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Influence of arbuscular mycorrhizal fungi on physiology and fruit quality of Pepino (*Solanum muricatum* Ait.) in vermicompost amended medium

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Abstract: The association level of pepino (*Solanum muricatum* Ait.) with two arbuscular mycorrhizal fungi (AMF) species (*Glomus etunicatum* and *G. versiforme*) was evaluated for the first time. The first part of experiment showed 30 and 50% root colonization for the two AMF species, respectively, while the second part of study was a pot experiment under greenhouse conditions. The effects of vermicompost and root inoculation with *G. etunicatum* and *G. versiforme* on reproductive stage, yield and fruit quality of pepino were investigated. Treatments included two levels of vermicompost (0 and 20% v/v) and inoculation with the two fungi species along with a non inoculated control. Application of vermicompost increased the number of flowers, fruits and fruit weight, but decreased the number of days from plant setting to first flower and fruit set, fruit dry matter percent, fruit titratable acidity and vitamin C content. Inoculation with *G. versiforme* increased fruit dry matter percent, fruit titratable acidity and fruit vitamin C content compared with the non inoculated control (NIC) plants. Plants inoculated with *G. etunicatum* showed greater fruit weight and juice pH compared to NIC plants. AMF inoculation in vermicompost amended pots led to 14 and 10 days earlier flowering for *G. versiforme* and *G. etunicatum*, respectively compared to those not amended with vermicompost. *G. etunicatum* in vermicompost supplemented medium hastened fruit set by 5.5 days compared to those without vermicompost application. Fruit quality characteristics were affected differently for the two AMF-inoculated plants in presence of vermicompost.

1. Introduction

Pepino (*Solanum muricatum* Ait.), a little-known herbaceous subshrub Solanaceous plant, is native of the tropical and subtropical Andes in South America. It is cultivated for its edible juicy, scented and sweet fruits (Prohens *et al*., 1996) and has been introduced to different countries, becoming a specialty fruit (Ahumada and Cantwell, 1996). Today, pepino is a species of increasing economic interest and it has considerable potential for future exploitation (Prohens *et al*., 1996). The cultural techniques used in modern tomato growing have been adapted with slight modification to pepino management (Dennis *et al*., 1985).

Symbiotic associations between arbuscular mycorrhizal fungi (AMF) and plant roots in the natural environment provide a range of benefits to the host plant, however many conventional agricultural practices are detrimental to AMF (Gosling *et al*., 2006). Organic farming systems may be less detrimental to AMF, because they exclude the use of chemical fertilizers and most biocides and generally have diverse rotations.

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Organic matter influences the nutrient profile, soil structure, water holding capacity and pH, all of which directly and or indirectly influence AMF development (Bagyaraj, 1991). Addition of organic amendments to soil has been reported to enhance plant biomass, mycorrhizal infectivity, and proliferation of AM fungal hyphae in soil (Joner and Jakobsen, 1995; Dai *et al*., 2011). Vermicompost as an organic fertilizer provides some essential nutrients for supporting plant growth compared with chemical fertilizers.

To the best of our knowledge, there is no published report about the association of pepino with AMF in literature. The objectives of the present study were to determine: 1) the association level of two AMF species with pepino plant; 2) the possible beneficial effects of symbiosis on plant physiology and fruit quality; and 3) the benefits of vermicompost on AMF association with pepino.

2. Materials and Methods

Pepino (cv. Kanseola) mother plants were obtained from Mashad Ferdowsi University research station, Iran. Cuttings with an average 20 cm length and four buds were rooted in a 1:1 (v:v) peat and sand mixture for four weeks. General cultural practices were according to Lopez *et al.* (2000).

AMF inocula

AMF spores were obtained from the Department of Soil Science, Faculty of Agriculture, Shiraz University, Iran. *Glomus versiforme* was isolated from a non-contaminated area of Anguran Mine, Zanjan, Iran (Zarei *et al*., 2008) and *G. etunicatum* was provided from Tabriz University, Iran; these fungi are abundant in Iranian soils (Aliasgharzadeh *et al*., 2001; Kariman *et al*., 2005). Mycorrhizal inocula were prepared through the trap culture of maize (*Zea mays* L.) on culture medium composed of autoclaved soil/quartz-sand (<1 mm) (1:4, v/v). Simultaneously, some pots containing non autoclaved soil were kept without any spore inoculation to preserve the naturally-occurring microbial association and used for non-inoculated control (NIC) treatments. After four and a half months, at the beginning of the maize reproductive period, shoots were removed and the contents of pots (mycorrhizal roots plus soil possessing fungal spores and mycelia) were maintained in polyethylene bags at 4°C. The potential of inoculants (spore numbers of 10-12 g^{-1} substrate and root colonization of 80-85%) for spore extraction, number, and evaluation of root colonization were measured based on the method described by Zarei *et al*. (2008).

