



Effect of different plant extracts on vegetative growth, yield and fruit quality of Zebda mango trees (*Mangifera indica* L.) under the condition of Aswaan Governorate.

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Abstract: Zebda mango trees during 2017 and 2018 seasons were sprayed four times by foliar application of turmeric and Rosella extracts as well as onion and garlic oils at 1.0 % and 2.0% from every materials, This study focused on the impact of these treatments on growth status of Zebdatrees, yield, physical and chemical characteristics of the fruits Sprayed with these extracts at four times results indicated that spraying was effective in enhancing growth traits, yield and Fruit quality rather than non- application " control". The promotion was associated with increasing the concentration of these extracts from 1.0% up to 2.0 %. Using garlic oil was surpassed those of the other treatments at the concentration of 2%, in both seasons 2017 and 2018, significantly.

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1. Introduction

Recently, plant extracts are used to improve production of mango instead of using chemicals. The change for using plant extracts against chemicals was performed because pathogens resistance to the fungicides has developed as well as for protecting our environment from pollution. The higher own content of these plant extracts are plant pigments, phenolic compounds and essential oils which have a synergistic effects on the yield of mango (Peter (16).

Turmeric is the dried rhizome of the plant *Curcuma longa* L. It is used in various industrial purposes, medicine and as bio pesticide.

Turmeric contains about 60% turmeric, 25% zingiberene and small quantities of d-phellandrene, d-sabienene, cineole and forneol. Turmeric is valued mainly for its principle coloring pigments, curcumin which imports the yellow color of turmeric, besides nutritive constituents like potassium. The main colorings constituents of turmeric and other yellow *Curcuma* species are curcumins, demethoxycurumin, methane and bisdemethoxycurumin together make the coloring pigment in the turmeric rhizomes (Govindarajan) (16).

The chemical components of Rosella "*Hibiscus sabdariffa*" calyx include anthocyanins flavonoids and polyphenols (Peng-Kong *et al.*) (24) and Tzu-Li Lin *et al.* (28). The calyx is potentially a good source of antioxidant agents as anthocyanins and ascorbic acid (Prenești *et al.*) (26). Roselle calyx contains a rich source of dietary fiber, vitamins, minerals and

bioactive compounds such as organic acids, phytosterols, and polyphenols. The phenolic content in the plant consists mainly of anthocyanins like delphinidin-3-glucoside, sambubioside, and cyanidin-3- sambubioside mainly contributing to their antioxidant properties (Aurelio *et al.*) (6).

Plant extracts are used to improve production of mango fruits instead of using chemicals. The change for using plant extracts against chemicals was performed because pathogens resistance to the fungicides has developed as well as for protecting our environment from pollution. It has long been recognized that naturally occurred substances in higher plants which have antioxidant activity.

Plant kingdom is a good source of natural preparations containing effective bioactive compounds which can be used for different application particular as food additives and health promoting ingredients in the formulations of functional foods and nutrients. Nowadays, the interest has considerably increased for the use in storage studies (Govindarajan) (16).

Ahmed, M.A.M. *et-al* (2), Alam, M.M. (3), Anwar, D.A. *et-al.* (4), Block, E. (7), Cairney, E. (8), Cazuola, I. (9), Darwish, S.N.A.S. (10), El-Khawaga, A.S. and Mansour, A.E.M. (11), El-Sayed - Esraa, M.H. (12), Eshmawy, E.M.S. (13) and Gamal, A.F.O. (14).

Previous studies showed that using plant extracts was favourable for improving growth, yield and quality of fruits, in various mangocvs.

This study aimed to examine the effect of turmeric and Roselle extracts as well as onion and garlic oils on growth, yield and fruit quality of Zebda mango trees under the condition of Aswan governorate.

2. Material and Methods

This investigation was carried out during 2017 and 2018 seasons on Zebda mango cv. Trees budded onto seedling rootstocks, grown in sandy loam soil in a private orchard situated at Aswan region.

