

## Deliverables

*D2a.1 (month 18) Characterization of local and ICARDA germplasm tolerant to multiple stresses by using molecular, physiological and morphological tools (15 person m.) in the three main experimental sites.*

Accessions of Chickpea, Faba bean and Lentils with high yield under rainfed and high temperature conditions have been identified and characterised (physiological and morphologically) across environments – in Syria, Portugal and Morocco (see Table 1 in Annex 1).

The results indicate a high variability in the yield response among **Chickpea** (*Cicer arietinum*) genotypes and regions, with differences in Portugal and Syria between the most productive variety/genotype (ILC588) and the least productive variety/genotype (FLIP03-002C) higher than 1000 kg/ha. In general, the Chickpea genotypes that fasten their development cycle showed the highest grain yield under water scarcity, both in Portugal and Syria. The genotypes - FLIP03-145C, FLIP87-8C and ILC 588 - were on the top 5 of yield in both countries, showing good adaptation under moderate and severe water scarcity conditions, as it is indicated in Fig 1. It should also be emphasized that these genotypes were exposed not only to drought but also to heat as a result of a planning of late in the season.

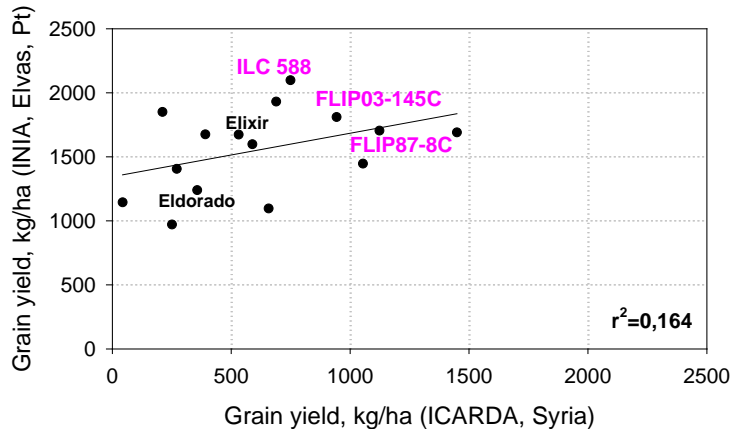


Fig 1: Grain yield of the 15 chickpea accessions in Portugal versus Syria

Larger variation in chickpea yields was observed in Morocco as (cultivated at different farmers) compared to Portugal and ICARDA , with values ranging from 60 to 4460 Kg/ha (see Fig 1, Annex 1).

Faba bean (*Vicia faba*) and Lentil (*Lens culinaris* Medikus subsp. *culinaris*) accessions (11 in Faba bean and 15 accessions in Lentil) were tested in Morocco and in ICARDA, where different irrigation schemes were also used.

For **Faba bean** the date of maturity for all accessions (eleven – 8 from ICARDA, 2 from Spain and 1 from Syria, see Table 1 in Annex 1) varied from 116 to 142 days; plant height ranged from 46 to 95 cm; distance between nodes varied from 3 to 6 cm;

root depth from 8 to 23 cm; dry rhizobium weight from 0.27 to 1.7 g; pod number from 147 to 215/m<sup>2</sup>; biomass from 285 to 952 g/m<sup>2</sup>. Analysis of variance for the different traits in the ICARDA experiment is seen in Table 3 of Annex 1.

In Morocco the yield ranged between 1000 and 4500 Kg/ha (Fig 2).

