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EFFECT OF ARTICHOKE PROPAGATION PARTS AND SOAKING IN HOT WATER AND FUNGICIDES ON HEALTHY SURVIVAL PLANTS, VEGETATIVE GROWTH AND FLOWER HEADS YIELD AND QUALITY

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ABSTRACT

Sclerotium rolfsii Saccardo, Rhizoctonia Solani, Diplodia sp. and Fusarium solani were isolated from naturally infected artichoke plants (Propagation parts). All isolated fungi were tested for their pathogenic effect. S. rolfsii gave the highest degree of infection (80%) followed by R. solani (50%), Diplodia sp. (40%) and F. solani (10%).

Two field experiments were conducted at the Faculty of Agriculture, Moshtohor, Zagazig University during 1990/1991 and 1991/1992 seasons to elucidate the effect of soaking the artichoke propagation parts (old crown or off-shoots) in fungicides (Rovral-50, Benlate-50 or Trpsin-M70) or hot water (at 45, 50 or 55°C) for 5, 10 and 15 minutes. The combination of 3 temperature treatments X 3 soaking periods in addition to 3 fungicide treatments beside the control one resulted in 13 treatments. Survival of healthy plants, physical characteristics of inflorescence and yield of flower heads were studied. Propagation parts and interaction between parts and treatments had no statistically significant effect for most of the vegetative growth characteristics. Hot water at 50°C for 15 min. was the most effective treatment that significantly increased most of the vegetative growth characters expressed as number of leaves, fresh weight and dry matter %. It also significantly increased all yield and physical characteristics of the flower head. The interaction effect between the off-shoot and hot water at 50°C for 15 min. showed the highest increments in flower heads yield and yield components.

Thus, for producing healthy artichoke plants with good standing and high yield of good quality, the use of off-shoots for propagation and soaking them in hot water (50°C for 15 min.) or in Benlate-50 fungicide may be recommended.

INTRODUCTION

Globe artichoke (Cynara scolymus, L.) is one of the winter vegetable crops grown in Egypt. Many attempts have been made to increase the cultivated area to face the increasing demand either for local

consumption or exportation. Globe artichoke is vegetatively propagated by means of either old crown pieces or off-shoots. The major problem of artichoke is the poor plant stand in field, i.e. the percentage of survival plants does not exceed more than 50-60% (Agwah et al., 1990).

The death of propagation parts is mainly due to the decaying and rotting of such parts caused by pathogens present either in the soil or in the vegetative parts such as Sclerotium rolfsii, sclerotinia sclerotiorum and Rhizoctonia solani which attack the roots of artichoke (Jones, 1925; Burger, 1927; Heald, 1932; Donald, 1946 and Ma-Rrasl, 1964). Therefore, for improving the percentage of survival plants and consequently the productivity and quality of this crop, many trials were previously carried out on artichoke to improve the survival through selecting the suitable propagation parts of either off-shoots or old crown pieces (Attia and Baha El-Din, 1958, Moustafa, 1969 and Agwah et al., 1990). The disinfection of the propagation parts of artichoke or seeds of other vegetable crops from the fungal spores and mycelia has been investigated by Ma-Rrasl (1964) on artichoke, Abdel-Aziz et al. (1979) on sunflower treatment with fungicides.

Others used hot water (Baker and Cummings, 1943 and Sherwood, 1970) and heating on agar medium (Pullman et al., 1981).

The present study was conducted to specify the pathogens causing root-rot of artichoke as well as the effect of soaking the propagation parts of artichoke in hot water and some fungicides on percentage of healthy survival plants, vegetative growth, flower head and yield parameters.

MATERIALS AND METHODS

1- Isolation of causal organisms:

Rotted propagation parts of artichoke plants were taken from the Farm of Faculty of Agriculture, Moshtohor, and used for isolation tests. Infested propagation parts were first washed thoroughly with tap water to remove the adjacent soil particles then sterilized with 2% sodium hypochloride solution for two minutes for surface sterilization. The sterilized pieces were rinsed several times with sterilized distilled water and dried between sterilized filter paper then cutted into small pieces and directly placed on PDA medium in Petri-dishes. The petri-dishes were inoculated at 70°C for five days. Isolated fungi were purified and identified according to Barnett and Hunter (1972) and Ainsworth (1974).

