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Improve the Growth and Yield of Figs by Foliar Nutrition at Post-Harvest

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Abstract

A factorial experiment was carried out by spraying the fig (*Ficus carica* L.) trees cv. Aswad Diyala at post-harvest in the 2014 and 2015 seasons, in one orchards of Diwaniyah city/ Iraq, with two liquid fertilizers: Azomin and Prosol at 3 levels (0, 3 and 6) $g.l^{-1}$ and (0, 2 and 4) $g.l^{-1}$, respectively. The results showed that third level of both fertilizers gave The widest leaf area:{(5.53, 6.42) and (5.52 , 6.38)}$m^2.tree^{-1}$, highest leaf content of chlorophyll{(131.63 ,132.55), (132.63 , 130.93)}$mg.100g^{-1}$more N percent of leaf {(2.12 , 2.11) ,(2.31, 2.34)}%, highest carbohydrates percent of leaf {(14.65 , 15.10) , (14.83, 15.02)}%, for compounds and seasons, respectively. As for the crop that took place in the 2015 and 2016 seasons gave the highest yield{(20.50, 21.66) (20.80, 21.30)}$kg.tree^{-1}$, most level of K in the fruit{(280.10, 272.70), (292.40, 288.10)}$mg.100g^{-1}$ and highest content of anthocyanin{(512.10, 519.90), (482.90, 494.50)} $mg.100g^{-1}$. There was a significant interaction between the experimental factors, which reached a peak in the third level, in the leaf area in the 2014 and 2015 seasons (5.85 and 6.86) $m^2.tree^{-1}$, and the anthocyanin in the 2015 and 2016 seasons in fruit (518.20 and 534.80) $mg.100g^{-1}$, respectively.

It can be concluded that the post-harvest spraying of Aswad Diyala cv., with the, Azomin and Prosol at the levels of 6 and $4g.l^{-1}$, respectively, gave the best results.

Introduction

The figs(*Ficus carica* L.)is member of Moraceae family, is a deciduous fruit treeof temperate and subtropical regions, originated from Asia Minor and Syria, It is first cultured and selected species in Southwest Asia,and one of the oldest plants in the world cultivated by humans, 11,400 years ago(1).

Iraqi fig cultivars are classified as common type, "Common-type, with only pistillate flowers developing into parthenocarpic fruits, is considered advanced and includes most commercial cvs" (2). Aswad Diyala cv.is the best of Iraqi fig cvs in the quality, especially in antioxidants, the most important of which are anthocyanin (3,4) found that the antioxidant capacity is the highest in Aswad Diyala cv. The antioxidant capacity of figs is closely associated with the fruit components of phenols and anthocyanin (5).

Post-harvest of figs at the end of summer and autumn start, tree re-grow for two months or longer before leaves falling,a period equivalent to more than a third ofpre-harvest season.In this period may neglect trees and did not think the owners of orchards that the remaining growth of the season needs nutrients. The amount of reserve nitrogen (N) at post-harvest affects tree growth and fruiting in the following season (6). Increasing N reserves has become one of the goals of nursery and orchard management, to ensure high tree productivity (7).

Seasonal variations in fig leaf nutrient concentrations are similar to those of other tree crops. Marked declines in tissue K and N concentrations toward the end of the season may indicate a need for supplemental N and K fertilization in highly productive orchards. The potential for K deficiency in figs also is indicated by the generally lower leaf K concentrations in the low vigor orchards examined(8).

Foliar application of urea in September or October supplied the equivalent of about 20% of crop nitrogen content, but only 14%when applied shortly before leaf senescence in November (9).Although urea spray can be used at any time during the growing season and even during the dormant season, autumn application may be most effective for deciduous trees because high urea concentrations can be used with minimal concern about phytotoxicity (10).

(11) found when Postharvest foliar B applied on apple trees with or without urea was efficiently transported from the leaves into storage tissues for the next year΄s growth . (12) was found Post-harvest B sprays are successful in improving reproductive growth and should be recommended without the addition of urea. It is suggested that combined B sprays with urea may be applied in autumn to apple trees with limited soil B and N availability.(13) showed that highest yield was obtained in foliar application of nutrients in the fall+spring.

