

Evaluation of Sun Flowers (*Helianthus ANNUUS L*) Hybrid Grown Under Rainfed Area (East of Haroun Blue Nile State) Sudan

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ABSTRACT

Estimation of the genetic variability among twenty locally generated sun flowers hybrids on yield and its components for two seasons (2003/2004 – 2004-/2005) were studied in East Haroun area Blue Nile State under rain condition. Twenty hybrids were planted mid July. The results in season 2003/2004 highly significant differences observed for tow characters that are days to 50% flowering and days to maturity while non – significant for the eight character are : plant height , stem diameter , head diameter , no of seeds per head ,empty seeds % , 1000 seeds weight , seeds yield per plant and seeds yield per (t /ha),on the other hands in season 2004/2005 highly significant showed for the four characters are number. of seeds per head, 1000 seed weight. Seed yield per plant and seed yield. t /ha While the rest of the six characters showed non – significant (days to 50% flowering, Days to maturity plant height, steam diameter , head diameter and empty seeds %

Keywords: *Sunflower, Hybrid, Sowing and Rainfed.*

1. INTRODUCTION

Sun flower is considered to be an important oil crop due to their rich oil composition and high nutrition quality¹. Crop represents an important source of raw materials required for industrial purposes. Sun flowers is considered to be a drought tolerant crops because its root has multiple branches and extracts water from depths not reached by other crops .In the futures the Sun flower will be grown in more arid areas of the world and this process is predicated to accelerate in the next ten years begin in 2007². The most progressive varieties grown in Sudan are hybrids varieties like hysun 33; Sun bred 28, seedtec 1560, seed tec1226, north rub king, pioneer 6480 and Deka LBG100. Whereas the open pollinated varieties are also grown in Sudan such as Polareo, Rodeo and Hungarian_A. It was found that hybrid varieties are better than open pollinated varieties grown in Sudan³. The question of why tested varieties of sunflowers did not reach their genetic capacity of oil under Sudan environmental conditions was answered by⁴ who attributing to: Percentage minimum tillage, Few crop rotation, Mono – cultural practices, Negligence of fertilizers Low rain fall.

The objective of this study is to evaluate 20 locally generated sun flowers hybrid for yield and yield components (Days to 50% flowering. Days to physiological maturity, plant height, stems diameters, heads diameters , number of seed per head , percentage of empty seeds and 1000 seed weight).

2. MATERIALS AND METHODS

Area of study

The experiment was conducted for two season 2003/2004 and 2004/2005 in East Haroun area Blue Nile

State (12^o:5.740' N. lat and 34^o:13.354'E. long). Under rain fed conditions. Climatic condition during May – October for two seasons 2003/04 and 2004/05 : average temperature in first and second season ranged 22.48 – 34.45 and 23.27 – 34.10 °C, respectively, while relative humidity in both seasons is 78.16%,. Total rainfall in first and second season is 588 and 634 mm, respectively. The genetic material used in this study of 20 single cross (F₁) hybrids of sun flowers (*Helianthus annuus L*). Nineteen of these hybrids (Coded as SHA1. SHA5, SHA6, SHA7, SHA11, SHA14, SHA15, SHA17, SHA18, SHA22, SHA25-1, SHA25-2, SHA29, SHA30, SHA32, SHA35, SHA37, SHA41 and SHA42-M) were derived from crossing of nineteen locally generated restorer lines with one male sterile line (Kh99). These nineteen hybrids plus hysun 33 were obtained from Department of Agronomy, Faculty of Agriculture, University of Khartoum at Shambat. These 20 sun flower hybrids were grown in a randomizing complete block design with six replications. Each block (replicate) was divided into 20 plots , in which the hybrids were assigned a randomly The plot size was 6x3 m. Each accession was presented by four ridges, each six meters long and 70 Cm apart .Three seeds were sown in holes of 20 Cm distance along the ridge and then thin was done into one plant per hole after three weeks from the sowing. Weeding was practiced three times to maintain the field clean. Fertilizer was not applied. The heads were bagged during the seed filling period using paper bags in order to avoid the birds attack. No infestation of the pest or diseases was observed. A sample of 10 plants and their heads were taken randomly from the middle (two ridges) in each plot to collect data.

