Indian J. Genet., **53** (2): 153–156 (1993)

A NOTE ON THE POTENTIAL SOURCES OF DWARFING GENES IN INDIAN RAPESEED (*BRASSICA CAMPESTRIS* L.)

B. RAI AND DINESH SINGH

Department of Genetics and Plant Breeding, Institute of Agricultural Sciences Banaras Hindu University, Varanasi 221005

(Received: December 21, 1990; accepted: August 25, 1992)

ABSTRACT

Two potential sources of dwarfing gene, one in toria and the other in yellow sarson have been described. They were considerably short in plant height than those of the commercial varieties. These sources could possibly be utilized in developing short statured, nonlodging, high yielding varieties of rapeseed.

Key words: Dwarfing genes, nonlodging, compact plant type, *Brassica*.

In past, the detection and incorporation of dwarfing genes in tall commercial varieties has provided the basic framework for developing high yielding, nonlodging, fertilizer responsive varieties in the major cereal crops. There are many reports on the beneficial effect of the dwarfing genes in enhancing the average grain yield in wheat [1–5]. In *Brassica* oil crops, incorporation of such genes could be helpful in developing semidwarf genotypes which can give higher yield under high population density.

MATERIALS AND METHODS

Two dwarf mutants were detected in the germplasm maintained at this centre. The toria mutant was detected in a stabilised open-pollinated, composite population of toria. The yellow sarson mutant, was obtained from an experimental culture provided by Dr. S. N. Roy of Bihar Agricultural College, Sabour, Bhagalpur (Bihar). The toria mutant was short. It had very prolific siliqua bearing appearance on the main reproductive axis as also on other branches as compared to the normal tall varieties. Since the dwarf plants had very distinct true breeding phenotype, it was considered to be a true mutant with clear phenotypic effects (Fig. 1: 1–3). In yellow sarson, the tall and dwarf plants were very distinct. The branches of the dwarf plants were very short compared to those of the normal tall plants and most of them arose from the base of the plant (Fig. 1: 4). The tall and dwarf plants were grown side by side with row-to-row and plant-to-plant spacing of 30 and 15 cm, respectively. Observations were recorded on plant height, yield and yield contributing characters in the two dwarf mutants as well as standard tall varieties of toria (PT 303) and yellow sarson (YST-151).

RESULTS AND DISCUSSION

The seeds produced on the dwarf plants by open pollination were harvested and planted in the subsequent season. Out of 204 toria plants 56 were dwarf. Considerable variation, however, was observed for relative plant height and compactness of the siliqua on the branches within the dwarf plants. The dwarf toria plant had an average plant height of 47.1 cm as compared to 104.5 cm of PT 303, i.e. 54.9% of PT 303 (Table 1). The range of variation in the dwarf plants themselves varied from 45 to 65 cm. Considerably large variation within the progenies of dwarf plants of toria have also been reported [6]. It has been indicated that dwarfness is desirable for selecting useful plants with very high number of siliquas per plant/unit area.

Table 1. Plant height, yield and yield contributing characters in the progenies of the dwarf plants of toria and yellow sarson

Character	Dwarf toria		Standard tall variety PT 303	Decrease or increase over PT 303 (%)	Dwarf yellow sarson		Standard tall variety YST 151	Decrease or increase over YST 151 (%)
	mean	range			mean	range		
Plant height (cm)	47.1	45-65	104.5	-54.9	50.0	46-52	152.7	-67.2
Branches/plant	7.2	5-9	6.7	7.4	8.6	6-11	10.9	-21.1
Siliquas/plant	222	190-235	264	-15.9	145	138-153	20.1	-27.8
Seeds/siliqua	15.4	15-17	20.4	-24.5	23.9	23-25	23.6	1.2
1000-seed weight (g)	3.0	3-3.5	3.2	-6.2	8.1	3.0-3.5	3.3	-6.0
Seed yield/plant (g)	9.0	8-12	9.8	-8.1	5.6	5.0-7.5	6.5	13.8
Oil content (%)	38.1	—	44.1	-6.0	38.8	—	46.0	-7.2

As compared to PT 303, the dwarf mutant showed comparatively less (–24.5%) number of seeds per siliqua (i.e. –15.9%). They also showed lower number of siliquas per plant and lower oil content in the seed. But the dwarf plants were relatively more compact with high siliqua density and occupied comparatively much less crop growing space than that of the tall plants of PT 303. However, the dwarf plants, on an average, had 7.2 branches/plant as compared to 6.7 in PT 303. Since there was considerable variation for plant height, number of siliquas/plant and seed yield/plant within the progenies of the dwarf plants, useful selection could be done for obtaining desirable dwarfs with ideal plant type for high yield.

