



Environmental Friendly Nitrogen Fertilization on Globe Artichoke

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Introduction

The availability of nitrogen depends on soil conditions and often limits plant growth. Arbuscular mycorrhizal symbiosis can effectively transfer large quantities of nitrogen from the soil to the plant roots (Govindarajulu et al., 2005). With the aim of reaching a more sustainable fertilization management of globe artichoke crop, the effects of different nitrogen fertilization rates and mycorrhizal inoculation on yield characteristics and nutrient efficiency were evaluated.



Materials and Methods

The trial was carried out in Monopoli countryside (BA, south Italy, Lat.: 40°56'57" N Long: 17°17'49" E 26 m a.s.l.) for two cropping seasons (2018-2019) on *Cynara cardunculus* L. var. *scolymus* (L.) Fiori, cv. Brindisino plants obtained from offshoots inoculated in greenhouse with AM fungus *Septoglomus viscosum* (MIC+).

The influence of mycorrhiza on the survival of rooted offshoots after transplant in field and on the yield of artichoke plants were evaluated, under the impact of two different plant nutrition management: nitrogen fertilizer (50, 100, 200 kg ha⁻¹ of urea) and mature manure (total N content 3%) (800 kg ha⁻¹). Non mycorrhizal offshoots submitted to the same fertilization treatments were used as control (MIC-). Moreover, to evaluate the mycorrhizal symbiosis efficiency in nitrogen uptake the following formula was used:

$$AMF_{NUT} = (Y_{AMF} - Y_0) / NF$$

where Y_{AMF} represents the heads yield of the AMF inoculated plants (expressed as kg dry weight ha⁻¹), Y_0 is the heads yield of the no inoculated plants (control), and NF represents the amount of N applied (expressed as kg ha⁻¹) for each treatment.

Results

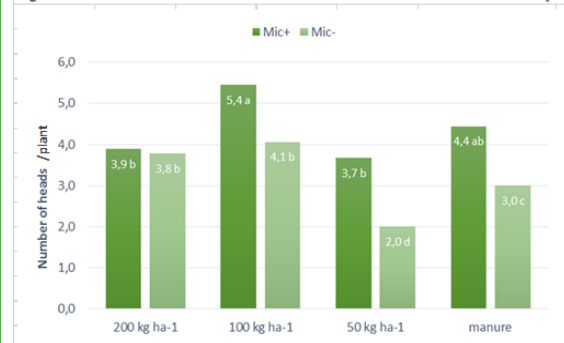
Analyzing the bio-agronomical variables of globe artichoke as affected by the main factors (tab. 1), about fertilization, the number of heads per plant was significantly higher using 100 kg ha⁻¹ of N, while the highest fresh weight of main heads was obtained with 200 kg ha⁻¹ of N followed by 800 kg ha⁻¹ of mature, 50 kg ha⁻¹ of N and 100 kg ha⁻¹ of N. The yield of mycorrhizal plants was significantly higher in comparison of the non mycorrhizal plants both for the number of plants per hectare that the fresh weight of the main heads. Significant differences were recorded in the two cropping seasons with regard to the number of heads per hectare and the fresh weight of main heads. The second season showed a higher number of heads compared to the first season, while the higher fresh weight of the main heads was obtained in the first season.

Tab. 1 Bio-agronomical variables of globe artichoke as affected by the main factors

Treatments	Number of heads (000 ha ⁻¹)	Heads fresh weight	
		main (g)	secondary (g)
<i>Nitrogen rates (kg ha⁻¹)</i>			
200	38.3 b	185.9 a	165.5 a
100	47.5 a	178.7 ab	154.6 b
50	28.3 c	179.3 ab	156.0 b
<i>Manure rate (kg ha⁻¹)</i>			
800	37.2 b	180.2 ab	156.8 b
<i>Mycorrhizal inoculation</i>			
Mic+	43.6 a	183.1 a	158.9 a
Mic-	32.1 b	179.5 b	156.7 a
<i>Season</i>			
I	31.7 b	182.7 a	157.5 a
II	42.2 a	178.4 b	155.3 a

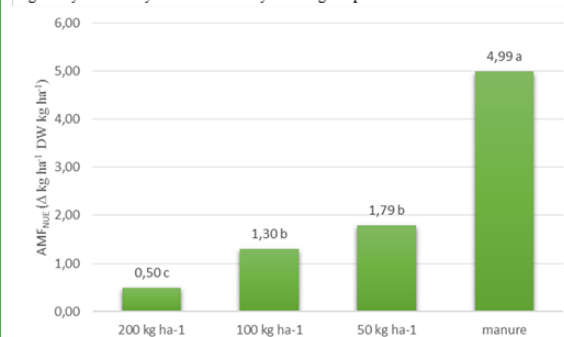
Different letters within each column's factor indicate significance at Fisher's protected least significant difference test (P=0.05)

Fig. 1 Interaction between N fertilization and AMF inoculation in relation to the heads yield



Different letters within each column's factor indicate significance at Fisher's protected least significant difference test (P=0.05)

Fig. 2 Mycorrhizal symbiosis efficiency in nitrogen uptake



Different letters within each column's factor indicate significance at Fisher's protected least significant difference test (P=0.05)

Considering the interaction N fertilization X mycorrhizal symbiosis, the productivity was increased significantly by AM inoculation with urea in the medium dose (100 kg ha⁻¹) or organic fertilizer (Fig. 1)

The results about the efficiency of mycorrhizal symbiosis in nitrogen uptake suggest that mycorrhizal plants utilize a substantially higher amount of N released from organic matter (Fig. 2).

Conclusions

The results showed an optimal performance of the mycorrhizal symbiosis in improving the yield and nitrogen uptake in the globe artichoke. Best results were obtained with mycorrhizal plants fertilized using 100 kg ha⁻¹ of N or mature manure, thus indicating a better nitrogen utilization of the crop, especially at lower doses. The evaluation of mycorrhizal symbiosis efficiency (AMF_{NUT}) as a useful tool to improve the agronomic performances of the crop, ensuring, at the same time, a more environment-friendly nitrogen fertilization.