

Foliar Application of Amino Acids, Bleed Grape and Seaweed Extract Improve Storability Properties of Fig Fruits

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Abstract: This study was conducted during the growing season of 2016 in a private orchard at AL-Abbasyia, Najaf Governorate on the local fig cv. Aswod Diala . The trees were spraying 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 at 1April, 1May and 1 June in 2016 . Results showed that spraying trees with amino acids ,bleed grape and seaweed extract treatments and their interactions caused a significant decrease percentage disease of *Alternaria tenuis* , *Alternaria fici*, *Penicillium expausum*, *Aspergillus niger* , souring , total decay, percentage of weight loss, respiration rate and increase total soluble solids ,vitamin C and fruit firmness after 7 days of the storage compared to control treatment . There was a significant effect between treatments. Treatment of spraying (Am + Gu+ Bg + Bs) gave a significant effect and the best results for the year of experiment.

Keywords: Amino acids, Bleed of grape, Seaweed extract, storage fig cv. Aswod Diala.

1. INTRODUCTION

Fig fruits are infected by a number of physiological and biological damages, and the foremost damage is fungal decay in the storage or orchards, which its ratio increased due to the increase in periods of storage (AL– Hameedawi , 2010) . AL-Eneabi (2008) noticed that, storage fruit local fig cv. Aswod Diala 7 days under 5C⁰ temperature and relative humidity 80-85 % increase total soluble solids and decrease the weight loss, respiration rate and percentage of total decay. Amino acids are considered as precursors and constituents of proteins (Rai, 2002), which are important for stimulation of cell growth. They contain both acid and basic groups and act as buffers, which help to maintain favorable pH value within the plant cell (Cerdana, *et al.*, 2009). Amino acids can directly or indirectly influence the physiological activities in plant growth and development such as exogenous application of amino acids have been reported to modulate the growth, yield and biochemical quality of squashes and garlic plants (Hounsoume, *et al.*, 2008 , Abd El-Aal *et al.*, 2010 and Shiraishi *et al.*, 2010) . Amino acids are responsible for improving physical and chemical parameters of fruits as well as increasing the productivity of trees (Mouco, *et al.*,2009) .The spraying with amino acids led to increased leaf containing from growth regulators cytokinines (Cks) , Gibberellins (GA³), Auxins , chemical eliminates and reducing Abscisic acid (ABA) (Talaat, *et al.*,2013). Schemata , *et al.*,(2011) found that spraying strawberry with amino acids and seaweed extract led to increase the fruit quality, fruit firmness and percentage humidity of fruits .Datir, *et al.*(2012) found that , spraying with amino acids has the positive effect in fruits growth and it is quality . Algae extract as a new bio fertilizer containing N, P, K, Ca, Mg, and S as well as Zn, Fe, Mn, Cu, Mo, and Co, some growth regulators, polyamines and vitamins applied to improve nutritional status, vegetative growth in different orchard such as vineyards (Elham, *et al.*, 2010) .

Subba Rao (2008) noticed the impact of algae extract application to orchard trees was caused a significant increased total soluble solids, vitamin C , and fruit firmness . Al – Hamdawi (2016) found that, spraying trees of fig cv. Aswod Diala with Hletab and Kelpak led to increased, total yield of tree and its quality compared with control treatment . Bondok ,*et al.*,(2013) found that spraying grape trees with extract of alga's (Acadian , Goemar and BM86) at conc. of (0.5 , 1 and 2 %) caused increase in the fruits quality with increase of concentration of extract of alga's. Foliar application of mixture of amino acids and seaweed extract at different growth stages had a positive effect on reproductive growth and berry quality of grapevines. Multiple application of 0.5 mL L⁻¹ mixture of amino acids and seaweed extract at flowering + fruit setting + one month after fruit setting stages is quite effective to improve growth and berry physicochemical quality characteristics of 'Perlette' grapes (EKhan, *et al.*, 2012) . The main objective of this investigation is to study of the effect of using amino acids(Amister and Gusto) , Bleed of grape and seaweed *Ascophyllum nodosum* treatments and their interactions on reducing percentage of fungi disease , total decay, weight loss and improve storability of fruits of fig cv. Aswod that stored 7 days at 5C and 80- 85 R.H .

