Investigation of the facilitation effect of the alfalfa-rhizobia symbiosis on durum wheat (*Triticum turgidum ssp. durum*) plants grown in association with alfalfa under water deficit

Lahrizi Yahya[1,3], Mouradi Mohammed[2], Bouizgaren Abdelaziz[3], Ghoulam Cherki[1]

[1] Center of Agrobiotechnology & Bioengineering, FSTM,UCA, Marrakech, Morocco

[2] Unit of Biotechnology & Sustainable Development of Natural Resources (B2DRN), Polydisciplinary Faculty, USMS, Beni Mellal, Morocco

[3] Unit of Plant Breeding, National Institute for Agronomic Research (INRA)Marrakech, Morocco

yahyalahrizi@gmail.com / mohammed.mouradi@usms.ac.ma

Introduction

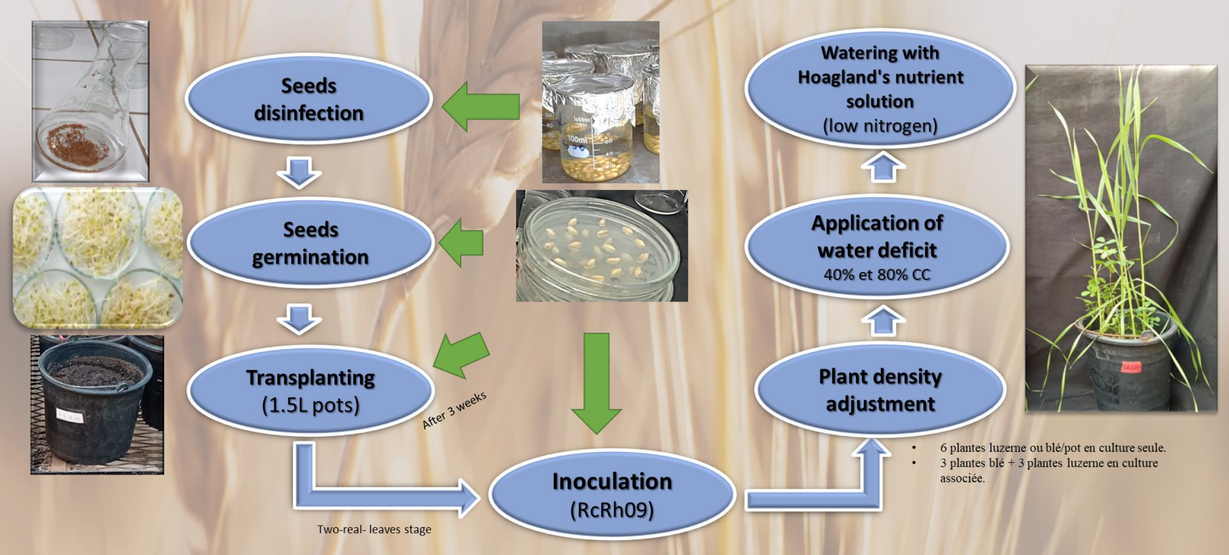
Legumes such as alfalfa contribute to nitrogen levels by fixing and incorporating some of the atmospheric nitrogen fixed in the soil for the benefit of other non-fixing crops like wheat, which are grown in association with legumes (Egamberdieva et al., 2011). Indeed, the yields of wheat and alfalfa remain unstable and relatively low due to various stress conditions, including deficiencies in nutrients such as phosphorus (P) and water limitation. In this context, the present greenhouse study was conducted to investigate the beneficial impact of alfalfa intercropping on associated wheat, by evaluating the positive effects of the alfalfa–rhizobia symbiosis on wheat development.

Materials and Methods

plant material

- A variety of *durum wheat* (KARIM)
- A Moroccan alfalfa population (Adis-Tata).
  - Thanks to their high yield potential and drought tolerance, they are widely cultivated by farmers in traditional Moroccan agrosystems.
- The indigenous rhizobial strain RcRh09 isolated from the Rich region.
  - For its tolerance to water deficit and its ability to solubilize organic phosphorus (Mouradi et al., 2017)

Trial installation



Results and discussion

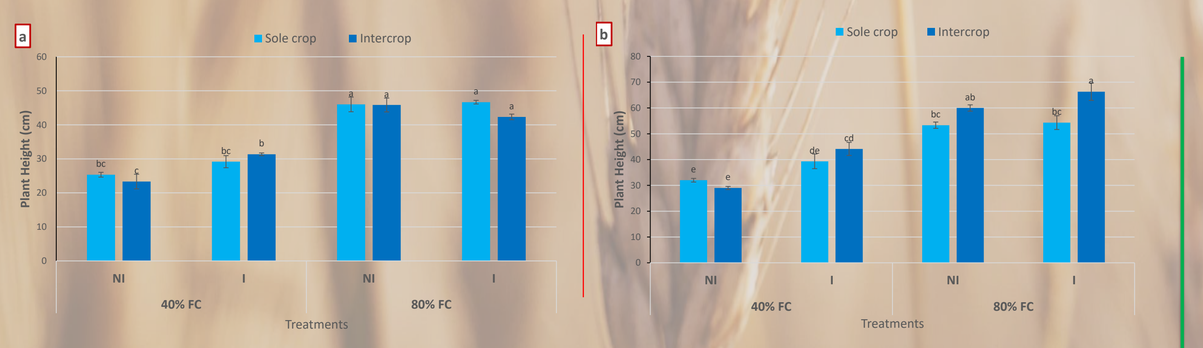


Fig. 3. Effect of intercropping on Plant Height content content of alfalfa (a) and wheat (b) under two water regimes (40 and 80% FC) and with or without inoculation (I, NI).

