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EFFECT OF WILLOW INFLORESCENCE EXTRACT, CuSO4 AND HEMORRHAGE CANE VINE ON VEGETATIVE AND FRUITING GROWTH OF FIG CV. WHITE ADRIATIC

Abstract: *This study was carried out in a private orchard at Al- Abbasyia / Najaf Governorate during the growing season 2017 to investigate the effects of spraying with Willow inflorescence extracts at concentration(30 and 40%), CuSO4 300 mg/L and hemorrhage cane vine local cv. Das alanze at(40 and 50%) on the local fig cv. White Adriatic in single way or in combination on the leaf aria, total chlorophyll, diameter of fruit, length of fruit, weight of fruit, volume of fruit , percentage of drop of fruit, humidity of fruit, carotene pigment in fruit peel, percentage of total acidity (TA) , percentage of total soluble sold (T.S.S),T.S.S/ TA ,vitamin C , percentage of souring, firmness, peel thickness, total cracking and total yield/ tree at maturity stage . Results showed that spraying with willow inflorescence extracts, CuSO4 and hemorrhage cane vine cv. Das alanze in single way or in interactions caused a significant increase percentage of leaf area ,total chlorophyll ,physical and chemical characterizes of fruits and total yield of trees, as well as decreased percentage of souring, percentage of dropping , total percentage of acidity and percentage of total cracking compared with control treatment . There was significant differences between above mentioned treatments .The treatment (willow inflorescence extracts 40% + CuSO4+ Hemorrhage cane vine 50 %) gave the highest rate of vegetative and fruiting characteristics on the year of experiment.*

Key words: *Willow inflorescence extracts, CuSO4, Hemorrhage cane vine, Fig.*

Language: *English*

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Introduction

The fig trees cv. White Adriatic is an important in the middle section of Iraq. The fig trees are medium in size and the branches area in outside direction. The fruits are medium size and the color is green yellow. The fruits are good for drying . Its belongs to normal fig group Ficus carica var. hortensis (AL –Dory and AL – Rawi , 2000). AL – Hameedawi (2009) showed that, spraying grape cv. Kamaly with the extract of bud of Salix with concentration of (10, 15 and 20%) and with the extract of bark of Salix with

concentration of (15, 20 and 25%) one week before full blooming caused a significant surplus on control treatment in an increase in leaf area, total chlorophyll percentage on leaves and its contents from similar material auxins and gibberellins, cluster diameter and its weight, tree yield, berry compact clusters degree and its contents of Anthocyanin pigment, total soluble solids, vitamin C and total carbohydrates percentage in cane. There was a significant differences between treatment that belong to treatment of Salix bud extract with conc. of 20%, which produced the best results. AL – Hameedawi (2019) noticed that, spraying bud populous extracts at 15 march and 15 May 2018 at concentration 50% on the local fig cv. Kadota, there was a significant indicated that leaf aria, total chlorophyll, diameter of fruit, length of fruit, shape of fruit, weight of fruit, volume of fruit, specific gravity of fruit, humidity of fruit, dry matter of fruit, carotene pigment in fruit peel, percentage of total soluble sold (T.S.S), vitamin C, antioxidant capacity of fruits, calcium pictate, Firmness and total yield / tree, also these treatment reduced percentage of acidity and percentage of total cracking at maturity stage. AL-Hameedawi and AL- Shemmeryi (2018) showed that, spraying the local sours orange trees with Willow bark extracts (30 %) the results indicated that treatments caused a significant increasing in the, length, diameter, weight of fruit, volume of fruit, Total soluble solids (T.S.S), percentage of treatable acidity (TA) and percentage of T.S.S / TA ratio, percentage weight of juice pre storage. Studies in different regions of the world were found that, some nutrients, such as Cupper has an important to increasing content of leaves from growth hormones, total chlorophyll, length and number of branches, firmness of fruits and production of fig trees and also led to decrease the percentage of dropping and cracking of fruits. The decline element Cupper in fig trees led to injury with deses rusty leaves, leaves pot, (Exanthema or die back) of branches and internal breakdown, senescent scald of fruits (Salvatava, 2006). AL – Hameedawi (2016) mentioned that spraying fig trees cv. Aswad Diala with Paisein at concentration of 300 mg/L at 15/3 and 15/5/2014 were a significantly increased the leaf area, total chlorophyll in leaves, shoot length, number of shoots, total carbohydrates percentage in shoots, total yield of tree and firmness of fruits and reducing percentage fruit drop, percentage fruit cracking, total soluble solids, vitamin C and anthocyanine pigment in fruit peel compared with control treatment. AL- Hameedawi and AL-Malikshah (2017) found that, spraying fig tress cv. Asowd Diala with amino acids(Amister and Gusto) at concentrations of 500 mg / L each other, Bleed of grape 100% and seaweed Ascophyllum nodosum at concentrations of 4% in single way or in combination caused a significant increase percentage of leaf area, total chlorophyll, length of shoots, percentage of carbohydrate in branches, percentage of nitrogen in branches, percentage of carbohydrate / nitrogen in branches, percentage of nitrogen in leaves, percentage of phosphor in leaves, percentage of potassium in leaves, diameter of fruit, length of fruit, weight of fruit, percentage humidity of fruit, percentage dray matter of fruit, number of days to ripening, percentage of total soluble sold, fruit firmness and total yield of trees compared with control treatment. This was agreed with AL–Hameedawi (2018) when the local fig cv. Aswod Diala trees were sprayed at 1 April, 1 May and 1 June in 2016 with Bleed of grape cv. Sada Batha at concentrations of 100%. The main objective of this investigation is to study of the effect of spraying with Willow inflorescence extracts, $CuSO_4$ and hemorrhage cane vine cv. das alanze on vegetative growth, physical and chemical characterize of fig fruit cv. White Adriatic.

