IMPROVEMENT OF SCENTED RICE VARIETIES (BASMATI 370) THROUGH INDUCED MUTATION

AT the Central Rice Research Institute, a breeding programme was initiated in 1971 to improve the yielding ability and arrest the lodging habit of fine and scented rice varieties through both conventional and mutation breeding. Significant results obtained through mutation breeding in the improvement of one such variety. Basmati 370, retaining all its original grain quality characteristics are reported in this paper.

Dry seeds of Basmati 370 (10% moisture) were treated with 20 Kr gamma rays from 60_{Co} source at IARI during June 1971. M_1, M_2 and M_3 generations of these irradiated seeds were grown during subsequent seasons. Most of the morphological mutants showing marked changes along with culm shortening were screened out and were grown separately. Short statured mutants with no change in grain and cooking qualities from that of the parent were retained. In M_4 generation, 16 promising semidwarf mutants were finally isolated. These mutants bred true in M_5 generation and were assessed for yielding ability, grain size, appearance, kernel elongation and scent in M_5 and M_6 generations.

Data presented in Table I showed that the mutants of Basmati 370 were shorter in height and had more ear bearing tillers and had given higher yield (33–133%) than the control. At the same time, there was no alteration either in their duration, grain appearance, cooking quality or aroma,. It was noted that some of the mutants had better kernel elongation on cooking than that of Basmati 370.

In the earlier attempt to induce high yielding semidwarf mutants in scented varieties[5], the mutants reported seemed to have lost their grain quality or proved lower yielding than the parent. Reddy and Reddy[7] obtained promising dwarf mutants from HR. 47 (Basmati) which were earlier and yielded (70%) more than the control. Likewise, dwarf mutants had been isolated in the scented varieties NP. 49 (Dehra Dun Basmati) and NP. 114 (Kamod, scented) with a fair degree of resistance to blast, bacterial leaf blight and tungro virus[4] but these were found to be inferior to high yielding semidwarf varieties. At the Central Rice Research Institute, Misra (unpublished) isolated a semidwarf high tillering mutant in the short grained scented rice variety T. 412 without scent.

Scent is a heritable character and its presence has been reported to be governed by two to three pairs of genes[6]. Grain size and shape are governed by polygenic systems[1] and hence it is a tardy process to fix such characters through recombination breeding. Introduction of an alien dwarfing gene seemed to disturb the genic alignment controlling scent and cooking quality and to render identification of scented segregants in rice varieties through recombination breeding more difficult. On the contrary improvement in cooking quality and other grain characteristics has been feasible through induced mutation[2,3]. These scented semidwarf

TABLE I

Agronomic characters of Basmati 370 mutants

Mutant No.	Height (cm)	Average ears (No.)	Elongation ratio on cooking	Computed yield potential (kg/ha)	% yield over Basmati control
5712–4	95	28	2·28	4158	133
5713–10	100	24	2·26	3670	106
5713–14	90	19	2·24	3148	76
5712–8	99	20	2·22	2970	66
5707–1	94	18	2·16	2970	66
5709–5	93	21	2·14	2768	55
5708–5	106	19	2·12	2376	83
5713–7	89	20	2·10	2376	83
Basmati-370 (Control)	132	14	1·62	1782	..

mutants, because of their higher yield potential, could be grown as commercial varieties or used as scented semidwarf donors for improvement of other scented rice varieties. Thus, when the breeding objective is elimination or modification of one or two characters with the integrity of all other characters in tact in a rice cultivar, mutation breeding seems to be a more elegant and quick approach.

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A PARTIALLY SELF-COMPATIBLE SUNFLOWER

The low seed yields of sunflower (*Helianthus annuus* L.) are due to the occurrence of a high degree of unfilled or empty seeds ranging from 10 to 50%[1]. The problem is further accentuated by the sporophytic self-incompatibility system[2] which prevents seed set under self-pollination. The high degree of empty seededness is a major genetical problem[1] and therefore the incorporation of certain degree of self-compatibility would ensure seed filling eliminating the need for pollnating agents. Some of the lines and hybrids developed were found to be partially compatible[3,4]. However, the degree of self-compatibility was not reported. The discovery of a spontaneously occurring self-compatible sunflower line and its performance under selfing and in crosses is reported here.

