short wheat cultivar that could increase wheat grain protein and pea proportion

MATERIAL AND METHODS

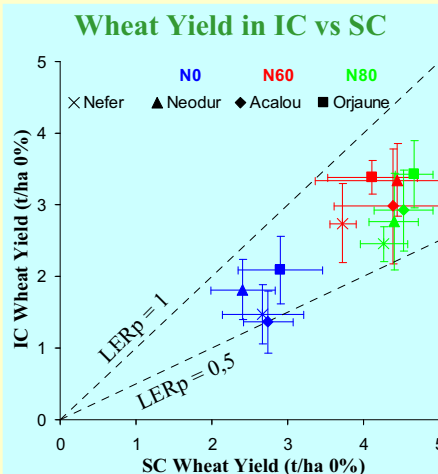
- An experiment was carried out in Auzeville (SW France) in 2006-2007 on a clay loamy soil. The two species were sown on November 2006 the 9<sup>th</sup> in **row-intercropping**. The experiment was based on a split-split-plot design with 3 replicates.
- **Three main treatments were compared:**
  - W-SC:** Durum wheat (sown at 280 seeds/m<sup>2</sup>) ;
  - P-SC:** Winter pea (cv. Lucy sown at 60 seeds/m<sup>2</sup>) ;
  - IC:** Durum wheat-winter pea IC, **each specie sown at half of SC density**
- **Four wheat cultivars of different height:** *i)* **Ac:** Acalou (89 cm); *ii)* **Nf:** Nefer (98 cm) ; *iii)* **Nd:** Neodur (98 cm) and *iv)* **Oj:** Orjaune (116 cm)
- **Three fertiliser-N sub-treatments:** *i)* **N0:** No fertilizer ; *ii)* **N60:** 60 kg N.ha<sup>-1</sup> (at **FLV** 'flag leaf visible' to increase **wheat GPC**) and *iii)* **N80:** 80 kg N.ha<sup>-1</sup> (at 'ear 1cm' to increase **wheat yield**)
- **Measurements made:** *i)* Wheat grain protein concentration (**GPC**) ; *ii)* Grain yield and *iii)* Land Equivalent Ratio (**LER**), defined as the relative land area under SC required to produce the yields achieved in IC and decomposed in partial LER (**LERp**) corresponding to each specie.



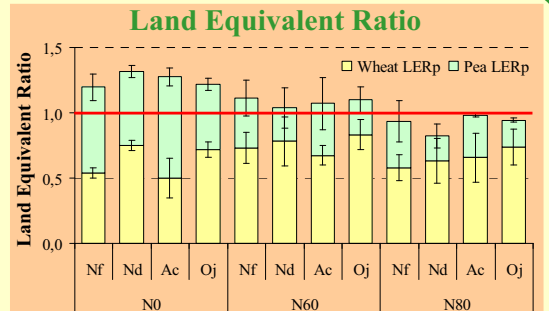
RESULTS



- **IC GPC** was 13% higher than in SC
- Greatest **GPC** for N60 applied at FLV
- **Ac** and **Nd** have greater GPC in SC & IC
- IC reduced the gap in cultivars **GPC**



- **IC Yield** was about 68% of the **SC Yield**
- **IC Yield** greatest with N60
- **SC Yield** greatest with N80
- **Oj/Nd** IC yield 20% greater than **Nf/Ac**



- **LER** greater than 1 for N0 and N60
  - **Wheat LERp** always higher than 0,5
  - **Nd & Oj** Wheat LERp greater than **Nf & Ac**
  - **Pea LERp** strongly reduced with N supply
  - **Pea LERp** lower for **Nd** and **Oj**
- **IC more efficient than SC in N0 and N60**  
 → **Wheat took more advantage of N than pea**  
 → **Complementary use of N resources**  
 → **Pea yield is more reduced with tall cultivars**