2.1 Yield and Yield Component

$$SY = (SW/\text{plot} \times 1000)/(\text{PA} \times 1000)$$

Where are: SY = seed yield (t/ha), SW = seed weight (kg)/plot and PA = plot area (m²)

2.2 Phenotypic, Genotypic and Environmental variance

Phenotypic variance (δ^2_{ph}) was calculated according to the following formula:

$$\delta^2_{ph} = \delta^2_g + \delta^2_e.$$

Genotypic variance (δ^2_g) was estimated as follows:

$$\delta^2_g = (M_2 - M_3)/r$$

Where: M₃ is the error mean squares and M₂ and r refer to the mean squares for genotype and number of replications, respectively

Environmental (δ^2_e) variance was calculated as:

$$\delta^2_e = M_3$$

2.3 Genotypic and Phenotypic Coefficient of Variations

Both genotypic (GCV %) and Phenotypic (PCV %) coefficient of variations was calculated according to the formula of ⁵ as follows:

$$\begin{aligned} \text{GCV}\% &= (\delta^2_g / G) \times 100 \\ \text{PVC}\% &= (\delta^2_{ph} / G) \times 100 \end{aligned}$$

Where: G = is the grand mean.

2.4 Heritability Estimate

The heritability (h^2) in broad sense was estimated for each character according to the procedure of ⁶ by

dividing the genotypic variance by the phenotypic one in percentage form.

$$h^2 = (\delta^2_g / \delta^2_{ph}) \times 100$$

2.5 Genetic Advance

Genetic advance (GA) and genetic advance as percentage of overall mean were estimated by the formula of ⁷ as follows

$$\begin{aligned} \text{GA} &= k (\delta^2_g / \delta^2_{ph}) \\ \text{GA}\% &= (\text{GA}/G) \times 100 \end{aligned}$$

Where: G = the grand mean, k = the selection differential, it equals 2.06 at 5% selection intensity as

$\delta^2_g / \delta^2_{ph}$ = are the genotypic and phenotypic variances, respectively.

2.6 Statistical Analysis

The collected data were analyzed according to the standard statistical procedure described by ⁸. Phenotypic and genotypic environmental variances were determined. Genotypic (G c v %) and phenotypic (P c v %) coefficients variation were calculated to the formula ⁵ Heritability (h^2) was estimated for each character according to the procedure of ⁶. Genetic advance and genetic advance percentage of over all means were estimated by formula of ⁶.

3. RESULT AND DISCUSSION

3.1 Yield and Yield Components

Table – 1 show the days to 50% flowering was highly significant in season 2003/2004 and non significant in season 2004/2005, but Table- 2 and 3 indicate the earliest hybrid was SHA14 in the first season and SHA22 in the second season, while the latest hybrid was SHA1 in the first season and SHA25 -1 in the second season.

Table 1: Mean squares from the analysis of variance for 10 characters of 20 sunflower Hybrids evaluated at East Haroun for two seasons.

Character	Season 2003/04		Season 2004/05	
	Genotypes (df = 19)	Error (df = 95)	Genotypes (df = 19)	Error (df = 95)
Days to 5% flowering	8.04**	3.72	2.0ns	3.8
Days to maturity	9.00**	2.15	2.0ns	3.8
Plant height (cm)	216.26ns	198.51	158.7ns	221.5
Stem diameter (cm)	76.86ns	76.25	0.2ns	0.1
Head diameter (cm)	2.60ns	3.31	7.1ns	6.6
No. of seeds/head	27763.11ns	40776.00	273850.8**	64269.7
Empty seeds (%)	5.90ns	5.63	6.9ns	4.3

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1000-seed weight (g)	11.78ns	11.13	65.6**	21.0
Seed yield/plant (g)	74.57ns	104.08	731.2**	158.2
Seed yield (t/ha)	0.41ns	0.43	3.8**	0.8

ns = not significant, * = significant at 0.05, ** = significant at 0.01

The days to physiological maturity showed highly significant in first season while it was no significant in second season, but Table - 2 and 3 indicate the earliest hybrid to mature was SHA35, while the latest hybrid to mature was hysun 33 in first season. The earliest hybrid to

mature was SHA 22, while the latest hybrid was 25 -1 in second season. Plant height showed no significant in both seasons. The shortest height was SHA 17 while the tallest height was SHA 1 in first season. The shortest height was SHA 29 while the tallest height was hysun 33 in second seasons. Table -2 and 3 indicate the stem diameter showed no significant in both season.

Table 2: Means of 10 characters of 20 sunflower hybrids evaluated at East Haroun in season 2003/04 (E9).