2- Pathogenicity tests:

Pathogenicity tests were designed in 30 cm pots at the Farm of Fac. of Agric., Moshtohor, Zagazig Univ.

They were sterilized by immersing them in 5% formalin solution for 15 minutes and then left to dry till the formalin evaporation. Soil used for potting was sterilized with formalin solution (1 litre/cubic foot of soil). They were then left for 2 weeks for formalin evaporation. Soil inoculation was carried out with the isolated fungi grown on barley medium (200 g barley + 200 cc of water) which was kept at room temperature (25-28°C) for two weeks. The soil infested with the different isolated fungi was watered and mixed thoroughly for one week to ensure even distribution of the inoculated fungi. Control pots were treated with the same amount of autoclaved barley. Oldcrown of artichoke plant was divided into 3-4 pieces, each containing at least one bud. They were washed thoroughly with water, immersed in sodium hybochlorite 2% (5% chlorine) for two minutes and then washed in several changes of sterilized water. Each pot was planted with two seed pieces. Five replicates were used for each treatment.

As the fungi attack seed pieces and prevent their germination, inhibition of germination was taken as a criterion of pathogenicity. Artichoke plants attain their full germination within three months, thus the pots were examined periodically for three months to study the pathogenicity of inoculated fungi.

3- Field experiments:

This study was carried out at the Experimental Farm of the Faculty of Agric. Moshtohor, Zagazig University, during two successive growing seasons of 1990/1991 and 1991/1992 to investigate the effect of treating the propagation parts (old crown or off-shoots) of artichoke plants with either hot water or some fungicides on percentage of healthy survival plants and vegetative growth as well as yield and physical characteristics of flower heads. This experiment included 26 treatments resulting from the combination of the propagation parts (old crown which was divided into 2-3 pieces each contains a piece of stem and 2-3 buds and the off-shoots which was trimmed before treating with the thirteen disinfection treatments for the propagation parts which were carried out before planting by soaking the parts in one of hot water or fungicides treatments.

Soaking treatments were as follows:-

- 1- Without disinfection (control).
- 2- Soaking in hot water for 5, 10 or 15 min. at degree of temperature 45, 50 or 55°C.
- 3- Soaking in fungicides (Rovral-50, Benlate-50 or Topsin-M70) for 20 minutes at concentration of 2 g/L.

The treated old crown pieces and off-shoots of artichoke cv. Herious were planted at 70 cm apart on one side of ridges 3.5 m long and 1m wide. Planting date was August 15th and 21th in 1990 and 1991 respectively. A split plot design with four replicates was adopted where the propagation parts were situated in the main plots and the disinfection treatments were randomly distributed in the sub-plots. Each experimental sub-plot consists of 3 ridges with an area of 10.5 m² (1/400 of faddan). All other agricultural practices required for artichoke plants were carried out as commonly followed in the district.

Data recorded:

- 1- Percentage of healthy survival plants was calculated by dividing of the number of emerged plants on that planted at each plot at 40-45 days after planting and then multiplied by 100.
- 2- Vegetative growth measurements were recorded 120 days after planting. Three plants were taken randomly as a representative sample from each plot and the vegetative growth parameters, i.e. plant height, number of leaves per plant and the fresh weight of the third, fourth and fifth leaves and their dry matter percentage were recorded.
- 3- Flower head yield and its quality:

All the mature and tender flower heads through the harvesting season (starting from 15th of December till the end of April) were picked with 10 cm flower stalk, counted and weighted for calculating number and weight of flower heads per plant and per faddan. Moreover, in a representative sample of 20 heads, at mid of the harvesting season, taken from each plot, flower head length and diameter, as well as diameter, thickness, fresh weight and dry matter percentage of the edible part (receptacle) were recorded.

All obtained data were subjected to statistical analysis according to Gomez and Gomez (1983).

RESULTS AND DISCUSSION

- 1- Isolation and identification of the causal organisms
Isolation tests from naturally infected plants on PDA and water agar yielded Sclerotium rolfsii

Saccardo, Rhizoctonia solani, Diplodia sp. and Fusarium solani.

