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RESPONSE OF TAIMOUR MANGO TREES TO FOLIAR APPLICATION OF TURMERIC EXTRACT

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ABSTRACT

Taimour mango trees were treated with turmeric extract at different concentrations (٠.٠٥ to ٠.٨ %) and frequencies (once, twice, three or four times) during ٢٠١١ and ٢٠١٢ seasons. The goal of this study was examining the effect of these turmeric treatments on growth and fruiting of Taimour mango trees.

Results showed that foliar application of turmeric extract at ٠.٠٥ to ٠.٨ % once, twice, three or four times considerably improved leaf area, total chlorophylls, leaf content of N, P and K, yield as well as physical and chemical characteristics of the fruits in comparison to the check treatment. The promotion was associated with increasing concentrations from ٠.٠٥ to ٠.٨ % as well as frequencies of turmeric from once to four times. Using turmeric extract at concentrations higher than ٠.١ % failed to show measurable promotion on all the investigated parameters. Increasing number of sprays from three to four times showed meaningless effect on these characters.

The best results with regard to yield and fruit quality of Taimour mango trees were recorded with foliar application of turmeric extract at ٠.١ % three times.

INTRODUCTION

Taimour mango cv. grown under middle Egypt conditions have poor yield and suffers from the exaggeration use of chemicals that

leads to cause a disturbance in physiological processes, metabolism and fruiting.

Since ancient times plant extracts were used in many ways. Recently, public health and environmental safety encourage the use of these natural products for improving growth, nutritional status, production and as pesticides. The higher content of plant extracts from phenolic and another chemical constituents seem to have synergistic effects on growth and mortality of most fungi. Out of the important plant extracts is turmeric. *Turmeric curcuma longa* L. is a herbaceous perennial plant belonging to the Zingiberaceous family. Curcuma genus contains about ٣٠ species. It originates from India and South East Asia and is cultivated in the majority of tropical countries. It is obtained from the rhizome of *Curcuma longa*. It contains ٢ to ٩ % curcuminoids which contain ٦٠ % curcumin, desmethoxycurcumin, monodemethoxycurcumin, bisdemethoxycurcumin, dihydrocurcumin and cyclocurcumin. Curcumins oxidation yield vanillin. Tumeric extract is rich in carbohydrates, (٥٠ % starch), arobinogalacton, potassium salt, essential oils and pigments. It is known for its anti-inflammatory, anti- oxidant and anti- microbial properties. Curcumin has a free radical scavenger activity namely hydroxyl radical that is responsible to protect DNA from damage and inhibit lipid peroxidation (Srimal, ١٩٩٧ and Alonso, ٢٠٠٤).

Previous studies emphasized the beneficial effects of using plant extracts on growth and fruiting of fruit crops. In addition, most studies found that cortain plant extracts are considered as antifungal compounds (Khanna and Chandra, ١٩٨٩; Ammon and Wehl, ١٩٩١; NRC, ١٩٩٢; Osawa, ١٩٩٤; Paik and Chung, ١٩٩٧; Obagwu *et al*., ١٩٩٧; Srivastava and Lal, ١٩٩٧; Purohit, ٢٠٠٠; Bruneton, ٢٠٠١; Okigbo and Emoghene, ٢٠٠٣; Parakash and Majeed, ٢٠٠٣; Pons, ٢٠٠٣; Chawdhury *et al*., ٢٠٠٧; Bhadwaj *et al*., ٢٠١٠ and Hanafy *et al*., ٢٠١٢).

The goal of this study was selecting the best concentrations and times of application of turmeric extract that were responsible for enhancing growth, yield and fruit quality of Taimour mango trees.

MATERIALS AND METHODS

This study was conducted during ٢٠١١ and ٢٠١٢ seasons on ٧٢ ١٦- years old Taimour mango trees onto seedling rootstock grown in a private orchard located at Nagah Hamady district, Qena Governorate, Upper Egypt where, the soil is clay. The trees were planted at ٧ × ٧ meters apart. Surface irrigation system using Nile water was followed. The selected trees were subjected to all the normal horticultural practices. This investigation included ٢٤ treatments from two factors (A & B).