Materials and methods

This study was conducted in a private farm at Abbasiya / Najaf governorate for the 2017 season on fig trees cv. White Adriatic, 42 at same size and growth trees were selected with 10 years of age, that planted on (5 x 5 m.), they watered every five days, and fertilized by Nitrogenous and phosphates in two periods in March and May of each year at a rate of 500 g. per tree, as well as by manure for the two years. The experiment included 14 treatments with three replicates. It is adopted according to Randomized Complete Block Design (RCBD), and the results were statistically analyzed according to Duncan test at the probability level of 5% (Snedecor, and Cochran, 1990). Treatments were adopted at 1 April and 1 May 2017, spraying was done early morning until wetness was full addendum. Tween 20 was added at concentration of $1cm^3$/ L. as spreader material. Treatments were as follows :

1- Control
2- Willow inflorescence extract (Wib) conc. of 30% .
3- Willow inflorescence extract (Wib) conc. of 40% .
4- $CuSO_4$ $5H_2O$(Cu) at conc. of 300 mg / L .
5- Hemorrhage cane vine (Hcv) of local grape cv. Das alanze at conc. of 40 %. AL- Saidi (2000) noted that, hemorrhage cane vine containing Fe 40 mg/L, Ca 160 mg/L, P 28 mg/L, K157 mg/L total acidity 11.5 mg/L, Mg 22.7 mg/L , Succinct acid 0.130 mg/L, Malic acid 4.50 mg/L, Tartaric acid 2.15 mg/L, Formic acid 0.020 mg/L, Citric acid 5.63 mg/L, Na 3.50 mg/L, Zn 1.9 mg/L, IAA26 mg/L, GA_3 40 mg/L, CKs 35 mg/L, olego scoris 95 mg/L, amino acid 7%, organic nitrogen 3%, organic matter 16%, Algonac acid 50%.
6- Hemorrhage cane vine (Hcv) at conc. of 50%.
7- Wib30% + Cu.
8- Wib40% + Cu.
9- (Hcv) 40 % + Cu.

10-(Hcv) 50 % + Cu.
11- Wib30% + (Hcv) 40%.
12-Wib40% + (Hcv) 50 %.
13-Wib30% + (Hcv) 40 % + Cu.
14-Wib40% + (Hcv) 50 % + Cu.