II- Pathogenicity tests:

Data in Table (1) indicate that the different isolated fungi were varied greatly in their pathogenicity as indicated by their effect on germination of the plants. The highest degree of infection was recorded by Sclerotium rolfsii since it decreased germination by 30% over the control. Rhizoctonia solani caused a reduction of 50%, while Diplodia sp. reduced germination by 40%. Fusarium solani exhibited the lowest degree of infection (10%). The tested fungi were reisolated from the inoculated plants.

These data indicate clearly that the main pathogens for root rot of artichoke plants are Sclerotium rolfsii and Rhizoctonia solani. Such obtained results are in agreement with those reported by Ma-Rrsal (1964) and Abdallah (1967).

Table (1): Pathogenicity test of the isolated fungi on pieces of artichoke 60 days after inoculation.

Treatments	Infection %
<u>Diplodia</u> sp.	40.0
<u>Rhizoctonia solani</u>	50.0
<u>Fusarium solani</u>	10.0
<u>Sclerotium rolfsii</u>	80.0
Control (sterilized soil)	0.0

L.S.D. at 5%	3.2

Field Experiments:

(a) Survival plants:

Data in Tables (2 & 3) show that percentage of survival plants was significantly increased by using off-shoots in propagation in the second season 1991/1992 only. These results are in agreement with those of Attia and Baha El-Din (1958) and Beshr and Moustafa (1981), who found that the rate of plant survival after transplanting was increased considerably by using off-shoots method of propagation. The improvement of the survived number of plants by off-shoots method could be attributed to the increased rooting of planting materials which enhanced the establishment of transplants in the field. Moreover, it is evident also that treating seed pieces with hot water or fungicides showed an increase in the percentage of survival

Table (2): Effect of seed pieces treatment with hot water or some fungicides on survival plants and vegetative growth characters of artichoke (season 1990/1991).

Propagation parts	Treatments							Fungicides		Mean					
	Cont-rol	5/45	5/50	5/55	10/45	10/50	10/55	15/45	15/50		15/55	Rot-ral	Ben-late	Top-sin	
a) % survival plants															
Crown pieces	40.0	50.0	56.1	58.2	62.3	66.5	72.6	80.3	90.3	86.6	87.7	89.6	85.5	71.2	
Off-shoots	45.0	53.3	59.6	61.7	68.6	74.3	83.2	92.5	88.6	87.3	87.3	90.4	86.2	73.4	
Mean	42.5	51.7	57.9	59.9	62.8	67.6	73.5	81.8	91.4	87.6	87.5	90.0	85.9	-	
L.S.D.	0.05	Treatments (T) = 3.1											Propagation (P) = n.s.		T x P = 4.4
b) Plant height (cm)															
Crown pieces	93.4	105.0	105.1	109.3	110.5	117.7	127.8	128.8	120.7	112.2	130.5	120.6	114.3	-	
Off-shoots	73.7	91.8	97.8	119.9	104.6	110.6	124.7	123.3	126.4	117.0	81.5	114.2	110.0	107.3	
Mean	83.6	98.4	101.5	112.5	107.0	110.6	121.2	125.5	127.6	118.9	96.9	122.4	115.3	-	
L.S.D.	0.05	T = 14.8, P = 2.1											T x P = n.s.		
c) Number of leaves															
Crown pieces	36.2	43.0	45.7	39.5	43.5	46.7	46.7	48.9	44.6	41.5	47.6	40.3	43.3	-	
Off-shoots	33.2	35.3	42.5	44.6	45.0	46.2	46.9	44.4	46.7	42.0	39.9	42.9	35.6	41.9	
Mean	34.7	36.8	42.8	45.2	42.3	44.9	46.8	45.6	47.8	43.3	40.7	45.3	38.0	-	
L.S.D.	0.05	T = 2.9, P = n.s.											T x P = n.s.		
d) leaves fresh weight (No. 3, 4; 5)															
Crown pieces	145.4	155.5	160.3	185.2	175.3	189.1	200.2	230.2	250.3	221.6	155.8	175.4	170.5	185.8	
Off-shoots	139.1	151.3	159.4	168.5	171.6	189.0	193.7	220.6	245.3	215.2	145.0	168.0	159.6	178.9	
Mean	142.3	153.4	159.9	176.9	173.5	189.1	197.0	225.4	247.8	218.4	150.4	171.7	165.1	-	
L.S.D.	0.05	T = 25.0, P = n.s.											T x P = 21.0		
e) Dry matter of leaves (%)															
Crown pieces	14.6	14.8	15.2	15.6	16.0	16.1	16.4	15.9	18.5	17.6	15.0	16.8	15.8	16.0	
Off-shoots	15.5	15.0	15.3	15.6	14.9	15.7	15.9	16.0	17.4	15.4	14.4	15.5	15.1	15.4	
Mean	14.6	14.9	15.3	15.6	15.5	15.9	16.2	16.0	18.0	16.5	14.7	16.2	15.5	-	
L.S.D.	0.05	T = 1.5, P = n.s.											T x P = n.s.		