The first factor (A) consisted of six concentrations of turmeric extract namely a_1) ٠.٠ %, a_2) ٠.٠٥ %, a_3) ٠.١ %, a_4) ٠.٢ %, a_5) ٠.٤ % and a_6) ٠.٨ %. While the second factor (B) comprised from four frequencies of turmeric extract namely b_1) once at Spring growth cycle start (١st week of Mar.), b_2), twice at the same previous date and again just after fruit setting (٤th week of Apr.), b_3), three times at the same previous two dates and two weeks later (٢nd week of May.), and b_4) four times at the same previous three dates and at two weeks later (٤th week of May.). Triton B as a wetting agent was added to all turmeric extracts at ٠.٠٥ %. Spraying was done till runoff (٢٠ L W/ tree). Untreated trees were sprayed with tap water containing Triton B at ٠.٠٥ %. Randomized complete block design in split plot arrangement was adopted. The six concentrations and the four frequencies of turmeric extract occupied the main and subplots, respectively.

Twenty leaves below panicles of the spring growth cycle according to Summer (١٩٨٥) were taken (٢nd week of June) for measuring leaf area (according of Ahmed and Morsy, ١٩٩٩) as well as chlorophylls a & b then summation of both for producing total chlorophylls (mg/ ١٠٠ g F.W) (according to Wettstein, ١٩٥٧) and percentages of N, P and K in the dried leaves were determined according to Wilde *et al*., (١٩٨٥).

Harvesting was achieved at the middle of July in both seasons when the flesh of fruits became light yellowish, the yield expressed in weight (kg.) was recorded. Twenty fruits were taken from each tree for measuring fruit weight (g.), T.S.S %, total and reducing sugars %,

total acidity % (as citric acid/ ١٠٠ ml juice) and vitamin C content (as mg/ ١٠٠ ml juice) (A.O.A.C., ١٩٩٥).

All the obtained data were tabulated and statistically analyzed according to Mead *et al*. (١٩٩٣) using new L.S.D at ٥ % for comparing the differences between various treatment means.

RESULTS AND DISCUSSION

١- Leaf area and its chemical composition:

It is clear from the data in Tables (١ & ٢ & ٣) that using turmeric extract at ٠.٠٥ to ٠.٨ % once, twice, thrice or four times significantly improved the leaf area, total chlorophylls and leaf content of N, P and K comparing with the check treatment. The promotion was associated with increasing concentrations and frequencies of turmeric extract. Significant differences on these parameters were observed among the concentrations lower than ٠.١ %. Using turmeric at concentrations higher than ٠.١ % caused unsignificant promotion on these parameters, therefore the recommended concentration is ٠.١ %. The maximum values were recorded with using turmeric four times at ٠.٨ %. The untreated trees produced the lowest values. Similar results were recorded during both seasons.

The own higher content of turmeric extract from antioxidants especially phenolic compounds, nutrients and plant pigments which in turn stimulating cell division (Pons, ٢٠٠٣) may explain the present results. These results are in harmony with those obtained by El- Wasfy *et al*. (٢٠١٢).

٢- Yield per tree:

Table (٣) shows that spraying turmeric extract once, twice, thrice or four times at ٠.٠٥ to ٠.٨ % significantly improved yield. There was a gradual promotion on the yield with increasing concentrations and frequencies of turmeric extract.

Response of Taimour mango trees to foliar application

Table ١: Effect of concentrations and frequencies of turmeric extract on the leaf area ($cm^{٢}$) and total chlorophylls (mg/ ١٠٠ g F.W of leaves) of Taimour mango trees during ٢٠١١ and ٢٠١٢ seasons.