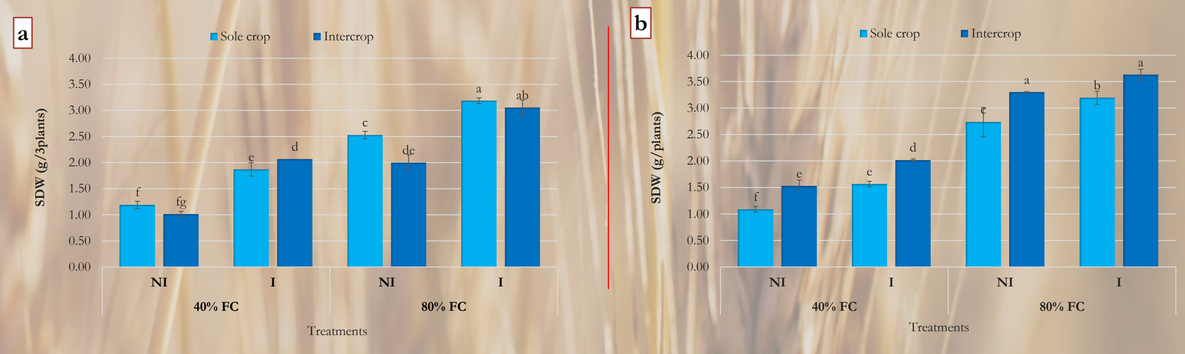


Fig. 1. Effect of intercropping on shoot dry weight (SDW) of alfalfa (a) and wheat (b) under two water regimes (40 and 80% FC) and with or without inoculation (I, NI).

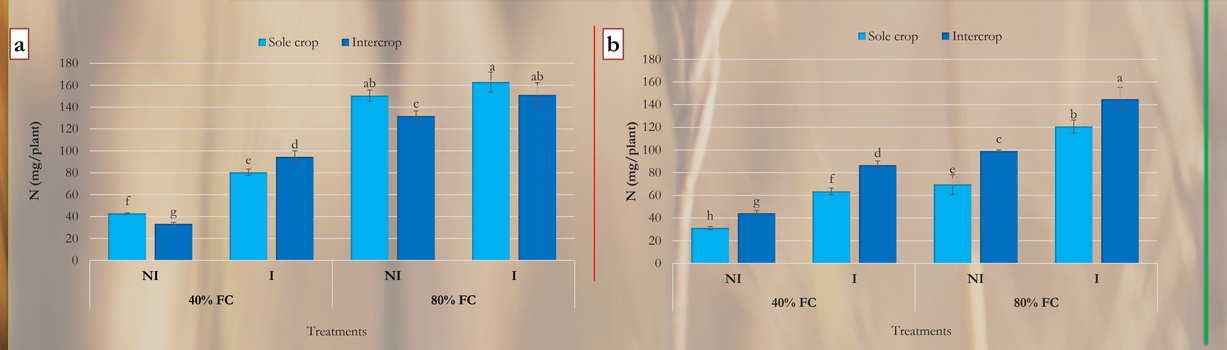


Fig. 3. Effect of intercropping on Total N content content of alfalfa (a) and wheat (b) under two water regimes (40 and 80% FC) and with or without inoculation (I, NI).

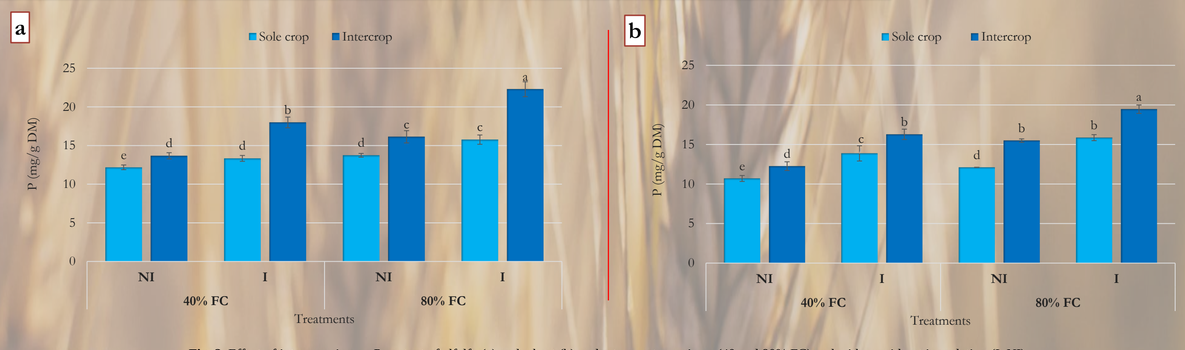


Fig. 2. Effect of intercropping on P content of alfalfa (a) and wheat (b) under two water regimes (40 and 80% FC) and with or without inoculation (I, NI).

- In the intercropping with alfalfa, the highly competitive root system of cereals exhausts residual N in the soil and stimulates the alfalfa plants to establish an efficient symbiosis for N fixation with rhizobia. The obtained results showed that the associated crop significantly improved the growth parameters of wheat compared to the sole crop such as SDW, plant height, N content and P content.

Conclusions

According to the results obtained in the present study, plants grown in association with wheat show the best performance under water deficit conditions. The ability of this indigenous rhizobial strain (RcRh09), isolated from alfalfa root nodules, to mobilize significant amounts of N through nitrogen-fixing symbiosis. We can therefore confirm the facilitating effect of alfalfa on associated wheat.