2. MATERIALS AND METHODS

This study was conducted in a private farm at AL-Abbasyia .Najaf governorate for the 2016 season on local fig tree cv. Aswod Diala , 48 trees at same size and growth were selected with 12 years of age , that planted on (5 x 5 m.) , they were spraying with Amister it was mixtures of amino acids (Arginine ,Tyrosine and Proline) and Gusto it was mixtures of amino acids (Glutathione , Aspartic acid , Glycine and Lysine) at concentrations of 500 mg / L each other , Bleed of local grape cv. Sada Batha at concentrations of 100% that 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 , GA₃ 40 mg /L ,CKs 35 mg/L , olego scoris 95 mg/L, amino acid 7%, organic nitrogen 3%, organic matter 16%, Algonac acid 50%. (AL- Saidi,2000), and Brawn seaweed extract *Ascophyllum nodosum* that containing (Fe 46-70 mg/L , N 1400 -1800 mg/L , P 1500 -2000 mg/L , Cu 10-15 mg/L potassium 2000-2006 mg/L ,B 30-44 mg/L , Kinetin% 0.06 and organic matter 13%) at concentrations of 4% in three periods at 1April , 1May and 1 June in 2016. The experiment included 16 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% (Al-Rawi and Khalf Allah , 2000) . The experiment involved the following 18 treatments :

- 1- Control treatment (sprayed with tap water) .
- 2- Amister (Am)as foliar sprays at concentration of 4 % .
- 3- Gusto (Gu) as foliar sprays at concentration of 4 % .
- 4- Bleed of grape (Bg) as foliar sprays at concentration of 100% .
- 5- Brawn seaweed extract (Bs)as foliar sprays at concentration of 4 % .
- 6- Am + Gu .
- 7- Am + Bg .
- 8- Am + Bs .
- 9- Gu + Bg .
- 10- Gu + Bs .
- 11- Bg + Bs .
- 12- Gu + Bg + Bs .
- 13- Am + Gu %+Bg .
- 14- Am+ Bg +Bs .
- 15- Am + Gu+ Bs .
- 16- Am + Gu+ Bg + Bs .

Trees spraying was done early morning until wetness was full addendum. Tween 20 was added at conc. of 1cm³/L as spreader material . In 16-7 -2016 harvested 96 Kg fruits similar in size and color without dieses and mechanical injures from trees of experiment . Fruits were divided into 18 treatments weight 6 Kg for each treatment. The fruits of each previous treatments were divided into 3 replicates and each part weight was 2 Kg . These parts were placed in polyethylene bags with 22 holes for each bags and the diameter of the hole were 0.5 cm . The fruits were stored under 5C⁰ temperature and relative humidity 80-85 % for 7 days starting in 16 / 7 /2016 . The design for this treatment was similar to that of the field experiment . In 23 / 7 /2016 fruits were taken out and traits were measured . The

percentage disease of *Alternaria tenuis* , *Alternaria fici* , *Penicillium expausum* , *Aspergillus niger* , Souring , total decay and percentage of weight loss according to (Lisa and Kader 2003). Acidity percentage , Vitamin C mg /100 ml Juice , according to (A.O.A.C , 1985) . The percentage of total soluble solids were determined by hand refract meter. .Firmness Kg/cm² was measured on two sides of each fruit with an Effegi penetro meter (Model NI , McCormick Fruit Tech ,Yakima ,WA) Fitted with an 0.5 cm tip. Respiration rate mg CO₂ / Kg /hr according to (Ibrahim , 2010) .

3. RESULTS AND DISCUSSION

1- The percentage disease of *Alternaria tenuis* , *Alternaria fici* , *Penicillium expausum* , *Aspergillus niger* , Souring , and total decay .