The self-compatible (SC) mutant has a distinct plant type with conical appearance and additional inflorescences in the terminal axils of leaves (Fig. 1). The progeny derived from this exhibited wide variability for several morphological characters. The plants were of different heights (200–250 cm) and later in duration (120–140 days). The leaves numbering 80 to 98 were typically light green in colour. The diameter of the head ranged from 9 to 19 cm at maturity. The seeds (achenes) were small with thick ashy white hull and small kernels.

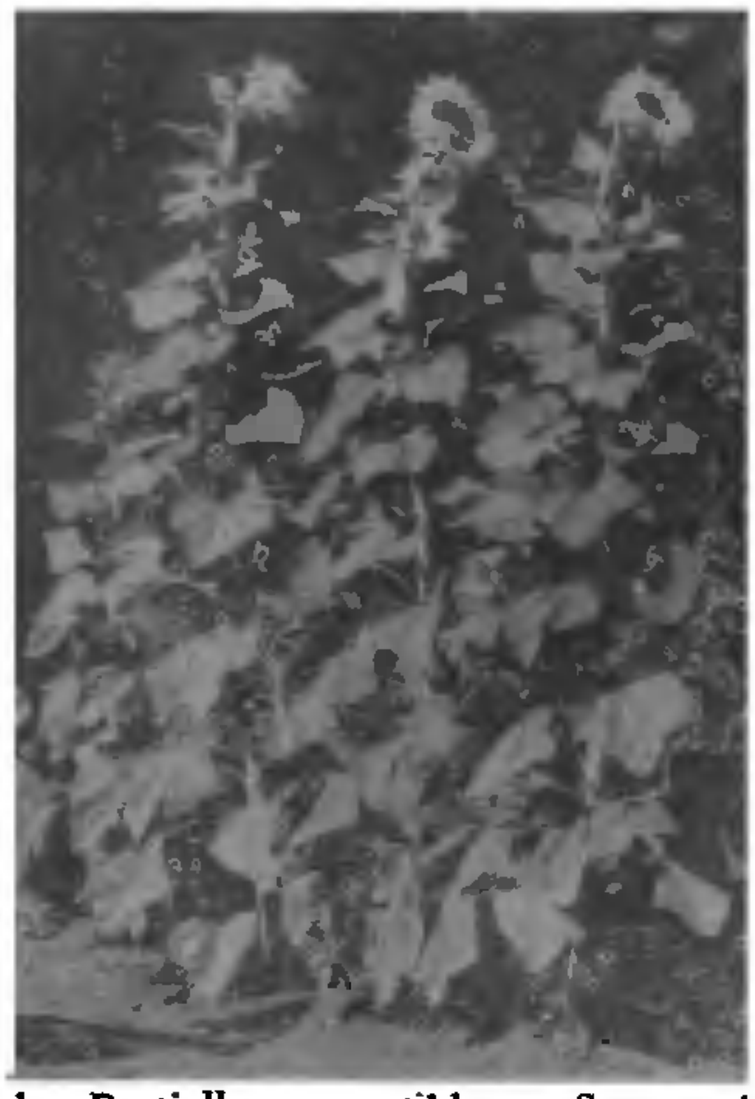

Fig. 1. Partially compatible sunflower plants.

Table I

Seed set under selfing in sunflower

Particulars	Range %	Mean
A. Self-incompatible (SI)		
EC 27501 (10)*	0 0– 0 0	0·0
Sunrise (13)	0 0–46·7	8·3
EC 77195 (12)	0·0–38·7	8·5
B. Self-compatible (SC)		
(Plant numbers)		
289 (2)	13 0–56 9	35·0
290 (3)	4 5–37·0	25 8
291 (8)	0·0–54·3	30 5
292 (2)	42·8–69·9	56·3
293 (11)	25·5–85·8	54·0
C. Hybrids (F_1's)		
SC × EC 77195 (7)	0 0–64 0	26·6
SC × EC 27501 (13)	0·0–82·9	41·6
SC × Unknown (14)	0·0–80·8	59·3
SC × Sunrise (1)	0·0–80·8	65·1
D. Group means		
SI	0·0–46·7	5 6
SC	0·0–85·8	40·3
F_1's	0·0–82·9	48·2

* Number of plants.