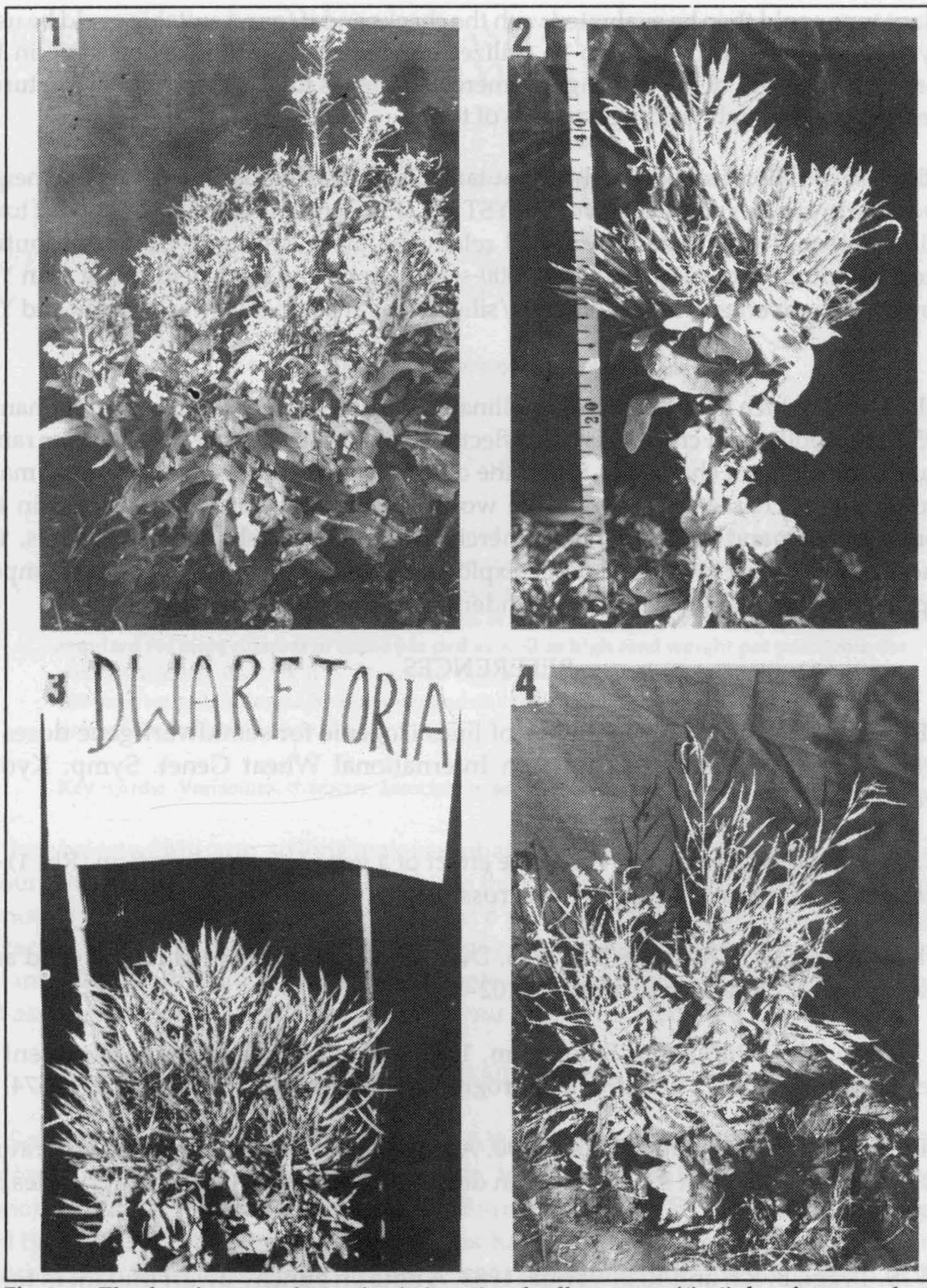

Fig. 1 **The dwarf mutant plants of toria (1 to 3) and yellow sarson (4) : 1) dwarf mutant plant at full flowering; 2) dwarf mutant plant at the siliqua maturity stage; 3) a variant form of dwarf toria mutant; and 4) dwarf mutant plant of yellow sarson.**

Such plant type could then be evaluated with the checks and if found suitable could be used directly. Alternatively, it could also be utilized for incorporating dwarfing gene in the agronomic background of the existing commercial varieties for developing short statured, fertilizer responsive, high yielding varieties of toria.

In the case of yellow sarson, the dwarf mutant (50 cm) had almost one-third plant height of the popularly grown commercial variety YST 151 (152.7 cm). As in the case of dwarf toria, the yellow sarson dwarf mutant also, had relatively lower values of yield contributing characters like number of siliquas/plant, 1000-seed weight, and seed yield/plant than YST 151. However, the average number of seeds/siliqua was at par in the dwarf mutant and YST 151.

Unlike toria, which is a highly cross-pollinated crop, yellow sarson is a predominantly (85 to 95%) self-pollinated crop. This has reflected in obtaining comparatively lower range of variation for different characters. Since, the dwarf plants had lower values of the major yield contributing characters, it would be worthwhile to transfer the dwarfness in the agronomic background of the tall commercial varieties of yellow sarson. Thus, the usefulness of this dwarf mutant could be explored in the developing dwarf and compact genotypes which are likely to yield more under high plant population density.

REFERENCES

1. R. E. Allan. 1983. Yield performance of lines isogenic for semidwarf gene doses in several wheat populations. Proc. 6th International Wheat Genet. Symp. Kyoto, Japan: 265–270.

2. J. E. Brandle and D. R. Knott. 1986. The effect of a gene for semidwarfism (Rht 1) on various characters in a spring wheat cross. Can. J. Plant Sci., **66**: 526–533.

3. H. K. Jain and V. P. Kulshrestha. 1976. Dwarfing genes and breeding for yield and bread wheat. Z. Pflanzenzuchtg., **76**: 102–112.

4. W. Nelson, H. J. Dubin and S. Rajaram. 1980. Norin 10 dwarfing genes present in lines used in CIMMYT bread wheat programme. Cereal Res. Comm., **8**: 573–574.

5. R. Tripathi, A. K. Joshi and B. Rai. 1990. Agronomic consequences of incorporating Rht 3 dwarfing genes in four tall Indian desi wheat varieties. Orissa J. Agric. Res., **3**: 51–53.

6. D. V. S. Tyagi, B. Rai and R. B. Verma. 1983. A note on bunchy dwarf mutant in toria. Indian J. Genet., **43**: 374–377.