Table (3): Effect of seed pieces treatment with hot water or some fungicides on survival plants and vegetative growth characters of artichoke (season 1991/1992).

Propagation parts	Cont-rol	Treatments						Fungicides		Mean				
		5/45	5/50	5/55	10/45	10/50	10/55	15/45	15/50		15/55	Kov-ral	Bon-late	Top-sfn
a) % survival plants														
Crown pieces	41.2	52.1	57.0	59.0	62.9	67.5	73.8	80.5	91.5	85.3	86.5	88.4	84.1	71.5
Off-shoots	50.1	54.0	59.1	63.2	64.4	69.5	75.1	82.0	91.8	88.0	84.0	89.5	85.0	73.5
Mean	45.7	53.1	58.1	61.1	61.7	68.5	74.5	81.3	91.7	86.7	85.3	89.0	84.6	-
L.S.D.	0.05	Treatments (T) = 2.6									F = 1.5		T x P = 1.7	
b) Plant height (cm)														
Crown pieces	97.0	103.4	106.2	106.3	110.1	112.0	115.0	118.9	126.1	121.0	115.2	128.3	124.1	114.1
Off-shoots	79.0	90.1	95.2	121.0	107.6	113.6	123.4	125.0	128.0	118.1	85.0	117.0	112.0	108.8
Mean	88.0	96.8	100.7	113.7	108.9	112.8	119.2	122.0	127.1	119.6	100.1	122.7	118.0	-
L.S.D.	0.05	T = n.s.									P = 2.6		T x P = n.s.	
c) Number of leaves														
Crown pieces	37.0	39.1	42.0	44.6	40.4	44.6	47.5	48.5	49.8	45.5	42.4	46.5	40.2	43.7
Off-shoots	34.2	36.1	41.0	45.0	46.0	47.0	47.8	45.0	47.0	41.0	38.0	41.2	36.0	41.9
Mean	35.6	37.6	41.5	44.8	43.2	45.8	47.7	46.8	48.4	43.3	40.2	43.9	38.1	-
L.S.D.	0.05	T = 2.1									P = n.s.		T x P = n.s.	
d) Leaves fresh weight (No. 3, 4; 5)														
Crown pieces	149.0	158.1	163.1	187.5	178.3	192.4	210.5	235.0	260.0	228.2	161.6	177.0	169.0	190.0
Off-shoots	140.0	153.0	160.1	170.5	173.1	174.3	176.0	230.2	258.3	220.7	146.8	172.9	153.7	170.2
Mean	144.5	155.6	161.6	179.0	174.4	183.4	193.3	232.6	259.5	224.5	154.2	175.0	161.4	-
L.S.D.	0.05	T = 23.0									P = n.s.		T x P = 18.0	
e) Dry matter of leaves (x)														
Crown pieces	14.1	14.3	14.6	14.9	15.3	15.5	16.7	15.8	18.9	16.5	16.3	17.2	16.1	15.9
Off-shoots	13.8	15.3	15.7	15.9	14.4	14.6	14.9	15.9	16.9	14.6	15.3	16.8	15.4	15.3
Mean	14.0	14.8	15.2	15.4	14.9	15.1	15.8	15.9	17.9	15.6	15.8	17.0	15.8	-
L.S.D.	0.05	T = 1.1									P = n.s.		T x P = n.s.	

plants compared with control. Treating with hot water at 50°C for 15 min. followed by 55°C for 15 min. exhibited the highest percentage of survival plants in both seasons, whereas, hot water treatment at 45°C for 5 min. exhibited the lowest percentage of healthy survival plants. This may be due to the effect of temperature on the resting spores or sclerotia of pathogens in seed pieces. These results are in agreement with those found by Miller and Stoddard (1956), Nelson and Wilhelm (1958), Sherwood (1970) and Pullman *et al.* (1981).

