



# STUDIES ON MAINTAINER/ RESTORATION OF FERTILITY IN RAPESEED (BRASSICA NAPUS L.) AND MUSTARD (BRASSICA JUNCEA L.) CZERN & COSS)

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## ABSTRACT

The present study on maintainer restoration of fertility in rapeseed with the use of 75 F<sub>1</sub>s line and 25 testers data were recorded on important characters. The relative contribution of line tester components were higher than that of lines and tester to other variability for all the characters. Non additive genetic component play the vital role in the governing the expression of seed yield and its major determinate. Majority of parents show non significant GCA value.

Keywords: Maintainer, restoration, line tester, non additive, GCA, variability.

## INTRODUCTION

Rapeseed- mustard occupy a prominent position next to groundnut among various oil yielding crops in India. It is a major rabi oil seed crop of northern India.

Exploitable levels of standard heterosis and effective male sterility and fertility restorer system are the most important prerequisite for the development of commercially viable hybrid varieties (Zhang and Fu, 1991)

The hybrid breeding approach based on "line x tester" (table 1) involves identification of an outstanding heterotic combination followed by conversion of one of the parent into "A line" by transfer of cytoplasmic genetic male sterility and the other parent into "R line" by incorporating restorer genes (Yang and Fu, 1991)

The present investigation in Indian mustard was initiated, planted and conducted with following major objective.

1. *To study floral characters of male steriles and male fertility.*
2. *To identify restorer/ maintainer lines from the rapeseed and mustard germplasm.*
3. *Hybridity percentage.*
4. *To estimate general and specific combining ability variances and their effects for the characters under study.*
5. *To estimate heterosis over better parent and standard variety.*

## MATERIALS AND METHODS

The present investigation entitled “ studies,” on Maintainer/ Restoration of Fertility in rapeseed( Brassica napus L.) and Indian Mustard ( Brassica juncea L. Czern & coss) (Banga and Dhillon,1991) was carried out at the students instructional farm of Narendra deva University of agriculture and technology Narendra Nagar (Kumargunj) Faizabad during rabi season of 1998 to 2000.

The experimental materials for the present investigation consisted of 75 F1 's derived from the crosses of cytoplasmic male sterile lines viz, Trachystoma, Moricandia and siifolia as females and 25 testers viz, NDRF - 4, PR 8905,ZEM -1 ,

NDR 9761,NDYR -8 ,NDYR-10 ,NR SELECTION-5 , SK-93-1, NARENDRA RAI , PHR-1 , NRCM-16, NRCM-95, NRCM -57, NRCM -140, NRCM- 86, NRCM- 74 ,NRCM -

131 ,NRCM- 79, NRCM -48, NRCM-

54,NRCM -40 NRCM- 118, NRCM- 98,

NRCM- 69, SM-1 as males in brassica Juncea(Yadav et.al.1976)

Five competitive plants were randomly selected and tagged well in advance for recording the observation on parents and crosses. Data were recorded for following characters.

- *Days to flower initiation.*
- *Days to maturity*
- *Plant height*
- *Number of primary branches per plant.*
- *Number of secondary branches per plant*
- *Number of seeds per siliqua.*
- *Seed setting under bagging.*
- *Thousand seed weight.*

- *Hybridity*
- *Oil content*

## RESULTS AND DISCUSSION

Analysis of Variance in Indian mustard for the randomized block design was carried out for all the 16 characters for evaluating 103 treatments viz , 75 F1s 3 lines and 25 testers and the standard variety, kranti.

In Indian mustard 25 lines were crossed with three male steriles lines to identify prospective restorers and maintainers. In Indian mustard the pollen fertility percentage showed that none of the pollen parents had the complete Restoration ability for any of the three CMS lines most of the genotypes evaluations were identified as either maintainer or partial restorers of the CMS lines.

For days to flower initiation gca effect (Bhadouria et.al.1991) with negative values are desirable among the lines Trachystoma (-2.00) showed significant and negative gca effect (Gupta et.al.1981) for earliness whereas Moricandia showed significant positive gca effect for late flowering.

For days to maturity gca effect (Habetinek,1993) with negative values are desirable among lines Moricandia and Siifolia showed negative and non significant gca (Yadav et.al.1992) effect in the desirable direction.

Among lines, siifolia (0.38) showed Significant positive gca effect in the desirable direction. However, Trachystoma (0.20) showed positive gca effects (Gupta et.al,1984) and Moricandia (-0.58) showed negative significant gca effect for number of seeds per siliqua.

Among testers, NDYR 10( 4.50) was beat general combiner for high oil content (Chaurasia,1979) followed by NDYR 8 (3.79) and NRCM 74 (1.60).

Maximum contribution of lines was recorded for pistil length (35.69%) followed by filament length (25.67%) , 1000- seed weight (17.08%), plant height (14.56%) , number of secondary branches per plant (6.64%) , days to flower initiation (6.4%), pollen Fertility (6.18%) , days to maturity (6.09%) , number of primary branches per plant (2.85%) , seed setting under bagging (2.78%) , number of seeds per siliqua (2.25%) .

Maximum contribution of testers was recorded for oil content (69.15%) followed by days to flower (62.13%) , days to maturity (51.06%) and number of primary branches per plant (50.66%). Proportional contribution of lines \* testers for different characters in rapeseed varied from 29.51% (oil content) to 64.86% ( seed setting under bagging) . Maximum contribution of lines was recorded for pollen viability (99.69%) followed by hybridity (99.54%) pollen Fertility (99.45%) , seed setting under bagging (95.25%).

The success of hybrid mustard breeding programme mainly depends on identification , development , development, maintenance and evaluation of male sterile lines (A- lines) , their Maintainer (B lines) and effective restorers (R lines). A ,B and R lines is popularly called as “ three lines breeding” approach. In the

present investigation none of the hybrid showed fertility indicating the lack of restoration for CMS ogura and ISN 706 A in the available germplasm.