There is no researches on the nutrition of post-harvest fig trees, in addition, most of the researches on nutrition of other fruit species indicates the importance of nutrients: (N, K, Mg, B and Zn) at post-harvest, but focuses on ureaand boron only and did not consider the effects of other combined nutrients.This experiment aims for the possibility of improving the growth and production of fig trees by spraying with solutions containing different nutrients at post-harvest.

Materials and Methods

The study was conducted on mature fig trees of the Aswad Diyala cultivar, at postharvest of 2014 and 2015 seasons at one orchards of Diwaniya city/ Iraq. Growth parameters were measured in the 2014 and 2015 seasons, as for crop parameters measured in the 2015 and 2016 seasons. The experiment was designed with RCBD, three replicates, and the experimental unit consisted of one fig tree.

Trees was sprayed so full wetness with three levels of both nutritious fertilizers Azomin (liquid containing organic nitrogen 5% and organic carbon 10% provides the plant proteins and amino acids by 32%),and Prosol {macronutrients NPK(30-10-10) in addition to micronutrients (B - - Cu - Fe -Mn - Zn - Mo)}(Table-1). Levels used: (0, 3, and 6) $g.l^{-1}$ and (0, 2 and 4) $g.l^{-1}$, Symbolized her (A_0,A_1, A_2) and (P_0, P_1, P_2), respectively. When preparing solutions, add several drops per liter of Tween 20 as a diffuse material.

Table-1: Prosol composition

Pro.Sol property	%
Total Nitrogen(N)	30
Ammoniacal N.	1.9
Urea N	28.1
Total Phosphorus(P_2O_5)	10
Total Potassium (K_2O)	10
Trace Elements	
Boron(B)	0.02
Copper(Cu-EDTA)	0.05
Iron(Fe-EDTA)	0.10
Manganese(Mn-EDTA)	0.05
Zinc(Zn-EDTA)	0.05
Molybdenum(Mo)	0.0005

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Conducted three times between spraying one and another about two weeksstarting on 9/15 after the completion of harvest fruits, 10/1 and 10/15 in the 2014 and 2015 seasons. The trees in all treatments received the same of pre-harvest services including nutrients additives to soil and foliar spray and all fruits of the first crop were remove immediately after emergence at the start of growth in the three seasons 2014-2016. Spraying was conducted in the early morning.

The leaves were taken on 10/25 for both 2014 and 2015 seasons to measure the leaf area, total chlorophyll, nitrogen and total carbohydrates. The area of the leaf was calculateaccording to the method (14). Total chlorophyll was determined in leaves as well (15). Nitrogen concentration (%) was measure in the leaves using a MicroKjeldahl device,Potassium (%) with a Flame photometer as well (8) and total carbohydrates were measured in the leaves as well (16).On each harvested day from the 2015 and 2016 seasons, the fruits from the marked tree for each experimental unit were weighed and added to their weight from the previous harvest, Thus, until the end of the harvest, the total is the total yield of each tree. (17) followed for measure of anthocyanin. The statistical analysis of the results was performed using the GenStat Version12.1.0.3338 program (18). The differences between the averages were compared with the least significant difference of LSD at a probability level of 0.05.

Results

Leaf Area

The results of Table (2) showed that the spraying of nutritious fertilizer Azomin (A) resulted in a significant increase in the leaf area of Aswad Diyala fig cv. The A_2 treatment (6 $g.l^{-1}$) gave the highest mean of leaf area (5.53 and 6.42) $m^2.tree^{-1}$ for both 2014 and 2015seasons, respectively. While A_0 gave the lowest mean (5.16 and 5.75) $m^2.tree^{-1}$ for the two seasons, respectively. The treatment with Prosol P_2 (4 $g.l^{-1}$) gave the highest mean of the above character (5.52 and 6.38) $m^2.tree^{-1}$. While P_0 gave the lowest mean of leaf area (5.18 and 5.79) $m^2.tree^{-1}$, for the two seasons, respectively. The interaction was significantly higher in the leaf area with the highest mean of A_2P_2 (5.85 and 6.86) $m^2.tree^{-1}$, while the control treatment (A_0P_0) gave the lowest mean of (5.03 and 5.48) $m^2.tree^{-1}$ for the two seasons, respectively.

