J. Plant Production, Mansoura Univ., Vol. 8(11): 1253 - 1259, 2017

Response of Some Sunflower Varieties to Foliar Chitoker under Siwa Oasis Conditions

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ABSTRACT

The field experiment was carried out during two successive summer seasons of 2014 and 2015 at the agricultural experimental station of Khamisa, Desert Research Center Siwa Oasis, to study the response of three sunflower varieties, i.e. Hysun333, Sakha 53 and Giza 102 to foliar application by natural compounds chitoker. Seven natural compound treatments which used were , 1- without natural compound (as control), 2-spraying by 150 ml./100 liters in the vegetative growth stage, 3- spraying by 150 ml./100 liters in the vegetative and syphilis growth stages. 4- Spraying by 200 ml./100 liters in the vegetative growth stage, 5- spraying by 200 ml./100 liters in the vegetative. 6- Spraying by 250 ml./100 liters twice in the vegetative growth stage, and, 7- spraying by 250 ml./100 liters twice in the vegetative and syphilis growth stages.The obtained results could be summarized as follows:Sunflower verities were differed significantly in yield and its components, oil contents and oil yield. Giza 102 variety was superior to Hay Sun 333 and Sakha 53 varieties.A significant difference between the parameters of the natural compounds as chitoker, where the spraying twice by chitoker at 250 ml./100 liters of during the vegetable and flowering stages had a significant increase as compared to the rest of the treatments. All studied traits were significantly affected by the interaction between varieties and spraying by different chitoker treatments. An general, sprayed Giza 102 variety twice by the natural Chitoker at 250 ml. / 100 L. rate during vegetative and pre- flowering stages produced the highest yield, yield components and oil yield.The results of the calculation of the economic yield of the crop showed that the cultivation of the sunflower crop in Giza 102 + spraying with the natural compound Chitoker rate of 250 ml./100 liters of water in two stages are spraying in the stage of vegetable growth and spray in pre-growth flowering Is the best experimental economic transaction for the farmer, With some other factors being given an economic rate but to a lesser degree. This study concluded that the cultivation of Giza 102 sunflower variety + spraying twice with the natural compound Chitoker rate of 250 ml./100 liters of water in two stages of vegetable and pre-growth of the Zahra under the conditions of Siwa Oasis gave the best results economically.

INTRODUCTION

Siwa Oasis, as one of Egypt's isolated settlements, is located between the Qattara depression and the Egyptian Sand Sea in the Libyan Desert, nearly 50 km (30 mi) east of the Libyan border, and 300 km south west of Marsa Matroh. Siwa is popular for its palm and olive trees, producing values of detas and olives and play on local styles.

Sunflower *(Helianthus annuus)* is a member of the *Asteraceae* plant family. Sunflower seeds and the oils content of the are used in food preparations; sunflower oil is used in salads and as frying oil (not to be confused with sunflower oil used for therapeutic purposes). Sunflower seeds are a good source of nutrition and are high in vitamin D, vitamin B, niacin, and protein; sunflower seeds can be roasted. Sunflower oil, production in the world is 11.31 million tons in 2015, is the fourth more consumed oil in the world, surpassed only by soybean oil, palm oil and canola oil. Also, sunflower is considered one of the major sources of edible vegetable oil in Egypt. The average of vegetable oil consumption in Egypt at 2014 / 2015 was about 1.98 million tons of which amounts only one tenth was locally produced. Moreover, oil crops were grown only at about 1.83 % of the total cropped area, which was 13.92 million fedan (fedan=0.42 ha.). It is difficult to increase the area under oil crops on the old lands of the Delta and the valley because of the crop rotation stability and the high competition from other crops. Therefore, efforts should be undertaken to utilize the newly reclaimed lands for increasing the areas planted with oil crops Abd El- Wahab *et al.,* (2005), Salem, et. al. (2011).and Bahaa, (2015). Chitoker compound is a natural substance extracted from crustaceans (peel shrimp, crab, lobster) and extracted Alchetin treats Alchetin either chemically or vital to the production of alchitosan (chitoker) and called the process (Al Di Astellashen). Chitoker is one derivatives alchitosan Olageumr research has proved that he has a certain effect on the Plant Cell Where: 1- activates the natural genes of the cell becoming more and more speed work and Booze accelerate vegetative growth rate. 2- When the treatment of syphilis total chitoker running at speed cast hold and prevent hair loss and given a full-grown fruit. 3- Chitoker raises natural resistance and activates the immune system of the plant, which protect it from pathogens and raise productivity. As a result of these unique properties, which is characterized by repeated chitoker field trials it has shown a 25% increase in the productivity of crops with chitoker treatment from those untreated.