Table (1): Chemical composition in (mg/100g According to Mnayer *et al.* (22)

garlic oils	onion oil
D.W) Dipropyl disulfide 0.25	1-Propenyl propyl disulfide a 7.26
Diallyl disulfide 37.90	Methyl propyl trisulfide 5.2
Dimethyl trisulfide 0.33	Menthone 0.34
Dimethyl thiophene a 0.08	Methyl propyl trisulfide 0.47
Allyl methyl disulfide 3.69	Dimethyl tetrasulfide 0.15
Methyl propyl disulfide 0.25	Dipropyltrisulfide 17.10
Methyl 1-propenyl disulfide 0.46	Allyl propyl sulfide 0.42
Allyl propyl sulfide 0.09	2-Methyl-3,4-dithiaheptane 6.48
Bis-(1-propenyl)-sulfide a 0.08	Dipropyltetrasulfide 0.55
Diallyl sulfide 6.59	Dipropyl disulfide 30.92
Dimethyl disulfide 0.15	Allyl propyl sulfide 0.42
Allyl methyl tetrosulfide 1.07	Dimethyltrisulfide 0.30
Allyl propyl trisulfide 0.23	1-Propenyl propyl disulfide a 7.26
Diallyl trisulfide 28.06	Methyl propyl trisulfide 5.2
Eugenol 0.23	Dimethyltrisulfide 0.30

Twenty seven Zebda trees were selected, 5 years old, healthy, nearly uniform in vigor, planted at 5x5 meters apart and received the same cultural practices. Surface irrigation system was used. Soil analysis was done according to the procedures that outlined by **Wilde *et al.*, (29)**

Except those dealing with the present treatments (application of turmeric, Roselle extracts as well as onion and garlic oils) the selected trees (27 trees) received the usual horticultural practices.

The present experiment included the following nine treatments:

- 1- Control (untreated trees).
- 2- Spraying Turmeric extract at 1%.
- 3- Spraying Turmeric extract at 2%.
- 4- Spraying Rosella extract at 1%.
- 5- Spraying Rosella extract at 2%.
- 6- Spraying onion oil at 1%.
- 7- Spraying onion oil at 2%.
- 8- Spraying garlic oil at 1%.
- 9- Spraying garlic oil at 2%.

Every treatment was replicated three times using one tree per replicate. Trees were sprayed four times from every treatment extract "at growth start and then every one month later" in both seasons.

During both seasons, the following parameters were measured,

1- Spring shoot length (cm.).

2 -leaf area (cm²) according to **Ahmed and Morsy (1)**.

Yield and Fruit physical and chemical analysis:

Yield / tree (kg.), Av fruit weight (g.), Av. pulp of fruit, T.S.S. and. To talacidity, reducing sugar per. according to **(A.O.A.C. (5))**.

Statistical analysis

Statistical analysis was done using completely randomized block design "CRBD", new L.S.D. test at 5% was used to compare differences among the treatment means as mentioned by **(Mead *et al.*) (20)**.

3. Results and Discussion:

1- Shoot length and leaf area:

It is clear from the data in Table (2) that treating Zebda mango trees with turmeric, rosella extracts and onion, garlic oils from 1.0 to 2.0%, significantly enhanced the main shoot length and leaf area rather than the control treatment. The stimulations were significantly associated with increasing concentrations from 1.0 to 2%.

The maximum values were recorded on the trees that supplied with turmeric, Rosella, onion and garlic extracts at 2% in comparing with those of the control which produced the lowest values. These results were true during both seasons.

2-Av. yield per tree:

Data in Table (3) clearly show that Av. yield per tree was significantly improved in response to spray trees four times in relative to the check treatment. This promotion was significantly associated with Increasing concentrations of turmeric, Rosella extracts and onion and garlic oils from 1.0 to 2.0 % in both the experimental seasons 2017 and 2018.

Under such promised treatment yield per tree reached 32.5 and 35.5 by using garlic extract at 2.0% during both seasons, respectively. The control trees produced 15.5 and 15.7 kg/ tree during both seasons, respectively.

Increasing on the yield due to application of the promising treatment over the control reached 17 and 19.5 kg/tree during both seasons, respectively. These results were significant during both seasons.

3-Physical and chemical characteristics of the fruits:

It is evident from the data in Tables (3,4 and 5) that treating Zebda mango trees four times with turmeric, rosella, onion and garlic extracts from 1.0% to 2.0% was significantly effective in improving fruit quality in terms of increasing Av. fruit weight, Av. flesh weight, T.S.S. percentages, reducing sugars% while decreased total acidity rather than the check treatment. Using garlic oil extract at 2.0% is preferable than using other treatments in improving fruit quality. The promotion on fruit quality was significantly related to the increase in concentration of garlic oil from 1% to 2.0% significantly in both the experimental seasons.

Fruit quality was highly improved with increasing concentrations of garlic oils from 1 to 2%. Therefore, the recommended concentration was 2.0%. These results were true during in both seasons.