Table-2: Effect of Post-Harvest Foliar nutrition with Azomin and Prosol in the leaf area ($m^2.tree^{-1}$) of the Aswad Diyala fig tree for the 2014 and 2015 seasons

Azomin (A) Levels($g.l^{-1}$)		Prosol (P) Levels($g.l^{-1}$)			Azomin (A) Means
		P_0	P_1	P_2	
		0	2	4	
2014					
A_0	0	5.03	5.14	5.31	5.16
A_1	3	5.23	5.29	5.40	5.31
A_2	6	5.27	5.48	5.85	5.53
Prosol (P) Means		5.18	5.30	5.52	
LSD0.05		AorP means		0.08	
		A × P		0.13	
2015					
A_0	0	5.48	5.82	5.95	5.75
A_1	3	5.86	5.98	6.32	6.05
A_2	6	6.03	6.37	6.86	6.42
Prosol (P) Means		5.79	6.06	6.38	
LSD0.05		AorP means		0.07	
		A × P		0.14	

Total Chlorophyll

The results of Table (3) indicate that the foliar application with Azomin (A) was significantly increase in leaf content of total chlorophyll of Aswad Diyala figs. The A_2 treatment (6$g.l^{-1}$) gave the highest total chlorophyll mean

(131.63 and 132.55) mg.100g^{-1} for the 2014 and 2015 seasons, respectively. While A_0 gave the lowest mean (125.61 and 127.26) mg.100g^{-1} for the two seasons, respectively. Prosol (P_2) (4g.l^{-1}) also significantly increased (132.63 and 130.93) mg.100g^{-1} for the two seasons, respectively. P_0 and P_1 were not significantly different in chlorophyll. There was no significant interaction between nutrients in both seasons.

Table-3: Effect of Post-Harvest Foliar nutrition with Azomin and Prosol in the total chlorophyll of the Aswad Diyala fig in the 2014 and 2015 seasons

Azomin (A) Levels(g.l^{-1})		**Prosol (P) Levels(g.l^{-1})**			**Azomin (A) Means**
		P_0	**P_1**	**P_2**	
		0	**2**	**4**	
2014					
A_0	**0**	**123.15**	**123.71**	**129.97**	**125.61**
A_1	**3**	**131.85**	**129.72**	**132.33**	**131.30**
A_2	**6**	**129.88**	**129.42**	**135.59**	**131.63**
Prosol (P) Means		**128.29**	**127.62**	**132.63**	
LSD0.05		**AorP means**		**1.86**	
		A × P		**n.s.**	
2015					
A_0	**0**	**125.69**	**127.93**	**128.16**	**127.26**
A_1	**3**	**26.48 1**	**128.02**	**130.25**	**128.25**
A_2	**6**	**132.95**	**130.33**	**134.38**	**132.55**
Prosol (P) Means		**128.38**	**128.76**	**130.93**	
LSD0.05		**AorP means**		**1.76**	
		A × P		**n.s.**	

Nitrogen

The results of Table (4) indicate that the foliar application of the nutritious Azomin (A) was significantly increase in the nitrogen percent in leaf of Aswad Diyala figs. The A_2 treatment (6 g.l^{-1}) gave the highest N percent (2.12 and 2.11)% For both 2014 and 2015 seasons, respectively. While A_1 did not differ from A_0in the 2014 season, but surpassed it in the 2015. Prosol (P_2) treatment (4g.l^{-1}) also significantly increase of N, with a percent of (2.31 and 2.34) % in both seasons, respectively. P_0 and P_1 were not significantly different in nitrogen percent in both seasons. There was no significant interaction between nutrients in both seasons.

