

Role of Garlic and Turmeric Extract in The Leaves Mineral Contents of Apple Trees

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Abstract: This research was conducted in the Apple orchard belong to Department of Horticulture / Collage of Agriculture / University of Al-Anbar- Abu Ghraib during 2015 and 2016 seasons in order to investigate the response of four years old Apple trees (CV Anna) budded on seeding root stock to foliar application with turmeric extract at four levels 0 (T_0), 1.5 g.L⁻¹ ($T_{1.5}$), 3 g.L⁻¹ (T_3) and 4.5 g.L⁻¹ ($T_{4.5}$) and garlic extract at four levels, 0 (GA_0), 25ml.L⁻¹ (GA_{25}), 50ml.L⁻¹ (GA_{50}) and 100ml.L⁻¹ (GA_{100}) and their interaction between them in leaves mineral content. Each treatment replicated three times with a factorial experiment using RCBD. The number of trees used was 48 trees. The results showed that the interaction between the garlic extract at 100ml.L⁻¹ combined with turmeric extract at 4.5 g.L⁻¹ ($GA_{100}T_3$) gave a high value of leaves nitrogen content at 1.99 and 2.06%, potassium content at 2.09 and 2.13%, iron content at 210.2 and 214.4 ppm and high value of leaves zinc content at and zinc 23.54 and 25.53 ppm for both seasons, respectively. The lowest value of these parameters was found in the control (GA_0T_0) treatment.

I. Introduction

Apple (*Malus domestica* Borkh) is an important member of family Rosaceae and grown widely throughout the world. As originally grew up in the southern Caucasus region, it has been found in East Asia for thousands of years (Bright, 2005). The acreage of apple in the world reached about 4842822 hectare, with production of 76378738 tons (FAO, 2012). The main producing countries are China then United States of America, Turkey, Poland, India (FAO, 2012). The estimated number of apple fruit trees in Iraq, including nearly 1952970 tree produces up to 62433 tons, and the average production per tree about 32.0 kg (PCBS, 2013). The use of natural products in horticultural practices instead of synthetic chemical products is becoming as a main target for many fruit crop producers, where the world market has been growing rapidly in recent years for organic fruit production (Dimitri and Oberholtzer, 2006).

Turmeric *Curcuma longa* L. is an herbaceous perennial plant belonging to the Zingiberaceae family. Curcuma genus contains about 30 species. It originates from India and South East Asia and cultivated in the majority of tropical countries. It is obtained from the rhizome of *Curcuma longa*. It contains 2 to 9 % curcuminoids which contains 60 % curcumin, Curcumin oxidation yield vanillin. Turmeric extract is rich in carbohydrates, (50 % starch), arabinogalacton, 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, 1997 and Alonso, 2004). Ahmed et al., 2014, studied the effect of turmeric extract used as a foliar spray on leaf mineral content in mango trees. Found a significant increase in leaf N, P, K content. In addition, Al-Hadethi and Al-Kubaisy (2015) found that spraying peach with turmeric extract gave the highest value in leaf N, P, K content. Garlic (*Allium sativum*) extract contains enzymes and more than 200 chemical compounds, some of its volatiles are more important i.e. Allicin that gives garlic its antibiotic properties. Its higher contents of volatile and sulphur compounds put both in the top due to their real and essential roles they play in fruiting process of various fruit trees (Bruneton, 2001). Garlic also contains vitamins, minerals, flavonoids, ascorbic acid, sulphur and trace of iodine. Seventeen amino acids are found in garlic, including eight essential ones. Effect of garlic extract on leaves mineral content has been interpreted by Abd El-Hamied and El-Amary (2015) and El-Sharony et al. (2015). They reported that garlic extract showed comparatively greater efficacy on nutrition status of pear and mango respectively. The target of this study was to evaluate leaves mineral content of "Anna" apple cultivar under using turmeric and garlic extract under Iraq conditions.