Conc. of turmeric (A)	Leaf area ($cm^{٢}$)									
	٢٠١١					٢٠١٢				
	Frequencies of turmeric (B)									
	$b_{١}$ ١	$b_{٢}$ ٢	$b_{٣}$ ٣	$b_{٤}$ ٤	Mean (A)	$b_{١}$ ١	$b_{٢}$ ٢	$b_{٣}$ ٣	$b_{٤}$ ٤	Mean (A)
$a_{١}$ ٠.٠ %	٧٠.٠	٧٠.٣	٧٠.٣	٧٠.٥	٧٠.٣	٧٠.٢	٧٠.٥	٧٠.٥	٧٠.٦	٧٠.٥
$a_{٢}$ ٠.٠٥ %	٧٢.٠	٧٣.٥	٧٥.٠	٧٥.٣	٧٤.٠	٧٢.٩	٧٥.٠	٧٧.٠	٧٧.٥	٧٥.٦
$a_{٣}$ ٠.١ %	٧٣.٣	٧٦.٠	٧٧.٩	٧٨.٠	٧٦.٣	٧٥.٠	٧٧.٥	٨٠.٠	٨٠.٣	٧٨.٢
$a_{٤}$ ٠.٢ %	٧٣.٦	٧٦.٢	٧٨.٠	٧٨.٣	٧٦.٥	٧٥.٥	٧٧.٧	٨٠.٣	٨٠.٥	٧٨.٦
$a_{٥}$ ٠.٤ %	٧٣.٧	٧٦.٤	٧٨.٢	٧٨.٥	٧٦.٧	٧٥.٧	٧٧.٩	٨٠.٧	٨١.٠	٧٨.٨
$a_{٦}$ ٠.٨ %	٧٣.٨	٧٦.٥	٧٨.٣	٧٨.٥	٧٦.٨	٧٥.٩	٧٨.٠	٨١.٠	٨١.٥	٧٩.١
Mean (B)	٧٢.٧	٧٤.٨	٧٦.٣	٧٦.٥		٧٤.٢	٧٦.١	٧٨.٣	٧٨.٦	
New L.S.D at ٠.٠٥	A		B		AB	A		B		AB
	١.١		١.٠		٢.٥	١.٣		١.٢		٢.٩
character	Total chlorophylls (mg/ ١٠٠ g F.W)									
$a_{١}$ ٠.٠ %	٣٦.٦	٣٦.٦	٣٧.٠	٣٧.٥	٣٦.٩	٣٧.١	٣٧.٢	٣٧.٣	٣٧.٤	٣٧.٣
$a_{٢}$ ٠.٠٥ %	٣٧.٥	٤٠.٠	٤٢.٠	٤٢.٥	٤٠.٥	٣٨.٩	٤٠.٩	٤٣.٠	٤٣.٥	٤١.٦
$a_{٣}$ ٠.١ %	٣٩.٣	٤٢.٩	٤٥.٠	٤٥.٧	٤٣.٢	٤١.٧	٤٣.٣	٤٥.٣	٤٥.٥	٤٤.٠
$a_{٤}$ ٠.٢ %	٣٩.٤	٤٣.٠	٤٥.٣	٤٦.٠	٤٣.٤	٤١.٩	٤٣.٥	٤٥.٥	٤٥.٦	٤٤.١
$a_{٥}$ ٠.٤ %	٣٩.٧	٤٣.٢	٤٥.٤	٤٦.٠	٤٣.٦	٤٢.٠	٤٣.٦	٤٥.٧	٤٥.٧	٤٤.٣
$a_{٦}$ ٠.٨ %	٤٠.٠	٤٣.٣	٤٥.٥	٤٦.٢	٤٣.٨	٤٢.١	٤٣.٧	٤٥.٨	٤٥.٩	٤٤.٤
Mean (B)	٣٨.٣	٤١.٥	٤٣.٤	٤٣.٩		٤٠.٦	٤٢.٠	٤٣.٨	٤٣.٩	
New L.S.D at ٠.٠٥	A		B		AB	A		B		AB
	١.٠		٠.٩		٢.٢	١.٠		٠.٩		٢.٢

Using concentrations of turmeric above ٠.١ % did not cause a significant increase in the yield. Therefore, the recommended concentration of turmeric from economical point of view was ٠.١ %. Increasing number of sprays of turmeric from thrice to four times failed to promote the yield. The best results with regard to yield were obtained with treating the trees thrice with turmeric at ٠.١ %. Under such promised treatment, yield per tree reached ٤٨.٥ and ٤٩.٠ kg during both seasons (٢٠١١ and ٢٠١٢), respectively. The untreated trees produced the lowest values. Similar results were obtained during both seasons.

The beneficial effect of turmeric extract on yield was mainly attributed to its positive action on enhancing growth and nutritional

status of the trees in favour of producing higher number of fruits per tree. These results are in agreement with those obtained by El- Wasfy *et al*. (٢٠١٢) and Aly and El- Masry (٢٠١٢).

Table ٢: Effect of concentrations and frequencies of turmeric extract on the percentages of N and P in the leaves of Taimour mango trees during ٢٠١١ and ٢٠١٢ seasons.