Table-4: Effect of Post-Harvest Foliar nutrition with Azomin and Prosol in N (%) of the leaf of Aswad Diyala figs in the both 2014 and 2015 seasons

Azomin (A) Levels(g.l^{-1})		**Prosol (P) Levels(g.l^{-1})**			**Azomin (A) Means**
		P_0	**P_1**	**P_2**	
		0	**2**	**4**	
2014					
A_0	**0**	**1.69**	**1.68**	**2.10**	**1.82**
A_1	**3**	**1.72**	**1.72**	**2.39**	**1.94**
A_2	**6**	**2.00**	**1.92**	**2.45**	**2.12**
Prosol (P) Means		**1.80**	**1.77**	**2.31**	
LSD0.05		**AorP means**		**0.13**	
		A × P		**n.s.**	
2015					
A_0	**0**	**1.75**	**1.73**	**2.25**	**1.91**
A_1	**3**	**1.77**	**1.90**	**2.34**	**2.00**
A_2	**6**	**1.94**	**1.94**	**2.44**	**2.11**
Prosol (P) Means		**1.82**	**1.86**	**2.34**	

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LSD0.05	AorP means	0.05	
	A × P	n.s.	

Total carbohydrates (CHs)

The results of Table (5) showed that the spraying of nutritious fertilizer Azomin (A) has a significant effect on the CHs percent in the leaves of Aswad Diyala figs. The A_2 treatment (6 g.l^{-1}) gave the highest CHs percent (14.65 and 15.10) % for both 2014 and 2015 seasons, respectively. However, A_1 did not differ from A_0 in the 2014 season, while it significantly higher in the 2015 season. Prosol (P_2) (4g.l^{-1}) also significantly increase of CHs percent (14.83 and 15.02) % for both 2014 and 2015 seasons, respectively. While P_1 did not differ from P_0 in the 2014 and surpassed it in 2015. There was no significant interaction between the nutrients in both seasons.

Table 5. Effect of Post-Harvest Foliar nutrition with Azomin and Prosol in CHs (%) in Aswad Diyala leaf for the2014 and 2015 seasons

Azomin (A) Levels(g.l^{-1})		Prosol (P) Levels(g.l^{-1})			Azomin (A) Means
		P_0	P_1	P_2	
		0	2	4	
2014					
A_0	0	13.41	13.62	14.27	13.77
A_1	3	13.53	14.22	14.47	14.07
A_2	6	13.88	14.33	15.74	14.65
Prosol (P) Means		13.61	14.06	14.83	
LSD0.05		AorP means		0.47	
		A × P		n.s.	
2015					
A_0	0	13.10	13.71	14.44	13.75
A_1	3	13.61	14.47	14.79	14.29
A_2	6	14.55	14.91	15.84	15.10
Prosol (P) Means		13.75	14.36	15.02	
LSD0.05		AorP means		0.38	
		A × P		n.s.	

crop of fruits

The results of Table (6) indicate that the levels of the nutritious Azomin (A) resulted in a significant increase in the quantity of crop of Aswad Diyala fig trees. The treatment of A_2 (6g.l^{-1}) gave the highest quantity of crop (20.50 and 21.66) kg.tree^{-1} in the both 2015 and 2016 seasons, respectively. While treatment A_0 gave the lowest quantity of the crop (18.75 and 19.67) kg.tree^{-1} for both seasons, respectively. The spraying treatment with Prosol P_2 (4g.l^{-1}) gave the highest mean of the above character (20.80 and 21.30) kg.tree^{-1} in the both 2015 and 2016 seasons, respectively. P_0 and P_1 were not significantly different in quantity of fruits in both seasons. There was no significant interaction between nutrients in both seasons.

Table 6: Effect of Post-harvest Foliar nutrition with Azomin and Prosol in the crop of fruits (kg.tree^{-1}) of Aswad Diyala figs for both 2015 and 2016 seasons

Azomin (A) Levels(g.l^{-1})		Prosol (P) Levels(g.l^{-1})			Azomin (A) Means
		P_0	P_1	P_2	
		0	2	4	
2014					
A_0	0	18.31	17.79	20.14	18.75
A_1	3	19.42	19.65	20.77	19.95
A_2	6	20.13	19.87	21.49	20.50
Prosol (P) Means		19.29	19.10	20.80	

LSD0.05		AorP means		0.42	
		A × P		n.s.	
2015					
A_0	0	19.88	18.75	20.47	19.67
A_1	3	20.56	20.39	21.37	20.77
A_2	6	21.46	21.46	22.05	21.66
Prosol (P) Means		20.63	20.20	21.30	
LSD0.05		AorP means		0.35	
		A × P		n.s.	

