# The effects of symbiotic mycorrhizal fungi on drought tolerance and forage production of lucerne (*Medicago sativa*)

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**Keywords:** lucerne, symbiosis, mycorrhizal fungi, drought tolerance, forage production

**Introduction** Arbuscular mycorrhizal fungi (AMF) form beneficial symbioses with the roots of many plants. This association allows them to maintain themselves and grow well under relatively harsh conditions (Sieverding, 1986). They also improve the ability of plants to withstand or have enhanced water acquisition capability. AMF symbioses assist to extend crop and forage plants into arid and semi arid zones. In this research effects of AMF symbiosis were studied on drought tolerance and forage production of lucerne (*Medicago sativa*).

**Materials and methods** Effects of identified mycorrhizal fungi in soil of an abandoned lucerne farm (Panahpour, 2003) was studied on drought tolerance and forage production of lucerne. This experiment was carried out in a greenhouse at the Alborz research centre, Karaj, during 2002. Five cultivars (Krisary, Australia, Bami, FAO, and Ghareh ionjeh), 2 types of soil (heated and unheated field soil) and five levels of irrigation (20%, 40%, 60%, 80% and 100% of field capacity) were arranged in factorial combinations in a completely randomised block with three replications. Plant height, tiller number, fresh and dry weight of stem, leaf and forage, leaf to stem ratio and some root morphological attributes (dry weight, length, branches number,) were recorded for 3 cuts.

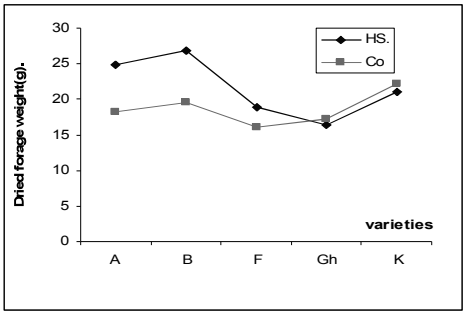
**Results** The performance of many traits in heated soil was significant and greater than unheated soil for both varieties and irrigation levels. The effects of heated soil also varied with cultivars (Figure 1).Forage yield in heated soil was greater than field soil at all but the second irrigation levels (Table1).

**Table 1** Interaction between (soil types× irrigation levels) on mean of dried forage in 3 cuts.

| Irr. Levels | Mean of f.soil ± std. | Mean of hf.soil ± std. |
|---|---|---|
| 10- 20%Fc | 8.28 ± 3.48 | 7.11 ± 2.25 |
| 20-40%Fc. | 12.48 ± 4.08 | 14.1 ± 5.28 |
| 40-60%Fc. | 20.55 ± 4.59 | 24.06 ±11.94 |
| 60-80%Fc. | 27.9 ± 6.9 | 33.96 ± 8.4 |
| 80-100%Fc. | 24.06 ± 8.43 | 28.86 ± 10.5 |

f= field, hf = heated field, std= standard deviation , Fc.= field capacity, Irr=Irrigation, s=soil.

**Figure 1** Interaction between (heated × field) soil on dried forage yield of varieties in 3 cuts




(A = Australia, B = bami, F = FAO, Gh = Ghareh ionjeh, K = krisary)

**Conclusions** Germination of spores and hyphal growth of AMF occurred after the first and second heating of field soil respectively.The preference of heated soil in comparison to field soil may be stimulation and prolonged dormancy of mycorrhizal fungi spores, respectively (Tomerup, 1983).High performance of all irrigations excluding 10- 20% levels of field capacity in heated soil vs. field soil indicate positive effects of AMF on drought tolerance of Lucerne. Low yield of Ghareh ionjeh and Krisary in heated soil was probably due to fungal disease infection (*Fusarium solani*) and high environmental temperature in the third cut (Figure1).

**References**

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