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EVALUATION OF SOME PROMISING SUNFLOWER GENOTYPES FOR YIELD, ITS COMPONENTS AND QUALITY

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ABSTRACT

Two field experiments were carried out at Sakha Agric. Res. Station, during two seasons of 2010 and 2011 to investigate the performance of fifteen sunflower genotypes namely some new open pollinated genotypes (120, 125, 230, 235, 240, 245, 350, 355, 460, 465, 770, 775, 880 and two commercial varieties Giza 102 and Sakha 53.

Giza 102 variety gave the lowest values for number of days from planting to 50% budding, flowering and maturity (39.5, 47.75 and 86.00 days, respectively, whereas genotypes 775 gave the highest values (47.88, 56.75 and 93.13 days, respectively).

Results of the combined analysis of the two seasons showed that significant differences were observed among the sunflower genotypes in all characters of yield and its components, physical properties, germination and seedling vigor. Genotype 245 gave the highest value for plant height (186.25 cm), whereas, Sakha 53 variety gave the highest values for head diameter and stem diameter (18.13 cm and 2.63 cm, respectively). Sakha 53 variety ranked first and achieved the highest estimates for seed yield/plant (45.38 gm), seed yield/fed. (1483.75 kg) and oil yield/fed. (590.51 kg). Physical properties of the fifteen tested sunflower seed genotypes varied from one genotype to the other. Genotype 120 gave the highest values for seed index and relative density (g/cm^3), while genotype 235 and genotype 240 had the highest volume values of 100 seeds (cm^3).

Sakha 53 variety exceeded all other genotypes in seed oil content 39.81% and protein content ranged from 24.30% genotype 350 to 29.59% in genotype 240.

Giza 102 variety gave the highest values of germination percentage and shoot length, while Sakha 53 variety had the highest value of radical length. Dry weight of seedling ranged from 55.1 mg (genotype 770) to 73.8 mg (genotype 235). SDS-PAGE showed changes in the protein banding pattern and hand density to different between 15 genotypes of sunflower under study.

Positive and highly significant correlation coefficient were found between seed yield/fed. and all related traits, stem diameter, head diameter, seed index, seed yield/plant, oil content and oil yield/fed.

Keywords:*Helianthus annuus* L., flowering and maturity stage, germination and seedling vigor, yield components and quality.

INTRODUCTION

Sunflower (*Helianthus annuus* L.) is one of the most important oil crops that could be grown to cover partially the gap between local production and consumption of edible oils. Sunflower is cultivated at approximately 24 million hectares in 40 countries of the world (FAS, 2011).

In Egypt, the cultivated area of sunflower is 833 ha as sold cultivation with productivity 2.4 ton/ha and 2500 ha as intercropped with other field crops and productivity 1.2 ton/ha (FAO, 2010). The local production of edible oils is about 3-5% only of the total requirements. For increasing the total production of edible oil, the area cultivated with oil crops such as sunflower should be increased by expanding in the newly reclaimed soil and planting high potential yield cultivars (Hussain *et al*., 2006).

The present investigation is designed to gain some information on the relative variation in yield and its components between fifteen sunflower genotypes. This study could be furnish a satisfactory basis for selection in sunflower breeding programs to achieve high yield and oil quality of sunflower.

Many investigators obtained higher levels of varietal differences in yield and its components of sunflower in many regions of growing sunflower in the world. Ibrahim *et al*. (2006); Abdel-Motagally and Osman (2010); Ahmed *et al* (2010); Sadak *et al*. (2010) and Aml *et al*. (2011) indicated that sunflower genotypes significantly differed in yield and its components.

Physical properties, oil and protein contents of different genotypes of sunflower seeds were carried out to figure out the natural and quality of sunflower seed samples. Kinman and Earle (1964); Marinkoovic *et al*. (2003) and Aml *et al*. (2011) on germination, seedling vigor and correlation. Many results were obtained by Rondanini *et al*. (2006); Radic *et al*. (2008) and Aml *et al*. (2011).