Examination of arbuscular mycorrhizal symbiosis

The association level of pepino plant with two AMF species along with a NIC was evaluated in a completely randomized design with three replications. The presence of AM propagules and the percentage of root colonization was determined after eight weeks of inoculation. The grid-line intersect method was used after cleaning washed roots in 10% KOH and staining with 0.01% fuchsin acid in lactoglycerol according to the method described by Kormanik and McGraw (1982). The AMF species colonizing roots of pepino plants were used for the main experiment.

Main experiment

The experiment was carried out in a polyethylene greenhouse using 10 L pots. The experimental design was 2×3 factorial with four replications (four plants each) in a completely randomized arrangement. The first factor consisted of control (V_0: no vermicompost) and V_1: vermicompost application at 20% (v/v) to soil. The second factor was soil inoculation with *G. etunicatum* and *G. versiforme*. Non-inoculated pots were considered as control (NIC). Four-week-old rooted cuttings were planted in pots which contained the described media for treatments. The physical and chemical properties of soil and vermicompost are presented in Table 1.

For the mycorrhizal treatments 50 g of each AMF inoculum was used as a thin layer near the roots of cuttings. NIC treatments consisted of adding 50 g of media from control maize trap culture pots (contained non-autoclaved soil with no spore inoculation) as described earlier (see section 2.1). Pots containing pepino plants were arranged in rows, 1 m apart and 0.4 m between pots. Plants were trained into three main branches. A total amount of 35 $g \cdot m^{-2}$ of organic soluble fertilizer Biomin464-sp (JH Biotech, Inc. Ventura, CA) was applied to fertigated plants during the experimental period. Irrigation frequency from transplanting to harvest varied from 2 to 4 days with 0.4 - 1 L per irrigation based on plant requirements.

Plant reproductive phase measurements

To evaluate the effects of colonization with AMF and vermicompost application on the pepino reproductive stage, the following characteristics were assayed: number of days to first flower formation, number of flowers in the first and second truss, number of days from transplanting to first fruit formation, fruit number and fruit set percentage, and fruit fresh weight. Fruit quality factors including vitamin C content at maturity [using the method described by Association of Official Agricultural Chemists (AOAC, 1984)], titratable acidity (Gutiérrez-Miceli *et al*., 2007), fruit juice acidity (using pH meter), soluble solid content (using refractometer), and dry matter percent were assayed after harvest.

Statistical analyses

The experiment was arranged in a completely randomized design. Four replicates per treatment were used, each with four plants. Data were analyzed using JMP statistical software, version 5.1 (SAS Institute Inc., Cary, NC, USA). If the interaction was significant, it was used to explain results; if it was not significant, means were separated with Least Significant Differences (LSD) test at $P \leq 0.05$.

3. Results and Discussions

The ANOVA revealed significant main and interaction effects of vermicompost and AMF for most measured characteristics (Table 2).

Determination of plant association with AMF

For the first time in literature, our results report the association of pepino with two AMF. The results indicate that *G. etunicatum* and *G. versiforme* can colonize pepino

Table 1 - Physical and chemical properties of soil and vermicompost used for the experiment

	Sand (%)	Silt (%)	Clay (%)	EC (dS/m)	pH	N (%)	P	K
Soil	34	46	20	1.63	7.82	0.031	5.4 mg/kg	135 mg/kg
Vermicompost	-	-	-	5	8.25	1.45	1.75%	1.2%

roots up to 30 and 50 percent, respectively. It has been stated that the difference between root colonization percentages of *Glomus* strains might be due to the fact that AMF have a wide host range, yet certain combinations of hosts and fungi are more efficient than others for either the fungus or the host (Douds and Millner, 1999; Gutierrez-Miceli *et al*., 2008). van der Heijden *et al*. (1998) showed that plant species differed in their dependency on AMF. Some results suggest that AMF has some degree of host-specificity (Eom *et al*., 2000).

