CHARACTERIZATION AND EVALUATION per se OF LOW PLANT SUNFLOWER LINES IN MEXICO.

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ABSTRACT

Twenty four S_5 lines and one open-pollinated variety of sunflower were evaluated to preliminary select parental lines to be utilized on the hibrids formation so as detect correlated characters with grain yields and oil seed content to be considered as selection criteria in the sunflower breeding program in México. The analysis detected highly significative difference between treatments for the variables; seed yields, oil content in the seed, plant height, head diameter, leaf area, petiole lenght and oil content of oleic and linoleic fatty acids. The Victoria variety & the lines LE 1030-194-6-4-3-2 and LE 1030-194-17-4-2-2 were similar statistically between them (DMS .05) and superior to the rest of sunflower materials on the variables: seed yields, oil content, leaf area and petiole lenght. Highly positive correlation was detected between seed yields and seed oil content, head diameter, plant height, petiole lenght, leaf area and harvest index. Seed oil content also positively correlated with the above variables.

INTRODUCTION

The sunflower growing area in México is relatively low (25 thousand hectareas a year) in spite of the proper climate and soil conditions for development of sunflower as oilcrop. One of the causes that has limited the expantion of sunflower crop in México is the lack of appropriate varieties and hybrids with higher production potential although up to date only two improved varieties and one plasmic male strerile hybrid developed nationally are available. Diverse introduced hybrids have been evaluated but they are not commercialy available if

well, some of them have been outstanding and frecuntly not recommended hybrids are sown. Certain preference for hybrids has been observed from the sunflower growers, because of its uniformity mainly although on scarce rain growing conditions (450 mm) the open pollinated varieties are much better than the hybrids on seed yields and oil content. The present study has as objective to select the best lines on grain yields and oil content so as to detect the morphologic characters that will be highly correlated to them to be considered as criteria on the selection of possible crossing parent lines. The previously selected lines through out the evaluation per se, wil be evaluated on hybrid combinations to determine the F_1 heterosis effect. The importance of identify the best lines in the per se evaluation, consist on the elimination of lines made before of formation and evaluation of the hybrids and although these take time and economic resources that can be saved. Shorgum and sunflower experimental results indicate that the per se lines yields can be useful as criteria to select parental lines with high combining ability (Mendoza, O., 1983 and Vranceanu, A., 1977). On the other hand, sunflower lines that grow vigorously have been detected generally with high combining ability (Russell, W.A., 1953) so as the combining ability of the sunflower lines is closely correlation with the seed production and which justify the previous line selection based on seed productivity (Kloczwski reported by Vranceanu in 1977). On corn, the vigor pure line selection is an adequate practical procedure (Jorgenson and Brewbaker, 1972).

MATERIALS AND METHODS

The trial was conducted at the San Luis Potosí Experimental Station of INIFAP-SARH and the date of planting was the 15th of July on 1987 under irrigation conditions and on a clay-sany soil. Twenty five sunflower, genotypes were evaluated, including 24 low plant lines and one open-pollinated variety as check. The evaluated lines were obtained

from a dwarf plant selected from composite of advanced generations of hybrids. The formation of the lines was made by the genealogical method where visual selection was used among and within lines. The line per se evaluation was made with experimental design of randomized blocks with 3 replications. The experimental plot was one row of 5 m of lenght and 0.8 m rows wide, the plant population was of 50,000 plants per ha, fertilized with 80-40-00 of N-P-K levels at the snowing time and 3 auxiliary irrigations of 10 cm of water layer each irrigation, were applied. The evaluated variables were: grain yields, seed oil content, plant height, head diameter, petiole lenght, fatty acid composition of the seed oil, so as some morphologic parameters as leaf area and harvest index. All the variables but grain yield, seed oil content and fatty acid composition, were estimated from 3 randomized plants and as sample per line in each replication. To estimate the grain yields the experimental plot was one row of 4.5 m of lenght, the seed oil content and the fatty acid composition was determined from a 20 gm sample form each plot and to statistically differenciate treatments, LSD $<.05$ test was utilized.

