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First Results Of Fertilization On The Morphological And Eco-physiological Parameters The Effects Of Inoculum And Organic Matter On *Lupinus albus* L.

Alfio Spina[1], Valeria Cavallaro[2], Giovanni Leonardi[3], Fiorella Stagno[4], Alessandra Pellegrino[2], Giancarlo Roccuzzo[4], Antonio Leonardi[1], Salvatore La Rosa[2], Antonio C. Barbera[3]

[1] CREA-Centro di Ricerca Cerealicoltura e Colture Industriali, Acireale, IT.

[2] CNR-Istituto per BioEconomia (IBE), Catania, IT.

[3] Di3A - Dipartimento di Agricoltura, Alimentazione e Ambiente, Università di Catania, IT.

[4] CREA-Centro di Ricerca Olivicoltura, Frutticoltura e Agrumicoltura, Acireale, IT.

Autore corrispondente: antonio.barbera@unict.it

Introduction

The inclusion of white lupin in the agricultural systems has numerous environmental and agronomic advantages. However, the scarce adaptability of the lupin to sub-alkaline soils determined, the absence, or the presence of an insufficient number of its specific rhizobium. Thus, to expand the adaptation of lupin the identification and inoculation of different rhizobium strains adapted to the various pedo-climatic conditions may play an important role. The aim of the present study was to evaluate the morphological and eco-physiological responses of the *L. albus* to organic matter and artificial rhizobium inoculation in a Mediterranean environment.

Materials and Methods

The study conducted at CREA-Acireale, Sicily, were: control, inoculum with nitrogen fixing bacteria (I), fertilization with organic matter (OM), combined effect of inoculum and organic matter (I+OM). Two rows of *L. albus* cv "Tennis" were sown (11/12/2020) in 0.35 m^3 pots in a sandy-loam soil (pH= 6.6; conductivity= 564 µS m^{-1}). A randomised block design with three replicates was used. The rhizobium strains used for the trial were: *Bradyrhizobium japonicum* AGF 542, *B. lupini* AGF 543 and 544 (Agrifutur, Alfianello-BS, Italia). For each pot were used in pre-sowing 9 g of organic matter (organic C 20%, humic and fulvic C 7%, organic N 0.8%, C/N ratio 25). The LAI and FPAR were monitored with a ceptometer (AccuPAR LP-80, Decagon Devices Inc., USA). Stomatal conductance was measured with a leaf porometer (Leaf Porometer, Decagon Devices Inc., USA). Canopy temperature (Tc,°C) was measured with an infrared (IR) thermometer (Infrared Multimeter 510, Everest Interscience Inc., USA). At flowering time, indirect chlorophyll measurements were performed using chlorophyll meter (SPAD-502, Minolta, Japan) and, total plant dry weight and plant height were measured.

Results

Significant differences were found in relation to the ripening stage but not in relation to the studied treatments in most studied physiological parameters. Significant differences ($p<0.05$) between flowering 120 days after sowing (DAS) and pod ripening phenological stages (150 DAS) were found for LAI, FPAR and gs, while for IR, no significant difference was found (mean value = about 22). Our results confirm high values of intercepted FPAR [1-(PAR above/PAR under)]*100, particularly in the I and OM treatments (Table 1). The effects of this variation in radiation use efficiency will be evaluated on crop yield. We observed a decrease of stomatal conductance (gs) after 150 DAS. This is correlated with water relations and the ability of lupin to maintain a good yield level. Moreover, the two treatments I and OM allowed to maintain a gs value in a mid-range of optimality. At the phenological stage of flowering the significant ($p< 0.01$) lowest leaf SPAD was measured in I+OM pots; while no significant differences among the other three treatments were found (Fig. 1). Whereas, at the pod ripening, SPAD measurements were positively influenced only by OM treatment ($p<0.05$). The I+OM treatment determined significant higher total plant dry weight and plant height ($p<0.05$) (Table 1).

Table 1 Morpho-physiological parameters. Different letters indicate significant differences at p< 0.05.

DAS	Treatments	LAI (m^2 m^{-2})	FPAR (%)	gs (mmol m^{-2} s^{-1})	Total plant dry weight (g)	Plant height (cm)
120	Control	1.6±0.50b	56.7±9.95b	316.9±9.69a	33.3±3.03c	29.0±1.37c
	I	1.9±0.47b	62.1±10.28b	357.1±35.40a	38.5±3.50b	33.8±2.98b
	OM	1.7±0.66b	53.3±11.28b	338.0±27.28a	39.2±0.97ab	34.7±0.55ab
	I+OM	1.0±0.08b	46.6±2.80b	272.7±22.06a	43.1±1.42a	37.4±1.30a
150	Control	2.3±0.10a	70.3±3.40a	135.5±24.65b	-	-
	I	2.4±0.10a	73.1±1.74a	155.6±28.37b	-	-
	OM	2.4±0.08a	74.0±1.36a	153.4±22.40b	-	-
	I+OM	2.5±0.05a	75.5±0.62a	142.2±27.53b	-	-

Conclusions

Fertilization with organic matter and combined effect of inoculum and organic matter (I+OM) directly and significantly influenced total plant dry weight, plant height and indirect chlorophyll measurement (SPAD) in both flowering and pod ripening phenological stages.

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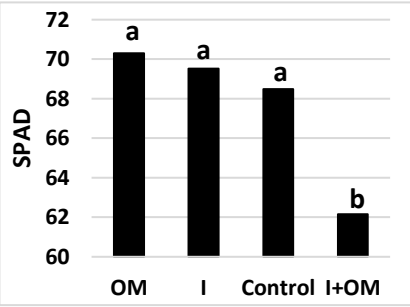

Fig.1. Effects of the studied treatments on SPAD. Different letters indicate significant differences at p < 0.01.