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North American Strawberry Growers Association

Arbuscular mycorrhiza improves growth of strawberry cultivars grown under salinity

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Introduction

Salinity stress is one of the most important environmental factors limiting plant growth and development.

Strawberries (*Fragaria* × *ananassa* Duch.) are among the most sensitive plants to salt and require a low pH to grow.

Arbuscular mycorrhizae fungi (AMF) are widespread microorganisms able to establish a symbiotic association with roots of most plants to the mutual benefit of both, the host plant and the fungus.

The purpose of this study was to determine the effects of mycorrhizal infection on growth of selected strawberry plants under different levels of salinity.

Materials & methods

➢ A greenhouse experiment was conducted to evaluate the performance of three strawberry (*Fragaria* × *ananassa* Duch.) cultivars ('Kent', 'Jewel' and 'Saint-Pierre') subjected to three NaCl levels (0, 30 and 60mM), inoculated and non-inoculated with AMF (*Glomus intraradices*, Schenck & Smith).

➢ After three months growth, fine roots were sampled for the fungal colonization assessment.

➢ The plants dry weight was determined after drying at 70ºC for 72 h.

➢ AMF dependency was calculated as follows:

$$\text{AMF Dependency (\%)} = \frac{\text{DWI} - \text{DWNI}}{\text{DWI}} \times 100$$

DWI: dry weight of inoculated plant

DWNI: dry weight of non-inoculated plant

➢ The data was subjected to a three-way analysis of variance using GLM procedure and orthogonal polynomial contrast analysis by SAS software.

Results & discussion

➢ The AMF root colonization rates were significantly influenced by salinity and AMF, but this was independent of cultivars.

➢ The AMF colonization rates of the inoculated strawberry plants significantly and linearly reduced when increasing salinity, the highest point being at 58.1% and the lowest at 33.6% (Fig. 1).

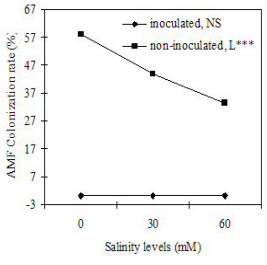

Fig. 1. AMF root colonization rates of non-inoculated and inoculated strawberry plants under three salinity levels [a].

[a]: The *, *** and NS indicate significant difference at P ≤ 0.05, 0.001 and not significant respectively. L indicates linear component based on the orthogonal polynomial contrast analysis of salinity effect.

➢ Salinity significantly reduced the plant dry weight (23.10% at 60 mM) but the addition of AMF increased it significantly (20.99%) compared to the control.

➢ Regardless of salinity, 'Jewel' showed more plant dry weight than 'Saint-Pierre', when colonized by AMF (Fig. 2).

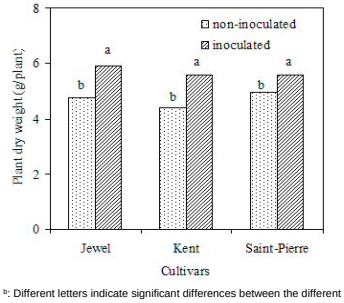

Fig. 2. Plant dry weight of the non-inoculated and inoculated strawberry plants [b].

[b]: Different letters indicate significant differences between the different treatments (P < 0.05).

Fig. 3. Strawberry growth treated with NaCl and AMF.

From left to right, 0, 30, 60 mM salt; front row: non-inoculated; back row: inoculated.

➢ AMF dependency is a percentage rate used to describe the benefits of inoculating plant species with AMF.

➢ The dependency of 'Kent' with 60 mM salt was the highest while 'Jewel' benefited the most from AMF with 30 mM. 'Saint-Pierre' had the least AMF dependency under salinity treatments and seemed to be more resistant to salinity (Fig. 4).

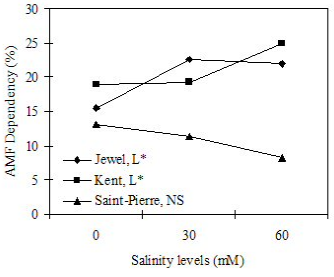

Fig. 4. AMF dependency of the three cultivars under different salinity levels[a].

Fig. 5. The effect of AMF on strawberry roots. Left: roots from inoculated plant; right: roots from non-inoculated plant.

Conclusions

In summary, results indicate that salt reduces the growth of strawberry plants and that the AMF is capable of alleviating the damage that it causes, promoting its growth. Thus, results confirm the potential of applying mycorrhizal biotechnology in sustainable horticulture for arid and semi-arid areas.

References

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