Conc. of turmeric (A)	Leaf N %									
	٢٠١١					٢٠١٢				
	Frequencies of turmeric (B)									
	b_1 ١	b_2 ٢	b_3 ٣	b_4 ٤	Mean (A)	b_1 ١	b_2 ٢	b_3 ٣	b_4 ٤	Mean (A)
a_1 ٠.٠ %	١.٨١	١.٨٢	١.٨٢	١.٨٢	١.٨٢	١.٨٩	١.٩٠	١.٩٠	١.٩٠	١.٩٠
a_2 ٠.٠٥ %	١.٩٢	١.٩٨	٢.٠٥	٢.٠٦	٢.٠٠	١.٩٩	٢.١١	٢.٢٢	٢.٢٣	٢.١٤
a_3 ٠.١ %	٢.٠١	٢.١٠	٢.٢٢	٢.٢٣	٢.١٤	٢.١٠	٢.٢٣	٢.٣٠	٢.٣١	٢.٢٤
a_4 ٠.٢ %	٢.٠٢	٢.١١	٢.٢٢	٢.٢٤	٢.١٥	٢.١١	٢.٢٤	٢.٣١	٢.٣٢	٢.٢٥
a_5 ٠.٤ %	٢.٠٢	٢.١١	٢.٢٢	٢.٢٤	٢.١٥	٢.١٢	٢.٢٥	٢.٣١	٢.٣٣	٢.٢٥
a_6 ٠.٨ %	٢.٠٢	٢.١١	٢.٢٢	٢.٢٤	٢.١٥	٢.١٢	٢.٢٦	٢.٣٢	٢.٣٤	٢.٢٦
Mean (B)	١.٩٧	٢.٠٤	٢.١٣	٢.١٤		٢.٠٦	٢.١٧	٢.٢٣	٢.٢٤	
New L.S.D at ٠.٠٥	A		B		AB	A		B		AB
	٠.٠٦		٠.٠٥		٠.١٢	٠.٠٧		٠.٠٥		٠.١٢
character	Leaf P %									
a_1 ٠.٠ %	٠.١٣	٠.١٣	٠.١٢	٠.١٣	٠.١٣	٠.١٤	٠.١٥	٠.١٥	٠.١٥	٠.١٥
a_2 ٠.٠٥ %	٠.١٧	٠.٢١	٠.٢٤	٠.٢٥	٠.٢٢	٠.١٨	٠.٢٠	٠.٢٣	٠.٢٤	٠.٢١
a_3 ٠.١ %	٠.٢١	٠.٢٢	٠.٢٦	٠.٢٦	٠.٢٤	٠.٢٢	٠.٢٤	٠.٢٧	٠.٢٨	٠.٢٥
a_4 ٠.٢ %	٠.٢٢	٠.٢٣	٠.٢٧	٠.٢٧	٠.٢٥	٠.٢٣	٠.٢٤	٠.٢٨	٠.٢٨	٠.٢٦
a_5 ٠.٤ %	٠.٢٢	٠.٢٣	٠.٢٧	٠.٢٨	٠.٢٥	٠.٢٤	٠.٢٥	٠.٢٨	٠.٢٩	٠.٢٧
a_6 ٠.٨ %	٠.٢٣	٠.٢٤	٠.٢٧	٠.٢٨	٠.٢٦	٠.٢٥	٠.٢٥	٠.٢٨	٠.٢٩	٠.٢٧
Mean (B)	٠.٢٠	٠.٢١	٠.٢٤	٠.٢٥		٠.٢١	٠.٢٢	٠.٢٥	٠.٢٦	
New L.S.D at ٠.٠٥	A		B		AB	A		B		AB
	٠.٠٣		٠.٠٢		٠.٠٥	٠.٠٣		٠.٠٢		٠.٠٥

٣- Fruit quality:

It is evident from the data in Tables (٤ & ٥) that supplying Taimour mango trees once, twice, thrice or four times with turmeric extract at ٠.٠٥ to ٠.٨ % was significantly improved fruit quality in terms of increasing fruit weight, T.S.S %, total and reducing sugars % and vitamin C and reducing total acidity % in comparison to the check treatment. The promotion on fruit quality was proportional to the increase in concentrations and frequencies of turmeric extract.

Table ٣: Effect of concentrations and frequencies of turmeric extract on the percentage of K in the leaves and yield/ tree (kg.) of Taimour mango trees during ٢٠١١ and ٢٠١٢ seasons.