Hybrids	Days to 50% Flowering	Days to Maturity	Plant height (cm)	Stem diameter (cm)	Head diameter (cm)	No. of seeds /head	Empty seed (%)	1000-seed wt. (g)	Seed yield /plant	Seed yield (t/ha)
SHA 1	75.8 ^a	91.7 ^{cdefg}	124.2 ^a	1.27 ^a	13.5 ^a	692 ^a	1.16 ^a	34.0 ^a	29.2 ^a	2.10 ^a
SHA5	74.3 ^{abc}	94.3 ^{ab}	111.5 ^a	1.39 ^a	14.4 ^a	746 ^a	1.03 ^a	34.1 ^a	32.8 ^a	2.34 ^a
SHA 6	74.2 ^{abc}	91.0 ^{efg}	106.4 ^a	1.27 ^a	13.9 ^a	695 ^a	1.58 ^a	35.2 ^a	30.6 ^a	2.07 ^a
SHA 7	73.3 ^{abc}	91.7 ^{cdefg}	110.0 ^a	1.30 ^a	13.7 ^a	771 ^a	1.11 ^a	36.4 ^a	34.2 ^a	2.42 ^a
SHA 11	75.5 ^a	91.0 ^{efg}	116.2 ^a	1.42 ^a	13.8 ^a	713 ^a	0.95 ^a	34.8 ^a	30.8 ^a	2.20 ^a
SHA 14	72.7 ^{bc}	92.8 ^{bcde}	109.5 ^a	1.39 ^a	13.8 ^a	679 ^a	1.31 ^a	36.6 ^a	31.4 ^a	2.24 ^a
SHA15	75.3 ^a	92.7 ^{bcdef}	113.9 ^a	1.41 ^a	14.5 ^a	653 ^a	1.02 ^a	34.8 ^a	28.4 ^a	2.02 ^a
SHA 17	74.2 ^{abc}	91.7 ^{cdefg}	105.5 ^a	1.26 ^a	13.3 ^a	685 ^a	1.29 ^a	34.5 ^a	28.3 ^a	2.02 ^a
SHA 18	75.2 ^{ab}	92.8 ^{bcde}	109.1 ^a	1.31 ^a	13.7 ^a	596 ^a	1.74 ^a	36.5 ^a	31.2 ^a	2.23 ^a
SHA 22	74.3 ^{abc}	92.2 ^{cdefg}	118.9 ^a	1.38 ^a	14.9 ^a	774 ^a	0.91 ^a	36.9 ^a	36.1 ^a	2.60 ^a
SHA 25-1	74.2 ^{abc}	91.0 ^{efg}	110.7 ^a	1.34 ^a	14.2 ^a	768 ^a	0.96 ^a	33.8 ^a	34.6 ^a	2.53 ^a
SHA 25-2	74.3 ^{abc}	90.8 ^{fg}	123.7 ^a	1.37 ^a	13.8 ^a	717 ^a	1.08 ^a	38.2 ^a	36.8 ^a	2.66 ^a
SHA 29	72.3 ^c	93.5 ^{abc}	116.8 ^a	1.52 ^a	14.8 ^a	833 ^a	1.19 ^a	35.3 ^a	35.6 ^a	2.54 ^a
SHA 30	72.7 ^{bc}	92.3 ^{cdefg}	123.6 ^a	1.59 ^a	14.8 ^a	766 ^a	1.08 ^a	36.2 ^a	35.7 ^a	2.55 ^a
SHA 32	75.2 ^{ab}	93.3 ^{abcd}	105.8 ^a	1.34 ^a	13.7 ^a	730 ^a	1.88 ^a	35.9 ^a	32.8 ^a	2.21 ^a
SHA 35	75.2 ^{ab}	95.0 ^a	107.9 ^a	1.26 ^a	13.3 ^a	683 ^a	0.95 ^a	35.9 ^a	28.0 ^a	1.99 ^a
SHA 37	73.7 ^{abc}	93.3 ^{abcd}	112.4 ^a	1.37 ^a	12.4 ^a	517 ^a	5.44 ^a	33.0 ^a	22.4 ^a	1.60 ^a
SHA 41	72.0 ^c	91.5 ^{defg}	114.7 ^a	1.37 ^a	14.5 ^a	726 ^a	0.98 ^a	35.7 ^a	34.9 ^a	2.50 ^a
SHA42-m	75.7 ^a	90.7 ^g	113.7 ^a	1.62 ^a	14.7 ^a	724 ^a	1.12 ^a	38.4 ^a	32.3 ^a	2.24 ^a
Hysun 33	73.3 ^{abc}	73.3 ^{abcd}	120.7 ^a	1.56 ^a	14.8 ^a	710 ^a	0.90 ^a	35.0 ^a	31.0 ^a	2.21 ^a
Overall mean	74.2	92.3	113.8	1.39	14.0	709.0	1.33	35.6	31.9	2.26
CV (%)	2.6	1.6	12.4	15.3	13.0	28.5	178.0	9.4	32.0	29.1

