

Impact of Spraying some Organic Manure Tea, Seaweed Extract and Royal Jelly on Fruiting of Keitte Mango Trees

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Abstract: Growth, total chlorophylls, N, P and K in the leaves, yield and fruit quality of Keitte mango trees in response to foliar application of three organic manures tea (farmyard manure, compost and chicken manure), seaweed extract each at 10% and Royal jelly at 0.05%, singly or in combinations were investigated during 2013 and 2014 seasons. The trees received three sprays from these biostimulants at growth start, just after fruit setting and at one month later.

Single and combined applications of all organic manure tea, seaweed extract and Royal jelly was very effective in stimulating all parameters comparing with the control treatment. The best organic manure tea in this connection was chicken manure, followed by compost and farmyard manure, in descending order. Combined application of any one of organic manure tea either applied with seaweed extract at 10% or with royal jelly at 0.05% was preferable than using organic manures tea alone in this respect.

The best results with regard to yield and fruit quality of Keitte mango trees were obtained due to treating the trees three times with a mixture of chicken manure tea at 10% plus spraying Royal jelly at 0.05 %.

Keywords: Tea of compost farmyard manure, chicken manure, seaweed extract, Royal jelly, yield and fruit quality, Keitte mango trees.

Introduction

Mango cv. Keitte as a prime, outstanding and popular fruit crops is still need more studies for overcoming yield poor by using new techniques for providing the trees with their requirements from most organic and mineral nutrients at faster time as well as protecting the trees from all stresses.

Organic manures especially when applied via tea source have an announced role on improving yield and fruit quality of fruit cops. Thus is attributed to the increase on the release of most nutrients due to this change from solid to liquid form. Using tea of all organic manures achieved many important functions when applied to the fruit crops at the optimum time and concentration. This is attributed to the higher content of organic manures tea from all nutrients, as well as the higher availability of these nutrients. The promotion on soil fertility and N fixation surely reflected on enhancing growth, yield and fruit quality.

The results of ²⁻¹⁶ confirmed the beneficial effects of using solid and tea forms of organic manure on growth and fruiting of fruit crops.

Seaweed extract considered an excellent natural fertilizer. It has higher amounts of most nutrients antioxidants and hormones^{17, 18}.

According to^{19, 20, 21} using seaweed extract has a pronounced effect on fruiting of different mango cvs.

Royal jelly is very effective in enhancing growth, nutritional status of the trees, yield as well as both physical and chemical characters. This is attributed to the higher content of Royal jelly from most sugars especially reducing sugars and sucrose, nutrients namely P, K, Mg, Ca, Fe, S, Mn and Fe, vitamins B₅, B₆, B₉, B₁₂, A.C.K.E.D. amino acids especially methionine and tryptophane and six hormones^(22,23, 24). Also, it is responsible for amending the plants with most nutritional requirements faster. Due to its higher content from antioxidants, it is responsible for protecting the plants from all stresses.

Previous studies confirmed the beneficial effects of using Royal jelly when applied three times at 0.05% on improving yield and fruit quality of fruit in different fruit crops^(25,26, 27, 28, 29).

The target of this was elucidating the impact of spraying compost, farmyard manure and chicken manure tea, seaweed extract and Royal jelly on fruiting of Keitte mango trees

Material and Methods

This study was carried out during 2013 and 2014 seasons on 36 uniform in vigour 11- years old Sukkary mango trees onto seedling mango rootstock. The selected trees are grown in a private orchard located at West Samalout, Samalout district, Minia Governorate. The trees are planted at 7x7 meters apart. The texture of the tested soil is sandy clay³⁰. The selected trees were kept under the normal horticultural practices that already applied in the orchard. Drip irrigation system was followed. Electrical conductivity of water and soil was 360 and 260 ppm, respectively.

