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Mutation Breeding Newsletter

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RESEARCH NEWS

"Golden Haidegg", a new apple mutant clone with improved marketing value

"Golden Delicious" and its derivatives are the leading apple cultivars in Austria. Traits limiting the economic yield are susceptibility to russeting, a heterogenous fruit assortment score and consumer preferences.

Mutation breeding was started in 1972. Dormant five bud scions of "Golden Delicious" were irradiated with 40, 50 or 60 Gy gamma rays at a dose rate of 20 Gy min^{-1} and grafted on rootstocks M9. M_1V_1 survival rates were 78% (40 Gy), 36% (50 Gy) and 6% (60 Gy). Surviving scions produced, on the average, two primary shoots from which three to five buds were used for summer budding. Primary shoots were pruned back to force M_1V_2 shoots from the lower secondary buds.

An incidental occurrence of viruses and mycoplasms was overcome by thermotherapy, but delayed completing procedures of selection, re-selection and confirmation of the selected traits till the M_1V_6 generation. Desirable mutations in shoot vigor, growth type, fruit size and fruit quality characters were obtained from the 40 and 50 Gy treatments only, while 60 Gy produced generally grossly aberrant phenotypes. A mutant with smooth sheen fruits associated with a more flat shape and non-russeting was selected from the 50 Gy treatment.

Smooth sheen and non-russeting are evidently independent traits. Among 18 different mutant clones tested in microtrials, only the russet-free, smooth sheen clone was superior to the parent cultivar in market value. This clone, named "Golden Haidegg", was tested during four years in different environments, compared with other clones derived from "Golden Delicious", i.e. Lysgolden, Belgolden, Supergolden, Cloden, Golden 1972, Golden s.r E9, Golden clone A and B, Golden Shay, Golden Missouri, Charden, Mutsu and Smoothe. All trees were virus free, grafted on rootstock M9 and trained as slender spindle; applied field management conditions were identical. The evaluation concerned yield, russeting, fruit-shape, colour, weight, assortment and cold-storability. Clone "Golden Haidegg" exerted similar performance as "Lysgolden" but had a better score of non-russeting and of fruit assortment. Though the fruit yield per unit area was insignificantly lower than of the highest yielding "Golden Delicious" clone, "Golden Haidegg" exceeded considerably the marketing value of "Golden Delicious" (99% compared to 63% A quality). While the fruit colour of "Lysgolden" is yellowish green with a dump reddish cover, "Golden Haidegg" has a faint yellow base and a brown-red cover colour. These differences may be associated with the 7-10 days later maturity of "Lysgolden". "Golden Haidegg" fruits have a 2-week longer cold-storability at 3°C and 90% rel.h. than "Lysgolden". Sensoric tests have valued the sweet-acid-aromatic components of "Golden Haidegg" higher than "Golden Delicious" which would improve acceptability by the consumer. Thus the new apple variety has a series of characteristics of economic value. "Golden Haidegg" has been released in 1984 and is already grown in several European countries.

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(Contributed by F. Strempl, H. Keppl, Fruit Research Station Haidegg, Ragnitzstr. 193, A-8047 Graz, Austria and H. Brunner, IAEA Laboratory, Seibersdorf, Austria).

Pollen irradiation method to obtain mutants in cucumber

Seed irradiation for mutation induction in dioecious crops like cucumber is not very useful because chimerism of the mutated tissues makes the segregation of mutants in the M_2 generation nearly impossible. This problem does not exist with pollen irradiation. Cucumber (*Cucumis sativus* L. var. Nishikisuyo) was used for a model experiment. The petals of male and female flowers were closed by pinching with binding wire before flowering to prevent pollination by insects. On the flowering day, the male flowers were collected and irradiated with 1 kR to 10 kR of acute gamma rays (137-Cs), then used to pollinate the female flowers. The M_1 seeds thus obtained are not chimeric but heterozygous for induced mutations. When planted, no mutant phenotype appared. Selfing within a plant lead to segregation of mutants in the M_2 generation. Seedling examination revealed eight mutants (Table). One mutant line, in which the shape of leaves changed from pentagonal to round heart shape, was found under field conditions.

The optimal dose for pollen irradiation seems to be between 2 kR and 4 kR.

Table: Mutation frequency of cucumber after irradiation of pollen.

Radiation dose (kR)	No. of selfed progenies	No. of mutants	Mutation freq. (%)
0	71	0	0.0
1	42	0	0.0
2	282	5	1.8
4	147	2	1.4
6	23	0	0.0
8	5	1	20.0

(Contributed by S. lida and E. Amano, Institute of Radiation Breeding, National Institute of Agrobiological Resources, MAFF, P.O. Box 3, Ohmiya-machi, Naka-gun, Ibaraki-ken, 319-22 Japan).

XA0201320

New early-ripening wheat mutant lines from the varieties Norman and Avalon

The English' wheat varieties "Norman" and "Avalon" are high-productive, resistant to lodging and to diseases but late-ripening in Bulgaria. They are 10-15 days later than the variety "Sadovo 1" and therefore suffer often from dry and hot weather, causing premature ripening and shrivelled seed. Dry seeds from the two varieties were irradiated with 10 and 15 kR ^{60}Co gamma rays. In M_2, several earlier ripening forms were selected and they were studied also in M_3 in 1987. In the Table, four early ripening mutant lines and the respective initial varieties are compared. They vary significantly in plant height and grain size. The mutant lines of "Norman" produce smaller grain but all mutants show a higher hectoliter weight. The mutant lines head and mature 4 to 10 days earlier than the respective initial varieties. Some of them are as productive as the standard and other cultivated varieties. We shall continue testing their productivity and possibilities for their use in the breeding.

Initial cultivars & mutant lines	Height cm	1000-grain weight	Hectoliter weight	Heading begin	Heading complete
Norman	70.0	44.0	69.5	8 June	10 June
M 42	80.0	36.4	78.2	29 May	1 June
M 889	90.0	37.9	72.1	2 June	4 June
Avalon	70.0	34.0	68.2	7 June	5 June
M 48	100.0	37.2	80.4	31 May	3 June
M 763/201	70.0	39.8	78.0	2 June	5 June

(Contributed by K. Djelepov, Wheat and Sunflower Institute, General Toshevo, Bulgaria).