The success of electrophoretic procedures depends on the wide ranging polymorphism of seed protein. SDS-PAGE of protein is the most commonly used method to discriminate the varieties. The protein banding pattern is unique for the particular genotype and is independent of seed vigor and physiological seed activity (Kamel *et al*., 2003). Denaturing system provides a simple reproducible technique for cultivar identification as reported by Devi (2000) in sunflower and SDS-PAGE of seed protein was successfully used for both identification and differentiation of sunflower cultivars (Jacques *et al*., 1995).

The present study aimed to evaluate the productivity of some new open pollinated sunflower genotypes with two commercial varieties as check varieties, physical properties, oil and protein contents, germination and seedling vigor and electrophoresis of total soluble proteins were evaluated.

MATERIALS AND METHODS

The present investigation was carried out at Sakha Agric. Res. Station, Kafr El-Sheikh, Governorate, Egypt, during the two successive seasons of 2010 and 2011 to evaluate fifteen sunflower genotypes (thirteen open pollinated sunflower genotypes and two commercial varieties Giza 102 and Sakha 53), as shown in Table (1).

The genotypes were planted in randomized complete black design, with four replications. The proceeding crop was the Egyptian clover in both seasons.

Seeds of each sunflower genotype were sown on May 16^{th} and 20^{th} in 2010 and 2011 seasons, respectively. Plot size was 12 m^2 (3 x 4 m) in 6 ridges each 4 meters long and 60 cm apart; 3-4 seeds per hill were placed with 20 cm between hills. One plant per hill was maintained by thinning of 21 days after sowing. The conventional cultural practices of growing sunflower were conducted as recommended at North Delta region.

Number of days from planting to 50% budding, flowering and maturity in each plot were recorded.

Two outside ridges were left to avoid border effects and the four inner ridges were used for the determination of seed yield and its components. The heads of four inner ridges in each plot were bagged at the end of pollination and fertilization to avoid damage that could be caused by birds until maturity.

Table 1: Pedigree of the different genotypes used in this study

No.	Genotype	Pedigree
1	Genotype 120	Mayak x Bulgarian 2*
2	Genotype 125	Mayak x Bulgarian 3*
3	Genotype 230	Giza 1 x Bulgarian 1*
4	Genotype 235	Giza 1 x Bulgarian 2*
5	Genotype 240	Bulgarian 8* x Bulgarian 3*
6	Genotype 245	Bulgarian 4* x Bulgarian 3*
7	Genotype 350	Bulgarian 4* x Bulgarian 2*
8	Genotype 355	Bulgarian 51* x Bulgarian 49*
9	Genotype 460	Bulgarian 51* x Bulgarian 52*
10	Genotype 465	Bulgarian 53* x Bulgarian 52*
11	Genotype 770	Bulgarian 53* x Bulgarian 49*
12	Genotype 775	Bulgarian 54* x Bulgarian 49*
13	Genotype 880	Bulgarian 54* x Bulgarian 52*
14	Giza 102	Giza
15	Sakha 53	Mayak x Bulgarian 1

*** A Bulgarian sunflower genotypes.**

For measuring studied plant traits, ten guarded plants were randomly taken from the four inner ridges of each experimental unit at harvest and the following data were recorded: plant height (cm), head diameter (cm), stem diameter (cm) and seed yield per plant (g).

The heads of four inner ridges of each plot were harvested to determine seed yield per feddan. Oil yield (kg/fed.) was estimated by multiplying seed yield (kg/fed.) by seed oil percentage.

Physical properties, oil and protein content:

1. Seed index (100 seed weight gm).
2. Volume of 100 seed was determined by rapeseed displacement according to the methods of Kulp *et al*. (1985).
3. Relative density was calculated according to Kramer and Twigg (1962) method and using the following equation:

$$\text{Relative density} = \frac{\text{Weight of 100 seed (gm)}}{\text{Volume of 1000 seed (cm}^3\text{)}} = \text{g/cm}^3$$

4. Oil and protein contents were determined according to the method described by A.O.A.C. (1995).

Germination and seedling vigor:

A standard in vitro germination test (I.S.T.A, 1993) was conducted in four replicates of 50 seeds for each seed sample using folded paper towels at 20^{o}C and germination counts for normal seedlings were done after ten days. The length of shoot and radial (cm) of the most 15 vigorous seedling of each replicates was measured, then seedling were oven dried at 105^{o}C to a constant weight.