Table (1): Analysis of the tested soil:

Constituents	Values
Particle size distribution :	
Sand %	50.0
Silt %	24.6
Clay %	25.4
Texture	Sandy clay
pH (1 : 2.5 extract)	7.11
E.C (ha 2.5 extract) mmhos/ 1 cm/ 25°C)	1.0
O.M. %	
CaCO ₃ %	4.13
Total N %	0.04
Available P (ppm , olsen)	2.1
Available K (ppm, ammonium acetate)	50.0

This study included the following twelve treatments of different compost farmyard manure and chicken manure tea as well as application of seaweed extract and Royal Jelly arranged as follows:

1. Control(untreated trees).
2. Spraying farmyard manure tea at 10 % .
3. Spraying compost tea at 10%.
4. Spraying chicken manure tea at 10%.
5. Spraying Seaweed extract at 10%.
6. Spraying Royal jelly at 0.05%.
7. Spraying farmyard manure tea at 10% + seaweed extract at 10%.
8. 8-Spraying compost teat at 10% + seaweed extract art 10%.
9. Spraying chicken manure art 10% + seaweed extract at 10%.
10. Spraying farmyard manure tea at 10^ + Royal jelly at 0.05%.
11. Spraying compost tea at 10% + compost tea at 10%.
12. Spraying Chicken manure tea at 10% + Royal jelly at 0.05%.

Each treatment was replicated three times, one tree per each. Analysis of farmyard manure, compost and chicken manure tea, seaweed extract and Royal jelly are shown in Tables (2 & 3 & 4) . These biostimulant were sprayed three times during the two growing season. The three dates of spraying were growth start (last

week of Feb.) , just after fruit setting (last week of Apr.) and at one month later (last week of May). Triton B as a wetting agent was added to all biostimulants at 0.05% and spraying was done till runoff (50 L/ tree) . Control trees were sprayed with water containing triton B. Royal jelly was stored in refrigerator at 4°C till use. Tea of the three investigated organic manures was prepared by weighing 10 kg form each organic manure plus 0.75 kg molase + 10.0 g sodium chloride + 55.0 g magnesium sulphate per 100 litres water and remained three days with continuous agitation. Tea of all organic manure was used at the fourth day of preparation start.⁽³¹⁾

Table (2): Analysis of compost, farmyard manure and chicken manure tea.

Parameters	Compost tea	F.Y.M. tea	Chicken tea
pH	7.1	7.4	6.8
EC (ds /m)	5.3	6.5	5.0
Nutrients (ppm)	-	-	-
Total N	221.0	200.0	230.0
Total P	22.0	20.0	26.0
Total K	16.0	14.1	20.0
Total Ca	14.0	13.0	15.9
Total Mg	7.0	6.0	9.5
Total Fe	133.0	127.0	136.0
Total Mn	23.0	20.0	26.0
Total Zn	14.5	12.0	16.5
Total Cu	16.0	14.2	18.5

Table (3): Analysis of seaweed extract (according to ³²)

character	values
Moisture %	: 6.0
O.M. %	: 45 – 60
Inorganic matter %	: 45 – 60
Protein %	: 6 – 8
Carbohydrates %	: 35 – 50
Aliginic acid %	: 10 – 20
Mannitol %	: 4 – 7
Total N %	: 1.0 – 1.5
P %	: 0.02 – 0.09
K %	: 1.0 – 1.2
Ca %	: 0.2 – 1.5
S %	: 3 – 9
Mg %	: 0.5 – 0.9
Cu (ppm)	: 1.0 – 6.0
Fe (ppm)	: 50 – 200
Mn (ppm)	: 5 – 12
Zn (ppm)	: 10 – 100
B (ppm)	: 20 – 100
Mo (ppm)	: 1 – 5
Cytokinins %	: 0.02
IAA %	: 0.03
ABA %	: 0.01

Table (4): Chemical Analysis of royal jelly (23

Constituents	Values mg/ 100 g F.W.
Dry matter	34.7
Portents	48.2
Carbohydrate	37.8
Lipids	10.4
Ash	2.0
Sugar	23.0
Glucose	4.0
Fructose	4.0
Sucrose	5.0
Nutrients (ppm)	
K	220
Mg	105
Ca	112
Fe	50
P	118
S	44
Mn	32
Si	5
Vitamins (mg/ 100 g F.W.)	
Vitamins B ₁	0.4
Vitamins B ₂	0.3
Vitamins B ₅	0.4
Vitamins B ₆	0.3
Vitamins B ₈	0.3
Vitamins B ₉	0.4
Vitamins B ₁₂	0.3
A	0.4
C	0.9
D	0.5
K	0.4
E	0.3
Essential amino acids	1100

Randomized completed block design (RCBD) was followed. During both seasons, the following parameters were recorded, vegetative growth characters namely shoot length and leaf area (cm)² in the Spring growth cycle ³³, total chlorophylls ³⁴ and ³⁵ as mg/ 100 g F.W., N, P and K in the leaves (³⁶ and ³⁰), yield / tree (kg.), fruit weight (g.), percentages of pulp, T.S.S. %, total and reducing sugars (³⁷), total acidity % as g citric acid / 100 g pulp, vitamin C content (as mg/ 100 g pulp) and total fibre % (³⁷).