Agrios (1988) mentioned that, treatment of bulbs and nursery stock with hot water frees them from nematodes that may be present within them. He added also that the temperature of the hot water used and the duration of the treatment varies with the different host-pathogen combinations.

As for the effect of fungicides, Benlate-50 exhibited the highest percentage of survival plants followed by Rovral-50 in the two seasons. These results are in agreement with Abygunawardena and Wood (1957), Abdallah (1967) and Radwan *et al.* (1985).

I- Plant vegetative growth:

Data presented in Tables (2 & 3) showed that using old crown pieces in artichoke propagation increased the vegetative growth characteristics of artichoke plant as compared with the off-shoots propagation part. The increment of the vegetative growth of plants produced from the old crown pieces than those of the off-shoots may be due to the nutrient reserve that supplies the small sprouts with its needs from accumulated nutrients and consequently, enhancement of plant height and other growth characters. These results are coincided with those obtained by Attia and Baha El-Din (1958), Moustafa (1969), and Agwah *et al.* (1990) as regards the suitability of the propagation part of either off-shoots or the pieces of the old crown. Moreover, it is obvious from the same data in Tables (2 & 3) that soaking the propagation parts in hot water at 50°C for 15 min. treatment followed by that of Benlate-50 as a fungicide treatment significantly promoted the number of leaves per plant, fresh weight and dry matter percentage of leaves. However, increments in this respect failed to reach the level of significance in case of plant height. The promotive effect of hot water may be due to that the prolonged period (15 min.) of heating at 50°C disinfected the propagation part from most of the fungi and may increase the sensitivity of fungal propagules to antagonistic microflora and consequently promotion of

plant vegetative growth. These results are in agreement with those reported by Baker and Cummings (1943); Sherwood (1970) and Pullman et al. (1981).

The marked improvement in most of the vegetative characteristics, and the enhancement of plant growth caused by Benlate-50 fungicide may be due to the disinfection criterion of this systemic fungicide (Ma-Rrasl, 1964 on artichokes, Abdel-Azim et al., 1979 on sunflower).

AS regards the interactional effect, it is clear from data shown in Tables (2 & 3) that using, for the propagation, crown pieces when treated with hot water at 50°C for 15 min. or by the treatment of Benelate-50, as a fungicide, significantly increased leaves fresh weight. Meanwhile, such increment was not statistically significant in case of plant height, number of leaves per plant and dry matter percentage.

II- Physical characteristics of flower heads:

Data presented in Tables (4 & 5) show clearly that hot water treatment at 50°C for 15 min. showed the highest significant increment in all physical characteristics of the flower heads as well as the edible part (receptacle) expressed as flower head length and diameter as well as receptacle diameter, thickness, fresh weight and dry matter percentage. However, no significant response could be noticed with respect to the effect of either the propagation parts or the interactional effect between the propagation parts and the treatments on the flower heads and receptacle (edible part). Meanwhile, the only exception herein was the significant increase of the receptacle thickness as a result of crown pieces as a propagation part as compared with the off-shoots part as well as the receptacle diameter, as a result of the interactional effect between the two studied factors. In this concern, the highest diameter of the edible part was obtained by the hot water treatment of 5/55, 10/45, 10/55 and 15/50 min./°C within the crown pieces as compared with the control or other treatments.

III- Flower heads total yield and its components:

Data illustrated in Tables (6 & 7) show that using the off-shoots as propagation part, exerted the highest significant promotion to the number of heads per plant, average flower head and yield per faddan. These increments were true during both seasons of growth. Such results are in agreement with those obtained by Agwah et al. (1990) working on artichoke.

Concerning the effect of the hot water and fungicides on flower head yield parameters, it was revealed

Table (5): Effect of seed pieces treatment with hot water for some fungicides on physical characteristics of inflorescence (flower head) of artichoke (season 1991/1992).

