THE COMBINE ABILITY ANALYSIS FOR SEED OIL CONTENT OF SUNFLOWER

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ABSTRACT

It is one of sunflower breeding objective to improve seed oil content. For breed high oil content sunflower hybrids ,we have to get good parents lines at first. Only when the good parents lines were obtained, we have the chance for get excellent hybrids. In this experiment, the general combine ability (GCA) and special combine ability (SCA) were tested for some CMS lines and restorer lines. Following results were achieved: (1) In sunflower breeding programme, we should lay emphasis on GCA selection, in order to reduce blindness in the work; (2) As SCA and GCA are independence, the SCA setection is effective based on high GCA level .

Key words: sunflower seed oil content combine ability

INTRODUCTION

Sunflower breeding work develop fast recently. It isone main breeding objective for oilseed sunflower to improve seed oil content. For get high oil content sunflower hybrids, we have topay more attention to parents materials, only if we have high oil content CMS lines and restore lines, it is expected to achieve oilseed sunflower hybrids which conform to sunflower breeding objective. We design an experiment to test the general combine ability (GCA) and the special combine ability (SCA) of seed oil content of some CMS lines and restorer lines cultured in JiLin province Research Institute of Sunflower recently years, in order to service for sunflower breeding work in future.

MATERIALS AND METHOD

The experiment was conducted at JiLin Province Research Institute of Sunflower in Baicheng in 1990, We get 21 sunflower hybrid combination rely on 74102-4A, 78104-321A. 83502-44532A. 83601-11451A, 83602-13441A, 83801-3541A, 85104-321A as mother lines, SUO-82-413R, 8003-8331531R and 811087-113223R as father lines in 1989. The 21 hybrid combinations were grown in a randomized block design with 3 replications in 1990 growing

season. Experimental plots consisted of 3 rows 5 metres in length spaced 70 cm apart, the plant density is 30 X 70 cm, the plot areais10.5 square metres. Five heads per plot were harvested for oil content test then statistical analysis was done on the basis of the data.Accoding to the result of statistical analysis, if F value reached significant level, we continue calculate as following: the general combine ability effect G(i.)= X(i.) - X(..), G(.j)= X(.j) - X(..); the general combine ability relative effect G'= G / X(..) x 100% ; the special combine ability effect S(ij)= X(ij) - X(..)- G(i.)- G(.j), the special combine relative effect S'= S(ij) / X(..) x 100% .

RESULTS AND DISCUSSION

(A) The results of radomized blocks analysis of mean squares
The results of radomized blocks analysis of mean squares for seed oil content of sunflower hybrid combinations are shown in table 1.

Table 1. Mean squares analysis of seed oil content of sunflower hybrids

Source	D. F.	S. S.	M. S.	F
Blocks	2	30.3477	15.1738	5.5242 **
CMS lines	6	51.8307	8.6385	3.1449 *
R lines	2	448.6689	224.3345	81.6712 **
CMS X R	12	27.3308	2.2776	0.8292
Error	40	109.8720	2.7468	
Sum	62	668.0501		

Here: CMS lines F(0.05)=2.34 F(0.01)=3.29
R lines F(0.05)=3.23 F(0.01)=5.18
CMS X R F(0.05)=2.00 F(0.01)=2.66

The results oftable 1shown that among sunflower hybrid combination the difference of seed oil content aresignificant, it shown ture genetical difference are existed for seed oil content. Among CMS lines the GCA difference achieved significant level, among R lines the GCA difference achieved extremely significant level, among hybrid combinations the SCA difference don't achieved significant level.

(B) Evalute of GCA effects and SCA effects
The values of the GCA effects and relative effects of parents lines for seed oil content were obtained through the given formula (see table 2).
According to the results of table 2, difference of GCA are existed among different materials for seed oil content. The GCA of 83801-3541A, 83601-11451A, 83602-13441A, SUO-82-413R are higher, the GCA of other materials are lower.