Data in Table (1) shows that, spraying trees with amino acids(Amister and Gusto) , Bleed of grape and seaweed *Ascophyllum nodosum* in single way or in combination led to decreased in the percentage disease of *Alternaria tenuis* , *Alternaria fici* , *Penicillium expausum* , *Aspergillus niger* , Souring , and total decay significantly compared to control treatment , The treatment (Am + Gu+ Bg + Bs) gave the lowest values in percentage disease and total decay they were (0.64 , 0.41 ,0.72 , 1.09 , 1.75 and 4.61) in comparison to the highest rates (1.80 , 1.70 ,1.62 , 1.91 , 3.75 and 10.78) in control treatment in the end of storage. The decrease in different type of fungi decay and total decay in fruits as a result of spraying trees with amino acids , Bleed of grape and seaweed led to its role in making new balance in fruits and around between O₂ , CO₂ and ethylene and reduced respiration rat of fruits which leads to decrease the percentage of decays . Cohen (2002) mentioned that , the amino acids protected fruits from some biological dieses are which caused by fungi and Bacteria .

2-Weight loss percentage.

Data in Table (2) shows that , spraying trees of local fig cv. Aswod Diala with amino acids , Bleed of grape and seaweed led to significantly decreased the percentage of weight loss after 7 days of storage that gave the lowest percentage 2.59% in the treatment (Am + Gu+ Bg + Bs) in comparison to the highest percentage 5.75% in the control treatment .The reason of decreasing the percentage of weight loss of fruits lead to influence these materials in some physiological changes in the fruit peel .This process leads to increase the poly amines which it used to enhance the stability of cell membranes .The poly amines are in content to nucleic acids in structure of membranes and this leads to make the peel thick and firmness and decrease the moisture loss .The result is decreasing the rate of respiration which decrease the loss in weight (Jundi , 2003) .

3- Acidity, total soluble solids, Vitamin C and firmness.

Data in Table (2) shows that percentage of acidity, total soluble solids , Vitamin C, and firmness in fruits were increased significantly when trees sprayed with amino acids ,

Bleed of grape and seaweed in single way or combination, while the rate of respiration was decreased in the all treatments compared to control treatment. The highest significance result were recorded in treatment (Am + Gu+ Bg + Bs), that gave the highest percentages of percentage of acidity, total soluble solids, Vitamin C, and firmness, they were (0.327 %, 17.51%, 8.78 mg / 100 ml Juice and 0.379 Kg/cm²) comparison with least rates of percentages (0.240 %, 16.02%, 7.51 mg / 100 ml Juice and 0.302 Kg/cm²) in the control treatment respectively at the end of storage. The increase in chemical compound of fruit juice because of fruits treated with such materials led to decreasing the loss in weight, increase in firmness peel of fruits and reduction the respiration rate (Hounsome, et.al, 2008). Increasing fruits from total soluble solids, Vitamin C and firmness of fruits which results through spraying amino acids, Bleed of grape and seaweed 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 (Ferguson et. al, 1999).

4- Rate of respiration of fig fruits.

Concerning the results in Table (2), rate of respiration of fig fruits were significantly affected by all treatments. It is cleared that spraying amino acids, Bleed of grape and seaweed in single way or in combination to the fig trees decreased compared with control treatment. In addition, spraying this material in combination gave the lowest parameters it was (15.55 mg CO₂ / Kg /hr). On the other hand, the fruits of untreated trees gave the highest value (39.60 rate mg CO₂ / Kg /hr). Using seaweed extract, amino acids and their combination caused increase in epidermis and cortex thickness of fruits and this reusing led to decreasing rate of respiration of fruits (AL-Zubaidy, 2015).

4. CONCLUSION

Foliar application of mixture of amino acids, Bleed of grape and seaweed extract at 1 April, 1 May and 1 June, had a positive effect to decreased in the percentage disease of *Alternaria tenuis*, *Alternaria fici*, *Penicillium expausum*, *Aspergillus niger*, Souring, total decay, percentage of weight loss, respiration rate and increase total soluble solids, vitamin C and fruit firmness in the fruits of fig trees cv. Aswod Diala after 7 days of the storage compared to control treatment

Table 1. Effect of spraying with amino acids, bleed grape and seaweed extract on percentage disease and total decay of fig fruits cv. Asowd Diala after 7 days from storage at 5 C⁰ and 80-85% R.H. for season 2016.