II. Materials and Methods

This study was conducted in the apple orchard; Horticultural Department, College of Agriculture – University of AL-Anbar during 2015 / 2016 growing seasons to investigate the influence of garlic extract and turmeric extract spray on 4 year's old trees of "Anna" apple cultivar. Trees were cultivated at 3 X 3 m apart under basin irrigation system. Trees were healthy, similar in vigor and subjected to the same horticultural

practices adapted in the region. This study included the following treatment: four levels of spraying of turmeric extract, **0 (T₀), 1.5 g.L⁻¹(T_{1.5}), 3 (T₃) and 4.5 g.L⁻¹(T_{4.5})** and four levels of spraying of garlic extract, **0 (GA₀), 25ml.L⁻¹(GA₂₅), 50ml.L⁻¹(GA₅₀) and 100ml.L⁻¹(GA₁₀₀)** and their interaction. Treatments were replicated three times at factorial experiment in a completely randomized block design. The number of transplant used was 48 transplants. Powders of turmeric were soaked in distilled water for 24 h at 25° in a lighted room to give concentrations the required. After soaking, solutions were filtered through four layers of cheesecloth then filtrate was taken to give the final water extract. The leaf mineral content were analyzed in the two successive seasons: Leaf Mineral Content: Leaf samples were collected for chemical analysis at the 1st week of June of both seasons. Each sample consisted of 20 leaves / tree. Leaves were washed several times with tap water, rinsed with distilled water, and then dried at 70 c° until a constant weight, ground and digested according (Chapman and Pratt, 1978). Nitrogen was estimated by semi-micro kieldahl method of (Plummer, 1974). Phosphorus was determined by the method outlined by (Jackson, 1973). Potassium was determined using atomic absorption spectrophotometer “Perkin Elmer 1100B” after samples digested according to (Chapman and Pratt, 1978). Iron, Manganese and Zinc were determined as ppm using atomic absorption according to (Carter, 1993). The obtained results were subjected to analysis of variance according to (Elsahookie and Wuhaib, 1990) using L.S.D 0.05 for comparing differences between various treatment means.

III. Results and Discussions

Effect of Turmeric and Garlic extracts spray on Leaf N,P,K Content: Concerning the Results in Table (1) nitrogen, phosphorus and potassium content in the leaves were significantly affected by all treatments in both seasons, with the exception of phosphorus, which affected but not significantly. However, spraying trees with garlic extract at 100ml .L⁻¹ combined with turmeric extract at 4.5 g .L⁻¹ gave the best leaf nitrogen content (1.99 and 2.06%) and potassium (2.09 and 2.13%) for both seasons, respectively. On the other side, control was the lowest leaf nitrogen content (1.22 and 1.29%) and potassium (1.45 and 1.61%) for both seasons, respectively.

Table (1): Effects of Turmeric and Garlic extracts spray on leaf N, P, K content of Anna apple trees during 2015 and 2016 seasons.

Turmeric g.L ⁻¹	Garlic ml.L ⁻¹	N (%)		P (%)		K (%)	
		2015	2016	2015	2016	2015	2016
0	0	1.22	1.29	0.18	0.19	1.45	1.61
	25	1.28	1.33	0.20	0.23	1.52	1.62
	50	1.40	1.43	0.20	0.22	1.62	1.68
	100	1.44	1.49	0.22	0.26	1.66	1.77
1.5	0	1.31	1.39	0.19	0.22	1.52	1.69
	25	1.52	1.61	0.23	0.26	1.71	1.73
	50	1.69	1.80	0.25	0.29	1.72	1.80
	100	1.55	1.83	0.26	0.32	1.85	1.90
3	0	1.52	1.61	0.21	0.20	1.64	1.75
	25	1.66	1.73	0.25	0.24	1.79	1.92
	50	1.84	1.98	0.27	0.30	1.91	1.98
	100	1.93	1.97	0.33	0.35	2.02	2.06
4.5	0	1.66	1.69	0.22	0.19	1.70	1.79
	25	1.75	1.70	0.27	0.26	1.83	1.88
	50	1.88	1.96	0.28	0.26	1.97	2.07
	100	1.99	2.06	0.29	0.33	2.09	2.13
L.S.D 5%	Turmeric	0.19	0.25	N.S	N.S	0.29	0.22
	Garlic	0.19	0.25	N.S	N.S	0.29	0.22
	Interaction	0.38	0.50	N.S	N.S	0.58	0.45