RESULTS AND DISCUSSION

The analysis of variance shown highly significative differences among treatments on most of the studied variables. On table 1, the variety Victoria together with the lines LE 1030-194-6-4-3-2 and LE 1030-194-17-4-2-2 were observed as the best statistically (LSD $<.05$) from the standpoint of grain yields and compared with the rest of evaluated genotypes. Generally the grain yields were low due to the irrigations that were limited, however, in the case of the lines are accepted as good, taking in account that because of the inbreeding effect, the lines reduces their vigor. The genotypes formerly indicated together with the lines LE 1030-194-4-8-1-1 and LE 1030-194-13-10-4-1, were outstanding in addition on seed oil content although the grain yield of these last lines is lower than the average percent. In addition to

its superiority on seed yields and oil content, the Victoria variety and the lines LE 1030-194-6-4-3-2 and LE 1030-194-17-4-3-2 are found among the best genotypes from the standpoint of: harvest index, leaf area and petiole lenght. The same genotypes except the line LE 1030-194-6-4-3-2 are higher on plant and longer on head diameter. With regard to seed oil fatty acids, the highest oleic acid is in the lines LE 1030-194-7-7-2-2 and LE 1030-194-16-6-1-1 with higher statistical velues than the rest of sunflower materials. It can be observed than the lines LE 1030-194-4-6-1-1, LE 1030-194-4-1-3-3 and LE 1030-194-4-1-1-1, higher in linoleic acid in the seed oil have also higher relationship with most of the utilized experimental, materials, however, this relationship stand out only in this agronomic trait since the statistic differences observed on the analysis of variance indicate that although the lines were derived from one plant alone, the visual selection made during the formation process, permitted to form lines with different traits.

Another of the evaluated genotypes that had some interesting characteristics was the line LE 1030-194-7-7-2, having among the shorter petiole lenght genotypes, lower plant height and grain yield over the average. The short petiole means an important agronomic trait to improve the plant architecture to permit higher plant populations per area unit and maximize the yield capacity (Vranceanu et al, 1988).

With regard to the trait correlations, on the Table 2, the grain yields are observed to correlate highly significative with head diameter, plant height, petiole lenght, leaf area, harvest index and seed oil content. The observed, high correlation between grain yield and head diameter, seed oil content and leaf area coincide with the ones reported by Espinosa (1990), in the same way high correlation was found between seed oil content and plant height, leaf area and grain yields. Important negative correlation is only the one between the seed oil oleic and linoleic acids porcentages.