Root colonization

The main and interaction effects of vermicompost and AMF on root colonization percent were significant (Table 2). Root colonization percentages in vermicompost amended soils were about 25% greater than the V_0 treatment regardless of AMF (Table 3). The greater percentage of mycorrhization in vermicompost amended soils has been attributed to the humic substances found in vermicompost, resulting in an increased metabolism of soil microorganisms, and the nutrient uptake (Atiyeh *et al*., 2002).

There was no significant difference between colonized root length of *G. versiforme* and *G. etunicatum* in vermicompost amended soils, but compared to NIC plants, a greater root colonization was observed (2.46 and 2.80 times, respectively) (Table 4). Mycorrhizal plants colonized well with introduced AMF species. A 15% mean root colonization in NIC plants shows that the soil used contained native AMF populations.

More than 100% greater root colonization was observed in the presence of vermicompost when compared with V_0 treatment (Table 5). This could be due to greater organic matter available for growth and development of AMF hyphae; it has been reported that AMF mycelia can mineralize and enhance utilization of organic materials (Feng *et al*., 2003).

Days to first flower formation

The main and interaction effects of vermicompost and AMF on the number of days to first flower formation were significant (Table 2). The number of days from planting to first flower formation was much lower in pots amended with vermicompost than in V_0 treatments (Table 3). Previous studies showing earlier flowering due to vermicompost application on German chamomile, begonia, and coleus (Tomati *et al*., 1983; Tomati *et al*., 1987; Azizi *et al*., 2008) are in agreement with our results. The reason for this has been attributed to the development of efficient photosynthetic structure, higher dry matter production, early initiation, and greater development of the reproductive system (Krishna *et al*., 2008).

Inoculation with *G. etunicatum* gave earlier flowering than *G. versiforme*-inoculated plants (Table 4). In agreement with our results, *Chrysanthemum* cuttings inoculated with AMF had a significantly shorter flowering time compared with non-inoculated plants (Sohn *et al*., 2003). It is reported that in AMF-inoculated tomato plants, the time between emergence and completion of fruit set (the duration of purely vegetative growth) decreased, while the duration of the reproduction period increased (Bryla and Koide, 1998). This is consistent with the idea that plant resource status serves as a partial control of the switch

Table 2 - Analyses of variance for vermicompost application and arbuscular mycorrhizal fungi inoculation on some pepino plant characteristics

Source of variation	df	Mean squares										
		Root colonization	Days to first flower	Flower number in truss	Days from flowering to fruit set	Fruit Number	Fruit fresh weight	Fruit dry matter percent	Fruit juice pH	Fruit titratable acidity	Total soluble solids	Fruit vitamin C content
Vermicompost	1	67**	1056.25**	28.44**	42.25**	27.39**	2321.47**	14.06**	0.06 NS	0.15**	0.13 NS	264.23**
AMF	2	26**	44.62**	0.16 NS	45.42**	4.64 NS	513.87*	90.97**	0.08**	0.21**	2.98 NS	165.20**
Vermicompost × AMF	2	12*	32.92 **	0.75 NS	28.15**	4.99 NS	18.16 NS	28.72**	0.11**	0.12**	5.92*	147.53**
Error	30	0.004	5.08	0.87	1.58	3.46	130.21	0.58	0.02	0.01	1.00	1.56
Total	35											

NS, *, *= non-significant, significant at 0.05 and 0.01, respectively.

Table 3 - The main effects of vermicompost application on some pepino plant characteristics

Treatment	Root colonization percent	Days to first flower	Flower number in truss	Days from flowering to fruit set	Fruit Number	Fruit weight (g)	Fruit dry matter percent	Fruit titratable acidity (ml/100 ml)	Fruit vitamin C (mg/100 ml)
Control	18 b	74.11 a	7.36 b	16.14 a	1.81 b	29.69 b	11.10 a	0.78 a	19.83 a
Vermicompost added	45 a	63.28 b	9.14 a	13.97 b	3.56 a	45.75 a	9.85 b	0.65 b	14.41 b
LSD value at p≤0.05	0.04	1.53	0.63	0.70	1.07	7.77	0.52	0.07	0.85

Values in each column with the same letter are not significantly different using LSD test at p≤0.05.

from vegetative to reproductive growth (Marschner, 1995). In mycorrhizal plants, greater root development leads to more phosphorus in vegetative and reproductive tissues, which eventually leads to early flowering (Bryla and Koide, 1998). This might explain the early flowering in this experiment due to inoculation with *G. etunicatum*.