Seedling vigor:

1. Shoot length (cm)
2. Radical length (cm)
3. Seedling dry weight (g)

   Measured according to the procedures exported in the seed vigor tested handbook (A.O.S.A., 1991).

Electrophoresis of total soluble proteins:

Soluble proteins were extracted from the seeds and SDS-PAGE was conducted according to protocol described by Laemmli (1970). The resulted protein banding patterns were analyzed in comparison to the protein marker using the computer program (Bio-1D).

Data were statistically analyzed for each season and the homogeneity of experimental error, in both seasons, was tested according to Snedecor and Cochran (1982). Then, the combined analysis of the two seasons was done and treatment means were compared by Duncan's multiple range test (Duncan, 1955). Correlation was performed according to Singh and Chaudhary (1977).

RESULTS AND DISCUSSION

Budding, flowering and maturity stages:

Number of days from planting to 50% budding, flowering and physiological maturity of different sunflower genotypes from the combined analysis over two seasons of 2010 and 2011 are presented in Table (2). Analysis of variance revealed significant differences between means of the fifteen sunflower genotypes for all studied traits. Number of days to 50% budding, flowering and maturity are substantially earlier in the sunflower commercial cultivar Giza 102 which gave 39.5, 47.75 and 86.00 days from planting, respectively, followed by Sakha 53 that recorded 42.63, 52.50 and 89.50 days, respectively, whereas budding dates were delayed significantly for genotype 775 (47.88 days) followed by genotype 245 and genotype 463.

Table (2): Number of days from planting to 50% budding, flowering and maturity of fifteen sunflower genotypes (combined analysis over the seasons of 2010 and 2011).

Traits / Genotypes	No. of days to 50% budding	No. of days to 50% flowering	No. of days to 50% maturity
Genotype 120	44.38 f	53.88 ef	92.38 bc
Genotype 125	44.63 ef	53.13 fgh	91.88 bcd
Genotype 230	45.00 def	53.88 ef	91.25 cd
Genotype 235	41.75 gh	52.75 gh	90.75 de
Genotype 240	46.75 abc	53.75 efg	92.13 bcd
Genotype 245	47.00 ab	56.00 ab	94.00 a
Genotype 350	41.25 h	54.25 de	92.75 ab
Genotype 355	45.75 cde	54.00 ef	92.38 bc
Genotype 460	45.88 bcd	55.13 bcd	93.00 ab
Genotype 465	47.00 ab	54.75 cde	91.75 bcd
Genotype 770	46.00 bc	55.75 abc	93.00 ab
Genotype 775	47.88 a	56.25 a	93.13 ab
Genotype 880	46.63 bc	56.38 a	94.00 a
Giza 102	39.50 i	47.75 i	86.00 e
Sakha 53	42.63 g	52.50 h	89.50 e
General mean	44.80	54.01	91.86

The highest number of days from planting to 50% flowering and maturity are recorded by genotype 880 (56.30 and 94.00 days), respectively followed by genotype 245 (56.38 and 94.00 days, respectively). These results are in the (2009) who found that sunflower genotypes differed in budding, flowering and maturity.

Yield and its components:

Mean values of yield and its components for fifteen sunflower genotypes from the combined analysis over two seasons are presented in Table (3). Analysis of variance revealed significant differences between means of the fifteen sunflower genotypes for plant height, head diameter, stem diameter, seed yield per plant and per feddan and oil yield per feddan. Genotype 245 showed the highest mean value for plant height (186.25 cm) followed by genotype 240 (185.00 cm), genotype 465 (183.88 cm) and genotype 770 (182.75 cm). On the other hand, two commercial varieties Sakha 53 and Giza 102 ranked the lowest values (163.13 cm and 163.50 cm), respectively.

