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Effect Of Spraying With SW Extract And Plant Earthing Up Process On Growth And Yield Of Greenhouse Tomato Lycopersicon Esculentum Mill

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ABSTRACT

The experiment was carried out in a plastic house belonging to the Department of Horticulture and Landscape of the College of Agriculture - University of Karbala for the 2021 growing season to study the effect of spraying with marine lichen solution and the export process on the growth and yield of tomato (Wjdan variety). The treatments included five concentrations of the organic nutrients marine lichens 0, 50, 100, 150 and 200 ml. Liter-1 for the first factor, while guaranteeing the factor or the procedure or not to make the Plant Hilling. The experiment was carried out in a randomized complete block design (RCBD), as a factorial experiment with three replications. The results showed that spraying SW extract had a significant effect on the characteristics of vegetative growth and plant yield. The best rate of plant yield was in the spray treatment with a concentration of 200 ml. L^{-1}, which led to 2.138 kg. $Plant^{-1}$, compared to the control treatment (spraying with distilled water), which led to 1.492 Kg. $plant^{-1}$. The results also showed that the plant earthing up process had a significant effect on the vegetative growth and yield characters, which was 1.956 Kg. $plant^{-1}$ in the hilled plants, while the non-earthing up plants gave 1.815 kg. $plant^{-1}$. In general, the best results of the yield were in the treatment of the interaction 200 $ml.L^{-1}$ SW and plant earthing up, which led to the highest yield of 2.152 $Kg.plant^{-1}$ compared to the yield of non-earthing up and DW sprayed plants which resulted in 1.235 Kg. $plant^{-1}$.

Keywords: earthing up, foliar spray, plant nutrition, organic fertilizer, tomato

INTRODUCTION

Tomato (Mill Lycopersicon esculentum) is one of the major vegetable crops in human nutrition and is the first for vegetables. It is cultivated for its fruits of high nutritional value and the wide variety of consumption, whether fresh or cooked. It is also used in various food industries (Al-Mohammadi, 1990). Tomatoes are widely consumed in Iraq, and each 100 gm of its fruits contains 0.9 protein, 0.1 g fat, 3.5 g carbohydrates, 15-20 calories, 1500-500 calories, IU of vitamin A, 0.1 mg, thiamin, mg-lav, 0.02 -36 calcium and 0-0.1 mg iron (Fariduddin et al., 2004). Tomatoes have increased in importance in recent times, as they contain substances that have proven to be anti-cancer, including prostate cancer. They contain the antioxidant lycopene, and tomatoes are among the top ten antioxidant crops because they contain glutathione, which helps support the human immune system (Turner, 2002).

Organic farming in its general and simple sense is a production process in which natural production elements and means that exist in the environment are used and does not depend on the introduction of manufactured materials such as fertilizers, nutrients, pesticides, seeds or genetically modified seeds. This system seeks to find an environmental balance to avoid problems of soil fertility and agricultural pests, in addition to ridding the environment of the accumulation of waste (Muwafaq and Omar, 2012).

Feeding the plant with elements by spraying on the vegetative system (leaf feeding) of the tomato plant is one of the usual methods, and it has advantages that make it preferable to methods of adding nutrients to the soil directly (Naseem et al. 2019). The trend of recent studies has focused on raising production efficiency by using new, high-quality varieties and unconventional cultivation methods or using directly added nutrients (Al-Doghi et al., 2008).

The agricultural specialists tended to take advantage of the possibility of using nutrients from their natural sources, especially lichens, which are an important marine source that contains high amounts of minerals. On the other hand, the hilling process, when soil is added around the plants, is necessary for tomato plants growth and encouraging the formation of adventitious roots on the buried stem and others, 2005 (Juan, in soil). Therefore, the research aimed to evaluate the efficiency of spraying with marine lichen extract at different concentrations and the effect of plant hilling process on some characteristics of vegetative growth yield of tomato, cultivar Wijdan under greenhouse conditions.

MATERIALS AMD METHODS

Three months before planting, the soil was sampled for soil analysis (Table 1), plowed and the furrows (70 cm wide) were made in the plastic house (1.5 m between each two furrows). A slit was dug on both sides of each furrow and animal manure was buried in it according to the cultivation of tomatoes in the desert method. The furrows were irrigated with a drip line for several times to insure the manure decomposition. The tomato variety Wejdan (a product from the American company Petocid for greenhouses), has been registered and approved since 1998 in Iraq (National Committee for the Registration of Agricultural Varieties, 2004). Tomato seeds were planted in the nursery of the Faculty of Agriculture - University of Karbala on 1/9/2020 for producing seedlings. After 30 days of germination, the seedlings plates were transferred and left for two weeks inside the plastic house for adaptation. Then the seedlings were planted in the plastic house with an area of 255 m 2, at 40 cm plant spacing and drip irrigated where the E.C for the irrigation water was 5.4.

The crop service operations continued continuously, which included irrigation, removing branches and occasional growths, hoeing, weeding and wiping plants, trimming the lower leaves and conducting the harvesting process on the site. A month after planting the seedlings, the plants were exported according to the treatments that included 10 treatments: five concentrations of marine lichen extract (0, 50, 100, 150, 200 ml. L-1) and two levels of plant export and no export. The experiment was according to the Randomized Complete Block Design R.C.B.D as a factorial experiment with three replications.

