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Optimizing durum wheat-grain legumes intercropping through cultivar choice

Bochra Kammoun, Laurent Bedoussac, Etienne-Pascal Journet, Eric E. Justes

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Bochra Kammoun, Laurent Bedoussac, Etienne-Pascal Journet and Eric Justes
E-mail: bkammoun@toulouse.inra.fr

BACKGROUND AND OBJECTIVES:

- **Intercropping (IC)** is defined as the simultaneous growing of two or more species for a significant period of their growth. **Grain legume-cereal intercropping** reveals many advantages in low N input systems (productivity, stability of outputs and ecological sustainability).
- **The advantages of intercrops compared to sole crops (SC) result from interactions between species** greatly influenced by their morphological and physiological traits (Willey, 1979; Davis and Wolley, 1993).
- **Aims of our work:** 1) Determine the main cultivar phenotype characteristics relevant to 2) Enhancing complementary vs. competitive interactions between intercropped species, and 3) Define rules for assembly of cultivars couples adapted to intercropping according to various objectives

MATERIAL AND METHODS:

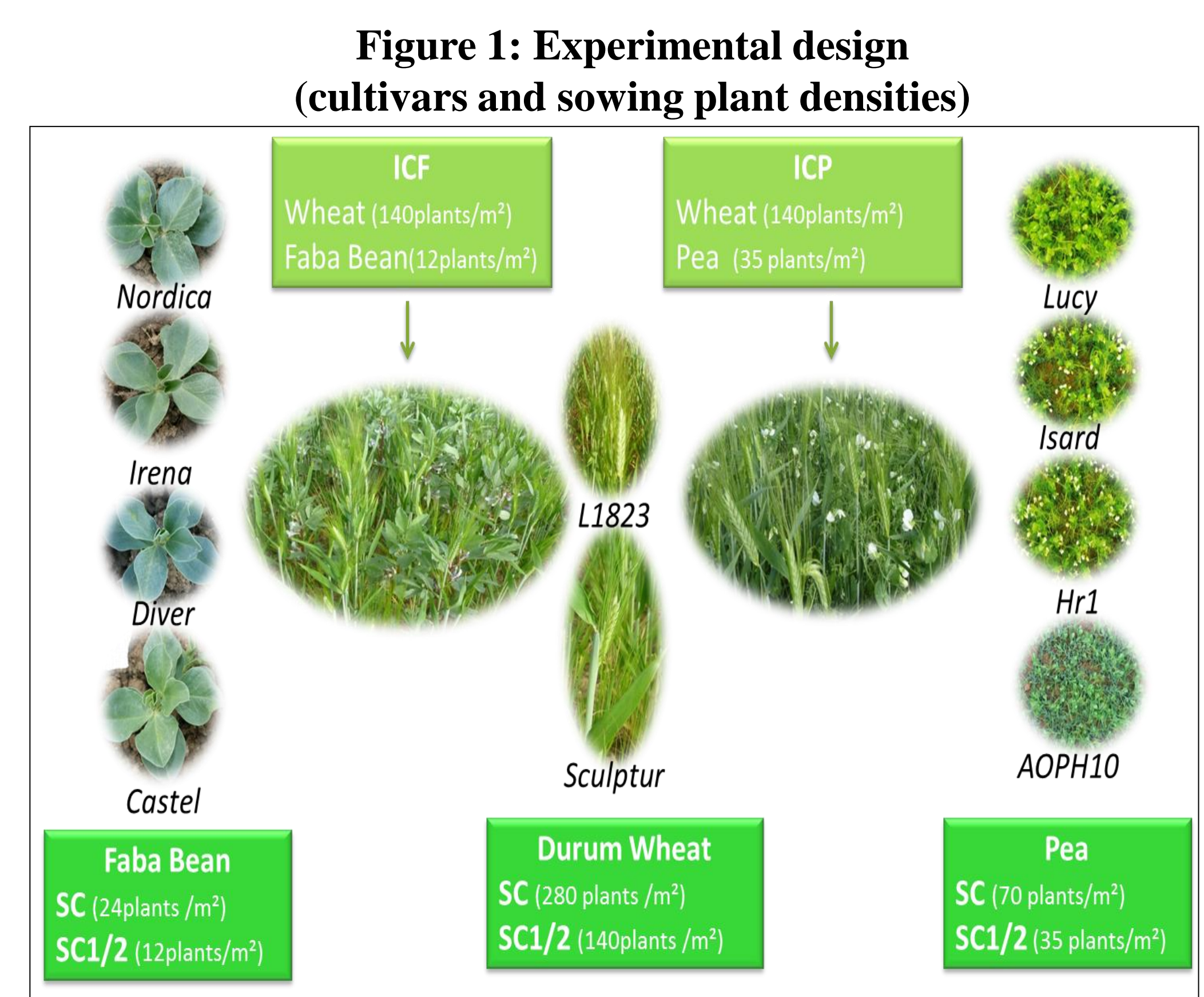
- An experiment was carried out in 2011-2012 in Auzeville (SW France).