Table 3: Mean values of yield and its components for fifteen sunflower genotypes (combined analysis over the seasons of 2010 and 2011).

Traits / Genotypes	Plant height (cm)	Head diameter (cm)	Stem diameter (cm)	Seed yield (g/plant)	Seed yield (kg/fed.)	Oil yield (kg/fed.)
Genotype 120	177.00 def	17.50 ab	2.51 ab	43.63 b	1307.75 b	517.84 b
Genotype 125	175.75 ef	16.53 bcd	2.11 cd	37.88 cd	1138.13 cd	445.00 cd
Genotype 230	174.50 f	16.48 bcd	2.04 de	38.38 cd	1153.13 cd	444.56 cd
Genotype 235	173.38 f	16.35 bcd	2.20 cd	36.13 d	1085.63 d	420.08 d
Genotype 240	185.00 ab	16.65 bcd	2.15 cd	37.88 cd	1140.00 cd	440.28 cd
Genotype 245	186.25 a	16.15 cd	2.24 bcd	40.88 bc	1228.13 bc	474.12 bc
Genotype 350	182.50 abc	16.76 bc	2.15 cd	39.50 cd	1205.00 bc	460.26 cd
Genotype 355	178.00 c-f	16.18 cd	2.15 cd	40.50 bc	1220.63 bc	467.38 c
Genotype 460	180.38 b-e	16.06 cd	2.24 bcd	39.13 cd	1177.50 cd	452.29 cd
Genotype 465	183.88 ab	16.41 bcd	2.18 cd	39.63 cd	1190.63 cd	456.17 cd
Genotype 770	182.75 ab	17.05 abc	2.39 abc	38.25cd	1156.88 cd	456.50 cd
Genotype 775	181.88 abc	15.48 d	2.09 d	38.50 cd	1156.88 cd	444.30 cd
Genotype 880	181.63 a-d	15.83 cd	2.28 bcd	39.63 cd	1192.50 c	458.51 cd
Giza 102	163.50 g	13.11 e	1.75 e	23.25 e	697.50 e	262.22 e
Sakha 53	163.13 g	18.13 a	2.63 a	49.38 a	1483.75 a	590.51 a
General mean	177.97	16.31	2.21	38.83	1169.00	452.667

The highest mean values of head diameter (18.13 cm) and stem diameter (2.63 cm) were found in commercial variety Sakha 53 followed by genotype 120 (17.50 cm and 2.51 cm, respectively, while Giza 102 variety had the lowest values (13.11 and 1.75 cm, respectively).

Data revealed that Sakha 53 variety ranked the first and achieved the highest estimates of seed yield/plant (49.38 g), seed yield/fed. (1483.75 kg) and oil yield/fed. (590.51 kg). Meanwhile, the lowest estimates were obtained by Giza 102 variety (23.25 g/plant), (697.50 kg/fed.) and (262.22 kg/fed), respectively.

The differences between the tested genotypes could mainly be attributed to the differences in their genetical constitution and their response to the environmental conditions.

Head diameter and seed yield/plant are commonly a major determinant of sunflower yield/feddan. Basha (2000), Abou-Ghazala *et al*. (2001), Oad *et al*. (2001), Abou-Khadrah *et al*. (2002), Killi (2004) and Ozer *et al*. (2004) found genotypic differences in seed yield and its components under their study.

The superiority of such genotypes could be due to their adaptation and high values of some yield components, i.e. head diameter, stem diameter and seed yield per plant. The results are in harmony with those obtained by Abdel-Motagally and Osman (2010) who observed that Sakha 53 significantly surpassed Giza 102 in head diameter, 100-seed weight, seed yield/plant and seed yield/ha. The differences between the tested sunflower genotypes could mainly be attributed to the differences in their genetic constitution and their different response to the environmental conditions. Aml *et al*. (2011) and Iraj *et al*. (2011) reported varietal differences in their studies for seed yield and its components.