The diameter of fruit cm, length of fruit cm, Volume of fruit cm^3 and percentage humidity of fruit according to (Mazumdar and Majumder, 2003). Leaf aria m2 /tree fruit dropt , percentage of total cracking and total yield kg/tree according to (Ibrahim, 2010). percentage souring of fruit was determined according to (Lisa and Kader 2003). Firmness was measured on two sides of each fruit with an Effegi penetrometer (Model NI, McCormick Fruit Tech, Yakima, WA) Fitted with an 11.1mm tip. The total chlorophyll mg/1gm FW, total soluble solids were determined by hand refract meter. Carotene pigment in fruit peel mg/100g peel, total percentage of acidity, Vitamin C mg /100 ml Juice according to (A.O.A.C, 2005).

Results and discussion

1- The leaf aria and total chlorophyll in fig trees cv. White Adriatic.

Results indicated in table (1) that spraying trees with Willow inflorescence extracts, CuSO4 and hemorrhage cane vine led to a significant increase of leaf aria and total chlorophyll compared to control treatment. Control treatment recorded the lowest percentage as compared to the individual treatments (4.83 m^2 /tree and 128.25 mg/1gm FW) . Treatment of (Willow inflorescence extracts 50% + CuSO4 300 mg / L + Hemorrhage cane vine 50%) gave the highest percentages of leaf aria and total chlorophyll, they were (6.32 m^2 /tree and 142.50 mg/1gm FW) on the year of study, respectively. The higher rates of leaf aria and total chlorophyll were due to the process of spraying of the Willow inflorescence extracts, CuSO4 and Hemorrhage cane vine might be due to increase in photosynthesis, nutrient uptake which are essential elements for chlorophyll biosynthesis and bio enzyme contain different acids more over willow inflorescence extracts and hemorrhage cane vine contain natural plant growth regulators which control growth and structural development of plants (Jundi, 2003).

2- Physical characterize of fruits and total yield of fig trees cv. White Adriatic.

Concerning the results in Table (1 and 2), diameter of fruit, length of fruit, weight of fruit, volume of fruit and humidity of fruit were significantly affected by spraying with willow inflorescence extracts, CuSO4 and hemorrhage cane vine in single way or in combination compared with untreated trees. In addition, spraying this material in combination gave the highest parameters they were (4.70 cm , 3.80 cm, 38.17 gm, 32.12cm^3 and 77.61%). On the other hand, untreated trees gave the lowest value they were (3.15cm, 3.20cm, 30.12gm, 28.70cm^3 and 76.48%). Increased physical characters of fruits at harvest may be due to spraying trees with willow inflorescence extracts, CuSO4 and hemorrhage cane led to the effect of these treatments in improvise trees growth i.e. leaf area total chlorophyll of the leaves and absorption of water, nutrition and an increase in food synthesized that trans located to fruits to increasing diameter of fruit, length of fruit, weight of fruit, volume of fruit, humidity of fruit and total yield (Stover et al., 2007). The increase in all parameter of fruits is ascribed to the increased of chlorophyll contents of leaves, which increased photosynthesis and ultimately overall health of fig, reduced premature dropping of fruit and this increased total yield of trees.

3- Chemical characterize of fruits of fig trees cv. White Adriatic.

Data in Table (1 and 2) show the effect of spraying willow inflorescence extracts, CuSO4 and hemorrhage cane vine in single way or in combination on carotene pigment in fruit peel, percentage of total soluble solids, percentage of total soluble solids / total acidity and vitamin C of fig trees cv. White Adriatic during 2017 season. Results clear that the all estimated characters were significantly increased and the highest averages (494.34 mg/100g peel, 15.90%, 76.07%, 9.75 mg / 100 ml Juice) , respectively in the treatment (Willow inflorescence extracts 50% + $CuSO_4$ 300 mg/ L + Hemorrhage cane vine 50 %) compared to the lowest rates (460.81 mg/100g peel, 14.20%, 52.59%, 7.75 mg / 100 ml Juice), respectively in control treatment. The increase in chemical characterize of fruits from carotene pigment in fruit peel, percentage of total soluble solids, percentage of total soluble solids / percentage of acidity and vitamin C, which results through spraying willow inflorescence extracts, CuSO4 and hemorrhage cane vine due to the fact that this compound increase vegetative growth and thus encourages the accumulation of carbohydrate materials in fruits leading to increased content of these materials (Devlin and Witham, 2001).