* Any means have the same letter(s) are non-significantly different according to Duncan multiple range test at 5% level of significance

Table- 2 shows the smallest stems were SHA 17 and SHA 35 while the largest stem was SHA 42 – M in first season. The smallest stem SHA 41 while the largest stem was SHA 6 in second season. Table - 2 indicates the head diameter showed no significant in both seasons. The smallest head was SHA 37 while the largest head was SHA

22 in first season. Table – 3 shows the smallest head was SHA 18 while the largest head was SHA 6 in first season. Number of seed per head showed non-significant in season (2003/2004) while it was highly significant in second season Table – 2 shows the lowest was SHA 35 while the highest SHA 29 in first season and Table- 3 show the lowest number was SHA25-1, while the highest was SH25- 2 in second season. An Empty seed percentage showed non- significant in both season. Table- 3 indicates the lowest empty seed was hysun 33 in first season, while the highest was SHA 37. The lowest empty was SHA 25 – 2 while the highest was SHA 18 in second season. The 1000 seed weight showed non-

significant in first season 2003/20, while highly significant in second season Table- 2 shows the lowest was SHA 37 and

the highest was SHA 42 – m in first season.

Table 3: Means of 10 characters of 20 sunflower hybrids evaluated at East Haroun in season 2004/05 (E10).