Table 2. The values of GCA of parents lines

Parents lines	G	G^
74102-4A	-1.31	-3.18
78104-321A	-0.16	-0.38
83502-44532A	-1.25	-3.03
83601-11451A	0.67	1.62
83602-13441A	0.53	1.28
83801-3541A	1.29	3.11
85104-321A	0.24	0.58
SUO-82-413R	3.64	8.81
8003-8331531R	-0.97	-2.35
811087-113223R	-2.67	-6.46

The F value of CMS XRdon't achieved significant difference, it indicate that difference of SCA among sunflower hybrid combinations are not significant. The SCA effects of them were shown in table 3. The SCA of different hybrid combinations are different, the relative effects change of -2.64 to 2.71%.

Table 3. The values of SCA effects of hybrid combinations

Hybrid combinations	S	S^
74102-4A X SUO-82-413R	0.09	0.02
74102-4A X 8003-8331531R	1.00	2.42
74102-4A X 811087-113223R	-1.09	-2.64
78104-321A X SUO-82-413R	0.23	0.56
78104-321A X 8003-8331531R	-0.77	-1.86
78104-321A X 811087-113223R	0.54	1.31
83502-44532A X SUO-82-413R	1.12	2.71
83502-44532A X 8003-8331531R	-0.19	-0.46
83502-44532A X 811087-113223R	-0.94	-2.27
83601-11451A X SUO-82-413R	-0.32	-0.77
83601-11451A X 8003-8331531R	-0.62	-1.50
83601-11451A X 811087-113223R	0.94	2.27
83602-13441A X SUO-82-413R	-0.33	-0.80
83602-13441A X 8003-8331531R	-0.03	-0.07
83602-13441A X 811087-113223R	0.36	0.87
83801-3541A X SUO-82-413R	-0.53	-1.28
83801-3541A x 8003-8331531R	-0.27	-0.65
83801-3541A X 811087-113223R	0.79	1.91
85104-321A X SUO-82-413R	-0.24	-0,58
85104-321A X 8003-8331531R	0.87	2.10
85104-321A X 811087-113223R	-0.63	1.52

Consider both of GCA and SCA, we find the GCA and SCA are indepentent, the SCA of hybrid combinations have nothing to do with the GCA of parents lines. For instance, the SCA of 83801-3541A X SUO-82-413R is low, but the GCA of 83801-3541A, SUO-82-413R are high.

We line up the seed oil contents of sunflower hybrid combinations in table 4. From the results of table 4, for high seed oil content hybrid combinations, at last one parent line has high GCA of seed oil content, For example, the seed oil content of 83801-3541A X SUO-82-413R is highest, its parents lines have high GCA of seed oil content; the seed oil contents of 78104-321A X SUO-82-413R, 85104-321A X SUO-82-413R are higher, one high GCA parent line of SUO-82-413R is included in them.

Table 4. The seed oil contents of sunflower hybrid combinations

Hybrid combinations	Seed oil content (%)
74102-4A X SUO-82-413R	43.78
74102-4A X 8003-8331531R	40.08
74102-4A X 811087-113223R	36.28
78104-321A X SUO-82-413R	45.07
78104-321A X 8003-8331531R	39.46
78104-321A X 811087-113223R	39.07
83502-44532A X SUO-82-413R	44.87
83502-44532A X 8003-8331431R	38.95
83502-44532A X 811087-113223R	36.50
83601-11451A X SUO-82-413R	45.35
83601-11451A X 8003-8331531R	40.44
83601-11451A X 811087-113223R	40.30
83602-13441A X SUO-82-413R	45.20
83602-13441A X 8003-8331531R	40.89
83602-13441A X 811087-113223R	39.58
83801-3541A X SUO-82-413R	45.76
83801-3541A X 8003-8331531R	41.41
83801-3541A X 811087-113223R	40.77
85104-321A X SUO-82-413R	45.00
85104-321A X 8003-8331531R	41.50
85104-321A X 811087-113223R	38.30

Accoding to above-mentioned analysis, we should pay more attention to GCA selection of seed oil content, get high GCA materials as parents lines of sunflower hybrids, in order to reduce blindness in breeding work. On the other hand, as GCA and SCA are independent, in accordance with breeding objective, the SCA selection is effective based on high GCA level.