Conc. of turmeric (A)	Leaf K %									
	٢٠١١					٢٠١٢				
	Frequencies of turmeric (B)									
	$b_{١}$ ١	$b_{٢}$ ٢	$b_{٣}$ ٣	$b_{٤}$ ٤	Mean (A)	$b_{١}$ ١	$b_{٢}$ ٢	$b_{٣}$ ٣	$b_{٤}$ ٤	Mean (A)
$a_{١}$ ٠.٠ %	١.٣٠	١.٣١	١.٣١	١.٣١	١.٣١	١.٣٣	١.٣٤	١.٣٤	١.٣٥	١.٣٤
$a_{٢}$ ٠.٠٥ %	١.٣٦	١.٤٣	١.٥٠	١.٥٢	١.٤٥	١.٤١	١.٥٢	١.٦٢	١.٦٣	١.٥٥
$a_{٣}$ ٠.١ %	١.٤٣	١.٥٤	١.٦٢	١.٦٣	١.٥٦	١.٥١	١.٦٤	١.٧٢	١.٧٢	١.٦٥
$a_{٤}$ ٠.٢ %	١.٤٤	١.٥٤	١.٦٣	١.٦٤	١.٥٦	١.٥٢	١.٦٥	١.٧٣	١.٧٤	١.٦٦
$a_{٥}$ ٠.٤ %	١.٤٤	١.٥٥	١.٦٤	١.٦٥	١.٥٧	١.٥٢	١.٦٦	١.٧٣	١.٧٤	١.٦٦
$a_{٦}$ ٠.٨ %	١.٤٥	١.٥٦	١.٦٥	١.٦٦	١.٥٨	١.٥٢	١.٦٦	١.٧٤	١.٧٥	١.٦٧
Mean (B)	١.٤٠	١.٤٩	١.٥٦	١.٥٧		١.٤٧	١.٥٨	١.٦٥	١.٦٦	
New L.S.D at ٠.٠٥	A	B	AB			A	B	AB		
	٠.٠٥	٠.٠٤	٠.١٠			٠.٠٦	٠.٠٥	٠.١٢		
character	Yield/ tree (kg.)									
$a_{١}$ ٠.٠ %	٣٥.٥	٣٦.٠	٣٦.٣	٣٦.٤	٣٦.١	٣٦.٩	٣٧.٠	٣٧.٠	٣٧.٠	٣٧.٠
$a_{٢}$ ٠.٠٥ %	٣٨.٥	٤٣.٠	٤٥.٥	٤٦.٠	٤٣.٣	٣٩.٩	٤٢.٩	٤٦.٠	٤٦.٥	٤٣.٨
$a_{٣}$ ٠.١ %	٤٢.٩	٤٦.٠	٤٨.٥	٤٩.٠	٤٦.٦	٤٣.٥	٤٦.٠	٤٩.٠	٤٩.٦	٤٧.٠
$a_{٤}$ ٠.٢ %	٤٣.٠	٤٦.٥	٤٨.٦	٤٩.٣	٤٦.٩	٤٤.٠	٤٦.٣	٤٩.٥	٤٩.٧	٤٧.٤
$a_{٥}$ ٠.٤ %	٤٣.٥	٤٦.٦	٤٨.٥	٤٩.٦	٤٦.٩	٤٤.٢	٤٧.٠	٤٩.٨	٥٠.٠	٤٧.٨
$a_{٦}$ ٠.٨ %	٤٤.٠	٤٧.٠	٤٨.٩	٥٠.٠	٤٧.٥	٤٤.٥	٤٧.٥	٥٠.٠	٥٠.٠	٤٨.٠
Mean (B)	٤١.٢	٤٤.٢	٤٥.٩	٤٦.٧		٤٢.٢	٤٤.٣	٤٦.٩	٤٧.١	
New L.S.D at ٠.٠٥	A	B	AB			A	B	AB		
	٢.٠	١.٨	٤.٤			١.٩	١.٧	٤.٢		

These results are in agreement with those obtained by El- Wasfy *et al*. (٢٠١٢) and Aly and El- Masry (٢٠١٢).

Using turmeric at concentrations higher than ٠.١ % showed little promotion on fruit quality. Increasing number of sprays from thrice to four times had negligible stimulation on fruit quality. From economical point of view, using turmeric extract at ٠.١ % thrice resulted in the higher promotion on fruit quality. Low fruit quality were observed in untreated trees. These results were similar during both seasons.

The promoting effect of turmeric extract as antioxidant on cell division as well as the biosynthesis of carbohydrates and plant pigments (Parakash and Majeed, ٢٠٠٣ and Pons, ٢٠٠٣) may explain the present results.

Table ٤: Effect of concentrations and frequencies of turmeric extract on fruit weight (g.) and T.S.S % in the juice of Taimour mango trees during ٢٠١١ and ٢٠١٢ seasons.