TREATMENTS (FIG.1):

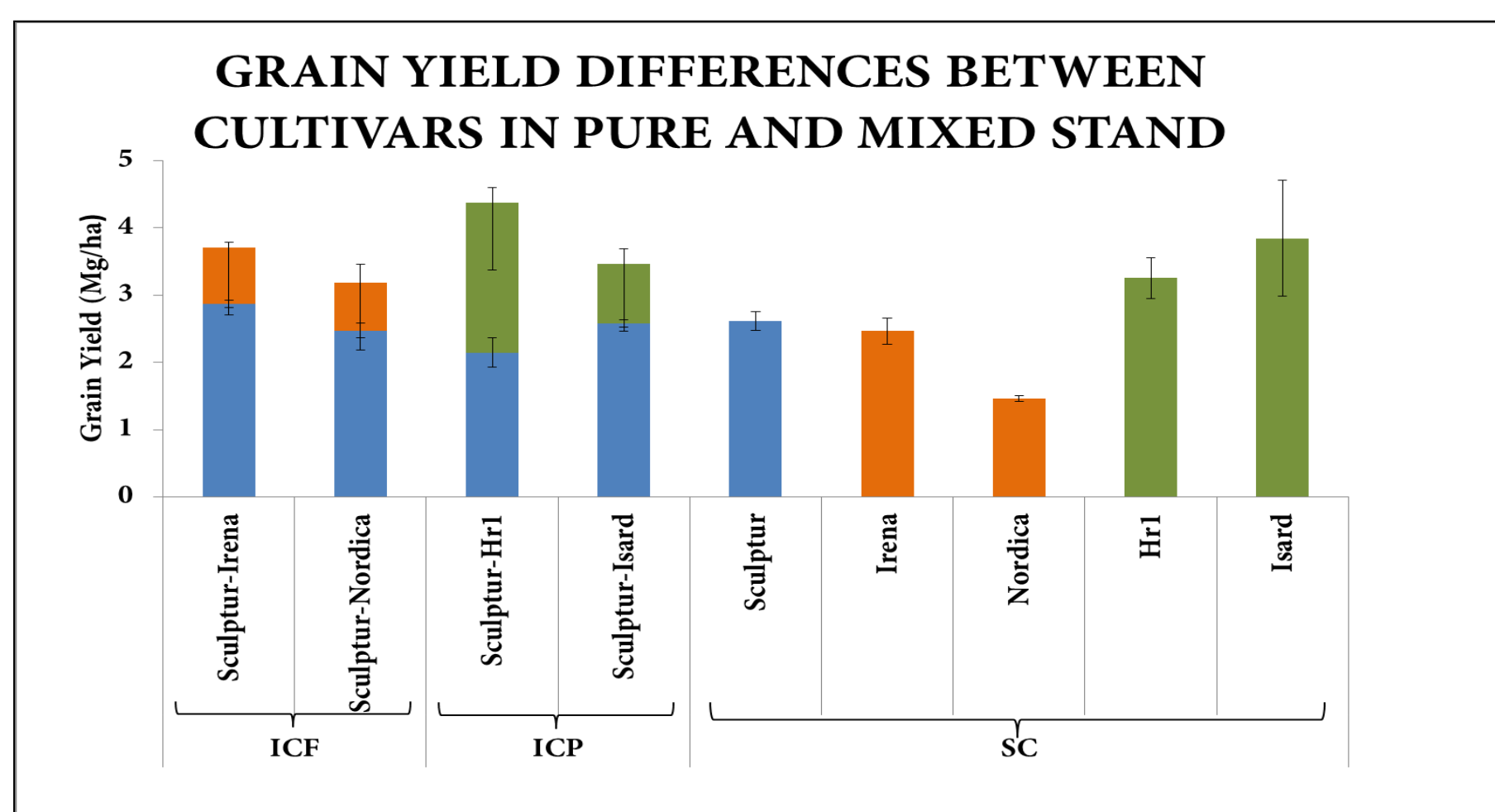
- **Faba bean (F; 4 cultivars), winter pea (P; 4 cultivars) and durum wheat (W; 2 cultivars)** were grown as sole crops (SC), half density sole crops (SC1/2) and **mixed-intercropping (IC) replacement design**, in 3 randomized replication blocks.