Treatments	<i>Alternaria tenuis</i>	<i>Alternaria fici</i>	<i>Penicillium expausum</i>	<i>Aspergillus niger</i>	Souring	% Total Decay
Control	1.80 a	1.70 a	1.62a	1.91a	3.75 a	10.78 a
Amister 4%	1.75 b	1.63 ab	1.54 ab	1.79 b	3.73a	10.44 b
Gusto 4%	1.72 b	1.66 ab	1.50 ab	1.80 b	3.68ab	10.36 bc
Bleed of grape 100%	1.45 c	1.32 bc	1.41 bc	1.52 ce	3.40 bc	9.10 c
Brawn seaweed extract 4%	1.41 ce	1.47 bc	1.47 bc	1.57 c	3.66 ab	9.58 b
Am + Gu	1.33 ef	1.35 ab	1.30 ce	1.60 c	3.52 bc	9.28 c
Am + Bg	1.36 e	1.29 abc	1.25 d	1.48 bc	3.25 d	8.63 cd
Am + Bs	1.27 de	1.22 de	1.27 cde	1.51 cd	3.44 bc	9.98 d
Gu + Bg	1.30 de	1.18 abc	1.19 cd	1.42 cde	3.15de	8.24 e
Gu + Bs	1.25 f	1.29 bcd	1.22 cde	1.46 cd	2.97e	8.19 ef
Bg +Bs	1.20 f	1.14 de	1.30 cde	1.42 cde	2.69ef	8.02 f
Gu + Bg + Bs	1.11fg	1.01 ef	1.12 de	1.29 def	2.43efg	6.96 g
Am + Gu +Bg	0.92 fg	1.05 ef	1.07 ef	1.34 cdef	2.27f gh	6.65g
Am +Bg +Bs	1.05g	0.94 fg	0.93 fg	1.23 efg	2.12 gh	6.27h
Am + Gu +Bs	0.83gh	0.78 g	0.88 gh	1.19 fg	1.89 hi	5.57 i
Am + Gu +Bg + Bs	0.64 i	0.41 h	0.72 hi	1.09 h	1.75 j	4.61 j

Table 2. Effect of spraying with amino acids, bleed grape and seaweed extract on physical and chemical parameters of fig fruits cv. Asowd Diala after 7 days from storage at 5 C⁰ and 80-85% R.H. for season 2016.

Treatments	% weigh loss	%Acidity	%T.S.S	Vitamin C mg / 100 ml Juice	Fruit firmness Kg/cm ²	Respiration rate mgCO ₂ / Kg /hr
Control	5.75 a	0.240 b	16.02 j	7.51 jk	0.302 i	39.60a
Amister 4%	5.52 ab	0.261a	16.18 hi	7.84 hij	0.320fgh	36.79b
Gusto 4%	5.40 abc	0.269	16.23ghi	7.80 ghij	0.325 efgh	35.10 bc
Bleed of grape 100%	5.23 abc	0.277 cd	16.40 efg	7.96 hij	0.327 efg	34.18 cd
Brawn seaweed extract 4%	5.31 abc	0.265 cd	16.29gh	7.89 ghi	0.323efgh	36.46 b
Am + Gu	4.99 bcd	0.281d	16.48 fg	8.17 fgh	0.330 defg	32.26 de
Am + Bg	4.83 cde	0.289 cd	61.63 def	8.34 cdef	0.334 cde	31.51 ef
Am + Bs	4.55 def	0.285 de	16.57 ef	8.22 fg	0.332 def	32.24 def
Gu + Bg	2.39 def	0.293 de	16.54ef	8.27 efg	0.338cd	30.84 efg
Gu + Bs	4.26 efg	0.289 cd	16.50 ef	8.37cdef	0.335cde	30.43 efg
Bg +Bs	4.10 fgh	0.296cd	16.84 cd	8.45 cde	0.339cd	29.70 fgh
Gu + Bg + Bs	3.70 ghi	0.305bc	17.19 bc	8.53 bcd	0.346cd	25.97 ghik
Am + Gu +Bg	3.55 hi	0.307 ab	17.07 bc	8.64 bc	0.341cd	23.37 ikj
Am +Bg +Bs	3.12 ij	0.312 bc	17.28 b	8.70ab	0.355bc	26.97ghi
Am + Gu +Bs	2.91 j	0.316ab	17.33 b	8.67ab	0.361bc	21.43 jl
Am + Gu +Bg + Bs	2.59 k	0.327 a	17.51 a	8.78 a	0.379 a	15.55 m

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