Plants inoculated with *G. versiforme* and *G. etunicatum* in vermicompost amended pots had 15 and 10 days earlier flowering, respectively, compared to non vermicompost amended pots (Table 5). The organic material provided by vermicompost can improve growth and development of AMF inoculum (Bending *et al*., 2004), which enhances nutrient uptake by the plant and hastens plant growth and development (Mahmood and Rizvi, 2010).

Flower number in truss

A 24% increase in the number of flowers per truss was observed in vermicompost amended pots compared with V_0 treatments, however the effects of AMF and co-application of AMF and vermicompost were not significant (Tables 2, 3). Previously, a 40% increase in flower number in strawberry was related to the increase in plant biological activity due to a vermicompost application rate of over 10 t/ha (Arancon *et al*., 2004 b). A 20% (v/v) vermicompost application in the present study led to a very significant increase in flower number in trusses (Table 2). Some possible factors that improve flowering after vermicompost application have been attributed to the improvement in physical structure of growth medium, increased biological enzymatic activities, increased populations of beneficial microorganisms, or the presence of biologically active plant growth-influencing substances (plant growth regulators) in the vermicompost (Arancon *et al*., 2008). Our results on increased flower number due to vermicompost are in agreement with previous reports on eggplant and tomato (Gajalakshmi and Abbasi, 2002).

Days to first fruit set

The main and interaction effects of vermicompost and AMF on the number of days from flowering to first fruit set were significant (Table 2). Vermicompost amended pots showed fruit set occurring an average of 2.17 days earlier compared with V_0 treatments (Table 3). Non-inoculated control plants and plants inoculated with *G. versiforme* showed fruit set to be three days earlier than in plants inoculated with *G. etunicatum* (Table 4).

The two AMF species showed different interactions with regard to the presence of vermicompost in the medium. Those inoculated with *G. etunicatum* in the presence of vermicompost set fruit 5.58 days earlier compared to non vermicompost amended soil (Table 5). It seems that the potential efficiency of *G. etunicatum* for earlier pepino fruit set is greater in the presence of vermicompost than with *G. versiforme*. NIC plants and plants inoculated with *G. versiforme* with vermicompost added and non vermicompost added media showed no differences.

Fruit number

Our results show that vermicompost application was the primary contributing factor in increasing pepino fruit

Table 4 - The main effects of arbuscular mycorrhizal fungi inoculation on some pepino plant characteristics

Treatment	Root colonization percent	Days to first flower	Days from flowering to fruit set	Fruit weight (g)	Fruit dry matter percent	Fruit juice pH	Fruit titratable acidity (ml/100 ml)	Fruit Vitamin C (mg/100 ml)
NIC	15 b	68.08 ab	13.75 b	32.64 b	8.79 b	5.02 b	0.67 b	16.54 b
Glomus versiforme	37 a	70.85 a	14.12 b	35.41 b	13.65 a	4.99 b	0.87 a	21.08 a
Glomus etunicatum	42 a	67.15 b	17.29 a	45.10 a	8.98 b	5.15 a	0.62 b	13.73 c
LSD value at p≤0.05	5.01	1.88	0.86	9.51	0.63	0.12	0.08	1.04

NIC= Non inoculated control. Values in each column with the same letter are not significantly different using LSD test at p≤0.05.

Table 5 - The interaction effects of vermicompost application and arbuscular mycorrhizal fungi inoculation on some pepino plant characteristics

		Root colonization percent	Days to first flower	Days from flowering to fruit set	Fruit dry matter percent	Fruit juice pH	Fruit titratable acidity (ml/100 ml)	Total soluble solids (brix)	Vitamin C (mg/100 ml)
No-vermicompost added	Non mycorrhizal control	5 c	72.17 b	13.58 b	8.06 d	5.09 ab	0.68 b	7.13 c	22.39 b
	Glomus versiforme	22 b	78.12 a	14.75 b	15.96 a	4.88 c	1.04 a	9.38 a	24.42 a
	Glomus etunicatum	27 b	72.04 b	20.08 a	9.28 c	5.06 ab	0.61 b	7.68 bc	12.66 e
Vermicompost added	Non mycorrhizal control	25 b	64.00 c	13.92 b	9.53 c	4.95 bc	0.65 b	8.15 bc	10.68 f
	Glomus versiforme	53 a	63.58 c	13.50 b	11.35 b	5.10 ab	0.69 b	7.88 bc	17.74 c
	Glomus etunicatum	58 a	62.25 c	14.50 b	8.68 cd	5.23 a	0.61 b	8.52 ab	14.80 d
LSD value at p≤0.05		7.0	2.66	1.21	0.90	0.17	0.12	1.18	1.47