XA0201321

Resistance to leaf spot disease in peanut

Leaf spot disease causes defoliation of peanut plants during pod development thereby reducing yield. To induce mutations for resistance to the disease, dormant seeds of peanut were irradiated with 10-40 kR gamma rays with pre- and post-irradiation treatments to minimize radiation damage. Spores of the causal fungi, Cercospora arachidicola Hori and Cercosporidium personatum (B&C) Deigh., were cultured under asceptic conditions in PDA medium with 2-3 drops of 10% table salt solution to enhance development of spores. The first two leaves of M_2 seedlings were hand-inoculated two or three times in the field at one week intervals. Out of a total of 2,453 M_2 seedlings inoculated thrice, 9 plants showed complete resistance based on degree of infection. However, after recurrent selection, only 3 M_5 lines gave complete resistance, the rest exhibiting only intermediate resistance.

The disease resistant lines yielded almost twice as much as several commercial varieties due to extensive leaf defoliation in the latter. One of the mutant lines is being crossed with some popular susceptible varieties.

Inheritance studies showed that leaf spot resistance is governed by two recessive mutant genes acting complementary. The F_2 ratio was close to 15:1. The mutant lines are presently evaluated through the Bureau of Plant Industry before seeds are distributed to peanut growers.

(Contributed by J.D. Soriano, Institute of Biology, College of Science, University of the Philippines, Diliman, Quezon City, Philippines).

XA0201322

Gamma ray induced mutants in Colocasia

Following treatments with 250 r, 500 r and 1000 r gamma rays Colocasia mutants with changes in morphological and yield characters were selected. Results from a preliminary yield trial of four mutants with its control variety C 9 are presented in the Table. The mutant's characteristics are (i) erect and narrow leaf (ii) cup shaped leaf, dwarf, matures within 120 days against 180 days in control (iii) narrow and thicker leaves, colour of lamina chalky and pale green (iv) vigorous.

Table: Characteristics of gamma ray induced mutants in Colocasia.

	Height	Sheath length	Leaf length	Leaf width	Tuber no/plant	Tuber wt/ plant
Erect leaf mutant	23.5	12.0	16.5	13.5	7.4	125.8
Cup shaped leaf mutant	51.0	34.4	20.0	12.0	9.5	342.0
Narrow leaf mutant	42.6	28.5	25.1	18.8	9.2	435.5
Vigorous mutant	53.5	36.3	30.3	28.5	11.5	575.0
C 9 control	50.4	31.5	28.5	25.2	10.1	373.7

(Contributed by K. Vasudevan and J.S. Jos, Central Tuber Crops Research Institute, Trivandrum, Kerala, India).

XA0201323

Gamma ray induced mutants in Coleus

The germplasm collection of Chinese potato (Coleus parviflorus Benth) contains almost no variation for yield contributing traits. The crop does not produce seeds. Treatment of underground tubers with 1 kR, 2 kR, 3 kR and 4 kR gamma rays resulted in 50 morphologically different mutants, which are maintained as mutant clones. In the M_1V_1 generation, suspected mutant sprouts, were carefully removed and grown separately. The most interesting mutant types are the following: (i) erect mutant with spoon shaped light green leaves, 30 cm long inflorescences against 20 cm in the control, cylindrical tubers measuring ca. 7.0 cm long and 3 cm girth against 4 cm and 2.5 cm in the control (ii) early mutants 1 and 2, one having less leaf serration, the other having light green small leaves and dwarf type (iii) fleshy leaf mutant, dark green, thick and smooth leaves. For more details see the Table. Control plants spread almost in 1 m^2 area and bear tubers from the nodes of branches. In the early mutants tuber formation is mainly restricted to the base of the plant, which makes harvest easier. The crop usually matures within 150 - 160 days, the early mutants are ready for harvest 100 days after planting. As the mutants are less spreading, the yield could be increased by closer spacing.

Table: Characteristics of gamma ray induced mutants in Coleus

	Vine length	Internode length	Leaf length	Leaf width	Days to flower	Tuber no/ plant	Tuber wt/ plant
Erect mutant	21.5	4.3	3.1	2.4	65	20	233
Early mutant 1	19.0	3.2	3.4	3.0	58	37	228
Early mutant 2	17.7	3.0	2.5	2.0	56	34	183
Fleshy leaf mutant	27.5	4.2	4.3	3.5	68	22	187
CP-11 (control)	38.5	6.3	5.1	6.0	105	45	256

(Contributed by K. Vasudevan and J.S. Jos, Central Tuber Crops Research Institute, Trivandrum, Kerala, India).

XA0201324

Induction of male sterility in rice using chemical mutagens

To diversify the sources of cytoplasmic male sterility for hybrid seed production in rice (Oryza sativa L.) attempts were made to induce this character in a popular indica cultivar PR 106 through chemical mutagens. Seeds were treated with 0.4% ethidium bromide (EB) for 24 or 48h at 10°C, with 0.4% ethyl methanesulphonate (EMS) for 24 or 48h at 10°C for 16 hr at 20°C or with 0.2% streptomycin sulphate (SM) for 24 or 48 hr at 10°C. In M_2 male sterile plants were detected in eleven different progenies, one from SM treatment and the remaining from EMS treatments. All the sterile plants had 100% non-stainable aborted pollen. Seed set upon open-pollination of the male sterile plants with the variety PR 106 ranged from 0.03 to 4.93 per cent whereas no seed formed in bagged panicles. In M_3, open-pollinated progenies of the male sterile plants and their fertile sibs were further studied. Two progenies segregated for male sterility, all others had only fertile plants. In one of the segregating progenies, five out of six and in the other nine out of fourteen plants were male sterile. The progenies of fertile sibs did not have any male sterile plant. The results indicate that sterility of cytoplasmic type has been induced by EMS. The parental variety PR 106 acts as the maintainer.

(Contributed by J.L. Minocha and R.K. Gupta, Department of Genetics, Punjab Agricultural University, Ludhiana 141 004, India).

XA0201325

Mutants for plant height in hexaploid triticale

Four hexaploid triticale varieties namely Beagle, Coorong, TL 419 and Welsh were subjected to gamma rays (100 Gy, 200 Gy, 300 Gy) and to aqueous solution of EMS (0.5%, (8h, 12h, 16h).

In all four varieties, three types of mutants for plant height were observed:

- Semidwarf - the mutant plants are 20-25 cm shorter than the shortest plant in the control.
- Dwarf - mutant plants grow up to 40-60 cm.
- Stunted - mutant plants grow up to 10-20 cm.

The segregation pattern suggests that semidwarf mutants are quantitatively inherited, showing continuous segregation in M_3, M_4 and M_5, whereas 'dwarf' and 'stunted' are monogenic recessive. They showed true breeding in M_3 and later generations.

The semi-dwarf, dwarf and stunted mutants can be used as initial material for development of new varieties with short straw and resistance to lodging.

