

Humic acid and manure tea affected reproductive stage and fruit quality factors of pepino in organic production system

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Key words: compost tea, biofertilizer, total phenolics, vitamin C.

Abstract

*Pepino (*Solanum muricatum*) a Solanaceous vegetable fruit has been of an increased interest in exotic fruit markets. The effects of sheep and cow manure teas in combination with humic acid on reproductive stage and qualitative characteristics of pepino fruit in an organic production system were evaluated. All traits were affected by combination of manure teas and humic acid except for fruit total soluble solid content. Sheep manure tea at 1:10 w/v increased fruit total soluble solid content as about 40% greater than control. Sheep manure tea (1:10 w/v) in combination with humic acid decreased required days preceding the first flower formation by 8 days. The highest fruit dry matter percentage was obtained in the same treatment, which was about 10 times greater than control. Comparing to control the total phenolic content were obtained about 62 and 37% greater, in cow manure tea (1/10 w/v) and humic acid treatments, respectively. Greatest number of flowers, fruit set percentage, earliness and ascorbic acid content were greatest when humic acid applied solely.*

Introduction

Organic fertilization is a global strategy to maintain natural fertility of the soil through increased soil microorganism activity (4). The use of composts from different organic sources improve physical, chemical and biological characteristics of soil (2). Increased seed germination, growth and yield are responses to plant hormones, micro- and macronutrients exist in composts and compost tea (11).

Humic substances are produced through the decay of plant and animal residues by soil microorganisms (7). Humic acid improves plant growth through better absorption of nutrients from the soil (10).

Pepino (*Solanum muricatum*) a Solanaceous vegetable fruit has been of increasing interest in exotic markets. Despite numerous studies on pepino plant nutrition, studies on organic fertilization is lacking. The aim of this study was to investigate the possibility of applying two manure teas and humic acid on the physiology of plant reproductive phase and fruit quality characteristics in organic farming.

Material and methods

Cuttings of pepino (*Solanum muricatum* cv. Kanseola) having 2-3 leaves and 3-5 healthy buds were rooted in peat : perlite (2:1 v/v) under greenhouse conditions and transferred to the field after danger of frost in late April. Treatments consisted of sheep and cow manure teas (1:5 and 1:10, w/v) in combination with or without humic acid (Humistar® containing 6.8% humic acid at 50 L/ha) as soil drench. Treatments started two weeks after plant establishment and continued for 10 weeks on a weekly basis.

The number of days from transplanting to first flower formation, fruit set percentage and the number of days from transplanting to harvest the ripe fruits were determined. Fruit quality factors including fruit dry matter percentage, total soluble solids, total phenolic content and vitamin C were measured.

Results and discussions

Plants treated with cow manure tea at 1:5 (w/v) ratio died after the first treatment. Therefore, all statistics and comparisons were based on 1:5 and 1:10 (w/v) sheep manure tea and 1:10 (w/v) cow manure tea.

Number of days from transplanting to first flowering

Sheep manure tea (1:10) plus humic acid resulted the minimum number of days to first flowering (Table 1). This could be related to the more availability of manure tea nutrients in the presence of humic acid. It is stated that humic substances enhance biochemical processes (respiration and photosynthesis), chlorophyll content, plant nutrient uptake and plants biological activity (3).

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Table 1. Mean comparison of some pepino fruit characteristics in response to manure tea and humic acid

Manure tea	Application ratio	Humic acid	Days to first flowering	Days to first harvest	Ascorbic acid (mg/100g)
Sheep	1:5	0	33.33 bc	53.66 c	12.03 bc
		50 L/ha	34.60 bc	64.00 ab	13.86 ab
	1:10	0	36.00 b	66.66 ab	11.60 bc
		50 L/ha	31.60 c	53.00 c	14.90 a
Cow	1:10	0	37.00 ab	60.61 ab	10.14 bc
		50 L/ha	33.33 bc	70.00 a	16.30 a
Control	-	0	39.60 a	70.00 a	9.93 c
		50 L/ha	36.30 ab	58.00 bc	15.26 a

Values with the same letter in each column have not significant differences based on Duncan's multiple test range at $p < 0.05$.