Table (2): Effect of Rosella, turmeric extracts as well as Onion and Garlic oils on Av. shoot length and Av. Leaf area (cm)² of Zebda mango cv during 2016 and 2017 seasons.

Treatments	Av. Shoot length (cm)		Av. Leaf area (cm) ²	
	2016	2017	2016	2017
Control (tap WATER)	41.2	42.9	71.2	70.9
rosella extract at 1%	42.6	43	72.3	72.6
rosella extract at 2%	43.0	44.7	73.8	74.3
turmeric extract at 1%	44.2	45	74.3	74.7
turmeric extract at 2%	45.7	46.3	75.9	76.9
Onion oil at 1%	47	48	77	78.1
Onion oil at 2%	47.3	48.3	77.5	78.9
Garlic oil at 1%	47.5	48.0	77.6	79.1
Garlic oil at 2%	48.9	49.4	78.9	80.2
New LSD 5%	1.0	0.9	0.5	0.2

Table (3): Effect of rosella, turmeric extracts as well as Onion and Garlic oils on Yield / tree (kg) and av. Fruit weight (g) of Zebda mango cv during 2016 and 2017 seasons.

Treatments	Av. Yield/ tree (kg.)		Av. Fruit weight (g.)	
	2016	2017	2016	2017
Control (Tap WATER)	15.5	15.7	368.5	373.4
rosella extract at 1%	18.1	19.8	347.2	373.5
rosella extract at 2%	22.4	23.7	360.3	383.6
turmeric extract at 1%	21.1	23.9	365.3	392.5
turmeric extract at 2%	26.6	28.7	380.9	408.6
Onion oil at 1%	29.1	32.9	384.6	422.3
Onion oil at 2%	30.6	32.3	390.4	423.4
Garlic oil at 1%	31	33.6	393.2	424.6
Garlic oil at 2%	32.5	35.5	407.9	444.0
New LSD 5%	0.9	0.8	0.7	0.1

Table (4): Effect of rosella, turmeric extracts as well as Onion and Garlic oils on TSS % and Av. Flesh weight (g). of Zebda mango cv during 2016 and 2017 seasons.

Treatments	T.S.S. %		Av. Flesh weight (g)	
	2016	2017	2016	2017
Control (tap WATER)	10	9.9	78.1	78.7
rosella extract at 1%	10.7	10.9	80.5	81.4
rosella extract at 2%	11.4	11.1	82.0	83.1
turmeric extract at 1%	11.1	11.2	82.3	84.4
turmeric extract at 2%	11.7	11.7	83.8	84.9
Onion oil at 1%	12	12.1	85.8	86.9
Onion oil at 2%	12.4	12.6	85.8	87.1
Garlic oil at 1%	12.7	12.8	86.2	88.6
Garlic oil at 2%	13.5	13.8	89.8	90.1
New LSD 5%	0.2	0.2	1.0	1.0

Table (5): Effect of rosella, turmeric extracts as well as Onion and Garlic oils on Total acidity per. and Reducing sugars per. Of Zebda mango cv during 2016 and 2017 seasons.

Treatments	Total acidity %		Reducing sugars %	
	2016	2017	2016	2017
Control (Tap WATER)	0.955	0.978	7.9	8.0
rosella extract at 1%	0.900	0.890	8.0	8.1
rosella extract at 2%	0.880	0.870	9.1	8.7
turmeric extract at 1%	0.879	0.868	9.2	9.6
turmeric extract at 2%	0.859	0.850	9.5	10.1
Onion oil at 1%	0.831	0.829	10.0	10.4
Onion oil at 2%	0.829	0.804	10.9	10.7
Garlic oil at 1%	0.822	0.836	11.0	10.9
Garlic oil at 2%	0.800	0.811	11.5	11.2
New LSD 5%	0.012	0.011	0.2	0.2

Conclusion

Zebda mango trees during 2017 and 2018 seasons were sprayed four times by foliar application of turmeric and rosella, onion and garlic extracts at 2.0% from every treatment, but the large increment was obtained by using garlic oil extract at 2.0%. Results of Yield as well as physical and chemical characteristics of the fruits Sprayed with these extracts indicated that spraying was effective in enhancing growth traits as well as yield and Fruit quality rather than non- sprayed control (sprayed with tap water only). The promotion was associated with increasing concentrations of these extracts from 1% till 2.0 %. Using garlic extracts was surpassed those of the other treatments at the concentration of 2%, in both experimental seasons significantly.

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