Biopolymer “Chitosan” has received much interest for potential wide application in agriculture due to its excellent biocompatibility, biodegradability and bioactivity. This naturally occurring molecule with interesting physiological potential has been getting more attention in recent years. Chitosan enhanced the efficacy of plants to reduce the deleterious effect of unfavourable conditions as well as on plant growth. Chitosan affects various physiological responses like plant immunity, defense mechanisms involving various enzymes such as, phenylalanine ammonium lyase, polyphenol oxidase, tyrosine ammonia lyase and antioxidant enzymes viz., activities superoxide dismutase, catalase and peroxide against adverse conditions. Recent studies have shown that chitosan induces mechanisms in plants against various biotic (fungi, bacteria, and insects) and abiotic (salinity, drought, heavy metal and cold) stresses and helps in formation of barriers that enhances plant's productivity. This paper takes a closer look at the physiological responses of chitosan molecule.

Therefore the present investigation was aimed to study the productivity of some sunflower varieties as affected by foliar chitoker on yield and its components as well as oil content and oil yield under Siwa Oasis conditions.

MATERIALS AND METHODS

A field experiment was carried out during the two summer growing seasons of average of 2014 and 2015 at the experimental station of Desert Research Center at Siwa Oasis, south west Matroh Governorate, Egypt, to study the response of three sunflower varieties i.e. , Hy-sun 333 (V1), sakha 53(V2).and Giza 102(V3) to seven natural compound treatments: 1- without natural compound (as control),2-Spraying by 150 ml./100 liters once in the vegetative growth stage,3-Spraying by 150 ml./100 liters twice in the vegetative and syphilis growth stages. 4- Spraying by 200 ml. /100 liters once in the vegetative growth stage, 5- Spraying by 200 ml. /100 liters twice in the vegetative and syphilis growth stages. 6- Spraying by 250 ml./100 liters once in the vegetative growth stage, 7- Spraying by 250 ml./100 liters twice in the vegetative and syphilis growth stage.

A split plot design with five replicates was used. The main plots were devoted to the above natural compound treatments:

The sub plots were devoted to the above sunflower varieties:

Each experimental unit contained 5 ridges (1.2 m. width and 6 m length). Before sowing all plots received 250 kg calcium super phosphate / fed. (15.5% P_2O_5) mixed with the surface layer. In addition, 200 kg ammonium sulphate / fed. (20.5% N) and 200 kg potassium sulphate / fed. (48% K_2O) were applied at two doses after two and three weeks from sowing date.

Mechanical and chemical analyses of the experimental soil are shown in Tables (1 and 2).

Table 1. Mechanical properties of the experimental soil at Khamisa research station.

Depth (cm)	Particle size distribution (%)				Soil texture
	Coarse sand	Fine sand	Silt	Clay	
0-30	46.8	28.2	15.4	9.6	Sandy loam
30-60	50.0	25.9	18.0	6.1	Sandy loam

Table 2. Chemical properties of the experimental soil at Khamisa research station.

Depth (cm)	pH	Ec (dS/m)	O.M %	Saturation soluble extract							
				Soluble anions (meq / L)				Soluble cations (meq / L)			
				Co^-_3	HCO^-_3	SO^-_4	Cl^-	Ca^{++}	Mg^{++}	Na^+	K^+
0-30	7.4	12.32	0.7	-	2.8	26.8	70.4	30.7	17.24	49.6	1.31
30-60	7.8	13.04	0.5	-	3.0	20.5	76.5	26.2	15.8	57.3	0.7

The soil analysis was carried out according to Black and Editor (1965) and Jackson (1967).

Regular irrigation was carried out in the whole experiment for one week from sowing. Analysis of irrigation water is given in Table (3). The meteorological data of Khamisa location was shows in Table (4).