Physical properties, oil and protein contents:

Mean values of physical properties, oil and protein contents of different sunflower genotypes from the combined analysis over the two seasons of 2010 and 2011 are presented in Table (4). Analysis of variance revealed significant differences between means of the fifteen sunflower genotypes for seed index (100 seed weight, gm), volume of 100 seeds (cm^3), relative density (gm/cm^3), oil and protein contents.

The following genotypes 880, 120 and 265 had the following highest values of seed index; 10.20, 10.06 and 9.79 gm, respectively, followed by genotype 230 and genotype 245 (9.48 and 9.35 gm, respectively). On the other hand, Giza 102 variety had the lowest value of seed index (6.88 gm).

Volume of 100 seed (cm^3) for genotypes 240 and 235 gave highest values (28.38 and 27.63 cm^3, respectively), whereas genotypes 460 and 775 gave the lowest values (18.00 and 18.25 cm^3, respectively).

Table 4:Mean values of physical properties, oil and protein contents for fifteen sunflower genotypes (combined analysis over the seasons of 2010 and 2011).

Traits / Genotypes	Physical properties			Oil %	Protein %
	Seed index 100 seed, gm	Volume of 100 seed (cm^3)	Relative density (g/cm^3)		
Genotype 120	10.06 ab	20.75 cde	0.497 a	39.56 a	26.07 cd
Genotype 125	8.05 fg	18.50 efg	0.431 bcd	38.51 b	25.89 d
Genotype 230	9.48 bcd	25.13 b	0.331 e	38.55 b	25.79 d
Genotype 235	8.37 ef	27.63 a	0.313 e	38.50 b	29.44 a
Genotype 240	9.28 cd	28.38 a	0.339 e	38.59 b	29.86 a
Genotype 245	9.35 cd	23.00 bc	0.418 cd	38.59 b	29.59 a
Genotype 350	7.54 gh	19.25 ef	0.414 d	38.20 bc	24.30 e
Genotype 355	8.50 ef	18.25 fg	0.477 abc	38.26 bc	25.10 de
Genotype 460	8.89 de	18.00 fg	0.511 a	38.39 b	26.00 d
Genotype 465	9.79 abc	22.00 cd	0.465 a-d	38.33 bc	29.64 a
Genotype 770	7.02 h	16.25 g	0.437 bcd	39.46 a	27.08 bc
Genotype 775	7.40 gh	18.25 fg	0.408 d	38.40 b	29.19 a
Genotype 880	10.20 a	21.75 cd	0.489 ab	38.44 b	26.05 d
Giza 102	6.88 h	20.38 def	0.340 e	37.56 c	25.54 d
Sakha 53	9.02 de	22.00 cd	0.420 cd	39.81 a	28.05 b
General mean	8.66	21.30	0.419	38.61	27.17

Highest values of relative density were recorded in genotypes 460, 120 and 880 (0.511, 0.497 and 0.489 g/cm^3, respectively), while genotype 235 gave the lowest value in this respect (0.313 gm/cm^3). These results are in the same trend of those reported by Kinman and Earle (1964) who found the bulk density of sunflower seed ranged from 0.4 to 0.5 gm/ml.

Sakha 53 variety showed the highest mean value of oil content (39.81%), followed by genotypes 120 and 770 (39.56% and 39.46%, respectively). On the other hand, Giza 102 variety ranked the lowest one in oil content (37.56%).

Dealing with protein content of sunflower genotypes, it can be seen that genotypes 240 and 245 contains the highest values 29.86% and 29.59%, respectively followed by genotype 235 (29.44%), while genotype 350 ranked the lowest one in protein (24.30%). Similar results were obtained by Awad and Gharib (2009), who found that sunflower genotypes differed in oil% and protein %, they mentioned that the difference ranged between (37.8-39.9 and 26.7-29.1, respectively.

Germination and seedling vigor:

As shown in Table (5) significant differences between sunflower genotypes in the percentage of germination, genotype 880 and Giza 102 variety had the highest values, followed by genotype 230 (97.25%) and genotype 125 (96.75%), while Sakha 53 and genotype 770 gave the lowest values (87.00% and 80%, respectively). Similar findings were reported by Khalil *et al*. (2003), who found that the greatest increase in germination percent took place after oil content reached its maximum.

