

Nitrogen fixation of annual *Medicago-Rhizobium* associations during cool season in Mediterranean dry areas.

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Abstract.

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### Introduction

Annual *Medicago* (medics) represent a great potential of forage production in areas suffering shortage of livestock food; however, low winter temperature delays the growth and reduces the nitrogen fixation of Medics in Mediterranean dry areas. In this context, the identification of Medics able to fix nitrogen and produce dry matter at low temperature is necessary in order to extend the grazing period.

### Materials and methods

The experiment was carried out at ICARDA in Syria (Aleppo) in 1999. Three accessions were used, two of *M. aculeata*, accessions 80 (A) and 5099 (B) and one of *M. rigidula*, accession 716 (R). Each accession was inoculated with *Sinorhizobium* strains appropriate for nodulation under low temperature (*S. meliloti* strain 620 with accession A, strain 508 with B and strain BZI with R). The percentage of fixation-derived shoot nitrogen was quantified at 5 growth stages using <sup>15</sup>N dilution technique with barley as reference plant.

### Results and discussion

Results indicate that nitrogen fixation initiated at low temperature, as early as growth stage 5-7 leaves. Accession A had the lowest yield and N fixation activity among the accessions tested. Percentages of N derived from fixation increased regularly during growth and reach 62, 85 and 87% at maturity stage for A, B and R accessions respectively. Extrapolated to a field surface, the N fixed amounted to 41, 109 and 113 kg.ha<sup>-1</sup> for A, B and R accessions respectively.

### Conclusion

The use of accessions more tolerant to low temperature should contribute to satisfy forage needs during cool season.

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### References

Table 1. Production of dry matter (kg ha<sup>-1</sup>; at the end of cold period and at maturity)

	End of cold period		End of spring	
	Inoculated	control	Inoculated	control
A ( <i>M. aculeata</i> 80)	476 <sup>de</sup>	377 <sup>e</sup>	2531 <sup>e</sup>	2096 <sup>e</sup>
B ( <i>M. aculeata</i> 5099)	757 <sup>e</sup>	566 <sup>cd</sup>	3110 <sup>cd</sup>	2730 <sup>de</sup>
R ( <i>M. rigidula</i> 716)	715 <sup>b</sup>	504 <sup>d</sup>	3706 <sup>b</sup>	2810 <sup>de</sup>

For a given period, data with similar superscript letters do not differ at p<0.05 level, LDS test

Table 2. Nitrogen fixation (total N in plants, amounts of N derived from fixation; Ndfa and percentages of N derived from fixation ; %Ndfa) at different growth stages

	5-7 leaves	16-18 leaves	End flowering	Maturity
Total N in plant (kg ha <sup>-1</sup> )				
A	2 <sup>bc</sup>	7 <sup>b</sup>	30 <sup>b</sup>	66 <sup>b</sup>
B	3 <sup>a</sup>	14 <sup>a</sup>	87 <sup>a</sup>	129 <sup>a</sup>
R	2 <sup>c</sup>	13 <sup>ab</sup>	104 <sup>a</sup>	129 <sup>a</sup>
Ndfa (kg ha <sup>-1</sup> )				
A	0.2 <sup>a</sup>	1 <sup>a</sup>	19 <sup>b</sup>	41 <sup>b</sup>
B	1.6 <sup>b</sup>	8 <sup>a</sup>	63 <sup>a</sup>	109 <sup>a</sup>
R	0.6 <sup>c</sup>	7.8 <sup>a</sup>	86 <sup>a</sup>	113 <sup>a</sup>
Ndfa (%)				
A	10 <sup>c</sup>	14 <sup>b</sup>	62 <sup>c</sup>	62 <sup>b</sup>
B	56 <sup>a</sup>	58 <sup>a</sup>	71 <sup>b</sup>	85 <sup>a</sup>
R	35 <sup>b</sup>	63 <sup>a</sup>	83 <sup>a</sup>	87 <sup>a</sup>

Data in same column with similar superscript letters do not differ at p<0.05 level, LSD test