Propagation parts	Cont-rol	Hot water (min/°C)					Fungicides						
		5/45	5/50	5/55	10/45	10/50	10/55	15/45	15/50	15/55	Ben-late	Top-sin	Mean
Treatments													
a) Flower head (length in cm)													
Crown pieces	11.3	10.1	10.6	11.9	10.3	10.3	11.6	11.2	12.9	11.3	10.1	12.2	12.0
Off-shoots	10.6	10.8	12.1	12.0	10.3	10.6	12.2	10.6	12.8	10.5	11.7	12.6	10.1
Mean	11.0	10.5	11.4	12.0	10.3	10.5	11.9	10.9	12.9	10.9	10.9	12.4	11.1
L.S.D. 0.05	Treatments (T) = 1.0 Propagation (P) = n.s.												
b) Flower head (diameter in cm)													
Crown pieces	6.4	6.4	7.2	8.1	7.3	7.6	8.1	7.6	8.5	8.1	7.2	7.9	6.3
Off-shoots	6.2	6.6	6.9	7.9	7.0	7.3	8.2	7.8	8.2	8.1	7.3	8.1	7.3
Mean	6.3	6.5	7.1	8.0	7.2	7.5	8.2	7.7	8.4	8.1	7.3	8.0	6.8
L.S.D. 0.05	T = 0.4 P = n.s.												
c) Receptacle (diameter in cm)													
Crown pieces	4.6	5.6	5.7	5.8	4.8	5.9	6.7	5.3	6.5	5.6	5.9	6.3	6.3
Off-shoots	4.8	5.7	5.8	6.0	5.8	5.9	5.2	5.3	6.5	5.2	5.2	5.9	4.3
Mean	4.7	5.7	5.8	5.9	5.3	5.9	5.2	5.3	6.5	5.4	5.6	6.1	5.3
L.S.D. 0.05	T = 0.5 P = n.s.												
d) Receptacle (thickness in cm)													
Crown pieces	1.9	2.4	2.4	2.5	2.5	2.7	2.8	2.8	3.2	2.8	2.6	3.1	2.9
Off-shoots	1.8	2.3	2.3	2.5	2.5	2.7	2.8	2.6	2.9	2.5	2.7	2.9	2.5
Mean	1.9	2.4	2.4	2.5	2.5	2.7	2.8	2.7	3.1	2.7	2.7	3.0	2.7
L.S.D. 0.05	T = 0.1 P = 0.1												
e) Receptacle (fresh weight in g)													
Crown pieces	53.2	56.0	57.0	57.3	54.0	55.0	56.3	58.2	68.3	62.7	63.7	65.3	59.6
Off-shoots	53.2	50.0	55.3	56.6	54.3	57.2	58.8	59.0	66.2	61.3	61.7	64.8	60.3
Mean	53.2	53.0	56.2	57.0	54.2	57.1	57.6	58.6	67.3	62.0	62.7	65.1	60.0
L.S.D. 0.05	T = 0.1 P = n.s.												
f) Receptacle dry matter (%)													
Crown pieces	14.6	15.9	15.8	16.3	16.7	17.1	17.5	16.3	18.0	17.2	17.0	18.1	16.5
Off-shoots	15.4	15.6	15.7	16.6	15.3	16.7	17.9	16.8	18.2	17.5	16.6	18.1	16.6
Mean	15.0	15.8	15.8	16.5	16.0	17.0	17.7	17.6	18.1	17.4	16.8	18.1	16.6
L.S.D. 0.05	T = 1.1 P = n.s.												

Table (6): Effect of seed pieces treatment with hot water and fungicides on flower head, total yield and its components (season, 1990/1991).