Potassium K

The results of Table (2) showed that the spraying of nutritious fertilizer Azomin (A) was significantly increase in the K content in the fruits of Aswad Diyala figs. The A_2 treatment (6g.l^{-1}) gave the highest mean of K (280.1 and 272.7) mg.100g.$^{-1}$ for the two seasons 2015 and 2016, respectively. While treatment A_0 gave the lowest mean of K (252.9 and 249.5) mg.100g.$^{-1}$ for the seasons, respectively. Prosol P_2 (4g.l^{-1}) also significantly increased K (292.4 and 288.2) mg.100g.$^{-1}$ for both seasons, respectively. P_0 and P_1 were not significantly different in K content in both seasons. There was no significant interaction between nutrients in both seasons.

Table 7: Effect of Post-harvest Foliar nutrition with Azomin and Prosol in the K content (mg.100g.$^{-1}$) in the figs of Aswad DiyalaFor both 2015 and 2016 seasons.

Azomin (A) Levels(g.l^{-1})		Prosol (P) Levels(g.l^{-1})			Azomin (A) Means
		P_0	P_1	P_2	
		0	2	4	
2014					
A_0	0	242.1	242.6	274.1	252.9
A_1	3	247.3	252.9	290.4	263.5
A_2	6	260.2	267.2	312.9	280.1
Prosol (P) Means		249.9	254.2	292.4	
LSD0.05		AorP means		10.76	
		A × P		n.s.	
2015					
A_0	0	240.7	247.2	260.6	249.5
A_1	3	254.1	256.6	287.5	266.1
A_2	6	248.0	253.7	316.3	272.7
Prosol (P) Means		247.6	252.5	288.1	
LSD0.05		AorP means		11.67	
		A × P		n.s.	

Anthocyanin

The results of Table (8) indicate that the levels of the nutritious Azomin (A) resulted in a significant increase in the anthocyanin content of Aswad Diyala fig fruits. A_2 treatment (6g.l^{-1}) gave the highest mean of this character (512.1 and 519.9) mg.100g^{-1}, for the 2015 and 2016 seasons, respectively. However, A_0 gave the lowest mean (438.7 and 441.5) mg.100g^{-1}, for both seasons, respectively. Prosol P_2 (4gl^{-1}) also increased significantly the anthocyanin (482.9 and 494.5) mg.100g^{-1}, for the both seasons, respectively. P_0 and P_1 did not significantly differ in the mean of anthocyanin in both seasons. There was a significant interaction between the nutrients in the dye with the highest mean of treatment A_2P_2 (518.2 and 534.8) mg.100g^{-1}, for the both seasons, respectively.

Table 8. Effect of Post-harvest Foliar nutrition with Azomin and Prosol in the Anthocyanins content (mg.100g.$^{-1}$) in the figs of AswadDiyala for both 2015 and 2016 seasons.

Azomin (A) Levels(g.l^{-1})		Prosol (P) Levels(g.l^{-1})			Azomin (A) Means
		P_0	P_1	P_2	
		0	2	4	
2014					
A_0	0	441.0	438.7	436.3	438.7
A_1	3	442.7	457.6	494.0	464.8
A_2	6	513.6	504.6	518.2	512.1
Prosol (P) Means		465.7	467.0	482.9	
LSD0.05		AorP means		12.37	
		A × P		21.43	
2015					
A_0	0	439.4	442.9	442.2	441.5
A_1	3	462.5	449.3	506.6	472.8
A_2	6	513.0	511.9	534.8	519.9
Prosol (P) Means		471.6	468.0	494.5	
LSD0.05		AorP means		16.37	
		A × P		28.36	

Discussion

Leaf area

The significant increase in leaf area of Aswad Diala fig tree (Table 2) may be attributed to treatment by nutrients especially N,which is "the main driver of the leaf area that will be achieved by increasing cell division and cell expansion" (19).Leaf area increment could be due to improving cell size and cell number by N application and increase in net photosynthesis and growth of leaves (20). In addition to nitrogen, there is also boron (B) found in the Prosol, "the effect of the studied N and B on activating of both cell division and elongating in the meristematic tissues as well as the biosynthesis of organic foods" (21).