MEASUREMENTS:

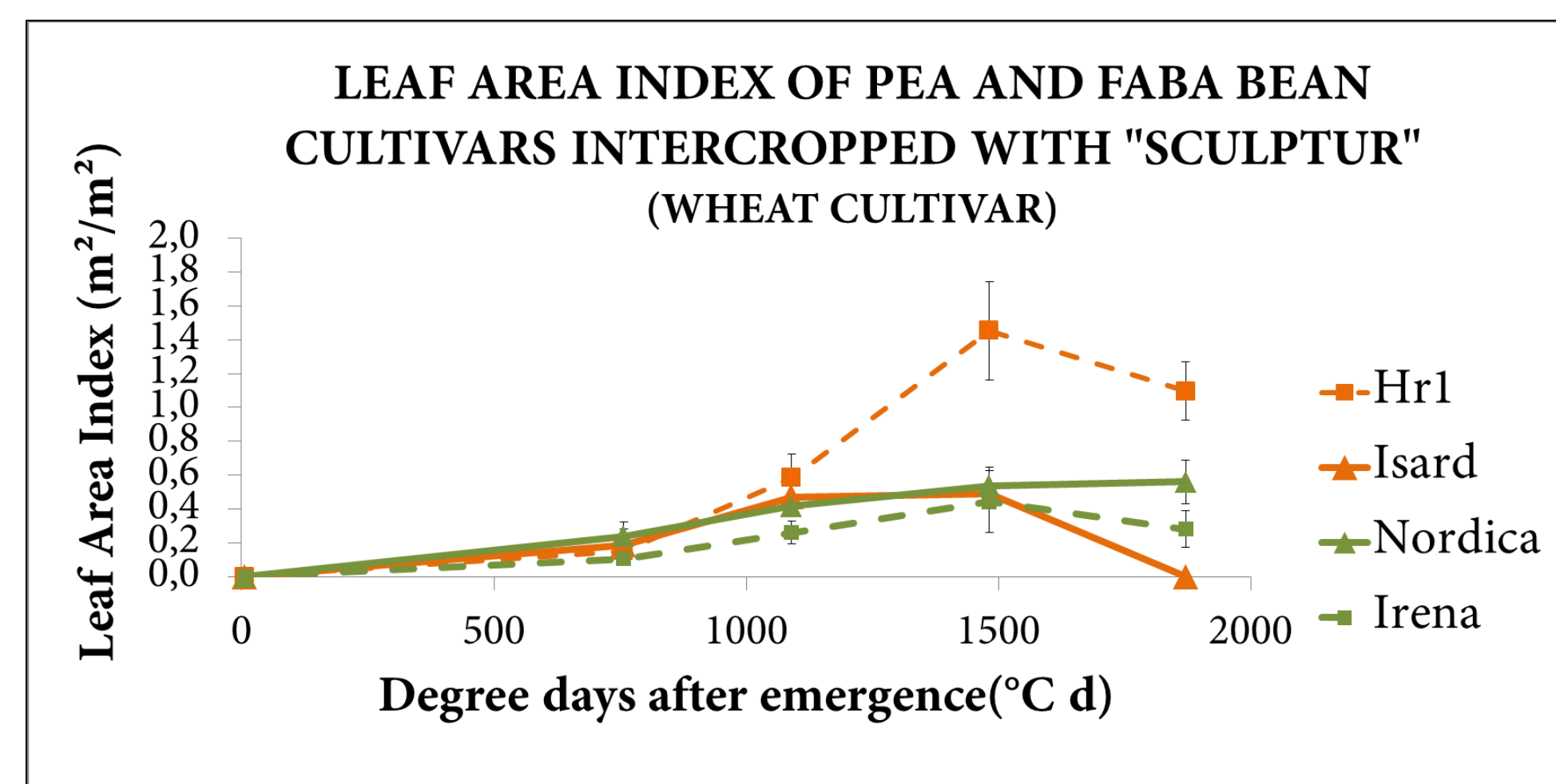
- **Morphological traits:** crop height, branching, leaf area
- **Agronomic variables:** soil cover; dry matter and accumulated N at 5 developmental stages; grain yield (GY) and yield components
- **Indices evaluating intercrop efficiency:** Land Equivalent Ratio, Interspecific and Intraspecific competition indices