Table 3. Chemical analysis of the irrigation water at Khamisa research station.

pH	EC (dS/m)	Soluble anions (meg/l)				Soluble cations (meg/l)			
		Ca^-_3	Hco^-_3	So^-_4	Cl^-	Ca^{++}	Mg^{++}	Na^+	K^+
7.3	4.01	-	10.3	8.74	20.5	8.69	9.08	21.5	0.48

Table 4. meteorological data of temperature (^oC), relative humidity (%), and Relative Humidity (%) of Khamisa location

Months	Average temperature. (^OC)		Average rain full (mm)		Average relative humidity (%)	
	2014	2015	2014	2015	2014	2015
March	27.35	28.14	-	-	75.66	77.33
April	32.84	34.51	-	-	77.25	78.18
May	34.78	36.25	-	-	81.42	83.44
Jun	37.57	39.40	-	-	83.29	84.06
July	41.32	43.55	-	-	85.41	87.63
March	27.35	28.14	-	-	75.66	77.33

Growth and yield of the two inner ridges were determined for each crop and a sample of five plants were taken at harvesting date at random from each crop to estimate the following characters: plant height (cm), head diameter (cm), number of seeds/ head, head seed weight (g) and seed oil content (%) which estimated by using soxhlet apparatus according to the method A.O.A.C. (1975). Seed yield /fed.(heads of the three inner ridges of each sub- plot were harvested and left until fully air- dried by sunshine) and Stover yield/ fed were weighted.

Oil yield (Kg/fed) was determined by multiplying seed yield (Kg/fed) by seed oil percentage. All the obtained data were subjected to statistical analysis, as well as the average of the two growing seasons. The mean values were compared according to the procedures of analysis of variance (ANOVA) by using LSD at the level of 5% of significance according to Snedecor and Cochran (1980). All statistical analysis was performed using analysis of variance technique by means of "IRRISTAT" computer software package.

Economic Assessment:

A comprehensive economic assessment of the experiment (for both inputs and outputs of the experiment) is performed.

RESULTS AND DISCUSSION

I: - Yield and yield components, oil ratio and oil yield.

1-Effect of sunflower varieties;

Data in Tables(5,6 and 7) showed that the Hysun 333, Sakha 53 and Giza 102 sunflower varieties were differed significantly in yield, yield components, oil(%) and oil yield, except had diameter in the two seasons. Hysun333 variety produced the highest value of plant height and No. of seeds/ head in the two seasons. Whereas, Giza 102 and Sakha 53 sunflower varieties gave the lower values in the above two yield

components (Table 5). Concerning the other yield components in Table(6),i.e. head seed weight, 100- seed weight, seed yield and stover yield, Hysun333, in the two seasons, and Giza 102 sunflower variety, in the 1st. season only, had a significant increase in seed yield/ fed. These results may be due to the highest values of No. of seeds/ head, head seed weight and 100- seed weight in Hysun 333 variety. In this respect, the differences in the productivity between sunflower varieties were reported by Abou- Khadrah *et al*. (2000) ; Ibrahim *et al*. (2003); Afifi *et al*.(2004); Ahmed and Hassanien (2006), Rafiq, and Nusrat, (2009), Ahmed *et al*.(2010), Salem, et. al. (2011),Saad, (2014) and Bahaa, (2015). Regarding oil percentage and oil yield/ fed.,data in Table (7) showed that Hysun 333 and Giza 102 sunflower varieties gave a significant increase in the 1st. season. These results was true for Hysun 333 variety in the 2nd. Season. These differences in oil yield plevelsercentage and oil yield were reported by many authors Ahmed and Hassanien (2006) and Ahmed *et al*.(2010).

Table 5. Effect of foliar application chitoker on some sunflower varieties yield and yield components in 2014 and 2015 seasons.

Plant height (cm.)