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(Contributed by V.R.K. Reddy and P.K. Gupta, Department of Agricultural Botany, Institute of Advanced Studies, Meerut University, Meerut, India).

Gamma ray induced high yielding dwarf mutant in Vigna radiata L. Wilczek

Single and combined treatments with gamma rays and EMS were tried on *V. radiata* (L. Wilczek) variety K 851. Seeds were exposed to 10, 20 and 30 krad gamma rays. One set of each dose was treated with 0.25% EMS solution (pH 7 at 30°C) for 6 hours. The M_2 generation was screened for mutants.

A dwarf mutant with signs of higher yield was observed in the 20 krad plot. The mutant exceeded the parent variety in several agronomic traits and was true breeding in M_3. Crossing with the control confirmed its monogenic and recessive character. Significant increase was found in number of pods/plant and number of seeds/pod (Table) leading to higher

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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	tol.	mod. tol.	tol.	mod. tol.
cls	mod.tol	mod.susc.	mod.susc.	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

Mutation Breeding Newsletter No. 30 (1987) p.28.

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

XA0201328

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.

Mungbean varieties Pak-22 and 6601 were treated with gamma rays (100, 200, 300 and 400 Gy). True breeding mutant lines from M_3 were evaluated in a yield trial during spring 1987.

Mutant lines showed significant differences in maturity, plant height, 100 grain weight and grain yield, the four top yielding mutant lines (24/20, 25/20, 2/40 and 6/20) have yield increases of 17-49% over their respective parents (Table). These mutant lines have the potentiality of being released as new mungbean varieties for the Province of Sind.

Table: Performance of mungbean mutants in yield trial

Mutant/Parent variety	Radiation dose (Gy)	Days till maturity	Plant height (cm)	100 grain weight (g)	Grain yield (kg/ha)	Rank	Yield increase over the parent (%)
Var. 6601		69	38.6	3.51	1011	16	-
Mutant 12/20	200	65	40.5	2.96	1247	8	23
Mutant 14/20	200	62	34.4	3.93	1153	12	14
Mutant 6/20	200	59	38.1	3.60	1341	4	32
Mutant 26/30	300	61	39.4	4.03	1186	9	17
Mutant 29/30	300	59	38.5	4.06	1324	6	30
Mutant 18/30	300	58	37.8	3.80	1100	14	8
Mutant 38/30	300	61	39.0	3.56	1109	13	9
Mutant 32/20	200	58	32.7	3.90	1051	15	3
Mutant 40/30	300	61	37.6	3.13	1334	5	31
Mutant 24/20	200	63	44.2	3.26	1506	1	49
Mutant 25/20	200	63	38.3	3.73	1419	2	40
Mutant 44/20	200	63	40.5	3.63	983	17	0
Var. Pak-22		62	38.5	3.26	1162	11	-
Mutant 1/40	400	61	38.6	3.41	1255	7	8
Mutant 2/40	400	63	37.5	3.93	1363	3	17
C-23 (check)		78	51.8	2.23	1178	10	-
LSD_1		0.54	3.8	0.67	106.85		
LSD_2		0.73	5.1	0.91	-		

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(Contributed by M.A. Rajput, G. Sarwar and K.A. Siddiqui, Atomic Energy Agricultural Research Centre, Tandojam, Sind, Pakistan).

A non-flowering green panic grass (Panicum maximum var. trichoglume) obtained through gamma irradiation

Supression of flowering has many advantages in a forage crop. Such genotypes are not only expected to give more yield but also to be more nutritious. Non-flowering plants also remain fresh and green for a longer period in the field compared to the flowering types.

Green panic (Panicum maximum var. trichoglume) is a high yielding, nutritious, fast growing and drought tolerant grass that has a potential to grow even under partial shade conditions. However, the major drawback of this grass is that it flowers early and profusely, with the result that most of the nutrients are diverted towards panicle formation. With an objective to supress the panicle initiation a mutation breeding programme was taken up. Seeds of green panic grass were subjected to gamma ray treatment with doses of 40, 50 and 60 krad.

From the large spectrum of variation observed for flowering habit quite a few non-flowering plants were isolated and of these the one from 40 krad treatment was prominent. This non-flowering plant yielded more green foliage than the flowering type and recorded an increase to the extend of 10.5% (Table I) and 22.5% in monthly and bi-monthly harvests respectively. The increase in green foliage yield was directly attributable to an increase in the number of tillers and concomitant reduction in culm weight. Unlike in the flowering types the mutant had more accumulation of dry matter in the leaves rather than the stem. Further nutritional analysis of leaves showed that the non-flowering plant is superior with 6.04% crude protein which represents 100% increase over that of flowering type. The calcium content (0.5%) was also double and the moisture content (11.70%) was higher in the non-flowering plant. The crude fibre content was reduced by 2%.

Inhibition of flowering is a common feature in mutagen treated material, but it is seldom inherited. In sugarcane non-arrowing mutants have been induced with advantage to increase the sugar content (Walker and Sisodia, 1969). The present investigation demonstrated the possibility of suppressing flowering in forage grasses.

REFERENCE

WALKER, D.I.J. and SISODIA, N.S., Induction of non-flowering mutants in sugarcane (Saccharum sp). Crop Science 9 (1969) 551-552.

(Contributed by G. Shivashankar, D.M. Mahishi and R.S. Kulkarni, Department of Agricultural Botany, University of Agric. Sciences, GKVK, Bangalore 560 065, India).

XA0201330

Mutagenesis in rice

Mutation induction has been used at the Food Crops Research Institute since the late 1970s. In the winter 1981-1982 dimethyl sulfate (DMS) was used to treat F_1 seeds of several crosses for 12 hours. Pedigree method was applied from M_2/F_3 onward. In M_6 some useful mutant lines were selected. They have a crop duration of 175-185 days in spring season, erect and dark green leaves, compact stem with plant height of 76-95 cm, sterility percentage of 9-17% and 1000 grain weight of 28-31 g.