Statistical analysis was done and treatment means were compared using new L.S.D. at 5% according to³⁸.

Results and Discussion

1- Shoot length and leaf area:

It is clear from the data in Table (5) that foliar application of anyone of organic manure tea (compost , farmyard manure and chicken manure) either applied separately or in combination with seaweed extract at 10% or Royal Jelly at 0.05% significantly stimulated shoot length and leaf area in the Spring growth cycle comparing to the check treatment. The great promotion on these growth characters was attributed to using

Royal jelly at 0.05%, seaweed at 10%, farmyard manure, compost and chicken manure, in ascending order. Using seaweed extract alone at 10% was significantly superior than using Royal jelly alone in this connection. However, when Royal jelly was foliar added with the tea of all organic manure had an announced promotion on such two growth characters rather than using each alone. Using farmyard compost and chicken manure tea with seaweed extract or Royal jelly significantly stimulated all growth characters comparing with spraying any one of the three organic manures tea at 10% alone. Using tea of anyone of the three organic manures besides Royal jelly at 0.05% gave the best results with regard to growth characters comparing with using seaweed extract with these organic manure tea. The maximum values were recorded on the trees that received three sprays of a mixture of chicken manure tea at 10% plus Royal jelly at 0.05%. Untreated trees produced the minimum values. These results were true during both seasons.

2-Percentages of N, P and K and total chlorophylls in the leaves :

Data in Tables (5) and (6) clearly show that spraying the three organic manures tea each at 10% with or without seaweed extract at 10% or Royal jelly at 0.05% , seaweed extract at 10% and Royal jelly at 0.05% significantly was followed by enhancing total chlorophylls , N, P and K in the leaves rather than non-application. Using any one of the three organic manures tea (compost manure, farmyard manure and chicken manure) with seaweed extract or Royal jelly was significantly superior than using tea of the three organic manure alone. The best organic manure tea in this respect was chicken manure tea followed by compost tea and farmyard manure tea ranked the last position in this respect. The maximum values were recorded on the trees that received three sprays of a mixture containing chicken manure tea at 10% plus Royal jelly at 0.5%. The untreated trees produced the minimum values.

3- Yield / tree:

It is clear from the data in Table (6) that yield per tree of Keitte mango trees subjected to organic manures tea , seaweed extract and Royal jelly treatments was significantly higher relative to the control treatment. The promotion was significantly associated with spraying tea of chicken manure , compost and farmyard manure, in descending order. Using seaweed extract alone at 10% was significantly preferable than using Royal jelly alone, but when Royal jelly incorporated with different organic manures tea a significant promotion on the yield was noticed rather than application of seaweed with these organic manure tea. Combined application of tea of any one of the three organic manures along with seaweed extract or Royal jelly significantly surpassed the application of organic manures tea alone in improving the yield. The best results with regard to yield of Keitte mango trees were recorded when the trees received three sprays of a mixture of chicken manure tea at 10% plus Royal jelly at 0.05%. Under such promised treatment, yield/ tree reached 37.0 and 38.6 kg during both seasons, respectively. The yield of untreated trees reached 20.1 kg and 20.6 kg during 2013 and 2014 seasons, respectively. The percentage of increase on the yield of the recommended treatment over the check treatment reached 85.11 and 87.4% during both seasons, respectively. The same trend was observed during both seasons.