Total chlorophyll

Nitrogen it is very important in synthesis protoplasm of cells, tissues, and all parts of the plant, without it the plant growth and development is weak, the yield and quality of the crop affected by it deficiency.

"Nitrogen is the constituent - which is an integral constituent of proteins, nuclleic acids, chlorophyll, co-enzymes, phytohormones and secondary metabolites" (22).foliar nutrition for apples at post-harvest would have more available N for chlorophyll synthesis which enhances photosynthesis (23). Therefore, the significant increase in leaf content of total chlorophyll (Table 3) may be due to N and other essential nutrients in two fertilizers that activate enzymes biosynthesis amino acids and proteins as well as participate in the synthesis of chlorophyll. This increase in chlorophyll of Aswad Diyala fig leaf agree with increase of this parameter by (23) in apples leaf at post-harvest nutrition.

Nitrogen N

The significant increase in N percent in fig leaves (Table 4) may be due to the uptake of urea, which accounts for more than 28% of the composition of the Prosol (Table 2), because the uptake of urea and the transition to the perennial parts may be similar to the peach (*Prunus persica*), within 4-7 days after spraying (9). This researcher confirmed that leaves produce 60% or more of N-urea at the beginning of autumn (September and October) But less than 50% when spraying before the leaves fall short November. He also confirmed that the use of urea in September and October is equivalent to 20% of the nitrogen content of the crop but only 14% when used in November. Organic N in the Azomin may be involved in increasing the N percent of the leaves.

We have sprayed the three times between once in two weeks and it is possible that the high N percent may come from the decomposition of proteins and amino acids that make up 32% of the Azomin compound as well as the remaining N urea in the leaves.

Total Carbohydrates (CHs)

The significant increase in the percent of total CHs in leaves (Table 5) may be due to the increase of photosynthesis effectiveness because increase leaf area and total chlorophyll (Table 2 and 3). “The availability of metabolites, most of which are produced in the leaf, depends on the process of photosynthesis” (22), Perhaps the presence of organic carbon in the Azomin has been analyzed and faster than the stabilization of carbon in the process of photosynthesis and thus increase total CHs.

Crop of fruits

Aswad Diyala fig cultivar gives fruit crops more than once a year. The first crop appears with the bud burst at beginning of spring on the terminal of last year branches, all fruits of this crop are abscission. There is no benefit, Should be removed as soon as they appear, So as not to depleted nutrients stored in trees, added, or in the soil,with metabolites produced from the process of photosynthesis. At the April, the second crop appears on the laterally branches in the axilla of the leaves or new branches. Figs differ from other deciduous fruit trees, such as apples, where there is only one crop showing flowers, as the new spring growth begins, and it needs boron to flowering and fruit set (11)(12). For figs,The effect of post-harvest foliar nutrition on the following crop is indirect,because the storage of nutrients and assimilates – increased leaf area and chlorophyll - in the perennial parts of the tree in the previous season(Table 2 and 3), is beneficial for growth in the spring, and with the first crop being removed, more nutrients are available, and the resulting nutrients increase this season.The increase in crop of fruits due to post-harvest foliar nutrition obtained in this experiment (Table 6) is Consistent with the result of the experiments of (12)(13).

Potassium K

The significant increase in the content of K in fruits (Table 7) may be due to the increase of vegetative growth and adequate nutrient uptake increases fruit activity which leading to increased fruit efficiency in the absorption of photosynthates and nutrients, including K. The fruits of figs contain more K than all other nutrients. The good growth of trees in post-harvest nutrition in the previous season and their supply of nutrients when the second crop appears in the current season increases the growth efficiency of processing the leaves for this crop, which requires sugar and nutrients, including (24) has shown that “The distribution of these substances is affected by the deficiency or imbalance of nutrients as well as the development of the sink parts (fruit) and the completion of the source (leaf) for the function of the plant needs a sufficient supply of nutrients”.(25) have confirmed that the sink need regulates nutrient uptake.In the grape Potassium is absorbed by the roots and distributed to all parts of the vine,early in the season, when the growth rate is high, much of the K accumulates in the leaves, after véraison, a sharp increase in berry K is observed as a result of K redistribution from leaves to berries (26). Potassium uptake by Cabernet Sauvignon berries is slow before véraison and strongly increases when ripening starts in the same proportion as sink strength and phloem water influx (27).