Since spring 1985 they have been in yield trials with Xuan no. 2, the most popular and high yielding spring crop variety, and one progeny of the cross Xuan no.2/2765 without mutagen treatment as check. Results obtained are as follows:

Mutant lines or varieties	Origin of the mutants	Grain yield t/ha	% as compared with check
DB 1	Xuan no.2/2765, 0.02% DMS	4.9	119
DB 2	" " "	5.8	138
DB 3	1623/Xuan no.2, 0.02% DMS	4.3	102
DB 4	IR 8/Xuan no.2, 0.02% DMS	5.6	133
DB 5	" " " "	5.2	123
control	Xuan no.2/2765, no treatment	4.4	104
check	Xuan no.2 (yield check)	4.2	100

Resistance to major pests and diseases was maintained or improved:

Lines or varieties	Resistance to Rice blast	BLB	BPH
DB 1 mutant	HR	HR	HR
DB 2 mutant	HR	HR	HR
DB 3 mutant	HR	HR	MS
DB 4 mutant	HR	HR	HR
DB 5 mutant	HR	HR	
CR 203 (BPH check)			HR
84-1 (BPH check)			HR
84-2 (BPH check)			HR
Xuan no.2 (yield check)	HR	R	HS

(Contributed by V.T. Hoang, N.T. Se, M.T. Mien and N.M. Don, Rice Breeding Division, Food Crops Research Institute, Tu Loc, Hai Hung, Vietnam).

Induced dwarf mutant of lentil, RPL-1

Seeds of LL-78 variety of lentil were irradiated with 5, 10, 15, 20 krad of gamma rays. In M_2 from 20 krad treatment, a plant with dwarf stature was obtained. Its height was 16 cm, the parent plant 42 cm. In M_3 (1985-86 winter season) 23 plants could be grouped into two classes. Sixteen plants were shorter than 10 cm (dwarf) and seven were between 20 and 30 cm (semi-dwarf). Dwarf plant bred true in M_4 but semi-dwarf segregated in the ratio of 1 dwarf: 1 semi-dwarf.

This dwarf mutant line, RPL-1 is the dwarfest genotype of lentil so far known. It may be useful in lentil breeding to evolve high yielding dwarf varieties suitable for areas where lentil plants lodge due to excessive vegetative growth.

(Contributed by R.P. Sinha, Tirhut College of Agriculture, Dholi, Muzaffarpur, Bihar, India).

Serrated leaf mutant in mungbean (Vigna radiata (L) Wilczek)

Dry dormant seeds of mungbean (*Vigna radiata* (L) Wilczek) were treated with gamma rays (15, 30 and 60 kR).

The serrated leaf mutation was noticed in M_2 of cultivar Pak 32 treated with 60 kR. Cf 14 plants, 3 showed the altered leaf structure and the others were normal. The feature of this mutant was the deep serration of leaflet margins. The mutant had large thick leaflets with prominent venation. The mutant bred true in the M_3 and successive generation.

Details of the morphological characteristics of the mutant are presented in the the Table.

Table: Mean values of characters of parent and the induced serrated leaf mutant of mungbean

Characters	Parent	Mutant
Days to flower	51	57
Days to mature	85	90
Plant height (cm)	71	62
No. of pods per plant	27.4	32.5
Length of the pod (cm)	7.2	7.1
No. of seeds per pod	11.6	8.1
Thousand seed weight (g)	29.6	46.5
Length of the 6th leaflet (cm)	10.5	12.6
Breadth of the 6th leaflet (cm)	11.6	15.6
No. of branches	2.1	2.7
No. of pod clusters	10.5	11.5
Seed colour/surface	Green/Glossy	Yellowish green/glossy
Seed yield per plant (g)	7.6	6.4
Seed protein (%)	22.4	25.6
Pollen fertility (%)	96.7	88.2 (Range 46-95%)

The mutant exhibited slower growth particularly during the early stages of development, flowered later and attained shorter height. There was an increase in the number of pods, in seed weight and in seed protein content, but number of seed per pod was considerably reduced. The seed coat colour showed a change from green to yellowish green. In the mutant's flowers the stamina were placed much below the stigma level and the stigma sometimes protruded the corolla. Outcrossing of 4% recorded in some of the mutant lines revealed a reduced cleistogamy. The low number of seeds per pod in the mutant could be due to reduced pollen fertility.

The mutant behaved as monogenic recessive. The symbols SL/sl are proposed for this allelic pair. The mutant may have use as a green manure crop because of its large foliage and for the breeders as a genetic marker.

(Contributed by I.A. Malik, Ghulam Sarwar Yousaf Ali and M. Saleem, Division of Mutation Breeding, Nuclear Institute for Agriculture and Biology, Faisalabad, Pakistan).

Biochemical characteristics of mutant lines of currant tomato

The currant tomato is used in breeding for fruit quality. It contains up to 50 mg% ascorbic acid, a large quantity of sugar and 8-10% of dry matter. The weight of the fruit, however, does not exceed 1.2-1.5 g. The plants have long, spreading and very branchy stems.

Gamma ray induced mutants of currant tomato were used, as initial material in breeding for of fruit quality in varieties suitable for mechanized harvesting. The research was carried out mainly at the Department of Vegetable Growing Ukrainian Scientific Research Institute of Irrigation Farming. The regional variety "Lebyazhinskij" (suitable for mechanized harvesting) was adopted as the standard. Its fruits contain: 5.6% dry matter, 2.7% sugars, 0.543% titrated acidity, 26.6 mg/100 g ascorbic acid, 0.425 mg% carotene and 0.35% cellulose.

The biochemical characteristics of the tomato mutants are shown in Table 1. In terms of fruit dry matter, all mutants surpassed the standard. The acidity and the ascorbic acid content varied considerably. Most noteworthy in terms of carotene were the lines GP-5, GP-9 and GP-12. An important factor in the production of tomato paste is the fruit cellulose content. The lowest cellulose content is found in mutant GP-3.

As shown in Table 2. all of the mutants were early ripening. The mutants surpassed the standard in simultaneous fruit ripening.

Mutant lines GP-3, GP-6, GP-9 and GP-12 will be used in the breeding programme for improving fruit quality of varieties suitable for mechanized harvesting.