4- Physical and chemical characteristics of the fruits

It is worth to mention from the data in Tables (6 & 7) that spraying Keitte mango trees three times with tea of compost, chicken manure and farmyard manure each at 10% with or without application of seaweed extract at 10% or Royal jelly at 0.05 % was significantly very effective in improving fruit quality in terms of increasing fruit weight and pulp % , T.S.S. %, total and reducing % and vitamin C and reducing total acidity % and total fiber % relative to the check treatment. Foliar application of organic manure tea either with seaweed extract or Royal jelly significantly was favourable in improving fruit quality relative to using the tea of any one of the three organic manures alone. The best organic manure tea in this respect was chicken manure, compost and farmyard manure tea, in descending order. Supplying the trees with seaweed / extract at 10% combined with compost tea was significantly preferable than using Royal jelly in this connection. Combined application of chicken manure tea at 10% , plus Royal jelly gave the best results with regard to fruit quality. Untreated trees produced unfavourable effects on fruit quality. These results were true during both seasons.

Table (5): Effect of single and combined applications of some organic manure stea, Royal jelly and seaweed extract on Spring shoot length, leaf area, total chlorophylls and percentages of N and P in the leaves of Keitte mango trees during 2013 and 2014 seasons.

Treatment	Spring shoot length (cm.)		Leaf area (cm ²)		Total chlorophylls (mg/ 100 g F.W.)		Leaf N %		Leaf P %	
	2013	2014	2013	2014	2013	2014	2013	2014	2013	2014
Control	40.1	41.0	74.1	74.3	11.1	10.9	1.61	1.59	0.16	0.14
Spraying F.Y.M. tea at 10 %	43.3	44.0	75.8	76.0	12.5	12.0	1.76	1.75	0.23	0.21
Spraying compost tea at 10 %	45.0	46.3	77.3	77.5	13.1	12.5	1.82	1.84	0.26	0.24
Spraying chicken manure tea at 10 %	47.7	49.0	79.0	81.3	14.0	13.0	1.92	1.92	0.30	0.27
Spraying seaweed extract tea at 10 %	49.0	50.5	81.0	83.0	14.7	13.5	2.02	2.03	0.34	0.30
Spraying Royal jelly at 0.05 %	42.0	43.1	75.6	75.6	11.9	11.5	1.68	1.66	0.20	0.17
Spraying F.Y.M. tea + seaweed extract	51.3	52.3	82.0	76.9	15.3	14.0	2.08	2.11	0.36	0.33
Spraying compost tea + seaweed extract	52.4	53.4	83.4	79.3	16.0	14.6	2.15	2.20	0.39	0.37
Spraying chicken manure tea + seaweed extract	53.5	55.0	84.6	81.9	16.9	15.2	2.22	2.27	0.41	0.40
Spraying F.Y.M. tea + Royal jelly	54.9	57.3	87.3	84.0	17.4	16.9	2.30	2.35	0.44	0.43
Spraying compost tea + Royal jelly	66.0	59.0	89.0	86.0	17.9	17.4	2.37	2.42	0.47	0.47
Spraying chicken manure tea + Royal jelly	69.3	60.3	96.3	97.0	18.4	18.0	2.44	2.50	0.50	0.52
New L.S.D. at 5%	1.0	1.1	0.9	0.8	0.4	0.3	0.06	0.07	0.03	0.03

Table (6): Effect of single and combined applications of some organic manures tea, Royal jelly and seaweed extract on the percentage of K, yield per tree, fruit weight , pulp % and T.S.S. % in the fruits of Keitt mango trees during 2013 and 2014 seasons.

Treatment	Leaf K %		Yield / tree (kg.)		Fruit weight (g.)		Pulp %		T.S.S. %	
	2013	2014	2013	2014	2013	2014	2013	2014	2013	2014
Control	1.37	1.41	20.5	20.6	340.0	341.0	66.5	66.0	9.0	8.8
Spraying F.Y.M. tea at 10 %	1.46	1.51	23.5	25.0	375.0	376.0	69.4	65.9	9.9	9.8
Spraying compost tea at 10 %	1.51	1.55	25.0	26.5	392.0	393.0	70.5	71.0	10.4	10.3
Spraying chicken manure tea at 10 %	1.55	1.60	27.0	28.5	418.0	419.0	71.6	72.1	10.9	11.0
Spraying seaweed extract tea at 10 %	1.60	1.65	28.6	30.1	434.0	435.0	72.9	73.4	11.4	11.4
Spraying Royal jelly at 0.05 %	1.42	1.47	22.0	23.5	357.0	358.0	68.0	68.9	9.4	9.3
Spraying F.Y.M. tea + seaweed extract	1.66	1.71	30.0	31.6	450.0	451.0	74.0	74.6	12.0	12.0
Spraying compost tea + seaweed extract	1.70	1.76	31.6	33.2	466.9	467.4	75.1	75.7	12.4	12.4
Spraying chicken manure tea + seaweed extract	1.75	1.81	33.0	34.5	481.0	481.5	76.2	76.9	13.0	12.8
Spraying F.Y.M. tea + Royal jelly	1.80	1.86	34.0	35.5	497.0	497.5	77.3	78.0	13.5	13.3
Spraying compost tea + Royal jelly	1.85	1.90	35.5	37.0	501.0	501.0	78.4	79.9	14.0	14.0
Spraying chicken manure tea + Royal jelly	1.90	1.94	37.0	38.6	506.1	507.9	79.9	80.1	14.4	14.5
New L.S.D. at 5%	0.04	0.04	1.0	1.0	15.1	16.1	1.0	1.0	0.4	0.4