Values in each column with the same letter are not significantly different using LSD test at p≤0.05

number (Table 2). Fruit number in vermicompost amended soils (an average of 3.56) was about 96% greater than V_0 treatments (1.81 fruits) (Table 3). Previously, increased yields of strawberry (Arancon *et al*., 2004 b) and pepper (Arancon *et al*., 2005) in vermicompost amended soils in field conditions were attributed to increased fruit number due to the availability of plant growth regulators and humic acids, which produced by the greatly increased microbial populations resulting from earthworm activity (Arancon *et al*., 2004 a; b). According to our results, the simultaneous increased flower number and fruit set percentage considerably increased total yield.

Fruit fresh weight

The main effects of vermicompost and AMF on fruit fresh weight showed significant differences, but the interaction of vermicompost and AMF was not significant (Table 2). Comparing fruit weight in vermicompost amended soils with V_0 treatments showed a 54% increase (Table 3). This result is in agreement with previous studies on the application of vermicompost for eggplant (Moraditochaee *et al*., 2011), greenhouse pepper (Arancon *et al*., 2004 a), and tomato (Arancon *et al*., 2003). It has been stated that the great microbial activity and populations in vermicompost are probably responsible for a considerable buildup of microbial populations and activity in soils. These improve the soil structure and have an indirect influence on root environment, nutrient absorption, plant growth (Arancon *et al*., 2005), and yield (Goswami *et al*., 2001).

No significant differences were found between plants inoculated with *G. versiforme* and NIC treatments. Plants inoculated with *G. etunicatum* produced fruits with an average weight of 45.1 g, which was about 32% greater than NIC and *G. versiforme*-treated plants (Table 4). It has been reported that individual tomato fruit weight significantly increased when the plants were colonized with AMF (Bryla and Koide, 1998). Such evidence, which is in agreement with our results, also showed different increased levels of fruit fresh weight for other inoculated Solanaceous plants, i.e. tomato plants inoculated with *G. mosseae* (Abdel Latef and Chaoxing, 2010), chili pepper plants inoculated with *G. intraradices* (Castillo *et al*., 2009), chileancho pepper inoculated with *G. fasciculatum* (Mena-Violante *et al*., 2006), and non-Solanaceous cucumber (Trimble and Knowles, 1995). Increased yields have been attributed to the increased yield components due to the positive effects of mycorrhiza including facilitated water and nutrient uptake through extension of root surfaces and increased photosynthesis (Ortas *et al*., 1996; Raman and Mahadevan, 1996; Tarkalson *et al*., 1998).

Fruit dry matter percent

The main and interaction effects of vermicompost and AMF on fruit dry matter percent showed significant differences (Table 2). The V_0 treatments produced 12% greater fruit dry matter than pots amended with vermicompost, regardless of AMF inoculation (Table 3). Results of fruit fresh weight and fruit dry matter percentage showed that vermicompost improved water uptake and partitioning in fruits, which had greater fresh weight (due to vermicompost) and lower dry matter percentages (Table 3).

Inoculating pepino plants with *G. versiforme* increased the fruit dry matter percent to over 50% compared to those inoculated with *G. etunicatum* and plants not inoculated with AMF (Table 4). The differences could be related to the developmental pattern of AMF species. An increased fruit dry matter percentage in AMF plants has been attributed to improved water and nutrient uptake/translocation, higher photosynthesis (Vamerali *et al*., 2003), and also to the pattern of dry matter distribution in inoculated plants, which pointed to a role of AMF in carbon partitioning (Mena-Violante *et al*., 2006).

Co-application of vermicompost and AMF showed different patterns for fruit dry matter percentage. *G. versiforme* in V_0 treatment produced about 40% greater fruit dry matter than vermicompost amended media, but no differences were observed between vermicompost and non vermicompost amended soils inoculated with *G. etunicatum* (Table 5).

Fruit juice pH

With regard to fruit juice pH, the main effects of AMF and its interaction with vermicompost were highly significant (Table 2). The pH of pepino plants inoculated with *G. etunicatum* was 0.13 higher than in NIC plants. The difference between *G. versiforme* inoculated plants and NIC plants was not significant for fruit juice pH (Table 4). Previously, inoculation of cucumber plants with *G. intraradices* gave no changes in fruit pH (Rouphael *et al*., 2010).

