A STUDY ON OIL CONTENT IMPROVEMENT IN INDIAN RAPE

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INTRODUCTION

Indian rape (Brassica campestris L. var toria) is an important oilseed crop of North-Western India. Oil yield per unit area in the crop depends upon oil content in the seed besides seed yield and from the breeding point of view, it is easier to increase/improve per cent oil content in stead of raising the seed yield as the former is less influenced by environment and is governed by a fewer genes than the seed yield (Kumar and Kumar, 1989). Therefore, a population improvement programme for increasing oil content in this crop was initiated in Punjab Agricultural University, Regional Research Station, Bathinda, using sibs of cultivar TLC-I as base population, during 1987-88.

MATERIALS AND METHODS

The population improvement programme for increasing oil content in Indian rape was initiated and for this purpose, a base population was constituted by bulking the equal quantities of seed of 38 F_1 progenies (Oil content 40.0% to 46.0%) of sibs of cultivar TLC-I (oil content 40%). Base population was raised in isolation from the bulked seed at Regional Research Station, Bathinda during 1987-88. No restriction was imposed on pollination among the individuals of the population. From the population 530 plants were selected on the basis of good plant type. Oil content of these plants was estimated by Nuclear Megnatic Resonance (NMR) technique.

In the subsequent year (1988-89), remanant seed of 85 plants having oil content more than 44.8%, was utilised to raise single plant progenies in 3-row plots (3m x 0.9m). Seed samples were drawn progeny-wise from the total produce of each progeny for estimation of oil content.

During the year 1989-90, a composite namely PBT-33 was constituted by bulking the seed of four progenies having early maturity, high seed yield and average oil content 45%. Composite was tested for performance in All India Co-ordinated trials. Random samples of 80 plants from the composite were also drawn from the seed multiplication plot raised at Bathinda (1989-90). Oil content was assessed.

Measures of variability and dispersion, Selection differentials(S) Response to selection (R) and heritability (h^2) were estimated according to Falconer (1975).

RESULTS AND DISCUSSION

Results obtained for the present investigation are presented in different tables and discussed as under:-

Table 1. Measures of variation and dispersion in Base Population, Single Plant Progenies and Composite PBT-33

Variable	Base Population (1987-88)	Single Plant Progenies (1988-89)	Composite PBT-33 (1989-90)
Mean	43.93	45.31	42.91
Median	44.10	45.50	43.30
Mode	44.10	45.30	43.30
Variance	4.31	2.23	2.15
Standard deviation	0.09	0.16	0.16
Minimum	37.70	41.50	36.30
Maximum	48.20	47.70	44.30
Range	10.50	6.20	8.00
Lower Quartile	42.60	44.60	42.90
Upper Quartile	45.50	46.30	43.70
Inter-Quartile Range	2.90	1.70	0.80
Skewness	- 0.40	- 0.79	- 2.24

A perusal of Table 1. indicated that oil content (%) varied from 37.7% to 48.2% in the base population, from 41.5% to 47.7% in single plant progenies and from 36.3% to 44.3% in composite PBT-33. Sarkar and Bhattacharya (1987) also reported a wide range of variability (31.2% to 44.4%) for oil content in toria. As a consequence, selection was very effective in the first cycle of selection. Mean of the base population (43.9%) changed to 45.31%. Variability was reduced and narrowed down for the trait in the single plant progenies. Such changes or effects of selection were also reported by Katiyar et.al. (1984) in turnip rape, Hallauer and Miranda (1981) in maize.

Oil content of PBT-33 (Table 1) was lower than the base population and also than its constituents mainly because, the objective herein for selection was not only increased oil content but also increased seed yield and early maturity. Moreover, the environmental influences that too played a role for lowering the oil content. However, the composite showed a potential of 46.9% oil under favourable environment like that of Hissar (Table 2).