Varieties /Trait	1 st. season 2014 V1	V2	V3	Mean	2 nd. season 2015 V1	V2	V3	Mean
Cont.	144.70	140.98	143.11	142.93	142.20	141.55	141.26	141.67
Chet.1	151.53	144.77	152.18	149.49	154.54	145.66	143.54	147.91
Chet.2	154.90	148.45	156.14	153.16	158.11	147.25	145.15	150.17
Chet.3	156.41	149.00	157.18	154.19	159.88	150.01	147.58	152.49
Chet.4	158.06	150.11	160.10	156.09	161.02	153.79	151.85	155.22
Chet.5	160.13	152.28	161.19	157.86	164.55	156.69	154.95	158.73
Chet.6	162.30	154.88	163.02	160.06	165.89	160.12	157.57	161.19
Mean	155.47	148.63	156.13		158.02	150.72	148.84	
L.S.D. 5%	V. = 0.724 Cheto. = 0.821 **Interaction** V. x cheto. = 0.0288				V. = 0.768 Cheto. = 0.889 **Interaction** V. x cheto. = 0.0364			

Head diameter (cm.)

Varieties /Trait	1 st season 2014 V1	V2	V3	Mean	2 nd season 2015 V1	V2	V3	Mean
Cont.	17.26	16.82	17.24	17.10	18.02	17.12	16.98	17.37
Chet.1	17.82	17.21	18.00	17.67	18.23	17.45	17.11	17.59
Chet.2	18.83	17.38	19.28	18.49	18.58	17.75	17.34	17.89
Chet.3	19.80	18.22	20.28	19.43	18.78	17.89	17.54	18.07
Chet.4	20.43	18.67	20.73	19.94	18.91	18.23	17.87	18.33
Chet.5	20.86	19.08	21.31	20.41	19.06	18.45	18.21	18.57
Chet.6	22.13	19.85	21.71	21.23	19.35	18.34	18.39	18.69
Mean	19.59	18.17	19.79		18.70	17.89	17.63	
L.S.D. 5%	V. = 2.014Cheto. = 3.421 **Interaction** V. x cheto. = 4.286				V. = 2.112Cheto. =3.398 **Interaction** V. x cheto. = 4.346			

No. of seed / head

Varieties /Trait	1 st season 2014 V1	V2	V3	Mean	2 nd season 2015 V1	V2	V3	Mean
Cont.	803.33	765.41	786.20	784.98	785.12	772.65	766.57	774.73
Chet.1	814.16	772.15	796.54	794.28	8.12.87	798.14	770.56	793.80
Chet.2	827.86	775.84	811.48	805.06	819.75	809.98	798.72	809.43
Chet.3	839.96	780.97	828.24	816.39	826.76	829.42	809.80	821.96
Chet.4	850.60	789.19	839.53	826.44	834.91	831.50	822.11	829.50
Chet.5	864.43	802.66	852.19	839.76	846.70	837.83	831.44	838.63
Chet.6	882.00	819.77	872.27	858.01	859.44	842.31	840.9	847.53
Mean	840.33	786.54	826.63		826.47	817.40	805.58	
L.S.D. 5%	V. = 7.624Cheto. = 8.012 **Interaction** V. x cheto. = 13.878				V. = 8.057Cheto. = 8.978 **Interaction** V. x cheto. = 12.487			

Head seed weight (g.)

Varieties /Trait	1 st season 2014 V1	V2	V3	Mean	2 nd season 2015 V1	V2	V3	Mean
Cont.	47.18	44.88	47.16	46.40	46.58	45.02	44.56	45.38
Chet.1	48.72	46.46	48.82	48.00	46.98	45.89	45.67	46.18
Chet.2	50.38	48.22	50.12	49.57	47.23	46.56	46.57	46.78
Chet.3	52.63	50.10	52.88	51.87	47.56	47.07	47.15	47.26
Chet.4	54.69	53.73	54.17	54.19	49.66	47.88	48.16	48.56
Chet.5	57.23	55.82	57.00	56.68	53.17	51.56	49.45	51.39
Chet.6	59.17	57.14	59.88	58.72	56.66	53.45	50.66	53.59
Mean	52.85	50.90	52.86		49.69	48.20	47.31	
L.S.D. 5%	V. = 1.924 Cheto. = 2.018 **Interaction** V. x cheto. = 0.867				V. = 2.018 Cheto. = 2.149 **Interaction** V. x cheto. = 0.967			

Table 6. Effect of foliar application chitoker on some sunflower varieties yield and yield components in 2014 and 2015 seasons.

100 – Seed weight (g.)