Hybrids	Days to 50% flowering	Days to Maturity	Plant height (cm)	Stem diameter (cm)	Head diameter (cm)	No. of seeds /head	Empty seed (%)	1000-seed wt. (g)	Seed yield /plant	Seed yield (t/ha)
SHA 1	63.7 ^a	93.7 ^a	160.1 ^a	2.51 ^a	21.4 ^a	898 ^c	1.67 ^a	62.1 ^{abcde}	46.6 ^{cde}	3.33 ^{cde}
SHA5	62.7 ^a	92.7 ^a	168.8 ^a	2.95 ^a	23.2 ^a	1264 ^{ab}	1.63 ^a	60.8 ^{abcde}	55.6 ^{bc}	3.97 ^{bc}
SHA 6	63.0 ^a	93.0 ^a	159.4 ^a	3.00 ^a	23.4 ^a	872 ^{cd}	3.47 ^a	60.7 ^{abcde}	55.7 ^{bc}	3.98 ^{bc}
SHA 7	63.3 ^a	93.3 ^a	161.4 ^a	2.87 ^a	22.5 ^a	1341 ^a	1.79 ^a	64.1 ^{abc}	68.1 ^{ab}	4.95 ^{ab}
SHA 11	63.3 ^a	93.3 ^a	165.0 ^a	2.89 ^a	22.4 ^a	894 ^c	1.53 ^a	61.8 ^{abcde}	44.4 ^{cde}	3.17 ^{cde}
SHA 14	63.8 ^a	93.8 ^a	164.8 ^a	2.66 ^a	20.3 ^a	976 ^{bc}	2.47 ^a	61.5 ^{abcde}	43.3 ^{cde}	3.09 ^{cde}
SHA15	62.8 ^a	92.8 ^a	168.8 ^a	2.64 ^a	21.1 ^a	1021 ^{bc}	1.51 ^a	59.3 ^{bcde}	48.1 ^{cde}	3.44 ^{cde}
SHA 17	63.0 ^a	93.0 ^a	170.7 ^a	2.72 ^a	22.1 ^a	733 ^{cd}	3.53 ^a	57.6 ^{def}	40.3 ^{cdef}	2.88 ^{cdef}
SHA 18	63.5 ^a	93.5 ^a	158.7 ^a	2.54 ^a	19.8 ^a	924 ^c	4.01 ^a	61.9 ^{abcde}	47.8 ^{cde}	3.42 ^{cde}
SHA 22	61.8 ^a	91.8 ^a	163.3 ^a	2.67 ^a	23.3 ^a	856 ^{cd}	2.19 ^a	60.3 ^{bcde}	46.9 ^{cde}	3.35 ^{cde}
SHA 25-1	64.3 ^a	94.3 ^a	163.4 ^a	2.40 ^a	20.5 ^a	541 ^d	2.77 ^a	52.8 ^f	25.9 ^f	1.85 ^f
SHA 25-2	63.0 ^a	93.0 ^a	168.8 ^a	2.74 ^a	22.8 ^a	1415 ^a	0.92 ^a	65.5 ^{ab}	75.4 ^a	5.39 ^a
SHA 29	63.5 ^a	93.5 ^a	153.2 ^a	2.44 ^a	20.9 ^a	956 ^{bc}	2.57 ^a	67.0 ^a	52.2 ^{cde}	3.73 ^{cde}
SHA 30	64.0 ^a	94.0 ^a	163.3 ^a	2.69 ^a	21.9 ^a	946 ^{bc}	1.68 ^a	65.1 ^{ab}	48.1 ^{cde}	3.39 ^{cde}
SHA 32	63.0 ^a	93.0 ^a	166.6 ^a	2.81 ^a	22.5 ^a	700 ^{cd}	2.26 ^a	56.3 ^{ef}	36.6 ^{ef}	2.62 ^{ef}
SHA 35	62.7 ^a	92.7 ^a	160.2 ^a	2.71 ^a	21.4 ^a	891 ^c	2.10 ^a	62.1 ^{abcde}	48.8 ^{cde}	3.46 ^{cde}
SHA 37	63.3 ^a	93.3 ^a	165.6 ^a	2.71 ^a	22.0 ^a	759 ^{cd}	5.42 ^a	60.0 ^{bcde}	37.2 ^{def}	2.66 ^{def}
SHA 41	63.5 ^a	93.5 ^a	154.8 ^a	2.38 ^a	20.2 ^a	739 ^{cd}	2.85 ^a	57.9 ^{cdef}	37.5 ^{def}	2.65 ^{def}
SHA42-m	63.5 ^a	93.5 ^a	161.9	2.89 ^a	22.6 ^a	836 ^{cd}	2.18 ^a	63.3 ^{abcd}	41.2 ^{cdef}	2.94 ^{cdef}
Hysun 33	64.2 ^a	94.2 ^a	173.4 ^a	2.88 ^a	20.7 ^a	1027 ^{bc}	3.74 ^a	62.4 ^{abcde}	54.4 ^{bed}	3.89 ^{cd}
Overall mean	63.3	93.3	163.6	2.70	21.8	929.0	2.51	61.1	47.7	3.41
CV (%)	3.1	2.1	9.1	13.8	11.8	27.3	82.5	7.5	26.4	26.3

Table- 3 shows the lowest was SHA 25 – 1 and the highest was 29 in second season. Seed yield per plant showed non-significant in first season, while highly significant in second season. Table- 2 shows the lowest seed yield per plant was SHA 37 while the highest was SHA 25 – 2 in first season and Table- 3 indicates the lowest was SHA 25 – 1 while the highest was SHA 25 – 2 in second seasons. Seed yield (t /ha) showed non-significant in first season while highly significant in second season. Table - 2 indicates the lowest was SHA 37 while the highest SHA 25 – 2 in first season and Table - 3 shows the lowest was SHA 25 – 1 while the highest was SHA 25 -2 in second season.

3.2 Phenotypic and Genotypic and Environmental Variance (Phenotypic δph^2 , genotypic δg^2)

Table - 4 indicates the value of Phenotypic (δph^2), genotypic (δg^2) and environmental (δe^2) variances were greater for all characters in second season than in first season

except days to 50% flowering and empty seed which had greater value in first season.

3.3 Phenotypic and Genotypic Coefficients of Variation (PCV% and GCV %)

Table – 4 indicates all the characters got greater coefficients in season 2003/2004 than season 2004/2005. The differences between PCV% and GCV% were high foremost studied characters at both season expect the days to maturity in first season, the lowest PCV% was 1.96 recorded for days to maturity in first season, while the highest PCV% estimate was 78.68 scored empty seed. However in second season the lowest PCV% was 8.73, recorded for 1000-seed weight, while the highest PCV% was 86.64, recorded for empty seeds %.

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Table 4: The phenotypic (δ^2_{ph}), genotypic (δ^2_g) and environmental (δ^2_e) variances for 10 characters of 20 sunflower hybrids evaluated at East Haroun for two seasons.