Table 2. Performance of Composite PBT-33 in All India Co-ordinated Trials (1989-90)

Station	Oil Content(%)	
	PBT-33	PT-303(Check)
Hissar	46.9	43.5
Bathinda	39.9	39.6
Gurdaspur	41.9	40.9
Pant Nagar	40.5	43.2
Raipur	40.5	41.5
Bahraich	43.5	41.3

Source:- Annual Progress Report Rapeseed-Mustard (1989-90), D.O.R. Hydrabad-500030

Measures of central tendency (Mean = 43.93, Median=44.10 Mode = 44.10) and Normal Probability Plot (Fig. 1) revealed that oil content in the base population was approximate to normal distribution. Therefore, selection differential(S) and Response to Selection(R) were perdicted. Heritability (0.46) has also been estimated from Offspring-One Parent Regression Analysis. Selection differentials at different levels of selections (%) do not differ from the expected ones (Table 3) and Response to Selection at 5% level of selection was 1.41 units. Character was moderately heritable.

Table 3. Estimates of Selection differntial and Response to Selection at different levels of selection.

Selection Level(%)	Selection differntial		Response to Selection	
	Observed	Expected	Observed	Expected
1%	2.08	2.64	2.04	1.26
2%	2.01	2.42	-	-
5%	1.63	2.06	1.41	1.96
10%	1.49	1.76	1.35	1.68
15%	1.45	1.52	-	-
20%	1.25	1.40	-	-
Chi-square = 0.33 (Non-significant at 5%)			-	-

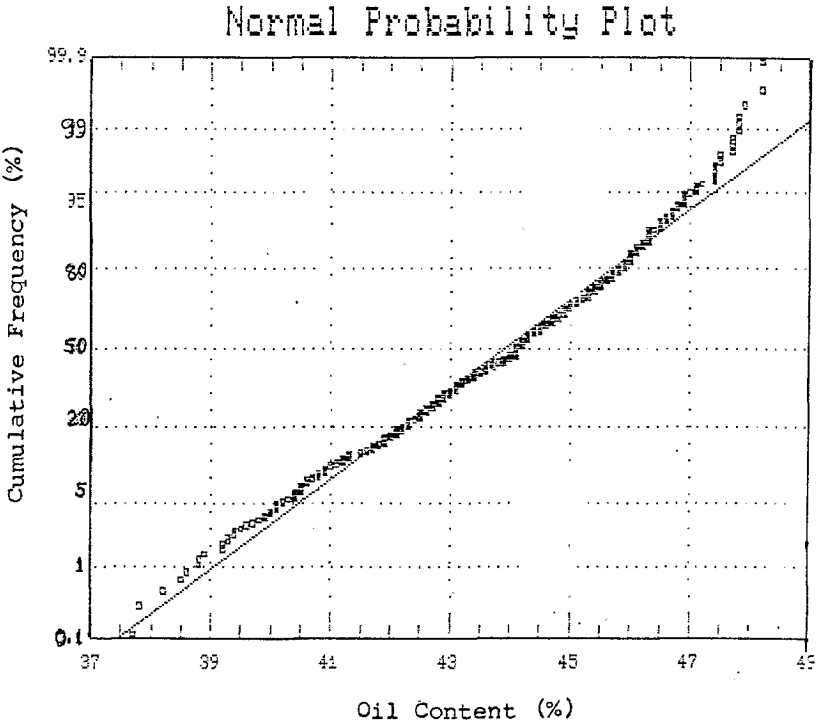

Fig. 1. Oil content distribution in the base population follows normal distribution with a little negative skewness.

CONCLUSIONS

Presence of sufficient variability in the materials for oil content (%) provides a scope for its improvement through single plant selection or any form of family selection. Further, character is modrately heritable and response to selection is sufficient in the first cycle of selection and improved oil content by 3% of the original Cultivar TLC-1 (oil content 40%). Composite PBT-33 has the potential to yield oil content even upto 46.9%.

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