Conc. of turmeric (A)	Fruit weight (g.)									
	٢٠١١					٢٠١٢				
	Frequencies of turmeric (B)									
	b_1 ١	b_2 ٢	b_3 ٣	b_4 ٤	Mean (A)	b_1 ١	b_2 ٢	b_3 ٣	b_4 ٤	Mean (A)
a_1 ٠.٠ %	٢١٧.٠	٢١٨.٠	٢١٨.٠	٢١٨.٠	٢١٧.٨	٢٢٠.٠	٢٢١.٠	٢٢١.٠	٢٢١.٠	٢٢٠.٨
a_2 ٠.٠٥ %	٢٢٥.٠	٢٣٣.٠	٢٤١.٠	٢٤٢.٠	٢٣٥.٣	٢٣٠.٠	٢٣٩.٠	٢٥٠.٠	٢٥١.٠	٢٤٢.٥
a_3 ٠.١ %	٢٣٣.٠	٢٤٢.٠	٢٥٢.٠	٢٥٣.٠	٢٤٥.٠	٢٤٠.٠	٢٥٥.٠	٢٦٣.٠	٢٦٤.٠	٢٥٥.٥
a_4 ٠.٢ %	٢٣٣.٣	٢٤٢.٥	٢٥٣.٠	٢٥٣.٥	٢٤٥.٦	٢٤١.٠	٢٥٥.٠	٢٦٤.٠	٢٦٥.٠	٢٥٦.٣
a_5 ٠.٤ %	٢٣٣.٥	٢٤٣.٠	٢٥٤.٠	٢٥٥.٠	٢٤٦.٤	٢٤٢.٠	٢٥٦.٠	٢٦٥.٠	٢٦٦.٠	٢٥٧.٣
a_6 ٠.٨ %	٢٣٤.٠	٢٤٣.٠	٢٥٥.٠	٢٥٥.٥	٢٤٦.٩	٢٤٢.٠	٢٥٦.٠	٢٦٥.٠	٢٦٧.٠	٢٥٧.٥
Mean (B)	٢٢٩.٣	٢٣٦.٩	٢٤٥.٥	٢٤٦.٢		٢٣٥.٨	٢٤٧.٠	٢٥٤.٧	٢٥٥.٧	
New L.S.D at ٠.٠٥	A	B	AB			A	B	AB		
	٧.٠	٦.٦	١٦.٢			٦.٩	٦.٤	١٥.٧		
character	T.S.S %									
a_1 ٠.٠ %	١٤.٢	١٤.٢	١٤.٣	١٤.٣	١٤.٣	١٤.٤	١٤.٤	١٤.٥	١٤.٥	١٤.٥
a_2 ٠.٠٥ %	١٤.٧	١٥.٢	١٥.٦	١٥.٧	١٥.٣	١٤.٨	١٥.٥	١٦.٠	١٦.١	١٥.٦
a_3 ٠.١ %	١٥.٠	١٥.٦	١٦.١	١٦.٢	١٥.٧	١٥.٣	١٥.٥	١٦.٠	١٦.١	١٥.٧
a_4 ٠.٢ %	١٥.١	١٥.٦	١٦.١	١٦.٢	١٥.٨	١٥.٣	١٥.٦	١٦.١	١٦.٢	١٥.٨
a_5 ٠.٤ %	١٥.١	١٥.٧	١٦.٢	١٦.٣	١٥.٨	١٥.٤	١٥.٧	١٦.١	١٦.٢	١٥.٩
a_6 ٠.٨ %	١٥.٢	١٥.٧	١٦.٢	١٦.٣	١٥.٩	١٥.٤	١٥.٧	١٦.١	١٦.٢	١٥.٩
Mean (B)	١٤.٩	١٥.٣	١٥.٨	١٥.٨		١٥.١	١٥.٤	١٥.٨	١٥.٩	
New L.S.D at ٠.٠٥	A	B	AB			A	B	AB		
	٠.٤	٠.٣	٠.٧			٠.٤	٠.٣	٠.٧		

Response of Taimour mango trees to foliar application

Table ٥: Effect of concentrations and frequencies of turmeric extract on the percentages of total and reducing sugars in the fruits of Taimour mango trees during ٢٠١١ and ٢٠١٢ seasons.