Characters	Season 2003/04			Season 2004/ 05		
	(δ^2_{ph})	(δ^2_g)	(δ^2_e)	(δ^2_{ph})	(δ^2_g)	(δ^2_e)
Days to 50% flowering	4.44	0.72	3.72	3.53	- 0.30	3.83
Days to maturity	3.29	1.14	2.15	3.53	- 0.30	3.83
Ph. Height (cm)	201.5	2.96	198.51	211.03	- 10.47	221.51
Stem diameter	0.05	0.00	0.05	0.15	0.01	0.14
Head diameter (cm)	3.19	- 0.12	3.31	6.66	0.10	6.56
No. of seed / head.	38607	- 2169	40776	99200	34930	64270
Empty seed (%)	5.68	0.04	5.63	4.74	0.44	4.30
1000-seed weight (g)	11.24	0.11	11.13	28.45	7.44	21.01
Seed yield/ plant (g)	99.16	- 4.92	104.08	253.67	95.51	158.16
Seed yield (t/ha)	0.43	0.00	0.43	1.31	0.50	0.81

3.4 Heritability Estimate (h^2)

Table- 5 regarding the heritability (h^2) estimate all character had lowest estimate (h^2 40.06) at both season in the location. The lowest heritability (h^2) estimate was ≤ 0.04 given by stem diameter in first season. While the highest was

0.35 given by days to maturity. However in second season, the lowest (h^2) estimate was 0.01 given by the head diameter, while highest one was 0.38 given by the seeds yield per plant. Similar to the trend of the (h^2) estimate the value of the expected genetic advance under selection (GA %)

Table 5: The phenotypic (PCV%), genotypic (GCV%) coefficient of variations, heritability (h^2) estimates, genetic advance (GA) and genetic advance as percentage of the mean (GA%) in 10 characters of 20 sun flower hybrids evaluated at East Haroun for two seasons

Characters	Season 2003/04					Season 2004/ 05				
	PCV %	GCV %	h^2	GA	GA %	PCV %	GCV %	h^2	GA	GA %
Days to 50% flowering	2.84	1.14	0.16	0.28	0.38	-	-	-	-	-
Days to maturity	1.96	1.16	0.35	0.76	0.83	-	-	-	-	-
Ph. Height (cm)	12.48	1.51	0.01	0.05	0.05	-	-	-	-	-
Stem diameter	39.987	14.53	0.00	0.00	0.04	14.31	3.64	0.06	0.01	0.49
Head diameter (cm)	-	-	-	-	-	11.86	1.42	0.01	0.01	0.04
No. of seed / head.	-	-	-	-	-	33.89	20.11	0.35	135.5	14.59
Empty seed (%)	178.68	15.90	0.01	0.00	0.26	86.64	26.41	0.09	7	5.06
1000-seed weight (g)	9.43	0.93	0.01	0.01	0.02	8.73	4.46	0.26	0.13	2.40
Seed yield/ plant (g)	-	-	-	-	-	33.39	20.49	0.38	1.47	15.89
Seed yield (t/ha)	-	-	-	-	-	33.59	20.84	0.38	7.58	16.53

- = not calculated because of its negative genetic variance

3.5 Genetic Advance (GA %)

Table- 5 shows the (GA %) that change over seasons and East Haroun location, Table – 5 shows the 1000-seed weight scored estimate of 0.02 and 2.40 at east Haroun in first and second season, respectively, whereas days to maturity recorded (GA %) of 0.83 and negative in first and second season, respectively. The rest of the characters showed low and staple value in the different seasons. The

lowest gain from selection (GA %) was 0.02 scored for 1000-seed weight in first and second season. It was 14.49 scored for head diameter. The highest estimate was 0.83, scored for days to maturity in first season, while it was 6.53 scored for seed yield (t / ha) in first season, on the other hand in first season, the lowest estimate was 0.02 scored for 1000 seed weight while highest estimate was 0.83 scored for days to maturity, but in second season, the lowest estimate was 0.04 recorded for head diameter, and the highest estimate was 16.53, recorded for seed yield (t/ha).

4. CONCLUSION

There is sufficient genetic variability in the tested sunflower hybrids which is, useful tool in breeding programmed and grouping of the different hybrids according to their adaptation through the environmental condition, SHA25-2 and Hysun 33 were most likely adapted favorable environmental condition whereas, SHA18 and SHA5 were the most stable hybrids for yield and its components under adverse conditions.

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