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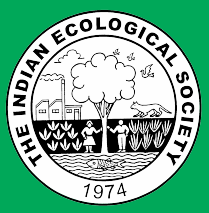

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Response of Injecting Salicylic Acid and Super Fifty on Performance of Date Palm

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Abstract: This experiment was connected at Ramadi, Anbar in 2019 on 11 years old Khistawi date palm. The objective was to determine the effect of injection salicylic acid (S) and extracts of sea algae super fifty (N) on some phenotypic traits and fruit yield. Salicylic acid used at 100 and 200 ppm, while super fifty used was 1, 2 and 3 ml L^{-1} in addition to control. The leaf chlorophyll, non-structural carbohydrates in the leaves, fruit set, fruit weight, total soluble solids and fruit yield were higher when used salicylic acid at 100 ppm. Super fifty at 3 ml L^{-1} gave the highest means of leaf chlorophyll, non-structural carbohydrates in the leaves, fruit set, fruit weight, total soluble solids and fruit yield. The interaction S1XN3 gave the best values of traits studied.

Keywords: Extracts of plants, Khistawi dates, Salicylic acid, Date Palm

Date plant trees have many benefits to human nutrition, economy and environment and many food products and medicines rely on dates. To increase yield of this tree and improve quality of the fruits, application of nutrients is helpful. Injection of some nutrients in to tree trunk gave positive results (Hesami and Abdi 2010). Salicylic acid was found effective (Ahmed et al 2015) and injecting salicylic acid into the tree, increased nitrate reductase, photosynthesis, cell division and plant acquire systemic acquired resistance (SAR) (Bartoli et al 2013). The nano extract of sea algae to improved soil characteristics and/or plant to improve productivity (Prasad et al 2014). The nano extract promotes metabolites transportation from the source (leaves) to the sink, then the fruits that will be better in size and weight. This also improve fruit quality by increased the contains of elements, amino acids, antioxidants, vitamins and hormones There are many other studies on improving fruit quality of other tree by using different methods (Ahmed et al 2014, Amro 2015, Ahmed 2019). This trial aimed at studying effect of injection with antioxidant and super fifty on growth and yield for date palm.

MATERIAL AND METHODS

This study was conducted in north west Ramadi city, Anbar, Iraq in 2019. The orchard contains 11 years old date palm trees. Salicylic acid and sea algae extract (nano) were injected into the trees to study their effects on vegetative and fruit yield and quality of date palm khistawi cv. Among trees, 36 trees were chosen of similar age and growth and were transplanted on 9 m × 9 m (81 m^2) and being watered from Euphrates River. Management of trees canopy were done by leaving 8-10 leaves for each cluster. Pollination was done by hand using male Red Ghanami. There were 8 clusters left for each tree in early stages. On 20th of March, 2019, drilling into each tree trunk was done with 16 mm diameter and 30 cm deep about one meter from soil surface. A plastic tube was fit led in each whole to15 cm deep into the trunk and fixed with a plastic cover. Salicylic acid was dissolved in water to prepare solutions of 100 and 200 ppm. This solution added in thrice on 22 March, 25 April and 25 May. One liter of each solution was injected into the trunk, and also one liter of sea algae extract. The time to absorb salicylic acid and sea algae was 23-26 and 36-48 h, respectively. The percent leaf chlorophyll (mg/100mg fresh weight) and non-structural carbohydrates were estimated according to Ranganna (1977). The percent fruit-set was calculated by dividing fertilized florets by total florets and fruit weight by dividing weight of a bunch of cluster by number of fruits. The total soluble solid (%) was determined according to Nelson (1983) and tree fruit yield was estimated weighing fruits of on all trees.

RESULTS AND DISCUSSION

The injection of 100 mg/L (S1) increased chlorophyll percent in leaves, whereas injecting super-fifty (N3) gave higher increase in this pigment, and did not differ from N2. The interaction of both factors (S1× N3) gave the higher chlorophyll. The non-structural carbohydrates in leaflets was higher in S1 (9.91%) compared with S0 (8.93%). The injecting super-fifty N3 gave higher mean of this trait (9.53%) compared with N0 (8.94%). The interaction S1×N3 gave

maximum value of these traits. Salicylic acid promoted growth, and so the physiological processes, and photosynthesis. This increased total metabolite accumulated in the leaflets, besides increasing carotene and cell division (Hayut et al 2007). Salicylic acid increases praline and osmosis and plant absorb more water and nutrients, and then chlorophyll content (Khan et al 2003). Non-structural carbohydrates increased due to salicylic acid due to promotion of transport and synthesis of prosthetic lipids (Abdel-Lattif et al 2019). Super fifty promoted photosynthesis as it contains several nutrients and hormones (Zielińska and Nowak 2017).