Plants inoculated with *G. etunicatum* exhibited a higher fruit juice pH than *G. versiforme* inoculated plants in V_0 treatment, but the difference was not significant when vermicompost was used (Table 5).

Fruit titratable acidity

The main and interaction effects of vermicompost and inoculation with AMF showed significant differences with NIC plants for fruit juice titratable acidity (Table 2). The plants grown in vermicompost amended soils (0.65 ml/100 ml fruit juice) had a 20% decrease in titratable acidity compared with plants in non-amended soils (0.78 ml/100 ml fruit juice) (Table 3). In other studies, the effect of vermicompost on tomato fruit titratable acidity did not show significant differences (Gutiérrez-Miceli *et al*., 2007).

The effect of inoculation of plants with *G. versiforme* showed a 40% increase in fruit titratable acidity compared with *G. etunicatum* inoculated plants and the control (Table 4). Our result is in agreement with a previous paper that reports a significant increase in fruit titratable acidity of AMF inoculated tomato plants (Regvar *et al*., 2003).

A different reaction to vermicompost application was observed for inoculated plants with two different AMFs (Table 5). Fruits of plants inoculated with *G. versiforme* in the V_0 treatment had a 0.5ml/100ml greater titratable acidity than fruits from *G. etunicatum*-inoculated plants.

It seems that the effect of AMF on pepino fruit juice titratable acidity is AMF-species dependent.

Total soluble solids

The main effects of vermicompost and AMF on total soluble solids were not significant but the interaction was significant (Table 2). Fruits of *G. versiforme*-inoculated plants in the V_0 treatment had 1.5 Brix greater soluble solid content than those grown in vermicompost amended media. The differences between AMF-inoculated and NIC plants in vermicompost amended treatments were not significant (Table 5). Greater fruit total soluble solids in AMF inoculated tomato plants, compared to non-inoculated plants, has been previously reported (Subramanian *et al.*, 2006). Different microorganisms have been reported as involved in breaking down (mineralize) and releasing mineral nutrients of organic materials, to then be taken up by plant roots (Linderman and Davis, 2004). It seems that *G. etunicatum* has the ability to improve vermicompost utilization by pepino plant roots, which leads to more efficient photosynthetic activity and therefore greater total soluble solids in fruits.

Fruit vitamin C

The main and interaction effects of vermicompost and inoculation with AMF showed significant differences for fruit vitamin C content (Table 2). Fruits produced in vermicompost amended soils had 37% less vitamin C than fruits in the V_0 treatments (Table 3). This could be related to a 1.5 times greater fresh fruit weight with constant vitamin C content in a unit volume. It seems that the level of vitamin C in pepino fruits is not affected by vermicompost application. Different reports are available on the effect of vermicompost application on fruit ascorbic acid content: some show increased fruit vitamin C in tomato (Sable *et al.*, 2007), while others report no significant effect (Roberts *et al.*, 2007).

The fruit vitamin C content was 53 and 27% greater in fruits from plants inoculated with *G. versiforme* as compared to fruits from plants inoculated with *G. etunicatum* and non mycorrhizal treatments, respectively (Table 3). Higher quantities of ascorbic acid in AMF-inoculated tomato plants compared to non-inoculated plants has been previously reported (Subramanian *et al.*, 2006).

The AMF used in this experiment showed different reactions to vermicompost application. Fruits from the V_0 treatment inoculated with *G. versiforme* and those inoculated with *G. etunicatum* in vermicompost amended soils had greater vitamin C than other treatments (Table 5). It seems that the effect of AMF on pepino fruit vitamin C is species dependent. Those plants treated with *G. etunicatum* had higher vitamin C content when vermicompost was applied, while the same trend was not observed when vermicompost was applied to *G. versiforme*-inoculated plants.

4. Conclusions

Despite the influence of AMF on crop yield as documented in many reports on Solanaceous plants, little is known about the potential of AMF to improve their fruit quality. Crop species and cultivars of plant species can differ dramatically in their ability to respond to different AMF strains. This can complicate predictions of the extent to which AMF colonize roots and the resulting effects on plant growth and development. This is the first report on the effects of AMF inoculation in pepino, on the level of colonization, plant growth, development, and fruit yield and quality. We have clearly demonstrated the positive impact of AMF on pepino fruit quality in terms of vitamin C, total acidity, pH, total soluble solid content, increased titratable acidity and dry matter percentage.

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