4-The percentage of souring, peel thickness, firmness, percentage of dropping, total cracking and total yield of fig trees.

Data in Table (1 and 2) shows that, spraying Willow inflorescence extracts, CuSO4 and hemorrhage cane vine alone or combination treatments led to reduce the percentage of souring, percentage of dropping and percentage of cracking of fruits to the lowest percentages in the treatment (Willow inflorescence extracts 50% + CuSO4 300 mg / L + Hemorrhage cane vine 50 %) it were (1.74%, 4.67 % and 4.14 %) and this treatment gave The highest significantly values of peel thickness, firmness of fruits and total yield of trees it were (1.50 mm, 0.451 kg/cm^2 and 22.90 kg/ tree) compared to the lowest percentages (1.18 mm, 0.339 kg/cm^2 and 13.42 kg/ tree) in control treatment. The spraying with Willow inflorescence extracts, CuSO4 and hemorrhage cane vine led to increase in the content of

leaves from growth hormones and total chlorophyll, these led to increase the length, number of branches and carbohydrates in fruits. These factors due to decrease the percentage of dropping and cracking of fruits and then increasing production of trees, peel thickness and firmness of fruits (Gerber, 2010).

Conclusion

It could be concluded from this experiment that, spraying Willow inflorescence extracts, CuSO4 300 mg / L and hemorrhage cane vine a single or combination has led to an increase in the physical and chemical characterize of fruits and total yield of fig trees cv. White Adriatic wi th significant differences between treatments for growing season.

Table 1 . Effect of spraying of Willow inflorescence extracts, CuSO4 and Hemorrhage cane vine on vegetative growth and physical characterize of fig fruit cv. White Adriatic for seasons 2017

Treatments	Leaf aria / tree m^2	Total chlorophyll mg/1gm FW	Diameter of fruit cm	Length of fruit cm	Weight of fruit gm	Volume of fruit cm^3	% Humidity of fruit	Carotene pigment in fruit peel mg/100g peel	% Fruit drop
Control	4.83 j	128.25 i	3.15j	3.20 e	30.12 i	28.70 i	76.48 i	460.81 k	17.5 3 a
Willow inflorescence extracts (Wib) at conc. of 30%	5.11hi	130.33 gh	3.80 hij	3.48cd	31.85 gh	29.33 h	77.36 defgh	488.90ghi	12.32 b
Willow inflorescence extracts (Wib) at conc. Of40%	5.25 gh	130.83 gh	4.04 fgh	3.46d	32.90 fg	29.55fg	76.83ki	481.62 jkl	10.67c
CuSO4 (Cu) at conc. of 300 mg / L	5.31g	131.40 efg	3.49 ghi	3.50 bcd	33.25 dfg	29.69 ef	77.02 ijk	468.50ijk	11.90 cd
Hemorrhage cane vine (Hcv) at conc. of 40%	5.60fg	132.61bef	4.14 fgh	3.56 bcd	32.31 fg	29.12 fg	76.89 jk	475.31hij	10.1 9 cd
Hemorrhage cane vine (Hcv) at conc. of 50%	5.62ef	132.39 ef	4.30 efgh	3.49 cd	34.43 dfg	30.75 cd	77.11 hijk	483.42 hi	9.55de
Wib 30%+Cu	5.79 de	135.18cde	4.34 defg	3.62 bcd	34.95 df	31.11bc d	77.16ghij	490.27 Fg	9.30 de
Wib 40%+Cu	5.74 e	136.35 bcd	4.34 defg	3.68abc	35.00 bcd	30.75 cd	77.26 fgh	491.29 Efgh	9.55de
Hcv 40% + Cu	5.80 de	135.23 cd	4.37 cdef	3.71bc	34.60 df	30.31 de	77.22 fghi	492.75 cdef	8.79ef
Hcv 50% + Cu	5.91 bc	137.62 bc	4.47 cde	3.73abc	36.56 bcd	31.29 abc	77.41 cdef	492.92 cd	7.21fg
Wib 30%+Hcv 40%	5.98 b	137.20c	4.59 bcd	3.71abc	36.71 bc	31.52 abc	77.59 bcd	495.13 bcd	6.85gh
Wib 40%+Hcv 50%	5.93 bc	138.19 bc	4.53abcd	3.75abc	36.95 bc	31.43 abc	77.45 cde	494.45 bc	6.82gh
Wib 30%+Hcv 40% + Cu	6.15b	140.42 ab	4.64 ab	3.77 ab	36.44 b	31.60 abc	77.53 bcd	495.20 ab	5.91hi
Wib 40%+Hcv 50% +Cu	6.32 a	142.50 a	4.70 a	3.80 a	38.17 a	32.12 ab	77.61abc	496.34 a	4.67j