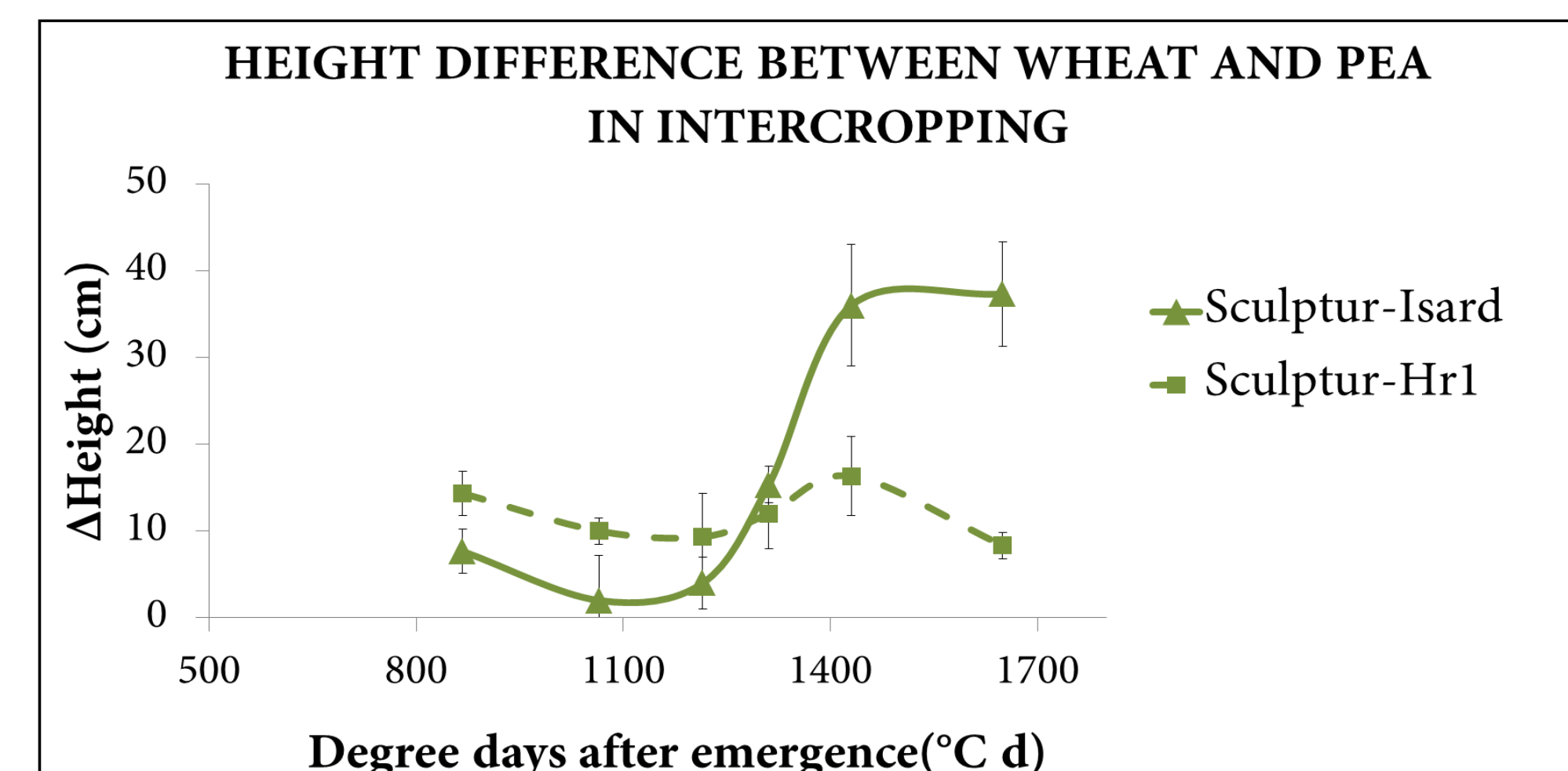
RESULTS:



- Wheat GY is similar in IC and SC whereas legume GY decreases in IC
- Wheat GY > Legume GY in IC
- GY varies with varieties and species



- Hr1, a late pea variety, developed a greater canopy than other legume cultivars in IC
- Faba bean cultivars do not differ in LAI



- From the pea flowering stage on, Sculptur was significantly taller than Isard
- Small and constant height difference between Sculptur and Hr1

CONCLUSIONS:

- There was a significant genotype x cropping system interaction
- Pea and faba bean were less competitive than wheat in IC. Competitiveness could be correlated to aerial cultivar traits such as leaf area and plant height, known to determine radiation distribution in IC.
- Pea cv. Hr1 was less sensitive than cv. Isard to competition with wheat in IC. Whilst a late pea cultivar, Hr1 was the most performing one in IC → taller cultivars such as Hr1 can access to higher incident light levels, which may explain their performance increase in IC.
- Further work is underway in a second year experiment and more in-depth analysis.

References:

Davis, J. H. C., and J. N. Woolley, 1993: Genetic requirement of intercropping. *Field Crops Res.* 34, 407–430
Willey R, 1979 : Intercropping - its importance and research needs. 1. Competition and yield advantages. *Field Crop Abstr.* 32, 1-10