Plants were sprayed with a commercial lichen solution of Sea force supplemented with elements (N: 36%, Mg: 4.8% B: 2.07% and Mo: 0.626%) in three batches, before flowering period and with an interval of two weeks between sprayings (11/20, 12). 4, 12/18).

The data for the studied measurements were taken weekly. Including number of leaves, number of fruit clusters, number of fruits/clusters, weight of fruits, weight of fresh and dry leaves. The percentage of total soluble solids (TSS) of the ripe red fruits was also measured using a Hand Refract meter. The percentage of vitamin C (mg.100gm-1) in 10 ripe fruits for each experimental unit was estimated in fruit juice using 2.6- dichloro phenol indlophenol dye (Mengel and Kirkby, 2001)

Table 1

Soil texture	Clay	200g/Kg	Loam
	Sand	300g/Kg	
	Silt	500g/Kg	
Available N		40.0 mg/Kg	
Available P		35.0 mg/Kg	
Available K		113.0 mg/Kg	
E.C:ds.m^{-1}		2.7	
pH		7.1	

RESULTS AND DISCUSSION

The results showed that the process of hilling the plants led to a significant increase in most cases in all the studied characteristics (number of leaves, fresh and dry weight, number of flower clusters, number of fruits per plant, total plant yield, fruit content of TSS and vitamin C) compare to no hilling plants (Table2). On the other hand, it was found that the use of seaweed extract, especially at high concentrations (150 and 200 ml/L-1) led to a significant increase in the values of all indicators under study compared to the values obtained from plants treated with lower concentrations or treated with distilled water.

The results also indicate that the interaction of spraying with seaweed and hilling the plants led to the highest values for all indicators under study, with significant differences from the values obtained from plants without hilling and treated with the same concentrations of the extract, or compared to plants treated with lower concentrations of seaweed extract or treated with distilled water.

The noticeable increase in the number of leaves of plants treated with seaweed extract is often attributed to the important role played by spraying with seaweed solution and the process of hilling plants in stimulating vegetative growth and increasing the number of leaves in the plant, which is positively reflected on the growth of the plant and its activity in flowering and knotting and increasing production. Also the effect of seaweed solution on increasing leaf size and growth and consequently leaf dry weight. In general, the increase in

the moisture content in the tissues of the paper results in an increase in the efficiency of the absorption process. This leads to the leaves retaining a higher percentage of water, which will help reduce thirst for later days for a longer period (Rasheed et al., 2017).

The increase in the number of flower clusters per plant is also due to the effect of seaweed extract on plant growth in general, which has positively affected the vital activities of the plant and increased food processing and increased growth, which has a direct impact on the number of fruit clusters and the positive effect in increase production (Suge et al., 2011).

Table2. Effect of spraying SW extract at different concentrations and plant hilling on growth indicators, yield, and nutrient content of tomato fruits cultivar Wijdan

SW extract con. ml.L^{-1}	Plant hilling	No. of leaf.Plant-1	Leaf FW	Leaf DW	The number of flower clusters	No. of fruits.Plant^{-1}	Yield (Kg.plant^{-1})	TSS (%)	Vit. C Mg.100g FW^{-1}
0	No-hilling	22.03	6.91	2.83	5.74	30.46	1.235	4.630	11.80
	Hilling	30.81	10.76	3.32	7.41	32.50	1.750	6.930	22.30
50	No-hilling	23.16	7.43	2.927	5.98	30.95	1.826	4.870	12.30
	Hilling	31.25	11.05	3.35	7.58	33.18	1.860	7.270	24.80
100	No-hilling	28.59	9.12	3.14	7.19	31.87	1.897	6.150	17.50
	Hilling	31.94	11.97	3.38	7.63	33.59	1.938	7.390	25.40
150	No-hilling	29.43	9.86	3.21	7.24	31.92	1.993	6.260	19.70
	Hilling	32.60	12.82	3.41	7.71	34.23	2.080	7.740	26.10
200	No-hilling	30.11	10.21	3.28	7.36	32.05	2.124	6.810	21.20
	Hilling	33.97	13.18	3.72	7.83	35.12	2.152	7.887	27.60
L.S.D		3.40	1.69	0.27	1.39	2.13	0.737	0.510	1.35

In general, spraying with seaweed extract and plant earthing up led to vigor vegetative growth, which provided a sufficient energy and absorption of nutrients by increasing photosynthesis. This will provide the plant, flower clusters and fruits with nutrients they needed, and thus leading to an increase in the total yield (Suge et al., 2011).

The study also showed that the experimental factors (spraying with SW extract and plant earthing up) had a positive effect on increasing the TSS% and vitamin C rate in tomato fruits (Rady, 2011). (Azeem and Ahmed, 2011) indicated that adding nutrients in the form of organic foliar nutrients was effective in improving the qualitative characteristics of tomato fruits. The foliar nutrients suffice the vegetative growth requirements of the tomato plant and thus improve the vegetative growth characteristics of the total yield (Ejaz et al., 2012).

CONCLUSION

The results of the study showed the response of tomato plant cultivar Wijdan to the process of spraying with SW extract and conducting earthing up the plants. The treatments led to better results in terms of vegetative growth and fruitful yield in the plants subjected to the treatments compared to the control treatment. The spraying SW extract and plant earthing up processes were economically feasible in increasing the production of tomato yield, especially when they were used interactively.

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