Table 1. Biochemical evaluation of currant tomato mutants in the nursery collection

Line	Content within fruit					
	Dry matter %	Total sugars %	Total titrated acidity %	Ascorbic acid mg/100 g	Carotene mg%	Cellulose %
108059/2-1 (GP-3)	6.1	3.40	0.603	27.07	0.326	0.21
116215/1-4 (GP-18)	5.9	3.14	0.395	34.14	0.620	0.31
108059/5 (GP-9)	6.8	3.28	0.469	30.30	1.120	0.39
108059/17 (GP-12)	7.6	3.46	0.281	31.20	1.040	0.38
108059/15 (GP-7)	6.6	3.00	0.446	25.99	0.830	0.43
108059/3 (GP-5)	6.3	2.24	0.549	19.87	1.138	0.36
108059/12 (GP-10)	6.4	2.95	0.378	20.15	0.377	0.43
108059/10 (GP-11)	6.6	3.00	0.446	20.99	0.830	0.43
108059/13 (GP-6)	6.2	3.40	0.362	30.10	0.631	0.32
Standard variety	5.6	2.70	0.543	26.60	0.425	0.35

Table 2. Agrobiological evaluation of currant tomato mutants in the nursery collection

Line/Variety	Vegetation period (days)	Yield per plant (%)		Weight per fruit (g)	Number of fruits	Red (%)
		Common	Commercial			
108059/2-1 (GP-3)	84	1507	1379	4.3	360	89
116215/1-4 (GP-18)	80	839	794	9.8	88	92
108059/5 (GP-9)	73	1035	1035	5.4	190	100
108059/17 (GP-12)	77	974	904	6.4	160	89
108059/3 (GP-5)	84	1345	1290	7.2	189	94
108059/12 (GP-10)	78	717	717	7.0	103	100
108059/10 (GP-11)	83	1208	1203	7.9	155	99
108059/13 (GP-6)	82	1318	1288	8.1	171	93
Standard variety	102	2336	1834	70.0	38	68

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Mutation Breeding Newsletter No. 30 (1987) 7-10.

(Contributed by I.Yu. Gorbatenko, Ukranian Scientific Research Institute of Irrigation Farmfing, Kherson, 325029 USSR; V.V. Khrustaleva and V.K. Shcherbakov, Department of Radiation Genetics and Radiobiology, N.I. Vavilov All-Union Scientific Research Institute of Plant-Growing (Moscow Branch), Moscow Province, Domodedovo District, Zelenaya roshcha Post Office, 142086 USSR).

High lysine and high yielding mutants in wheat (Triticum aestivum) L.

The dry seeds of the variety "Lu-26" were irradiated with 20 krad of gamma rays. In M_2 about 300 mutant plants were selected for short stature, rust resistance and other desirable triats. As a result of further selection, in M_6, eight superior lines were finally identified. The agronomic characteristics of these mutants, the parent variety (Lu-26) and a standard check variety (Pak-81) are shown in Table 1.

The selected mutants and commercially grown cultivars (Lu-26 and Pak-81) were studied for total protein content and amino acid pattern. The mutants WM-89-1, WM-6-17 and WM-81-2 showing high yield also contained comparatively high amounts of methionine and lysine. The lysine contents were 565, 410, and 370 mg/100g in the mutants WM-89-1, WM-6-17 and WM-81-2, respectively against a range value of 210-370 mg/100g in other mutants and 250-320 in the commercial cultivars. The mutant WM-81-2 was comparable to WM-56-1-5 in lysine content.

The results of these experiments show a possibility of developing varieties having high yield and high amounts of essential amino acids such as lysine and methionine.

Table: Agronomic characteristics of promising wheat mutants and varieties.

Mutant line/ Variety	Plant height (cm)	Grains/ spike	1000 grains wt. (g)	Harvest index	Yield/ha (kg)
WM-6-17	109.1	43.4	33.1	24.9	4150
WM-89-1	106.7	56.1	32.5	23.1	3561
WM-81-2	75.8	42.8	29.6	33.0	2816
WM-56-1-2	103.0	39.7	29.1	26.2	3500
WM-120-3	99.4	39.5	24.5	28.5	2966
WM-56-1-5	113.3	38.5	38.2	27.7	2996
WM-79-7	86.4	59.6	28.2	26.5	2598
WM-23-1-1	106.0	53.1	30.5	29.3	3056
Lu-26	95.6	38.2	30.9	27.6	2533
Pak-81	97.0	47.3	30.0	28.8	2983
Mean	99.2	45.8	30.7	27.6	3116
CV.	11.3	17.1	11.6	9.7	15.8

(Contributed by T. Mohammad, F. Mahmood, A. Ahmad, A. Sattar and I. Khan, Nuclear Institute for Food and Agriculture, Peshawar, Pakistan).

Modification of genetic effects of gamma radiation by laser radiation

Mutants obtained by means of ionizing radiation and chemical mutagens often show low viability and productivity that makes their use in plant breeding difficult. Methods reducing the destructive mutagen action on important functions of plant organism and increasing quality and practical value of induced mutants would be interesting.

We believe that one method for increasing efficiency of experimental mutagenesis in plants is the application of laser radiation as a modificator of genetic effects of ionizing radiation and chemical mutagens. Combined exposure of wheat seedlings to a gamma radiation dose of 2 kR and to laser radiation with the wave lenth of 632.8 nm (power density - 20 mVt/cm^2, exposure - 30 min.) resulted in reducing the chromosomal aberration percentage from 30.5% in the gamma version to 16.3% in the combined treatment version.

A radiosensibilizing effect was observed at additional exposure of gamma irradiated wheat seeds to laser light with the wave length of 441.6 nm where chromosomal aberration percentage increased from 22% in the gamma-irradiation version to 31% in the combined treatment version. By laser radiation it is also possible to normalize mitotic cell activity suppressed by gamma irradiation. Additional seedling irradiation with the light of helium-neon laser (632.8 nm) resulted in recovery of mitotic cell activity from 21% to 62% and increasing the average content of DNA per nucleus by 10%.

The influence of only laser radiation on plant variability was also studied and it was shown that irradiation of wheat seeds and seedlings with pulsed and continuous laser light of visible spectrum resulted in phenotypically altered forms in M_2. Their frequences was dependent upon power density, dose and radiation wave length. Number of altered forms increased in going from long-wave to short-wave spectrum region. In comparing efficiency of different laser types of pulsed and continuous exposure (dose - 180 J/cm^2) 2% of altered forms in M_2 was observed after using the light of helium-neon laser of red spectrum 6.1% from helium-cadmium laser radiation (λ = 441.6 nm) and 12.3% using powerful pulsed radiation of the second harmonic of neodymium laser (λ = 530 nm) but 9% for ruby laser radiation (λ = 694 nm).

In combined action (gamma radiation + helium-neon laser light) the yield of phenotypically altered forms was lower (from 7.4 up to 10.9% depending on exposure) than in a version of only gamma irradiation (14.0 - 17.6%).

The most interesting fact for plant breeding is that additional exposure of gamma irradiated wheat seeds and seedlings to laser radiation resulted in an expansion of the induced variability spectrum: in versions of combined treatment we selected alterations, which did not occur in plant progenies after their exposure only to ionizing radiation, forms with alteration of agronomic characteristics occurred more often.

(Contributed by L.V. Khotyljova, S.A. Khokhlova and I.V. Khokhlov, Institute of Genetics and Cytology of BSSR Academy of Sciences, Minsk, 220734, Akademicheskaja, 27).