Conc. of turmeric (A)	Total sugars %									
	٢٠١١					٢٠١٢				
	Frequencies of turmeric (B)									
	b_1 ١	b_2 ٢	b_3 ٣	b_4 ٤	Mean (A)	b_1 ١	b_2 ٢	b_3 ٣	b_4 ٤	Mean (A)
a_1 ٠.٠ %	١٣.٣	١٣.٣	١٣.٤	١٣.٤	١٣.٤	١٣.٠	١٣.٠	١٣.١	١٣.١	١٣.١
a_2 ٠.٠٥ %	١٣.٨	١٤.٣	١٥.٠	١٥.١	١٤.٦	١٣.٤	١٣.٨	١٤.٣	١٤.٤	١٤.٠
a_3 ٠.١ %	١٤.٢	١٥.٠	١٥.٥	١٥.٦	١٥.١	١٣.٧	١٤.٣	١٥.٠	١٥.٠	١٤.٥
a_4 ٠.٢ %	١٤.٣	١٥.٠	١٥.٥	١٥.٦	١٥.١	١٣.٨	١٤.٤	١٥.٠	١٥.١	١٤.٦
a_5 ٠.٤ %	١٤.٤	١٥.١	١٥.٦	١٥.٦	١٥.٢	١٣.٨	١٤.٤	١٥.١	١٥.١	١٤.٦
a_6 ٠.٨ %	١٤.٥	١٥.٢	١٥.٦	١٥.٦	١٥.٢	١٣.٩	١٤.٥	١٥.١	١٥.١	١٤.٧
Mean (B)	١٤.١	١٤.٧	١٥.٠	١٥.٠		١٣.٦	١٤.١	١٤.٦	١٤.٦	
New L.S.D at ٠.٠٥	A ٠.٣	B ٠.٣	AB ٠.٧			A ٠.٣	B ٠.٣	AB ٠.٧		
character	Reducing sugars %									
a_1 ٠.٠ %	٤.١	٤.١	٤.١	٤.٢	٤.١	٤.٠	٤.١	٤.١	٤.١	٤.١
a_2 ٠.٠٥ %	٤.٥	٤.٩	٥.٣	٥.٤	٥.٠	٤.٤	٤.٩	٥.٣	٥.٤	٥.٠
a_3 ٠.١ %	٤.٩	٥.٤	٦.٠	٦.٠	٥.٦	٤.٨	٥.٤	٦.٠	٦.٠	٥.٦
a_4 ٠.٢ %	٥.٠	٥.٥	٦.٠	٦.١	٥.٧	٤.٩	٥.٥	٦.٠	٦.١	٥.٦
a_5 ٠.٤ %	٥.٠	٥.٥	٦.١	٦.١	٥.٧	٥.٠	٥.٥	٦.١	٦.١	٥.٧
a_6 ٠.٨ %	٥.٠	٥.٥	٦.١	٦.١	٥.٧	٥.١	٥.٦	٦.١	٦.١	٥.٧
Mean (B)	٤.٨	٥.٢	٥.٦	٥.٧		٤.٧	٥.٢	٥.٦	٥.٦	
New L.S.D at ٠.٠٥	A ٠.٣	B ٠.٢	AB ٠.٥			A ٠.٣	B ٠.٢	AB ٠.٥		

As a conclusion, promoting yield quantitatively and qualitatively of Taimour mango trees required treatment with turmeric extract at ٠.١ % three times along with the other common horticultural practices.

Table ٦: Effect of concentrations and frequencies of turmeric extract on total acidity % and vitamin C content (mg/ ١٠٠ ml juice) of the fruits of Taimour mango trees during ٢٠١١ and ٢٠١٢ seasons.