Fruit set was significantly different in treatments (Table 1). The S1 gave higher mean (72.63%) compared with control (64.66%). Super fifty N3 gave higher fruit set (71.64%) with non-significant difference with N2 and N1 while the N0 gave the lowest (65.11%). Meanwhile, the S1×N3 gave the best fruit set (75.67%) compared to the control (54.08%). The effects of both Salicylic acid and super fifty gave better result for the combined actions of both compounds (Kolupaev et al 2011). The super fifty contains some plant hormones, such as gibberellin (Jiang and Asami 2018). Fruit weight was significantly different in treatments. S1 treatment gave heavier fruits (12.03 g) than the control (10.39 g). Also, the super fifty N3 gave better value of fruit weight (12.24 g) compared to the control (10.07 g). The interaction S1×N3 gave the higher fruit weight (13.06 g) compared to the control which gave the lowest (9.07 g).

A total soluble solid in leaflets was different in treatments. The S1 gave higher total soluble solids followed by S2 and S1. Super fifty gave N3 and N2 gave higher TSS. Meanwhile, the S1×N3 gave the best maximum total soluble solids (66.9%) compared to the control (57.07%). Fruit yield per tree was different among treatments. S1 treatment gave 146.61 kg dates per tree followed by S2 (128.14 kg/tree) and control (121.18 kg/tree). Super fifty S3 gave significant increase in this trait (143.84 kg/tree) followed by N2 and control. S1×N3 gave higher value (149.01 kg/tree), as compared to S0×N0 (81.95 kg/tree). Salicylic acid has the potential of promoting endogenous growth factors which assisted the tree to absorb more water and soluble, then increased fruit yield coincided with total soluble solids (Al-Saikhan and Sallam 2015).

The increase fruit size was due to nutrient which became

Table 1. Effect of injection with antioxidant and super fifty on growth and fruit yield of date palm

Treatment	Leaf chlorophyll (%)	Non-structural carbohydrates (%)	Fruit set (%)	Fruit weight (g)	Total soluble solids (%)	Tree fruit yield (kg tree^{-1})
$S_{0\ (0)}$	0.83	8.93	64.66	10.79	61.43	121.18
$S_{1\ (100)}$	0.88	9.71	72.63	12.03	65.68	146.41
$S_{2\ (200)}$	0.84	9.19	71.32	11.07	63.98	128.14
LSD S	0.01	0.12	1.84	0.26	0.79	8.51
$N_{0\ (0)}$	0.82	8.94	65.11	10.07	61.10	112.90
$N_{1\ (1)}$	0.85	9.23	70.24	11.07	63.72	132.31
$N_{2\ (2)}$	0.86	9.39	71.32	11.79	64.81	138.59
$N_{3\ (3)}$	0.87	9.53	71.64	12.24	65.16	143.84
LSD N	0.01	0.14	2.13	0.30	0.91	9.83
S_0N_0	0.79	8.33	54.08	9.07	57.07	81.95
$S_0\ N_1$	0.84	8.97	68.02	10.60	62.23	128.15
S_0N_2	0.85	9.23	69.45	11.44	63.47	132.27
S_0N_3	0.86	9.17	67.08	12.05	62.97	142.35
S_1N_0	0.86	9.57	70.91	11.04	64.50	141.54
$S_1\ N_1$	0.87	9.67	71.46	11.65	65.13	146.75
S_1N_2	0.89	9.77	72.47	12.36	66.17	148.32
S_1N_3	0.90	9.83	75.67	13.06	66.90	149.01
S_2N_0	0.81	8.93	70.35	10.12	61.73	115.21
$S_2\ N_1$	0.84	9.07	71.23	10.95	63.80	122.02
S_2N_2	0.86	9.17	71.51	11.59	64.80	135.17
S_2N_3	0.85	9.60	72.17	11.92	65.60	140.16
LSD SN	0.02	0.24	3.69	0.52	1.57	17.02

more available across cell membranes and increasing photosynthesis which led to increased cell division and metabolism (Nair et al 2010). Super fifty was may draw back metabolites from source to sink, and then fruit size was increased. These results were in agreement with Faissal et al (2013). The co-effect of both factors in chancing many growth parameters was positive and significant in most of traits studied.

CONCLUSION

The injecting Salicylic acid and sup fifty in the date palm trunk was very effective to improve many qualitative and qualitative of this tree and its fruit yield. It is an economic method, and less negative effects to the environment.

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