Propagation parts	Treatments					Fungicides		Mean						
	Cont-rol	Hot water (min./°C)	10/45	10/50	10/55	15/45	15/50		15/55	Rot-ral	Ben-late	Top-sin		
Crown pieces	11.0	11.4	11.8	12.3	12.7	12.9	13.0	13.1	14.8	14.0	13.1	14.7	12.1	12.8
Off-shoots	12.0	12.2	12.6	13.6	12.9	13.2	13.6	14.3	15.2	12.9	13.1	14.9	12.9	13.3
Mean	11.5	11.8	12.2	13.0	12.8	13.1	13.3	13.7	15.0	13.5	13.1	14.8	12.5	
L.S.D. 0.05	Treatments (T) = n.s. Propagation (P) = 0.02 T x P = 1.3													
Crown pieces	125.0	140.3	140.0	139.2	143.1	147.3	145.4	165.0	141.0	135.0	155.0	149.0	142.7	
Off-shoots	119.0	125.4	136.6	137.3	137.7	140.0	145.0	140.2	158.0	139.1	125.0	144.0	136.2	
Mean	122.0	127.8	138.5	138.7	138.5	141.6	146.2	142.8	161.5	140.1	130.1	149.5	136.2	
L.S.D. 0.05	T = 6.7 P = 1.7 T x P = 4.7													
Crown pieces	1.38	1.48	1.66	1.72	1.77	1.85	1.92	1.90	2.45	1.97	1.71	2.28	1.81	1.84
Off-shoots	1.43	1.53	1.72	1.86	1.78	1.85	1.97	2.01	2.40	1.84	1.64	2.19	1.63	1.84
Mean	1.40	1.51	1.69	1.79	1.77	1.85	1.94	1.96	2.42	1.91	1.71	2.24	1.72	
L.S.D. 0.05	T = n.s. P = n.s. T x P = 0.20													
Crown pieces	3.15	4.23	5.31	5.70	6.27	6.96	7.88	8.70	11.74	9.76	8.91	11.74	8.87	7.69
Off-shoots	3.75	4.73	5.71	6.60	6.49	7.19	8.34	9.63	12.62	9.26	8.26	11.28	8.00	7.84
Mean	3.45	4.48	5.51	6.15	6.38	7.08	8.11	9.17	12.60	9.51	8.58	11.51	8.44	
L.S.D. 0.05	T = 0.53 P = 0.13 T x P = 0.75													

Table (7): Effect of seed pieces treatment with hot water and fungicides on flower head, total yield and its components (season, 1991/1992).

Propagation parts	Treatments						Fungicides		Mean					
	rol	5/45	5/50	10/45	10/50	15/45	15/50	15/55		Rov- late	Ben- Top- sin			
a) Number of heads/plant														
Crown pieces	10.4	11.3	11.8	12.0	13.2	13.6	13.9	13.3	16.9	14.6	12.9	15.8	14.0	13.4
Off-shoots	9.5	12.4	13.1	11.0	12.0	11.5	11.9	12.9	15.6	14.0	11.1	15.3	13.9	12.6
Mean	10.0	11.8	12.5	11.5	12.6	12.6	12.9	13.1	16.3	14.3	12.0	15.6	14.0	-
L.S.D. 0.05	Treatments (T) = n.s.										Propagation (P) = 0.02		T x P = 1.2	
b) Flower head weight (g)														
Crown pieces	129.0	128.2	138.0	142.0	141.1	144.0	150.0	160.4	170.6	155.2	153.0	169.0	150.0	148.4
Off-shoots	123.0	126.3	128.6	130.3	138.3	144.6	152.7	148.9	163.2	148.0	155.0	160.3	149.2	143.7
Mean	126.0	127.3	133.3	136.3	139.7	144.3	151.4	154.7	166.9	151.6	154.0	164.7	149.6	-
L.S.D. 0.05	T = 7.9										P = 2.0		T x P = 5.3	
c) Yield/plant (kg)														
Crown pieces	1.34	1.45	1.63	1.71	1.86	1.96	2.09	2.13	2.88	2.27	1.97	2.67	2.10	1.99
Off-shoots	1.17	1.57	1.69	1.43	1.66	1.66	1.82	1.92	2.55	2.07	1.72	2.45	2.07	1.81
Mean	1.26	1.50	2.04	1.57	1.76	1.82	1.95	2.03	2.72	2.17	1.85	2.57	2.09	-
L.S.D. 0.05	T = n.s.										P = n.s.		T x P = 0.233	
d) Yield/faddan (Ton)														
Crown pieces	3.34	4.83	5.78	5.24	6.07	6.65	7.89	9.00	13.39	10.42	8.26	12.62	10.19	7.98
Off-shoots	3.22	4.31	5.40	5.86	6.60	7.61	8.82	9.75	15.16	11.14	9.70	13.43	10.08	8.54
Mean	3.28	4.57	5.59	5.55	6.34	7.13	8.35	9.38	14.27	10.78	8.98	13.02	10.14	-
L.S.D. 0.05	T = 0.29										P = 0.23		T x P = 0.41	