Varieties /Trait	1 st season 2014				2 nd season 2015			
	V1	**V2**	**V3**	**Mean**	**V1**	**V2**	**V3**	**Mean**
Cont.	5.55	5.18	5.48	5.40	5.67	5.42	5.32	5.47
Chet.1	5.64	5.28	5.54	5.48	5.77	5.68	5.48	5.64
Chet.2	5.75	5.42	5.63	5.60	5.99	5.89	5.76	5.88
Chet.3	5.91	5.60	5.78	5.76	6.22	6.02	5.98	6.07
Chet.4	6.03	5.79	5.90	5.90	6.39	6.34	6.04	6.25
Chet.5	6.18	5.92	6.08	6.06	6.84	6.44	6.24	6.50
Chet.6	6.32	6.08	6.22	6.20	6.99	6.57	6.39	6.65
Mean	5.91	5.61	5.81		6.26	6.05	5.88	
L.S.D. 5%		V. = 0.022 Cheto. = 0.041 **Interaction** V. x cheto. = 0.0211				V. = 0.035 Cheto. = 0.054 **Interaction** V. x cheto. = 0.0357		

Seed yield (Kg / fed.)

Varieties /Trait	1 st season 2014				2 nd season 2015			
	V1	V2	V3	Mean	V1	V2	V3	Mean
Cont.	912.13	850.41	900.61	887.71	922.31	895.45	888.25	902.00
Chet.1	920.33	860.85	911.45	897.54	938.54	904.25	897.15	913.31
Chet.2	933.46	866.54	923.87	907.95	950.54	912.55	906.29	923.12
Chet.3	945.16	873.37	940.13	919.55	966.80	916.36	919.22	934.12
Chet.4	960.03	887.09	958.65	935.25	975.21	928.55	931.22	944.99
Chet.5	975.56	908.64	970.59	951.59	988.66	939.45	942.89	957.00
Chet.6	994.66	933.46	985.28	971.13	995.12	950.68	946.23	964.01
Mean	948.78	882.85	941.45		962.45	921.04	918.75	
L.S.D. 5%		V. = 12.884 Cheto. = 13.121 **Interaction** V. x cheto.= 15.898				V. = 14.221 Cheto. = 14.964 **Interaction** V. x cheto. = 15.873		

Stover yield)Kg /fed(.

Varieties /Trait	1 st season 2014				2 nd season 2015			
	V1	V2	V3	Mean	V1	V2	V3	Mean
Cont.	1580.71	1465.4	1565.2	1537.1	1543.79	1535.62	1520.41	1533.27
Chet.1	1601.46	1489.0	1580.0	1556.8	1588.14	1564.35	1551.37	1567.95
Chet.2	1634.75	1535.6	1600.0	1590.1	1634.84	1598.48	1589.67	1607.66
Chet.3	1661.00	1562.8	1628.0	1617.2	1684.69	1634.86	1634.81	1651.45
Chet.4	1687.51	1589.9	1658.1	1645.1	1734.69	1679.69	1656.90	1690.42
Chet.5	1719.55	1619.3	1698.2	1679.0	1769.87	1711.34	1689.89	1723.70
Chet.6	1743.36	1655.2	1712.8	1703.7	1800.04	1756.24	1711.25	1755.84
Mean	1661.19	1559.6	1634.6		1679.43	1640.08	1622.04	
L.S.D. 5%		V.= 14.018 Cheto.= 13.883 **Interaction** V. x cheto. = 14.66					V. = 14.257 Cheto. = 14.624 **Interaction** V. x cheto. = 15.587	

2-Effect the differential of the natural compound:

Data in Table (5, 6 and 7) show that yield and some yield attributes of sunflower plants were significantly affected by different levels of natural compounds chitoker as foliar application during the growth stages, except head diameter in the 2nd. season. Agradualn increase in all yield, yield components, oil (%) and oil yield with increasing the natural compound levels from without to 250 ml. during vegetative or vegetative and syphilis growth stages in the two seasons. Moreover, spraying by natural compounds twice at any level increased yields the most yield components, oil percentage and oil yield as compared with spraying once at any growth stages. These results may be due to increasing carbohydrates and protein contents leading to a clear equilibrium of C/N proportion of carbohydrates and then oil (%) and oil yield. In this respect, Guo and Guo(2011) found that application of G- typed bio-fertilizer (GBF, which contain a large amounts of bacteria) could reduce the need for chemical fertilizers and improve yield. It could increase the organic content at soil, alleviate hard pan in soil profiles, the disease resistance and drought resistance. Deepmala.et. al. (2015).Ho found that the polymer Chitosan affects the different plants that enhance the effectiveness of plants to reduce the adverse impact of adverse conditions and also increases the growth strength of the plant and thus lead to increased productivity. Recent studies have shown that chitosan stimulates the mechanisms within plants against various biochemical and non-biological conditions such as salinity, dehydration, heavy metals, coldness and thermal stresses. Chitosan works to relieve various stresses and to help form barriers to increase plant productivity Treatment with Chitosan. Rafiq, and Nusrat, (2009). Akbari, et. al. (2011), Salem, et. al. (2011), Sabreen and Mansour, (2015).

3- Effect of the interactions between sunflower varieties and natural compound:

Results in Tables (5, 6 and 7) pointed out that all studied traits were significantly affected by the interaction between sunflower varieties and spraying by

the different levels of chitoker. In general, sprayed twice by the highest level of chitoker(250 ml./ 100L.) at vegetative and pre-flowering growth stages gave the higher values of the most yield, yield components, oil percentage and oil yield of Hysun 333 and to some extant, Giza 102 sunflower varieties in two seasons. On the other hand, Sakha 53 variety produced the lowest values of the above mentioned traits at any levels of chitoker. The results obtained are compatible with both, Afifi and Ahmed (2004), Rafiq, and Nusrat, (2009), Ahmed, *et al.(*2010), Akbari, *et al.* (2011), Salem, *et al.* (2011) , Abd El-Gwad and Salem (2013),and Bahaa(2016).

Table 7. Effect of foliar application chitoker on some sunflower varieties oil content and oil yield in 2014 and 2015 seasons.

					Oil %			
Varieties		**1 st season 2014**				**2 nd season 2015**		
/Trait	**V1**	**V2**	**V3**	**Mean**	**V1**	**V2**	**V3**	**Mean**
Cont.	43.19	42.14	43.25	42.86	43.18	42.10	42.18	42.48
Chet.1	43.71	42.85	43.80	43.45	43.69	42.76	42.69	43.04
Chet.2	44.39	43.28	44.33	44.00	44.41	43.56	43.54	43.77
Chet.3	44.82	43.77	44.73	44.44	44.79	44.09	44.18	44.35
Chet.4	45.50	44.38	45.28	45.05	45.30	44.86	44.79	44.98
Chet.5	46.12	44.78	45.83	45.57	46.09	45.62	45.45	45.80
Chet.6	46.92	46.22	46.33	46.45	47.06	46.48	46.27	46.60
Mean	44.95	43.91	44.79		44.93	44.21	44.15	
L.S.D. 5%		V. = 0.396 Cheto. = 0.382 **Interaction** V. x cheto.= 0.288				V. =0.354 Cheto. =0.365 **Interaction** V. x cheto. =0.255		
					Oil yield (Kg /fed.)			
Varieties		1 st season 2014				2 nd season 2015		
/Trait	V1	V2	V3	Mean	V1	V2	V3	Mean
Cont.	394.39	358.35	389.50	380.74	398.25	376.98	374.66	383.16
Chet.1	404.11	368.85	399.19	390.71	410.04	386.65	382.99	393.08
Chet.2	415.29	375.02	409.52	399.94	422.13	397.50	394.59	404.04
Chet.3	424.23	382.24	420.50	408.99	433.02	404.02	406.11	414.28
Chet.4	437.45	393.65	434.05	421.71	441.77	416.54	417.09	425.05
Chet.5	450.62	406.87	444.78	434.09	455.67	428.57	428.54	438.30
Chet.6	467.19	431.41	456.44	451.68	468.30	441.87	437.82	449.22
Mean	27.61	388.05	421.99		432.42	407.44	405.97	
L.S.D. 5%		V. = 12.022 Cheto. = 11.911 **Interaction** V. x cheto. = 7.964				V. = 12.995 Cheto. =12.124 **Interaction** V. x cheto. = 8.888		

II: - The economic assessment of the Experiment:

Data in tables (8 and 9) revealed that the assessment of the experimental inputs and outputs as well as the ratio between outputs and inputs for each treatment introducing investment ratio (IR) under the condition of Siwa Oasis .The data indicated the progressive increment in IR by increasing of foliar chitoker and some sunflower varieties. The application rate of the cultivation of Giza 102, spraying with the natural compound Chitoker at 250 cm^3/100 liters of water in two stages are spraying in the stage of vegetable growth and spray in the pre-growth of flowering led to highest IR for all application rates of the Hay-Sun variety 333 and the treatment of comparison (spraying with tap water), 1.55, 1.45 and 1.27 respectively. Thus, the results show application of the cultivation of Giza 102, spraying with the natural compound Chitoker at 250 cm^3/100 liters of water to get high economical crop return. Furthermore, there are some other treatments could give higher IR than one , i.e., Sakha 53 and Hy-sun 333 verities Spraying at a rate of 200 cm^3/100 liters twice in the vegetative growth stage. The growth stage of syphilis and spraying at a rate of 250 cm^3/100 liters once in the vegetative growth stage.

Table 8. The prices of all agricultural management inputs under the condition of field experiment according to market price.

Economic item	**Management type**	**Unit**	**Price (L.E.)**
	foliar chitoker	Liter/ fed.	250
	N fertilization	Bag (50 kg. / fed.)	100
	Mineral fertilizationP_2O_5	Bag (50 kg. / fed.)	75
	K_2O	Bag (50 kg. / fed.)	250
	Management operation		750
	Irrigation water	M^3	1.90
Input	Seeds	Kg./ fed.	120
	Pesticides and herbicides	Fadden	150
	Agricultural rent	Fadden	2000
Output	Seed yields	Kg. / fed.	350

Table 9. The economic assessment of the Experiment treatments of sunflower verities yields under Siwa Oasis conditions

foliar chitoker	Economic item	sunflower verities V1= Giza 102	V2 = Sakha 53	V3 = Hy-sun 333
Cont.	Input	7296.1	6958.2	6734.0
	Output	5448.2	5012.0	4883.0
	Investment*	0.74	0.72	0.69
Chet.1	Input	7455.2	7014.0	6884.1
	Output	5546.0	5158.1	4972.1
	Investment*	0.73	0.72	0.71
Chet.2	Input	7669.1	7168.0	6973.1
	Output	7601.2	6324.0	6014.1
	Investment*	0.98	0.88	0.86
Chet.3	Input	7732.0	7311.0	7002.0
	Output	7856.1	7211.0	6985.1
	Investment*	1.01	0.98	0.99
Chet.4	Input	7815.0	7411.1	7001.0
	Output	7958.1	7525.0	7110.0
	Investment*	1.03	1.01	1.01
Chet.5	Input	7954.0	7584.1	7210.0
	Output	8110.1	7699.0	7311.1
	Investment*	1.12	1.08	1.05
Chet.6	Input	7964.0	7658.1	7321.0
	Output	8985.1	7966.0	7699.1
	Investment*	1.24	1.14	1.12

***Investment ratio = output / input **National IR = 1.22 LE output / LE input**

CONCLUSION

This study concluded that the cultivation of the sunflower crop under the conditions of Siwa oasis economic cultivation recommended the cultivation of Giza 102, spraying with the natural compound chitoker at 250 cm^3/100 liters of water in two stages are spraying in the stage of vegetable growth and spray in the pre-growth of flowering that was the best compared to the rest of the other transactions of the experiment and the economic return of that transaction was the best.

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استجابة بعض أصناف دوار الشمس للرش بالشيتوكير تحت ظروف واحة سيوة

