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North American Strawberry Growers Association

Nutrient Uptake of Selected Strawberry Cultivars in Response to Arbuscular Mycorrhizal Fungi under Salinity

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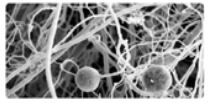
Introduction



Soil salinity is becoming an increasing threat to agro-ecosystems in arid and semi-arid regions. Under saline conditions, development, growth and productivity of the plants are adversely affected.

Arbuscular mycorrhizal fungi (AMF) establish symbiosis between plant roots and fungi. That symbiosis occurs widely in natural biotic communities, and this highly dynamic interaction affects many aspects of the host plant physiology.

Materials & methods

A greenhouse experiment was conducted at Agriculture and Agri-Food Canada, L'Acadie Experimental Farm, in L'Acadie, Quebec, Canada, to evaluate the nutrient uptake of four commonly grown strawberry (*Fragaria* × *ananassa* Duch.) cultivars ('Kent', 'Jewel' 'Glooscap', and 'Saint-Pierre') along with an advanced line (SJ8976-1).

All genotypes were subjected to three NaCl levels (0, 30 and 60mM) with or without inoculation with AMF *Glomus irregulare* DAOM 197198.

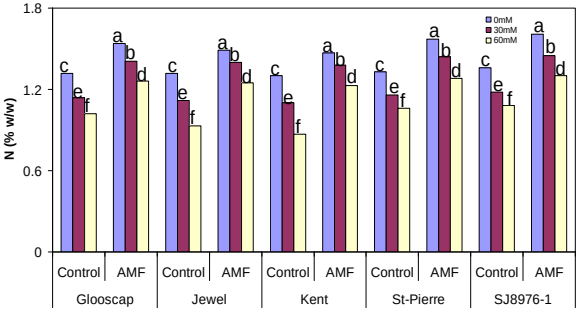
N content was measured by QuickChem 8500 serie II (Lachat Instruments, Colorado , USA).

P, K, Ca, Mg, Cu, Fe, Mn, Zn and B contents was measured by Optima 3200DV, ICP-AOE (Perkin Elmer instrument, USA).

Results & discussion

AMF significantly improved N uptake in all selected genotypes at the three salinity levels compared to control. 'SJ8976-1' showed the highest N uptake while 'Kent' showed the least.

Fig. 1. N uptake of the 5 strawberry cultivars treated with AMF and salinity



Note: Bars with the same letter within the same cultivar are not significantly different at 0.05 level.

Table 1. Macroelements of the 5 strawberry cultivars with AMF and salinity

	P	K	Ca	Mg
Salinity				
0mM	2276	16525	11278	3801
30mM	1918	15240	11531	3546
60mM	1826	14938	11106	3364
OPC	Linear***	Linear*	NS	Linear***
AMF				
Control	1790	15104	11584	3493
AMF	2223	16031	11026	3648
F value	45.74***	3.21^{NS}	3.23^{NS}	2.76^{NS}

Note: all the elements are expressed as mg per kg dry weight of strawberry leaves.

OPC: orthogonal polynomial contrast.

*, **, *** and NS indicate significant difference at 0.05, 0.01, 0.001 and not significant respectively.

Table 2. Microelements of the 5 strawberry cultivars with AMF and salinity

	Cu	Fe	Zn
Salinity			
0mM	8.83	111.2	22.17
30mM	12.10	108.7	20.10
60mM	6.57	99.3	16.53
OPC	Quadratic*	NS	Linear***
AMF			
Control	9.33	109.0	17.69
AMF	9.00	103.8	21.51
F value	0.03^{NS}	0.55^{NS}	15.06***

Conclusions

Generally speaking, salinity significantly reduced the N, P, K, Mg, Cu and Zn uptake but addition of AMF significantly increased the N, P and Zn uptake compared to control. B and Mn were not affected either by salt or AMF. Genotypes responded similarly to AMF and salt treatments on all the elements measured indicating no interactions between these factors with an exemption for N and Ca. Our results showed that the AMF was capable of enhancing the nutrient uptake of strawberry plants under salt stress and promoting plant growth. Hence, the use of AMF might be a biological and practical way to alleviate the unfavourable effects of salinity stress on plant growth.

References

Daei G, Ardekani MR, Rejali F, Teimuri S, Miransari M (2009) Alleviation of salinity stress on wheat yield, yield components, and nutrient uptake using arbuscular mycorrhizal fungi under field conditions. Journal of Plant Physiology 166 (6):617-625.

Wu QS, Zou YN, He XH (2010) Contributions of arbuscular mycorrhizal fungi to growth, photosynthesis, root morphology and ionic balance of citrus seedlings under salt stress. Acta Physiologiae Plantarum 32 (2):297-304.

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