Determinate growth in Pisum: "det" a new mutant gene on chromosome 7

A characteristic feature of the growth of legume plants is the absence of a clear border between vegetative and generative phase. By contrast in cereals, the growth of the vegetative mass ceases with flowering and assimilates are destined for filling grains. With regard to this feature in breeding of legume crops the ideotype of "the self-completion variety" has been conceived. In the broad sense, this term means a plant with a clear end of vegetative growth, after which assimilates should be transported to seeds resulting in more uniform maturity and higher seed yield. Such self-completion can be achieved in different ways, even in the same species. In white lupin, e.g. the cultivar "Wat" drops its leaves in the stage of pod filling. Moreover, in white lupin as well as in yellow and narrow-leaved lupins unbranched genotypes have been selected in which only one, the main stem develops with the inflorescence on top. Additional nodes with a single flower appear instead of branches [1]. The field bean Vicia faba similarly to the pea produces inflorescence on nodes and consecutive nodes develop continuously from the apical meristem. But in the mutation type "determinate growth", controlled by a single gene, the stem is ended by the inflorescence [2].

A comparable gene was found in pea in 1980 as an effect of seed treatment of the line Wt 3527 by the combined dose 200r Nf+0.014% NEU [3,4]. Plants are characterized by inflorescence on the top of the stem and smaller number of flowering nodes. Sometimes apical flowers are abnormal, open, but fertile. The mutant was included in the gene bank under number Wt 16100.

A phenotypically similar line was found at the John Innes Institute, Norwich (UK) [MATHEWS, personal communication]. According to the locus allelism test (Wt 16100 x JI 1358) both mutants are controlled by the same gene. The suggested symbol for this monogenic inherited character is det determinated growth.

For the linkage test, the tester line Wl 1238 was crossed with the mutant Wt 16100. The dihybrid segregation showed the linkage between Det and markers on chromosome 7 - R and Tl. Further analyses for mapping on chromosome 7 are in progress.

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[4] SWIECICKI, W.K., Induced mutation spectrum based on 1314 mutations found in two genotypes of pea under the influence of Nf, NF + NEU, NEU. Pisum Newsletter 16 (1984) 84-86.

(Contributed by W.K. Swiecicki, Plant Breeding Station, Wiatrowo, Poland).

Genetic improvement of sesame by induced mutations

This project started in 1983 with assistance by IAEA at the Agricultural Department of Zulia University and with co-operation of FONALI.

The main objective was the development of mutants with early ripening, between 85 and 95 days, which are drought and disease resistant. During experimentation in Portuguesa and Oriente, with materials produced under this project researchers identified about 20 mutants that show promise in terms of high yield, earliness and disease resistance. Among them are two mutants of the Piritu variety, P-10-7412 (early), and P-10-7412 (medium); four mutants of Criollo Falcón, CF 6-N3H494, CF 53-8874, CF 35-9306 and CF 25-9382, and a Venezuela 44 mutant, III-8408. They exhibit early flowering at 35-45 days, are resistant to the problematic leaf diseases (Cylindrosporium and Cercospora, are resistant to Macrophomina, are drought tolerant and possibly also virus resistant.

These new potential varieties coincide in ripening time, have a good appearance, and show little or no branching, good root development and a good average yield of at least 1000 kg/ha, with a potential of 1500-2000 kg/ha.

(Excerpt from "Ajonjoli" (Sesame) Year XX, No. 1, Caracas, Venezuela, January-June 1986).

Application of chemical mutagens and radiation in breeding buckwheat for larger seeds

In 1974, seeds of the Viktoriya variety of buckwheat were treated with 20-30 krad gamma radiation and chemical mutagens in the Biophysics Department of the Kishinev Agricultural Institute. For the chemical mutagen treatment, we used N-ethylnitroso-urea NEH (0.025 and 0.012%), N-methylnitroso-urea NMH (0.01 and 0.005%), ethylenimine EI (0.01 and 0.005%), dimethyl sulphate DMS (0.01 and 0.005%) and 1.4-bis-diazoacetyl butane DAB (0.01 and 0.05%). Since some investigators think that different results are produced by changing the order of the treatment, we treated seeds with chemical mutagens before and after irradiation and this was followed by drying. A total of 2400 seeds were treated.

Selection started with M_2 seeds produced by M_1 plants. The thousand seed weight of the best ones ranged from 40.7 to 47.8 g, which was 11.9 - 18.7 g heavier than the control. The large seed size thus selected was heritable. Since larger seeds are very important for the creation of high yielding varieties buckwheat, only families with these characteristics were selected for further work. We observed even some further increase in seed weight in the next generation.

It was observed that when planting large seeds, after six days of growth the cotyledons were significantly larger than in the control plants. This characteristic was used in selecting for a high yielding large-seed variety of buckwheat. The plants were selected twice: once for development of large cotyledon leaves and the second time for plant yield. In the fourth generation, the families thus obtained continued to be studied in greenhouse experiments and the same time be propagated under field conditions. The seeds of these families were then combined and under the name "Podolyanka" in 1976 were subjected to competitive variety testing.

Following the competitive variety testing the mutant variety "Podolyanka" was released in 1984. It is high yielding (2950 kg/ha), has a short vegetation period (matures 17-18 days earlier than "Viktoriya"), short stems (height of plant 60-80 cm). The stem has seven nodes, 2-3 primary branches (no secondary branches), 10-12 inflorescences, the first branches occur at the second node and the first inflorescence at the fourth node.

REFERENCE

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(Contributed by E.S. Alekseeva, Agricultural Institute, Kamenets-Podolsky 291900, USSR).

LIST OF CULTIVARS

The Plant Breeding and Genetics Section of the Joint FAO/IAEA Division undertakes the collection and dissemination of information on commercially used agricultural and horticultural cultivars developed through the utilization of induced mutations. This list does not claim to be comprehensive. Its content is strictly based on information transmitted by the breeders themselves and/or other institutions involved. Listing of a cultivar does not imply its recommendation by FAO/IAEA.