The parents which showed desirable significant gca effect For oil content as well As for seed yield were PHR-1 and NRCM - 86 among male parent.

As regards oil content, the magnitude of heterobeltiosis in desired direction was mostly non -significant. However, large number of crosses (23) showed significant heterosis over standard variety which was mainly due to performance of better parent and standard variety for oil content. The crosses were NDBN 1 × GSL - 1 (2.47), and NDBN -1 × HNS 4 (1.13)

and NDBN-1 × NDBN -1 × NRCG -2 (0.07)

over the better parent and standard variety were crosses NDBN -1 × GSL -1

(9.63) , NDBN 1× PBN 9501 (9.05) and NDBN-1 × NRCG-2 (8.80).

Table 1. Proportional contribution Of lines, testers and their interactions to total variance in a set of line x tester crosses in Rapeseed.

Character	Contribution (%)		
	Line	Tester	Lines X testers
DF	3.43	68.37	28.19
DM	7.38	31.83	60.78
PH	21.50	37.03	41.46
PB	9.01	29.31	61.66
SB	11.86	24.67	63.45
S/S	1.59	44.45	53.94
SUB	99.25	0.23	0.50
SW	1.00	44.62	54.36
SY	1.73	35.77	62.49
FL	64.24	6.65	29.09
AL	45.35	24.00	30.63

PL	31.79	22.32	45.89
PF	99.45	0,17	0.37
PV	99.69	0.10	0.20
H	99.54	0.15	0.29
OC	7,61	26.40	65.98

Table 2. Best three parents for different characters on the basis of their gca effect in rapeseed (Brassica napus L).

Characte rs	Parents		
	1	2	3
1. DF	GSL-406	Westar	GSL 6067
2. DM	EC 129120	NDBN-1	FM 27
3. PH	NRCG-13	GSL-1	NDBN-1
4. PB	GSL 6067	PBN 9501	GSL 6267
5. SB	FM 27	GSL 6267	PBN 9501
6. S/S	Westar	HNS-4	EC 129120
SUB	NDBN-1	Westar	EC 129120
8. SW	EC 129120	NRCG- 13	GSL 6067
9. SY	NRCG-14	NRCG-2	NRCG-13

10. FL	ISN 706 A	Westar	FM 27
11. AL	GSL 8814	NDBN-1	NRCG- 13
12. PL	NRCG-7	ISN 706 A	EC 129120
13. PF	NDBN-1	GSL-1	NRCG-7
14. PV	NDBN-1	EC 129120	PBN 9501
15. H	NDBN-1	GSL-1	HNS-4
16. OC	GSL-1	NRCG-2	NDBN-1

Table 3. Prospective cross combination based on per se performance and desirable sca and gca and heterosis (BP & SC ) effect in rapeseed (Brassica nupus L)

Charact ers	Per performa nce	sca	Heterosis( %)		gca
			BP	SV	
Seed yield (g/plant )	ISN 706 A x NRCG-14 (16.53)	Ogura x NRCG -13 (5.23 **)	ISN 706 A x NRCG-14 (63.16**)	ISN 706A x NRCG-14 (62.09 **)	NRCG -14 (3.92 **)
	ISN 706 A: x NRCG-2 (15.67)	NDBN -1 x GSL 8814 (4.48 **)	ISN 706 A x NRCG-2 (54.61**)	ISN 706 A x NRCG-2 (53.59 **)	NRCG -2 (1.93 **)
	ISN 706 A x GSL-1 (14.50)	NDBN -1 x GSL 6267 (3.29 **)	ISN 706 A x GSL-1 (42.16*)	ISN 706A x GSL-1 (16.53 )	NRCG -13 (1.72 **)

Oil content (%)	NDBN-1 x GSL-1 (43.18)	Ogura x GSL 6303 (2.54 **)	NDBN-1 x GSL-1 (2.47)	NDBN-1 x GSL-1 (9.63* *)	GSL-1 (2.15 **)
	NDBN-1 x PBN 9501 (42.95)	Ogura x Westar (2.35 **)	NDBN-1x HNS-4 (1.13)	NDBN-1 x PBN 9501 (9.05* *)	GSL-1 (2.15 **)
	NDBN-1 x NRCG-2 (42.88)	ISN 706 Ax FM 27 (2.23 **)	NDBN-1 x NRCG-2 (- 0.07)	NDBN-1 x NRCG- 2 (8.86* *)	NDBN -1 (0.48 **)

## SUMMARY AND CONCLUSION

Effective restorers for these CMS lines (stoma, Moricandia and Siifolia) could not be identified from the present Set of material. Based on desirable gca effect in B.junceae, PHR 1 and NRCM 86 among males were identified as superior donors for seed yield (Chaudhary et al. 1998). Majority of parents (table 2) showed non significant gca v

alues for oil content. The relative contribution of lines × testers components was higher than that of lines and testers towards the total variability exhibited for all the characters (Gupta et al. 1991).

The results obtained in the current investigation revealed a general depression in various yield and yield contributing traits and storage product such as oil.

Based on desirable gca effects NRCG 25, GSL 6303, NRCG 13 and NRCG 14 among males were identified as superior donors for seed yield (table 3).

The study elucidated that non-additive genetic component played the vital role in governing the expression of seed yield and its major determinate. Estimates of combining ability (Chander et al. 1985) and heterotic response further showed the perceptible advantage of heterozygosity in increasing the yield (Singh and Chauhan, 1979). The phenomenon led to identify heterosis as the key methodology for improving genetic yield ceiling in Indian mustard. The biological system i.e. male sterility to produce FI hybrids also exists in this crop which requires further investigation.

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