Table 2 . Effect of spraying of Willow inflorescence extracts, CuSO4 and Hemorrhage cane vine on chemical and physical characterize of fig fruit cv. White Adriatic for seasons 2017

Treatments	% Total Acidity	%Total soluble solids	% T.S.S / Acidity	Vitamin C mg / 100 ml Juice	% Souring	peel thickness mm	Firmness Kg/cm^2	% Total cracking	Total yield Kg/ tree
Control	0.270 a	14.20 i	52.59j	7.75k	4.55a	1.18h	0.339 h	16.45 a	13.42 j
Willow inflorescence extracts (Wib) at conc. of 30%	0.261ab	14.35 ghi	55.19 ghij	8.20ijk	4.00 ab	1.20efgh	0.345 efg	14.15b	14.70 ij
Willow inflorescence extracts (Wib) at conc. Of40%	0.260 ab	14.39 fghi	57.30efgh	8.36hij	3.69 ab	1.22fgh	0.358 efg	12.40bc	15.00 hij
CuSO4 (Cu) at conc. of 300 mg / L	0.256 bcd	14.42 efgh	56.32 efg	8.29fgh	2.95bc	1.23def	0.366 def	12.00b	15.52 hij
Hemorrhage cane vine (Hcv) at conc. of 40%	0.257 bcd	14.46 efg	56.26ddefg	8.61efg	3.55bcd	1.20efgh	0.375 de	11.77c	16.11 hij
Hemorrhage cane vine (Hcv) at conc. of 50%	0.255bcde	14.50 efg	56.86 defg	8.77ef	2.90cd	1.26def	0.389 cde	9.81 cd	16.72 ghi
Wib 30%+Cu	0.251 cde	14.75ef	58.76def	8.99ef	2.82cde	1.30cde	0.390 cd	8.21 de	17.85 fgh
Wib 40%+Cu	0.249 cdef	14.88 de	59.75ccdef	9.11cd	3.00cde	1.35cde	0.399 bcd	8.35ef	18.15 efg
Hcv 40% + Cu	0.250 cde	14.95 cde	59.80 cde	9.00 def	2.91cde	1.36cd	0.395 cd	8.75ef	18.25 def
Hcv 50% + Cu	0.245 cdefg	15.22cd	62.12cd	9.22 cd	2.77cde	1.36cd	0.408 bc	5.74fg	19.60 cde
Wib 30%+Hcv 40%	0.238efg	15.47 bc	65.00cd	9.25 bc	2.63 dfg	1.39bc	0.383 cd	5.16gh	19.65 cd
Wib 40%+Hcv 50%	0.230efgh	15.51 bc	67.43bc	9.40abc	2.40fh	1.40 abc	0.411 bc	5.03gh	20.22 bcd
Wib 30%+Hcv 40% + Cu	0.221 fghi	15.69 ab	70.99b	9.37 ab	2.19fgh	1.42ab	0.430 ab	4.86ghi	21.36 b
Wib 40%+Hcv 50% +Cu	0.209 i	15.90 a	76.07a	9.75 a	1.74 i	1.50a	0.451 a	4.14 i	22.90 a

Due to spraying trees with growth regulator led to the effect of these treatments in improvise trees growth i.e. leaf area total chlorophyll of the leaves and absorption of water, nutrition and an increase in food synthesized that trans located to fruits to increasing length of fruit, diameter of fruit, weight of fruit, firmness of fruit, humidity of fruit and total yield.

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