Anthocyanin

(28) show that the increase in fruit color is due to increased fruit content of anthocyanin, which is due to the high accumulation of carbohydrates. In the grape variety Flam Seedles color and phenolic compounds increased by increasing the level of fertilizer (29). The nutrients, especially K, play a role in the translocation of sugar to the fruits and activation of reactions in them and synthesis of phenols, including anthocyanin, (30) explained, “as much as 50% of total K taken up by the grapevines accumulates in berries. Its functions in the fruit are related to synthesis reactions and enzymatic activation, directly contributing to fruit maturation, sugar synthesis, and the maintenance of cell turgor. In addition, through its mobility in the phloem and xylem, K is important in the transport of solutes, the partition of assimilates, and the synthesis of polyphenols responsible for fruit color and aroma”. The increase in anthocyanins in fig fruit (Table 8) may be due to increased uptake of potassium fruits (Table 7)which made the fruit attractive to sugar.

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تحسين نمو وحاصل التين بالتغذية الورقية ما بعد الحصاد

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الخلاصة

أجريت تجربة عاملية برش أشجار التين *Ficus carica* L. صنف أسود ديالى بعد الحصاد في موسمي 2014 و 2015 في أحد بساتين الديوانية، العراق، بكل من المحلولين السماديين المغذيين: الأزومين(Azomin) والبروسول (Prosol) بثلاث مستويات لكل منهما (0 و 3 و 6) غم.لتر$^{-1}$ و(0 و 2 و 4)غم.لتر$^{-1}$، بالتتابع. وتشير النتائج الى ان المستوى الثالث لكل من المركبين أعطى أوسع مساحة ورقية { (5.53 و 6.42) و (5.52و6.38)} م^{2}.شجرة$^{-1}$. واعلى محتوى من الكلوروفيل الكلي {(131.63و 132.55) و (132.63و 130.93)} ملغم.100غم$^{-1}$، واعلى نسبة نتروجين في الأوراق {(2.12 و 2.11) و (2.31 و 2.34)} % واكثر نسبة من الكربوهيدرات الكلية في الأوراق{(14.65 و 15.10) و (14.83 و 15.02)} %، للمركبين وللموسمين، بالتتابع. وفي مؤشرات الحاصل التي اخذت في موسمي 2015 و 2016 فقد أعطت أعلى كمية للحاصل {(20.50 و 21.66) و (20.80و 21.30)} كغم.شجرة$^{-1}$،واكثر مستوى للبوتاسيوم في الثمار {(280.1 و 272.7) و (292.4و 288.1)}ملغم.100غم$^{-1}$، واعلى صبغة انثوسيانين في الثمار{(512.1 و 519.9) و (482.9و 494.5)} ملغم.100غم$^{-1}$، بالتتابع. وكان هناك تداخل معنوي بين عاملي التجربة بلغ ذروته في المستوى الرابع لكل من المركبين في المساحة الورقية في موسمي 2014 و 2015 (5.85 و 6.86) م^{2}.شجرة$^{-1}$ ، بالتتابع، وفي صبغة الانثوسيانين في الثمار في موسمي 2015 و 2016 (518.2 و534.8)(ملغم.100غم$^{-1}$)، بالتتابع. يمكن الاستنتاج بان رش أشجار التين صنف اسود ديالى بعد الحصاد بالمحلولين السماديين المغذيين الأزومين و البروسول بمستوى 6 و4 غم.لتر$^{-1}$، لكل منهما بالتتابع، اعطى احسن النتائج.

الكلمات الدالة: التين، الأزومين، البروسول، التغذية ما بعد الحصاد.