Fruit set percentage

The greatest fruit set percentage was observed in humic acid treatment (Figure 1). This could be due to increased absorption of macro and micro elements (3) which are involved in better plant performance for floral parts (6).

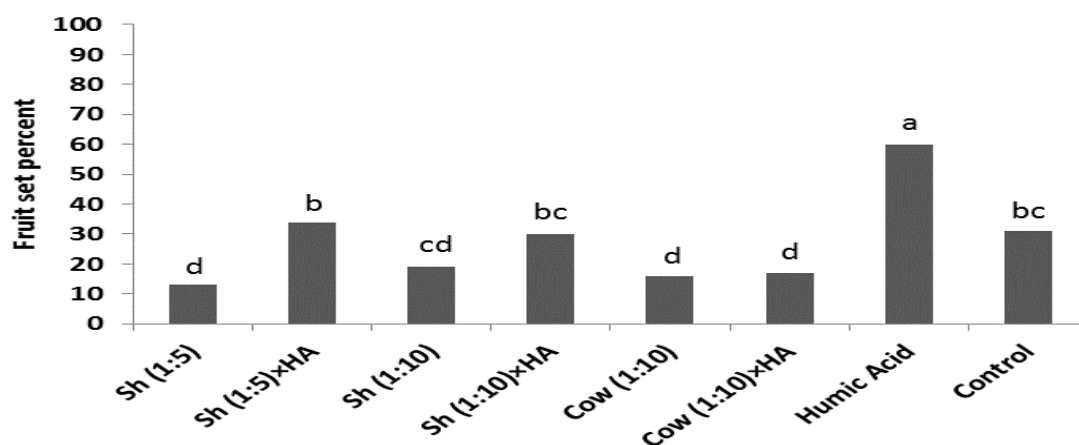


Figure 1. Effect of humic acid (HA), compost tea of sheep (Sh) and cow (Cow) manure on pepino fruit set percent

Days from transplanting to first harvest (earliness)

Cow manure tea, whether used alone or in combination with humic acid caused fruit maturity to delay. However, high concentrations of sheep manure tea without humic acid and humic acid at low concentrations can caused earlier crop than those treated with humic acid alone (Table 1). This could be due to twice amount of nitrogen in sheep manure tea than cow manure tea (data not shown). It has been reported that the application of nitrogen-rich fertilizers caused earlier tomato crop (5).

Total soluble solids (TSS)

The maximum TSS was found in the treated plants with 1:10 sheep manure tea with about 40% greater than other treatments (Figure 2). Similar results have been obtained in earlier study on pepper plant (8).

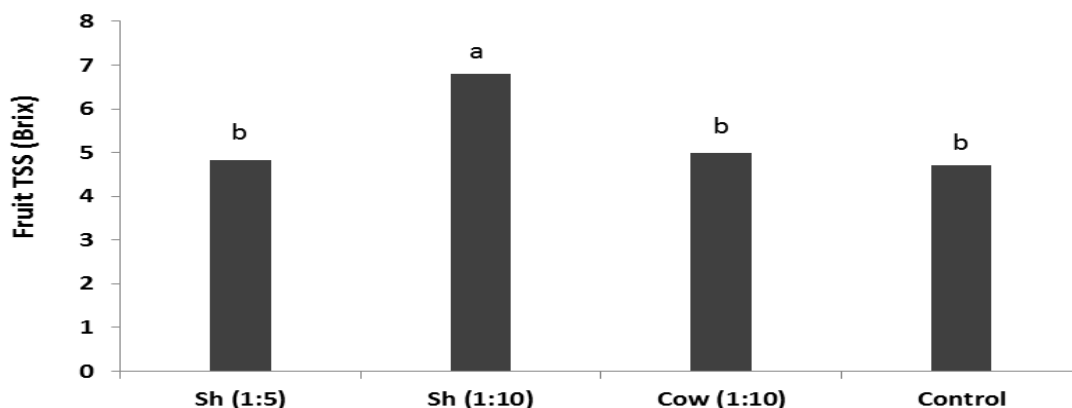


Figure 2. Effect of compost tea of sheep (Sh) and cow (Cow) manure on pepino fruit total soluble solid (TSS).