Name of new cultivar	Place and date of release (or approval) and name of principal worker and institute	Kind and date of mutagenic treatment [parent variety] or mutant crosses (mutant underlined)	Main improved attribute of cultivar
Agrostis sp. (creeping bent grass)			
Springs	Japan, 1983 H. Mori, M. Yoshizaki, Nihon Ryokuci Co. Ltd. 1201-2 Takasaka Higashimatsuyama-shi Saitama-ken	Gamma rays, 1970 [Pencross]	Improved heat tolerance
Arachis hypogaea L. (groundnut)			
BP-1	India, 1979 P.K. Sinha, H. Rahman Agric. Res. Inst. Kanka Ranchi 834006	Gamma rays 45 kR, 1969 re-irradiated in M_3 [41-C]	Bold seeded, semi-erect, high yield
BP-2	India, 1979 P.K. Sinha, H. Rahman Agric. Res. Inst. Kanka Ranchi 834006	Gamma rays 45 kR, 1969 re-irradiated in M_3 [41-C]	Bold seeded, semi-erect gigas type, high yield
Luhua No. 7	China, 1986 Agric. Institute Linyi Municip.	Gamma rays [Linhua No. 1]	Improved lodging, shattering and waterlogging resistance, medium maturity, vertical plant type, bigger kernel

Name of new cultivar	Place and date of release (or approval) and name of principal worker and institute	Kind and date of mutagenic treatment [parent variety] or mutant crosses (mutant underlined)	Main improved attribute of cultivar
Avena sativa L. (oat)			
Veli	Finland, 1981 Agric. Res. Centre Dept. of Plant Breeding Jokioinen	Titus x Sisu mutant (Jo 50-2395)	High yield
Brassica napus L. (rape)			
Xiuyou No. 1	China, 1979 Yichun Regional Inst. of Agric. Science Jiangxi Province	Gamma rays 8 kR seeds [F_1 Chuannongchangjiao x Qianyou 23]	Early maturity, suitable for rice-rice-rape multiple cropping, high yield; disease and cold resistance; 33 000 ha
Ganyu No. 5 (correction of MBNL No. 25)	China, 1984 He Yuanchui et al. Oil Crops Research Institute Chinese Acad.Agric. Sci. Wuhan	Gamma rays 140 kR seeds, 1970 [Shenli]	Plant height 30 cm shorter, inflorescence 10-20 cm longer, siliqua diameter 0.2 cm more, siliqua length 1 cm more, growth period reduced by 10-20 days, resistance to white rust and *Sclerotinia*; yield increased by 10-15% grown on 250 000 ha/year, so far accumulated 2 million hectares
Canna indica L. (ornamental)			
Caixiao	China, 1986 C. Niu, Y. Li Shandong Agric. Univ.	Gamma rays 9.2 Gy, 1983 [Dahuahong]	Flower colour changed from red to red with yellow spots at the edge
Caixui	China, 1986 C. Niu, Y. Li Shandong Agric. Univ.	Gamma rays 36.8 Gy, 1983 [Dahuahong]	Flower colour changed from red to light apricot with golden edge

Xuhong	China, 1986 C. Niu, Y. Li Shandong Agric. Univ.	Gamma rays 27.6 Gy, 1983 [Dahuahong]	Flower colour changed from red to reddish orange
<u>Chrysanthemum sp</u>. (ornamental)			
Ki-uzushio	Japan, 1985 Y. Yamate, Seikonen Co. Shin-ichi-chou, Ashishina-gun Hiroshima-ken	Gamma rays 2.5 kR 1982 [Uzushio]	Flower colour change from white to yellow
Baiogiku rainbow (orange)	Japan, 1985 Y. Yamate, Seikonen Co. Shin-ichi-chou Ashishina-gun Hiroshima-ken	Gamma rays, 1983 [Seikouno-kurnenai]	Flower colour change from crimson to orange
Baiogiku rainbow (peach)	" "	Gamma rays, 1983 [Seikouno-kurnenai]	Flower colour change from crimson to light pink
Baiogiku rainbow (pink)	" "	Gamma rays, 1983 [Seikouno-kurnenai]	Flower colour change from crimson to pink
Baiogiku rainbow (red)	" "	Gamma rays, 1983 [Seikouno-kurnenai]	Flower colour change from crimson to red
Baiogiku rainbow (white)	" "	Gamma rays, 1983 [Seikouno-kurenai]	Flower colour change from crimson to white
Baiogiku rainbow (yellow)	" "	Gamma rays, 1983 [Seikouno-kurenai]	Flower colour change from crimson to yellow; tissue cultured from petal
<u>Citrullus lanatus</u> (Thumb.) Matsum. et Nakai (water melon)			
Lu No.1	China, 1980 Melon and Vegetable Station of Ye County	Gamma rays 20 kR seeds [Taojian No.8 x Lemi No.1]	Medium maturity, disease resistance, high yield

Name of new cultivar	Place and date of release (or approval) and name of principal worker and institute	Kind and date of mutagenic treatment [parent variety] or mutant crosses (mutant underlined)	Main improved attribute of cultivar
<u>Dianthus sp</u>. (carnation)			
Scarlet bell	Japan, 1983 U. Miyoshi, Miyoshi Co. Ltd. 2-21-28, Kyakunin-chou Tokyo-to	Gamma rays 31 kR 1977 [Angel]	Change of flower colour to red
<u>Glycine max L</u>. (soybean)			
Heilong 31	China, 1987 Xiuying Weng Binru Wang Soybean Research Institute Heilongjiang Academy of Agric. Sciences Harbin	Thermal neutrons 5 x 10^{11} thn/cm^2 dry seeds, 1974 [F_4 of Har 70-5072 x Har No. 53]	4 years average yield 2.25% t/ha, growing period 119d, 80 cm plant height, TGW 180g, 23.14% fat, 41.4% of protein. Tolerant to diseases and drought; ca. 1300 ha cultivation in 1987
Heilong 32	China, 1987 Xiuying Weng Binru Wang Soybean Research Institute Heilongjiang Academy of Agric. Sciences Harbin	Thermal neutrons 5 x 10^{11} thn/cm^2 dry seeds, 1974 [F_4 of Har 70-5072 x Har No. 53]	High yield, resistant to virus, drought tolerant, good adaptability. 22.87% fat, 40.77% protein. ca. 10 000 ha cultivation in 1987
Kosuzu	Japan, 1986 I. Watanabe et al. Touhuku Agric. Exp. Station Kariwano Branch Akita-ken	Gamma rays 10 kR 1979 [Nattou kotsubu]	Earliness, lodging resistance