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نفذت التجربة الحقلية خلال موسمى 2014 و 2015 م. في المحطة التجريبية بخميسة بواحة سيوة والتابعة لمركز البحوث الصحراوية لدراسة استجابة بعض أصناف عباد الشمس للرش بالشيتوكر الورقي على المحصول ومكوناته وكذلك محتوى الزيت ومحصول الزيت. من ثلاثة أصناف عباد الشمس. هاي- صن 333 ، سخا 53. وجيزة 102 تحت سبع مستويات من المركب طبيعي الشيتوكر، معاملة الرش بماء الصنبور (المقارنة) ،. الرش بمعدل 150ملى/100لترماء مرة واحدة فى مرحلة النمو الخضرى. الرش بمعدل 150 ملى/100لترماء على مرتين فى مرحلة النمو الخضرى. ومرحلة النمو الزهرى. الرش بمعدل 200 ملى/100لترماء مرة واحدة فى مرحلة النمو الخضرى. الرش بمعدل 200 ملى/100لترماء على مرتين فى مرحلة النمو الخضرى. ومرحلة النمو الزهرى. الرش بمعدل 250 ملى/100لترماء مرة واحدة فى مرحلة النمو الخضرى. الرش بمعدل 250 ملى/100لترماء على مرتين فى مرحلة النمو الخضرى. ومرحلة النمو الزهرى. وإستخدم تصميم القطع المنشقة مرة واحدة للتجربة حيث توزع تركيزات المركب الطبيعى فى القطع الرئيسية بينما الأصناف فى القطع شقية ، فى ثلاث مكررات. ويمكن تلخيص النتائج فيما يلي ."أظهرت البيانات أن اصناف عباد الشمس هاى صن 333 , سخا 53 و جيزة 102 إختلفت معنويا فى صفات المحصول , والمحصول ومكوناتة , نسبة الزيت و محصول الزيت. وقد تفوق الصنف جيزة 102 بشكل كبير على أصناف سخا 53 و هاى صن 333 على التوالى وذالك فى الموسم الأول, اما فى الموسم الثانى فقد تفوق الصنف جيزة 102 على أصناف هاى صن 333 و سخا 53 على التوالى , وذلك فى جميع صفات الدراسة. أرتفاع النبات , قطر القرص , عدد البذور بالقرص , وزن بذور القرص, وزن ال100 بذرة, محصول البذور,محصول القش, نسبة الزيت و محصول الزيت على التوالى , وكانت نسبة الزيادة فى الصنف جيزة 102 عن الصنف هاى صن فى الموسم الأول , والصنف سخا 53 فى الموسم الثانى فى صفات المحصول ومحصول الزيت. دلت النتائج المتحصل عليها من جداول المحصول والمحصول ومكوناتة وجود إختلافات معنوية بين معاملات المركب الطبيعى الشيتوكير حيث كانت معاملة الرش بمعدل 250 ملى/100لترماء مرتين فى مرحلة النمو الخضرى ومرحلة ما قبل الزهرى كانت معنوية مقارنة عن باقى معاملات المركب الطبيعى الشيتوكير, وذلك فى جميع صفات الدراسة. أوضحت النتائج أن جميع الصفات المدروسة قد تأثرت بشكل كبير بالتفاعل بين الأصناف ومعاملات الرش بالمركب الحيوى الشيتوكير المختلفة. وبصفة عامة تم الحصول على القيم من صفات المحصول والمحصول ومكوناتة ومحصول الزيت من خلال التفاعل بين الصنف جيزة 102 ومعاملة الرش بالمركب الطبيعى الشيتوكير بمعدل 250 ملى/100لترماء على مرحلتين هما الرش فى مرحلة النمو الخضرى والرش فى مرحلة ما قبل النمو الزهرى, بينما كانت أقل القيم من صفات الدراسة من خلال التفاعل بين الصنف هاى صن 333 ومعاملة المقارنة (الرش بماء الصنبور).أظهرت نتائج حساب العائد الاقتصادي للمحصول أن زراعة محصول عباد الشمس في الجيزة 102 + رش بالمركب الطبيعي معدل شيتوكير من 250 ملى/100لترماء من الماء على مرحلتين يرش في مرحلة نمو الخضروات والرش في مرحلة ما قبل النمو الزهرى هو أفضل المعاملات التجريبية إقتصاديا للمزارع, مع وجود بعض المعاملات الأخرى التى تعطى معدل إقتصاديا ولكن بدرجة أقل اقتصاديا للمزارع.

وقد خلصت الدراسة إلى أن زراعة محصول عباد الشمس بالصنف جيزة 102 + الرش بالمركب الطبيعى الشيتوكير بمعدل 250 ملى/100لتر ماء على مرحلتين هما الرش فى مرحلة النمو الخضرى والرش فى مرحلة ما قبل النمو الزهرى وذلك تحت ظروف واحة سيوة أعطت أفضل النتائج إقتصاديا .