Table 5: Germination and seedling vigor for fifteen sunflower genotypes (combined analysis over 2010 and 2011 seasons).

Traits / Genotypes	Germination %	Seedling vigor		
		Shoot length (cm)	Radical length (cm)	Dry weight (mg)
Genotype 120	90.25 def	6.50 f	4.42 g	63.00 ab
Genotype 125	96.75 a-d	9.08 b-e	6.28 f	63.00 ab
Genotype 230	97.25 abc	10.74 ab	9.32 bc	63.00 ab
Genotype 235	95.63 a-g	10.98 ab	10.58 ab	73.8 a
Genotype 240	91.00 c-f	9.85 a-d	6.73 ef	67.00 ab
Genotype 245	91.63 b-f	9.75 bcd	8.43 cd	66.00 ab
Genotype 350	96.25 a-e	10.65 abc	9.93 ab	71.00 a
Genotype 355	95.38 a-e	9.13 b-e	8.25 cd	69.00 a
Genotype 460	90.25 def	7.18 b-e	9.28 bc	64.00 ab
Genotype 465	89.50 ef	7.50 ef	8.13 cde	71.00 a
Genotype 770	80.00 g	8.50 ef	7.65 def	55.1 b
Genotype 775	98.50 ab	8.15 c-f	7.63 def	62.00 ab
Genotype 880	100.0 a	8.35 def	7.63 def	66.00 ab
Giza 102	100.0 a	12.02 a	9.94 ab	73.4 a
Sakha 53	87.00 f	10.88 ab	11.01 a	63.00 ab
General mean	93.30	9.28	8.34	66.00

The results of seedling vigor (shoot length, radical length and seedling dry weight) were significant between genotypes under study. Giza 102 variety had the highest shoot length (12.02 cm), followed by genotype

465 and Sakha 53 variety (10.98 cm and 10.88 cm, respectively). On the other hand, genotype 120 gave the lowest value (6.50 cm). Sakha 53 variety gave the highest value of radical length (11.01 cm), followed by genotype 235 and Giza 102 variety (10.58 cm and 9.94 cm, respectively), while genotype 120 showed the lowest one (4.42 cm) compared to the other genotypes. Data in Table (5) indicated that seedling dry weight of sunflower genotypes ranged from 55.1 mg to 73.8 mg. Genotype 235 had the highest value (73.8 mg), followed by Giza 102 variety (173.4 mg). On the other hand, genotype 770 ranked the lowest value (55.1 mg). In this respect, confirmed results were reported by Rondanini *et al*. (2006) and Aml *et al*. (2011), who found that sunflower genotypes differed in shoot length, radical length and dry weight.

Biochemical analysis by used protein proteins:

SDS-PAGE electrophoresis patterns for water soluble proteins in 15 sunflower genotypes are shown in Figure (1) and Table (6). All markers were scored for presence/absence (+/-) of specific amplified products. A maximum number of 18 bands was detected with molecular weights (WM) ranged from 360 to 30 KDa. Some genotype were characterized by the appearance of a higher number of brands which found that in genotypes 6, 7 and 10 (16 bands), while the lower number of bands were appeared in genotypes 13 and 15 (11 bands).

The variation in number and intensity of the bands might be due to differential extraction or difference in solubility of protein having similar migration rate (Ladizinsky and Hymowitz, 1979). Similar observations based on band intensity were reported by Devi (2000) in sunflower, SDS-PAGE was used by Kumar *et al*. (2001) for establishing the genetic identity of sunflower hybrids and determining percentage genetic purity of F_1 hybrid.