from the same data in Tables (6 & 7) that the treatments of soaking the propagation parts in hot water for a period of 15 min. at 50°C exerted a significant increment in flower head weight and total yield. This treatment is followed by that of the Benlate-50 one as a fungicide. This was true during both seasons of growth. It is worthy to mention herein that the increment in number of heads per plant and the flower head weight/plant failed to reach the level of significance. The significant increment in the average weight of the flower head and total yield per faddan may owe much to the highest vegetative growth of the artichoke plant that will synthesize much metabolites which takes part in increasing the aforementioned characteristics. These results were reported by many investigators from the pathological view (Miller and Stoddard, 1956; Nelson and Wilhelm, 1958; Sherwood, 1970 and Pullman *et al.*, 1981), since, hot water or temperature treatments were lethal to the mycelia spores and the moist sclerotia as well as the resting structures of the fungi on the propagation part or on the agar media and in turn, producing healthy plant foliage. Regarding the interactional effect between the propagation part and the hot water and fungicidal treatment, it was revealed from the data illustrated in Tables (6 & 7) that the most effective treatment that significantly increased the flower heads yield parameters expressed as number of flower heads per plant, flower head weight, yield per plant as well as total flower heads yield per faddan was the use of off-shoots as a propagation part within hot water treatment at 50°C for 15 min.

Generally, under such conditions of this experiment, it could be concluded that for producing healthy plants with good standing in the field as well as high yields, using off-shoots as propagation parts of artichoke and then treated with hot water at 50°C for 15 min. should be recommended.

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تأثير الجوهر المستخدم في تكاثر الفطريات والتغلب في بعض الليبيات الفطرية والماء الساخن على النباتات السليمة النبتية والنمو الخضري ومحصول وجودة الكيزان الزهرية

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تم عزل الفطريات سكليروتسيوم رولفساي والرايزوكتونيا سولاني والسلبوليا والفيوزاريوم سولاني من الاجزاء التكاثرية لنباتات الخضروات المصابة طبيعياً ، وقد اختبرت الفطريات المعزولة بالنسبة لتأثيرها المرض لهذه الاجزاء ، وقد وجد ان الفطر سكليروتسيوم رولفساي اكثرها احداثاً للاصابة (80%) يليه الفطر رايزوكتونيا سولاني (50%) والفطر بيلوبيا (40%) ثم الفطر فيوزاريوم سولاني (10%).

وقد اجريت تجربتان حقليتان بكلية الزراعة بشنهر - جامعة الزقازيق خلال المواسم الانتزاعية لعامي 1990/1991 ، 1991/1992 للدراسة تأثير كل من اجزاء التكاثر (اجزاء من الساق او من الفسائل) وتتمها في بعض البيئات الفطرية (روفرال-50 ، بيليتند-50 ، اوتوسين-70) وساخن بدرجات 15 ، 20 ، 25 ، 30 ، 35 ، 40 ، 45 ، 50 ، 55 م لمدة 10 ، 15 ، 20 دقيقة لكل درجة حرارة بالإضافة للكنترول كوتا بنلك ثلاثة عشر معاملة حرارية وبيئات فطرية وذلك على النمو الخضري للنبات ونسبة النباتات النبتية والصفات الطبيعية للنورة وكذلك الصفات المحصولية وقد اظهرت النتائج ان اجزاء التكاثر وكذلك التفاعل لم يؤثر احكامياً على معظم الصفات الخضرية الا ان المعاملة الحرارية او الفطرية اظهرت ان تسخين الماء لدرجة حرارة 50 م لمدة 15 دقيقة كان له اكبر الاثر في زيادة معظم الصفات الخضرية معنياً معبراً عنه بعدد الاوراق والوزن الغض الاوراق ونسبة المادة الجافة كما اتت ايضا الى زيادة كل من الصفات الطبيعية للجذر الاقتصام والمحصول ومكوناته وكان لتأثير التفاعل بين الفسائل كجذر تكاثرى والماء الساخن لدرجة 50 م لمدة 15 دقيقة تأثير ايجابي في زيادة محصول الرؤس الزهرية ومكوناته ومعها تحت ظروف هذه التجربة فانه يمكن ان نخلس الى امكانية انتاج نباتات قوية خالية من الامايات الفطرية وتتأثر بمحصول هالى وذلك باستخدام الفسائل في الزراعة مع تطهيرها بما سخن عند درجة 50 م لمدة 15 دقيقة او استخدام المبيد الفطري بيليتند-50 او اوتوسين-70 على الترتيب