TABLE 1 SUNFLOWER GRAIN YIELD, SEED OIL CONTENT AND LOW PLANT LINES MORPHOLOGIC TRAITS

GENOTYPE	YIELD Kg/ha	SEED OIL %	HARVEST INDEX	LEAFT AREA cm^2	PETIOTLE LENGHT cm	PLANT HEIGHT m	HEAD DIAM. cm	SEED OIL OLEIC ACID	SEED OIL LINOLEIC ACID
VICTORIA	1519*	43.2*	.44	56.3*	38*	1.19*	17	19.0	68.0
L. 1030-194-6-4-3-2	1335*	40.2*	.56	48.4*	33*	.81	13	16.3	70.7
L. 1030-194-17-4-2-2	1271*	43.8*	.55	50.8*	33*	1.04*	15*	17.8	69.2
L. 1030-194-2-8-4-1	991*	36.5	.38	34.7	29	1.02*	13	15.3	70.0
L. 1030-194-7-7-2-2	990	37.9	.43	30.0	21	.58	11	21.9*	66.3
L. 1030-194-1-4-3-4	928	37.8	.53	40.4	31	.84	15*	16.0	71.6
L. 1030-194-7-7-4-1	861	37.8	.43	35.3	31	.83	12	19.0	68.6
L. 1030-194-1-1-1-1	828	37.2	.40	30.2	29	.69	12	13.8	74.6*
L. 1030-194-15-6-1-1	810	37.6	.49	28.9	24	.74	12	15.0	71.9
L. 1030-194-10-1-2-4	786	39.8	.44	44.7*	33*	1.01*	12	18.8	68.3
L. 1030-194-8-9-3-2-2	772	37.3	.49	57.8	28	.95	16*	17.4	70.5
L. 1030-194-2-8-3-1	693	37.3	.33	43.8	32	1.00	12	15.2	72.3
L. 1030-194-1-4-4-1	690	37.0	.41	26.6	28	.68	11	16.5	69.2
L. 1030-194-4-8-1-1	661	42.2	.40	29.6	28	.58	12	13.9	75.5*
L. 1030-194-9-9-1-1	592	38.3	.39	31.5	28	.66	13	13.0	72.7
L. 1030-194-1-4-1-2	579	35.8	.35	31.6	27	.68	11	17.8	69.0
L. 1030-194-4-1-2-2	562	32.9	.34	28.3	26	.53	11	16.6	70.3
L. 1030-194-14-5-3-2	542	37.3	.30	34.0	25	.72	12	15.7	71.5
L. 1030-194-15-2-2-1	523	38.0	.33	22.2	21	.41	10	14.7	72.5
L. 1030-194-13-10-4-1	510	42.0	.36	21.1	20	.54	11	15.9	70.8
L. 1030-194-4-1-3-3	440	35.1	.36	38.4	28	.63	12	14.1	75.1*
L. 1030-194-1-4-5-1	432	32.6	.44	18.0	25	.56	11	16.2	70.3
L. 1030-194-16-6-1-1	430	38.1	.33	34.4	19	.77	13	21.4*	64.56
L. 1030-194-8-3-2-1	345	37.5	.33	18.2	22	.68	9	16.8	69.1
L. 1030-194-5-9	380	35.9	.28	29.5	30	.85	13	16.4	70.2

* LSD SIGNIFICATIVE AT 5 % OF PROBABILITIES

TABLE 2 PHENOTYPIC CORRELATION COEFICIENTS OF THE STUDY VARIABLES

VARIABLES	YIELD	SEED OIL %	HARVEST INDEX	LEAFT AREA cm^2	PETIOTLE LENGHT cm	HEAD DIAM. cm	PLANT HEIGHT m	SEED OIL OLEIC ACID	SEED OIL LINOLEIC ACID
YIELD		.5238**	.4478**	.6594**	.5526**	.5690**	.6854**	.3182**	.2356 NS
SEED OIL	.5238**		.2822*	.4334**	.3233 *	.3231**	.4160**	.2305 NS	.1498 NS
HARVEST INDEX	.4478**	.2823**		.2545 *	.3453**	.2994**	.2055 NS	.1616 NS	.1011 NS
LEAF AREA	.6594**	.4314**	.2145*		.6879**	.6685**	.8020**	.2828 *	.1855 NS
PETIOLE LENGHT	.5526**	.3233**	.3453**	.6879**		.5702**	.7249**	.0542 NS	.0287 NS
HEAD DIAM.	.5960**	.3231**	.2994**	.6685**	.5702		.5618**	.1990 NS	.1892 NS
PLANT HEIGTH	.6854**	.4160**	.2055 NS	.8020**	.7249**	.6618**		.3191 *	.3263**
OLEIC ACID	.3182**	.2350 NS	.1616 NS	.2828 *	.0542 NS	.1990 NS	.3191 *		.8864**
LINOLEIC ACID	.2356 NS	.1498 NS	.1011 NS	.1855 NS	.0287 NS	.1892 NS	.3263**	.8864**	

** SIGNIFICATIVE AT 1 %
* SIGNIFICATIVE AT 5 %
NS : NO SIGNIFICATIVE

CONCLUSIONS

The best lines on seed yields, seed oil content and other significative correlated agronomic variable traits were: LE 1030-194-6-4-3-2 and LE 1030-194-17-4-2-2-. These two lines together with LE 1030-194-7-7-2-2 which stand out because its lower plant height, short petiole and grain yields wil be selected to be directly evaluated on hybrid combinations with the final purpose to identify the best parental lines.

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