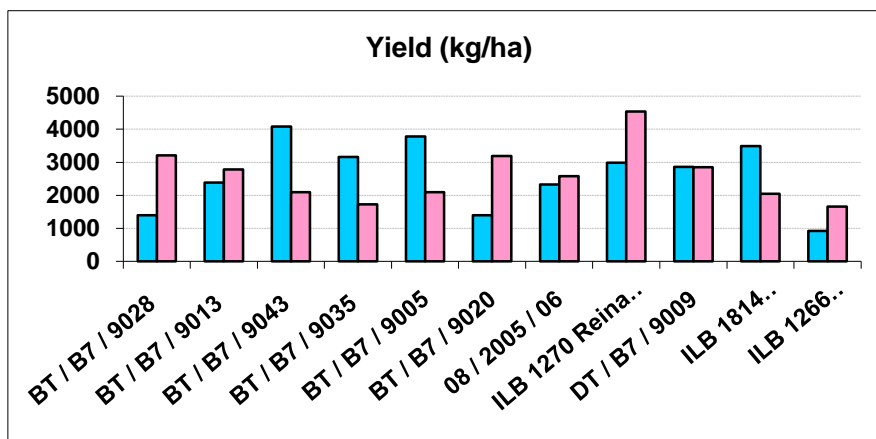


Fig 2: Grain yield (kg/ha) in Faba bean genotypes growing in Morocco.

Significant differences between three water regimes were observed for all the faba bean accessions studied in Syria as well as between genotypes for several parameters such as date of maturity and dry weight of rhizobium per plant ( $p < 0.001$ ). The date maturity was longer in plots with irrigations than in plots under rainfed conditions. The Genotypes  $\times$  Treatment interaction was not significant.

The harvest index of Faba bean accessions varied from 0.27 to 3.3 under rainfed conditions. With almost the same harvest index under the different conditions, accession 3 (DT/B7/9043/2005/06) had better tolerance to drought. However, in the case of genotypes 1, 2, 4, and 5, the harvest index was significantly increased with the increase in irrigation level from 50% IRR to 100% IRR.

The results show that phenological and agronomical traits were affected by terminal drought. Supplemental irrigation at flowering stages, pod and grain filling stages had a positive effect on increasing biomass, plant height, and rhizobium weight for the genotypes.

In Lentil the average grain yield under rainfed conditions was 766 kg/ha with a range between 446 to 998 kg/ha, whereas under irrigated conditions the average rose to 841 kg with a range of 215 to 1160 kg/ha. Under rainfed conditions, the highest grain yield was recorded in ILL 7670 (998 kg), followed by ILL 590 (988 kg), ILL 10707 (981 kg), ILL 7979 (926 kg) and ILL 8068 (859 kg). Genotypes with more than 10% yield advantage under supplemental irrigation were ILL 10691 (38%), ILL 6994 (20%), ILL 10707 (18%) and ILL 5883 (12%), with ILL 10707 (1160 kg) and ILL 6994 (927 kg) being the top yielders under irrigated conditions

Supplemental irrigation showed a positive effect on biological yield in lentils, from 2518 kg/ha to 3406 kg/ha, an increase of 35%. All genotypes responded positively with improvement in biological yield ranging from 5 to 39%. However, this did not hold true for grain yield as only seven genotypes responded positively in term of higher yield (Fig 2).

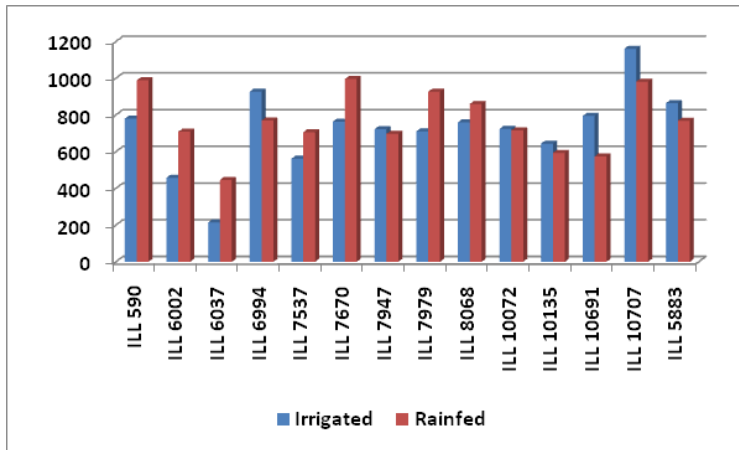


Figure 2 - Effect of supplemental irrigation on grain yield (kg/ha) in lentil genotypes (ICARDA trial)

Molecular characterization of genotypes from chickpea, faba bean and lentil (already characterized morphological and physiologically) will take place in the next two years of the project.