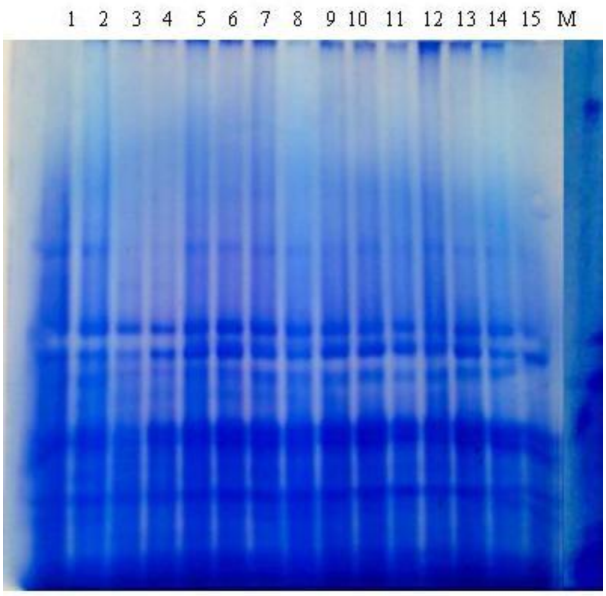

Fig. 1: SDS-PAGE profiles of 15 sunflower genotypes.

Table 6: SDS-PAGE of water-soluble protein extracted from 15 sunflower genotypes.

Band number	MW (KDa)	Genotypes														
		120	125	230	235	240	245	350	355	460	465	770	775	880	Giza 102	Sakha 53
1	360	-	-	-	-	+	+	+	-	-	+	+	-	-	-	-
2	290	-	-	-	-	+	+	+	-	-	+	+	+	-	-	-
3	250	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+
4	240	+	-	+	+	-	-	-	-	-	+	-	-	-	-	-
5	230	-	-	-	-	-	-	-	-	-	+	-	+	-	+	-
6	195	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
7	190	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
8	175	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-
9	140	+	+	+	+	-	+	+	+	+	+	+	+	-	-	-
10	120	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
11	100	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
12	85	-	-	-	+	+	+	+	+	-	-	-	-	-	-	-
13	75	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
14	60	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
15	50	+	+	-	-	+	+	+	+	+	+	+	-	-	+	+
16	40	-	-	+	+	+	+	+	-	-	+	+	+	+	+	+
17	35	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
18	30	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+

Correlation coefficients:

Simple correlation coefficients (r-values) among seed yield and its related traits of 15 sunflower genotypes from combined data are presented in Table (7). Positive and insignificant correlation coefficients was found between plant height and each of stem diameter, head diameter, seed index, seed yield/plant, seed yield/fed. and oil yield/fed. On the other hand, a negative and insignificant correlation coefficient was found between plant height and oil content.

Table 7: Simple correlations coefficients among seed yield and its components of 15 sunflower genotypes

	Plant height (cm)	Stem diameter (cm)	Head diameter (cm)	Seed index	Seed yield/ plant	Seed yield/ fed	Oil content	Oil yield/fed.
Plant height (cm)	-	0.036^{NS}	0.105^{NS}	0.160^{NS}	0.099^{NS}	0.108^{NS}	-0.104^{NS}	0.073^{NS}
Stem diameter (cm)		-	0.510**	0.583**	0.665**	0.659**	0.536**	0.671**
Head diameter (cm)			-	0.576**	0.704**	0.715**	0.472**	0.724**
Seed index				-	0.766**	0.769**	0.435**	0.764**
Seed yield/ plant					-	0.998**	0.553**	0.989**
Seed yield/ fed						-	0.553**	0.991**
Oil content							-	0.640

***, ** and NS: significant at 0.05, 0.01 probability levels and insignificant at 0.05 probability level, respectively**

Positive and highly significant correlation coefficients were found between stem diameter and each of head diameter (r = 0.510), seed index (r = 0.583), seed yield/plant (r = 0.665), seed yield/fed (r = 0.659), oil % (r = 0.536) and oil yield/fed. (r = 0.671).

Head diameter and seed index showed positive and significant correlation coefficients with seed yield/plant (r = 0.704 and 0.766), seed yield/fed. (r = 0.715 and 0.769), oil % (r = 0.472 and 0.435) and oil yield/fed. (r = 0.724 and 0.764, respectively).