Table (7): Effect of single and combined applications of some organic manures tea, Royal jelly and seaweed extract on some chemical characteristics of the fruits of Kette mango trees during 2013 and 2014 seasons.

Treatment	Total acidity %		Total sugars %		Reducing sugars %		Vitamin C (mg/ 100 g pulp)		Total fiber %	
	2013	2014	2013	2014	2013	2014	2013	2014	2013	2014
Control	0.901	0.899	7.0	6.7	2.3	2.4	41.5	42.4	1.11	1.08
Spraying F.Y.M. tea at 10 %	0.840	0.837	7.7	7.7	2.7	2.9	43.0	44.0	0.99	1.00
Spraying compost tea at 10 %	0.811	0.808	8.1	8.2	3.0	3.1	44.0	44.9	0.94	0.95
Spraying chicken manure tea at 10 %	0.791	0.788	8.5	8.5	3.3	3.4	44.6	46.0	0.90	0.90
Spraying seaweed extract tea at 10 %	0.766	0.763	9.0	9.4	3.5	3.6	45.0	47.0	0.84	0.83
Spraying Royal jelly at 0.05 %	0.870	0.870	7.4	7.2	2.5	2.6	42.4	43.0	1.04	1.05
Spraying F.Y.M. tea + seaweed extract	0.740	0.737	9.4	9.8	3.9	3.8	46.3	48.3	0.79	0.80
Spraying compost tea + seaweed extract	0.714	0.711	9.8	10.2	4.4	4.2	47.3	49.5	0.74	0.75
Spraying chicken manure tea + seaweed extract	0.691	0.685	10.2	10.6	4.8	4.5	48.5	50.6	0.70	0.71
Spraying F.Y.M. tea + Royal jelly	0.666	0.661	10.6	11.0	5.3	4.8	50.0	51.7	0.66	0.66
Spraying compost tea + Royal jelly	0.640	0.637	11.0	11.5	5.5	5.1	50.6	52.8	0.61	0.59
Spraying chicken manure tea + Royal jelly	0.615	0.616	11.4	11.8	5.6	5.5	51.5	53.9	0.55	0.54
New L.S.D. at 5%	0.025	0.022	0.3	0.3	0.2	0.2	0.5	0.5	0.05	0.06

Discussion:

The higher content of essential nutrients of compost, farmyard manure and chicken manure tea could explain the present results. (39) (as previously mentioned in Table (2) could explain the promoting effect of tea of the three organic manures on fruiting of Keitte mango trees.

These results are in agreement with those obtained by ^{13, 12, 14, 16 and 15}.

The positive action of seaweed extract on fruiting of Keitte mango trees might be attributed to its higher content of most essential nutrients, vitamins, amino acids and other antioxidants as shown in Table (3) as well as according to ¹⁸.

The results concerning the effect of seaweed extract on promoting yield and fruit quality of Keitte mango trees are in concordance with those obtained by ^{19, 20 and 21}.

The higher content of Royal jelly from nutrients, amino acids, lipids, fructose, glucose, sucrose, vitamins and fats (^{22, 23 and 24} could explain the present results.

These results are nearly the same results obtained by ^{25, 26, 27, 28, and 29}.

Conclusion:

Under the climatic conditions prevailing in Minia region, it is advised to spray a mixture of chicken manure tea at 10% plus Royal jelly at 0.05% three times at growth start, just after fruit setting and at one month later for the productivity of Keitte tree mango trees.

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