seed yield. The mutant took only 54 days to mature. This early mutant is very interesting for double/triple cropping and may help to bridge the widening gap between pulse production and consumption in India.

Table: Various agronomic traits of mutant and control plants in M_3 generation

Variety/ mutant	Height (cm)	Number pods/ plants	Pod length cm	No. of seeds/pod	Seed yield/ plant	Days to maturity
K851	28.5	10.8	6.5	9.0	3.29	60
Mutant	20.3	12.9	8.5	14.2	4.15	54

(Contributed by Pande, Kalpana and S.S. Raghuvanshi, Plant Genetics Unit, Department of Botany, Lucknow University, Lucknow 226 007, India).

High yielding and early maturing mutants in mungbean (Vigna radiata (L) Wilczek)

Mungbean in Pakistan is grown on about 79 thousand hectares with an annual production of around 39600 t. The poor yield of cultivars may be largely due to their indeterminate excessive vegetative growth, low harvest index, and susceptibility to various diseases. Lack of synchrony in maturity and pod shattering are also limiting factors. Mutation breeding of mungbean at NIAB has the object of evolving early and uniform maturing high yielding mutants.

Seeds of mungbean strains Pak-22 and RC71-27 were irradiated with ^{60}Co gamma rays (5 kR to 80 kR) in 1977. After selecting mutants in the M_2, further selections were made in M_3 for earliness, uniform maturity, short plant stature and larger number of pods/plant. In the M_4, 62 selections were subjected to micro plot yield trials and seed protein analysis. Selection was continued in the advanced generations and performance was studied in multilocational trials arranged through the Department of Agriculture. The important characteristics of two mutants namely NM19-19 (derivative of strain Pak 22 at 40 kR) and NM121-25 (derivative of strain RC71-27 at 20 kR) are listed in Table 1, whereas their field performance is summarized in Table 2.

Both the mutants are short statured and have erect determinate growth habit. They mature early by a margin of 16 days and yield higher. The high 'harvest index' of the mutants indicates their efficiency in partitioning photosynthates towards grain formation. Because of their synchrony in maturity and top fruit bearing habit the mutants are amenable to mechanized harvesting. The early maturity in mutants also makes them more suitable for intercropping practices. The mutants possess greater degree of tolerance to yellow mosaic disease and have shown wide adaptability and stability when grown under different agroclimatic conditions. Both the mutants have been released in 1986, by the Punjab Seed Council as commercial varieties under the names of "NIAB Mung 121-25" and "NIAB Mung 19-19" respectively.

Table 1: Comparison of mutants with parents (Average of 3 crop seasons)

Character	Mutant NM19-19	Parent Pak-22	Mutant NM121-25	Parent RC71-27
Maturity in days	66	88	70	86
Height (cm)	62	77	65	78
No. of pods/plant	36	24	33	27
Pod length (cm)	7.3	7.4	7.5	7.4
Seeds per pod	12.4	12.9	12.7	12.9
No. of pod clusters	10.8	8.7	11.3	9.4
% of pods with less than 50% filling	14.3	21.6	13.3	24.2
No. of branches	2.4	2.6	2.3	3.0
Harvest index (%)	30.1	13.2	26.8	14.4
Per day productivity (kg/ha)	15.4	6.3	14.7	6.9
Thousand seed wt. (g)	30.8	29.6	31.9	29.5
Seed protein content (%)	23.2	23.0	23.6	23.0
Pollen fertility (%)	94.8	94.8	94.6	94.5
Disease reaction MYMV cls	tol. mod.tol	mod. tol. mod.susc.	tol. mod.susc.	mod. tol. mod.susc.

Table 2: Performance of mutants and their parents in multilocation yield trials 1980-1983

Mutant/Parent/ Check	Average yield kg/ha 1980 4 loc.	1981 11 loc.	1982 26 loc.	3 years average yield 41 loc. kg/ha	% increase over check var. 6601
Mutant NM19-19	952	1345	1636	1311	35.5
Mutant NM 121-25	1052	1484	1644	1393	44.0
Strain Pak-22	792	1027	1211	1010	4.0
Strain RC71-27	786	1111	1217	1038	7.3
Var. 6601 (check)	747	1003	1153	968	-

39 out of 41 locations, the differences in yield were statistically significant.

REFERENCE

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(contributed by I.A. Malik, Nuclear Institute for Agriculture and Botany, Pakistan Atomic Energy Commission, P.O. Box 128, Jhang Road, Faisalabad, Pakistan).

Improvement of mungbean through induced mutations

Mungbean (Vigna radiata (L.) Wilczek) a crop of high nutritive value is the major summer pulse in Pakistan. However, the farmers yield is only about 450 kg/ha. Hybridization is tedious because of cleistogamy and delicate floral structure but mungbean is well suted for mutation breeding (Rajput 1974, Malik et al. 1986). We report new useful mutants in mungbean developed at this Centre.