Data revealed that seed yield/plant was highly significant and positively correlated with seed yield/fed (r = 0.998), oil content (r = 0.553) and oil yield/fed. (r = 0.989). In addition, seed yield/fed was positively and high significantly correlated with both oil content (r = 0.553) and oil yield/fed. (r = 0.991). Also, a significant and positive correlation coefficient was obtained between oil content and oil yield/fed. (r = 0.640). These results agreed with those obtained by Radic *et al*. (2009). In conclusion, the results of the present performance of fifteen sunflower genotypes varietal differences are important for improving sunflower with high seed yield and seed oil content via recombination in breeding programs.

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تقييم بعض التراكيب الوراثية المبشرة لعباد الشمس بالنسبة للمحصول ومكوناته وجودته

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أقيمت تجربتان حقليتان بمحطة البحوث الزراعية بسخا ـ محافظة كفرالشيخ خلال موسمى الزراعة 2010 ، 2011 ، وقد إشتملت كل تجربة على 15 تركيب وراثى من بعض التراكيب لعباد الشمس المبشرة مفتوحة التلقيح (التركيب الوراثى 120 ، 125 ، 230 ، 235 ، 240 ، 245 ، 350 ، 355 ، 460 ، 465 ، 770 ، 775) والصنفين التجاريين جيزة 102 ، سخا 53 بهدف تقييم إنتاجية المحصول ومكوناته والصفات الطبيعية ومحتوى البذور من الزيت والبروتين و نسبة الانبات وقوة البادرة هذا بالإضافة إلى التفريد الكهربى للبروتين وعلاقات التلازم بين المحصول وبعض الصفات الأخرى وقد أوضحت الدراسة ما يلى:

أظهر الصنف جيزة 102 أقل القيم لعدد الأيام من الزراعة وحتى تكوين 50% من البراعم والازهار والنضج الثمرى (39.5 ، 47.74 ، 86 يوم على التوالى) بينما نتج عن التركيب الوراثى 775 أعلى القيم لهذه الصفات (47.88 ، 56.25 ، 93.13 يوم على التوالى).

لوحظ أن هناك اختلافات معنوية بين التراكيب الوراثية لعباد الشمس لكل الصفات التى درست وقد نتج عن التركيب الوراثى 245 أعلى القيم لطول النبات (186.25 سم) بينما كان الصنف سخا 53 الاعلى فى قيم محصول البذرة/للنبات (45.38 جم) ومحصول البذرة/للفدان (1483.75 كجم) ومحصول الزيت/فدان (590.51 كجم).

بمقارنة الصفات الطبيعية للتراكيب الوراثية لعباد الشمس التى تم دراستها وجد أن التركيب الوراثى 120 أعطى أعلى قيم لوزن 100 بذرة والكثافة النسبية (جم/ سم^3) بينما أظهرت التركيب الوراثى 235 ، 240 أعلى قيم لحجم 100 بذرة (سم^3).

تفوق الصنف سخا 53 فى محتوى البذور من الزيت (39.81%) وتراوحت نسبة البروتين ما بين 24.30% للتركيب الوراثى 350 ، 29.59% للتركيب الوراثى 240.

أعطى الصنف جيزة 102 أعلى القيم لنسبة الانبات وطول الريشة بينما أظهر الصنف سخا 53 أعلى القيم لطول الجذير وقد تراوح الوزن الجاف للبادرة ما بين 55.1 ملجم للتركيب الوراثى 770 الى 73.8 ملجم للتركيب الوراثى 235.

تم استخدام طريقة التفريد الكهربى للبروتين لـ15 تركيب وراثى من عباد الشمس وأظهرت النتائج اختلافات فى عدد وسمك العلامات الجزيئية من الأصناف المختلفة.

توجد علاقة معنوية موجبة بين محصول البذور/فدان وقطر الساق وقطر القرص ووزن 100 بذرة ومحصول البذور/نبات ونسبة الزيت ومحصول الزيت/فدان.

قام بتحكيم البحث

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