Effect of Turmeric and Garlic extracts spray on leaf Fe, Mn, Zn content: Seen from the results shown in the table (2) the interaction between turmeric and garlic extracts spray are affected significantly, with the exception of manganese, which affected but not significantly. However, spraying trees with garlic extract at 100 ml .L⁻¹ combined with turmeric extract at 4.5 g .L⁻¹ gave the best leaf iron content (210.2 and 214.4ppm) and zinc (23.54 and 25.53 ppm) for both seasons, respectively. On the other side, control was the lowest leaf iron content (133.2 and 138.1ppm) and zinc (16.51 and 18.87ppm) for both seasons, respectively. This result could be due to the important role of turmeric extracts that contain a carbohydrates, (50 % starch), arabinogalacton, potassium salt, essential oils and pigments, and which plays an important role in leaf mineral content (Srimal, 1997 and Alonso, 2004). And these results may be returning to the role of garlic extract, as this extract contains vitamins, minerals, flavonoids, ascorbic acid, sulphur and trace of iodine. Seventeen amino acids are found in garlic, including eight essential ones. These results are parallel with Jamali(2012) who found that spray of olive transplants with garlic extract at 50 mg .L⁻¹ rates potentially increased the content of nitrogen and potassium in leaves. Abd El-Hamied and El-Amari (2015) who found that spray of pear transplants with garlic extract at 4% rates potentially increased the content of, N and K in leaves. Generally, these results are in agreement with

Ahmed et al., (2014) who found that the turmeric extract increased leaf N, P, K content in mango trees. Armanious (2014) who worked on turmeric extract sprayin Thompson Seedless grapevines.

Table (2): Effects of Turmeric and Garlic extracts sprayon leafIron, Manganese and Zinc contentofAnnaapple trees during 2015 and 2016 seasons.

Turmericg.L ⁻¹	Garlicml.L ⁻¹	Fe (ppm)		Mn (ppm)		Zn (ppm)	
		2015	2016	2015	2016	2015	2016
0	0	133.2	138.1	1.734	2.115	16.51	18.87
	25	137.1	144.4	1.755	2.109	16.72	18.96
	50	145.9	156.8	1.795	2.216	16.89	19.11
	100	153.9	166.2	1.896	2.223	19.26	19.35
1.5	0	147.2	158.7	1.929	2.154	19.32	21.25
	25	159.6	161.6	1.917	2.213	19.52	21.54
	50	156.0	168.4	1.926	2.229	21.69	21.87
	100	165.3	170.8	2.107	2.231	22.14	21.90
3	0	177.9	175.3	2.119	2.197	22.19	21.34
	25	164.3	186.1	1.893	2.209	22.35	21.78
	50	193.9	199.2	1.892	2.227	22.51	22.00
	100	195.3	201.9	1.834	2.217	23.11	22.97
4.5	0	185.7	192.6	1.778	2.277	22.35	23.94
	25	196.8	199.1	1.896	2.310	22.42	24.34
	50	204.4	213.8	1.786	2.387	22.89	25.21
	100	210.2	214.4	1.960	2.132	23.54	25.53
L.S.D 5%	Turmeric	20.26	23.19	N.S	N.S	0.42	0.56
	Garlic	20.26	23.19	N.S	N.S	0.42	0.56
	Interaction	40.52	46.38	N.S	N.S	0.84	1.12

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