Conc. of turmeric (A)	Total acidity %									
	٢٠١١					٢٠١٢				
	Frequencies of turmeric (B)									
	b_1 ١	b_2 ٢	b_3 ٣	b_4 ٤	Mean (A)	b_1 ١	b_2 ٢	b_3 ٣	b_4 ٤	Mean (A)
a_1 ٠.٠ %	٠.٤٤٠	٠.٤٣٨	٠.٤٣٨	٠.٤٣٨	٠.٤٣٩	٠.٤٣١	٠.٤٣٠	٠.٤٣٠	٠.٤٣٠	٠.٤٣٠
a_2 ٠.٠٥ %	٠.٤٠٥	٠.٣٦٠	٠.٣٣٠	٠.٣٢٧	٠.٣٥٦	٠.٤٠١	٠.٣٦٠	٠.٣٣٠	٠.٣٢٩	٠.٣٥٥
a_3 ٠.١ %	٠.٣٦٠	٠.٣٢٧	٠.٢٩١	٠.٢٩٠	٠.٣١٧	٠.٣٧٠	٠.٣٣٠	٠.٣٠١	٠.٣٠٠	٠.٣٢٥
a_4 ٠.٢ %	٠.٣٥٩	٠.٣٢٦	٠.٢٩٠	٠.٢٨٨	٠.٣١٦	٠.٣٦٨	٠.٣٢٩	٠.٣٠٠	٠.٢٩٩	٠.٣٢٤
a_5 ٠.٤ %	٠.٣٥٨	٠.٣٢٨	٠.٢٩٠	٠.٢٨٧	٠.٣١٥	٠.٣٦٧	٠.٣٢٨	٠.٣٠٠	٠.٢٩٨	٠.٣٢٣
a_6 ٠.٨ %	٠.٣٥٧	٠.٣٢٥	٠.٢٩٠	٠.٢٨٧	٠.٣١٥	٠.٣٦٦	٠.٣٢٨	٠.٣٠٠	٠.٢٩٦	٠.٣٢٣
Mean (B)	٠.٣٢٨	٠.٣٥٠	٠.٣٢٢	٠.٣٢٠		٠.٣٨٤	٠.٣٥١	٠.٣٢٧	٠.٣٢٥	
New L.S.D at ٠.٠٥	A		B		AB	A		B		AB
	٠.٠٢٩		٠.٠٢٧		٠.٠٦٦	٠.٠٣٠		٠.٠٢٨		٠.٠٦٩
character	Vitamin C content (mg/ ١٠٠ ml juice)									
a_1 ٠.٠ %	٣٥.١	٣٥.٢	٣٥.٢	٣٥.٢	٣٥.٢	٣٦.٣	٣٦.٤	٣٦.٥	٣٦.٦	٣٦.٥
a_2 ٠.٠٥ %	٣٧.٩	٤٠.٥	٤٣.٠	٤٣.٣	٤١.٢	٣٩.٥	٤٢.٥	٤٦.٠	٤٦.٥	٤٣.٦
a_3 ٠.١ %	٤٠.٠	٤٢.٩	٤٥.٠	٤٥.٢	٤٣.٣	٤٢.٩	٤٦.٣	٤٨.٠	٤٨.٠	٤٦.٣
a_4 ٠.٢ %	٤٠.٠	٤٣.٠	٤٥.٣	٤٥.٤	٤٣.٤	٤٣.٠	٤٦.٤	٤٨.٢	٤٨.٦	٤٦.٦
a_5 ٠.٤ %	٤٠.٥	٤٣.٠	٤٥.٤	٤٥.٥	٤٣.٦	٤٣.٠	٤٦.٤	٤٨.٥	٤٨.٧	٤٦.٧
a_6 ٠.٨ %	٤٠.٨	٤٣.٠	٤٥.٥	٤٥.٦	٤٣.٧	٤٣.١	٤٦.٥	٤٨.٦	٤٨.٧	٤٦.٧
Mean (B)	٣٩.١	٤١.٣	٤٣.٢	٤٣.٤		٤١.٣	٤٤.١	٤٦.٠	٤٦.٢	
New L.S.D at ٠.٠٥	A		B		AB	A		B		AB
	١.٢		١.٠		٢.٥	١.٠		٠.٩		٢.٢

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"استجابة أشجار المانجو التيمور للرش الورقي لمستخلص الكركم"

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تم معاملة أشجار المانجو التيمور خلال موسمي ٢٠١١ ، ٢٠١٢ بمستخلص الكركم بتركيزات مختلفة (من ٠.٠٥ إلى ٠.٨ %) وعدد مرات رش مختلفة (مرة – مرتان – ثلاثة – أربعة مرات) وكان هدف هذه الدراسة اختبار تأثير هذه المعاملات من الكركم على النمو والإثمار في أشجار المانجو التيمور .

أشارت نتائج الدراسة إلى أن الرش الورقي لمستخلص الكركم بتركيز ما بين ٠.٠٥ إلى ٠.٨ % مرة – مرتان – ثلاثة أو أربعة مرات تؤدى إلى تحسين مساحة الورقة والكلوروفيل الكلى ومحتوى الورقة من عناصر النيتروجين والفوسفور والبوتاسيوم وكمية المحصول وكذلك الخصائص الطبيعية والكيميائية للثمار وذلك بالمقارنة بمعاملة الكونترول وكان التحسن مرتبطا بزيادة التركيز المستخدم من ٠.٠٥ إلى ٠.٨ % وكذلك عدد مرات الرش من مرة إلى أربعة مرات ولم يؤد استخدام مستخلص الكركم بتركيز أعلى من ٠.١ % إلى أي تحسين في جميع الصفات تحت الدراسة، كذلك لم يؤد رفع عدد مرات الرش من ثلاثة إلى أربعة مرات إلى أي تأثيرات معنوية على هذه الصفات

أمكن الحصول على أفضل النتائج بخصوص كمية المحصول وجودة الثمار في أشجار المانجو التيمور عند الرش الورقي لمستخلص الكركم بتركيز ٠.١ % ثلاثة مرات