Fruit dry matter percentage

Combination of humic acid with sheep manure tea 1:10 resulted the highest percentage of fruit dry matter (Figure 3). Organic compost or manure teas contain appropriate amounts of macro- micro elements and carbohydrates which can increase fruit weight by enhancing assimilation (1).

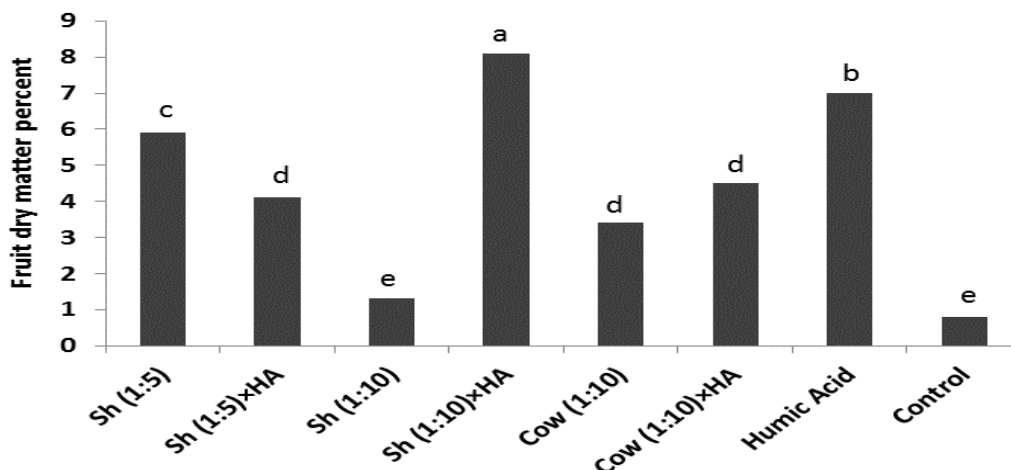


Figure 3. Effect of humic acid (HA), compost tea of sheep (Sh) and cow (Cow) manure on pepino fruit dry matter percent

Total phenolics and ascorbic acid content

The greatest amount of total phenolics was found in cow manure tea 1:10 and humic acid alone which were over 62% and 50% greater than control, respectively (Figure 4).

Treatments contained humic acid caused greater levels of ascorbic acid comparing to no humic acid containing treatments (Table 1). It has been shown that high concentrations of ascorbic acid in tomato could be produced if just one time humic acid is applied during plant growth cycle (9).

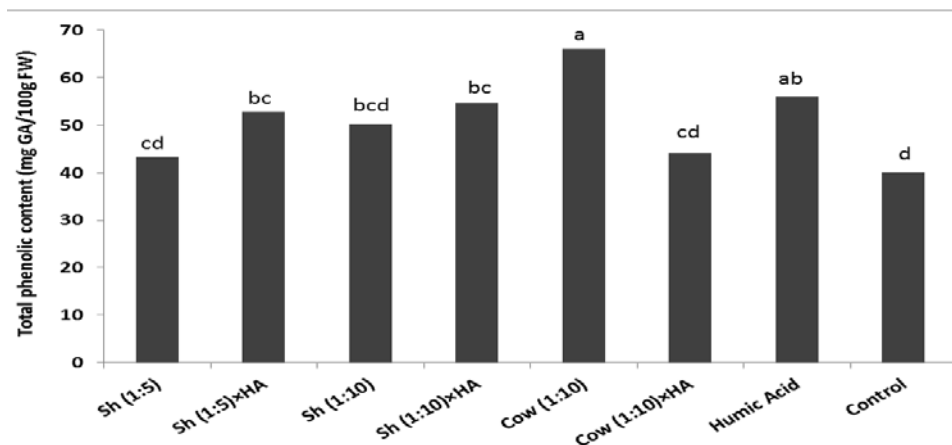


Figure 4. Effect of humic acid (HA), compost tea of sheep (Sh) and cow (Cow) manure on pepino fruit total phenolic content

Conclusion

The use of organic materials such as humic acid, compost and byproducts for plant nutrition in organic production systems should be considered. Desired biochemical or physiological processes and fruit quality factors could be obtained by the right choice of organic fertilizers or application rates.

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