Wase-suzunari	Japan, 1983 K. Hashimoto et al. Touhoku Agric. Exp. Station Kariwano Branch	Gamma rays 10 kR 1975 [Okushirome]	Very early, maintaining good quality and high yield of original variety
Wei 7610-13	China, 1983 Science and Technology Institute of Wei County	Gamma rays and fast neutrons [Fengshouhuang]	Matures 6d earlier, resistant to sporotrichosis; 20% yield increase
Zarya	Bulgaria, 1984 Institute of Genetics Sofia	Gamma rays, 8 krad seeds [Zora]	Early, high yielding, high protein content
<u>Hordeum vulgare L.</u>			
Camargue	UK, 1986 D. Lau Inst. f. Getreideforschung Bernburg-Hadmersleben GDR	Complex cross, incl. <u>Diamant</u>	High yield, lodging resistance, disease resistance, good brewing quality
Consista	GDR, 1979 D. Lau Inst. f. Getreideforschung Bernburg-Hadmersleben	Complex cross, incl. <u>Diamant</u>	High yield, loding resistance, disease resistance, good brewing quality
Corniche	UK, 1985 E. Koch VEB Saatzucht Bernburg	Complex cross, incl. <u>Diamant</u>	High yield, loding resistance, good resistance to stripe rust and leaf rust; good brewing quality, identical with "Nebi" GDR 1983
Defra	GDR, 1984 E. Richter VEG Pflanzenprodukt. Langenstein	Complex cross, incl. <u>Diamant</u>	High yield, lodging resistance, medium disease resistance; good brewing quality
Delita	GDR, 1987 E. Richter VEG Langenstein Saatzuchtstation Derenburg	Complex cross, incl. <u>Diamant</u>	High yield, lodging resistance, disease resistance; brewing quality

Name of new cultivar	Place and date of release (or approval) and name of principal worker and institute	Kind and date of mutagenic treatment [parent variety] or mutant crosses (mutant underlined)	Main improved attribute of cultivar
Dera	GDR, 1982 E. Richter VEG Pflanzenproduktion Langenstein	Complex cross, incl. Diamant	High yield, lodging resistance, disease resistance; good brewing quality
Derkado	GDR, 1987 E. Richter VEG Langenstein Saatzuchtstation Derenburg	Complex cross, incl. Diamant	High yield, lodging resistance, disease resistance; good brewing quality
Dorina	GDR, 1984 D. Lau Inst.f. Getreideforschung Bernburg-Hadmersleben	Complex cross, incl. Diamant	High yield, lodging resistance, good mildew and leaf rust resistance, top brewing quality
Femina	GDR, 1984 D. Lau Inst.f. Getreideforschung Bernburg-Hadmersleben	Complex cross, incl. Diamant	High quality, lodging resistance, good mildew and leaf rust resistance, top brewing quality
Gerlinde	GDR, 1979 D. Lau Inst.f. Getreideforschung Bernburg-Hadmersleben	Complex cross, incl. Diamant	High yield, lodging resistance, disease resistance, top brewing quality
Grit	GDR, 1979 E. Richter VEG Pflanzenproduktion Langenstein	Complex cross, incl. Diamant	High yield, lodging resistance, disease resistance, top brewing quality

Ilka	GDR, 1984 D. Lau Inst.f. Getreideforschung Bernburg-Hadmersleben	Complex cross, incl. Diamant	High yield, lodging resistance, good mildew resistance, top brewing quality
Lada	GDR, 1979 E. Richter VEG Pflanzenproduktion Langenstein	Complex cross, incl. Diamant	High yield, lodging resistance, disease resistance, top brewing quality
Lenka	GDR, 1985 D. Lau Inst.f. Getreideforschung Bernburg-Hadmersleben	Complex cross, incl. Diamant	High yield, lodging resistance, good mildew resistance, good brewing quality
Maresi	GDR, 1986 H. Herrmann Inst.f. Getreideforschung Bernburg-Hadmersleben	Complex cross, incl. Diamant	High yield, lodging resistance, disease resistance, top brewing quality
Nebi	GDR, 1983 E. Koch VEG Saatzucht Bernburg	Complex cross, incl. Diamant	High yield, lodging resistance, good resistance to stripe rust and leaf rust; good brewing quality, identical with "Corniche" UK 1985
PL 56	India, 1975 G.S. Sethi, Dept. Plant Breed. H.P. University Palampur	EMS 0.2% seeds [C-164]	High tillering, superior in yield, suited for rainfed areas recommended for Punjab and Haryana)
Salome	GDR, 1981 E. Richter VEG Pflanzenproduktion Langenstein	Complex cross incl. Diamant	High yield, loding resistance, disease resistance, top brewing quality
Spirit	GDR, 1986 R. Focke Inst.f. Getreideforschung Bernburg-Hadmersleben	Complex cross incl. Diamant	Earliness, good yield, feeding quality; lodging resistance

Name of new cultivar	Place and date of release (or approval) and name of principal worker and institute	Kind and date of mutagenic treatment [parent variety] or mutant crosses (mutant underlined)	Main improved attribute of cultivar
Tamina	GDR, 1982 D. Lau Inst.f. Getreideforschung Bernburg-Hadmersleben	Complex cross incl. Diamant	High yield, lodging resistance, disease resistance, brewing quality
Linum usitatissimum L. (flax, linseed)			
Heiya No. 6	China, 1984 Zhongfeng Yan Institute of Economic Crops Heilongjiang Academy of Agric. Sciences	Cross r7107-2-4 (Gamma rays 20 kR, 1971) x r7005-21-6-7 (Gamma rays 30 kR, 1971)	High yield, lodging resistance, disease resistance; salt and alkali resistance; ca. 10.000 ha of cultivation

Correction:
Ningya No. 10 and Heiya No. 4 listed in MBNL No. 29 erroneously under *Cannabis sativa* belong to *Linum usitatissimum* L.

Luffa acutangula (L.) Roxb. (ridged gourd)			
PKM-1	India, 1984 S. Rangasamy School of Genetics Tamil Nadu Agric. University Coimbatore 641 003	Gamma rays [H.160]	High yield (28 t/ha), tolerant to pumpkin beetles, fruit fly and leaf spot diseases
Lycopersicon esculentum Mill. (tomato)			
Kyouryoku-ogata-reikou	Japan, 1984 Musashi Breeding Farm Co. Kamishakujii, Tokyo	IRB301-31/Sekaiichi x (Anahu x Ichihara)/ Sekaiichi	Multiple disease resistance introduced from *L. peruvianum* by irradiation-aided inter-specific hybridization

Kagyoku	Japan, 1985 Vegetable and Ornamental Crop Research Station, Anou-chou Mie-ken	Chuukan-bohon Nou 3 x Chuukan-bohon Nou 4	Multiple disease resistance introduced from L. peruvianum by irradiation-aided hybridization
Ryuugyoku	Japan, 1985 Vegetable and Ornamental Crop Research Station, Anou-chou Mie-ken	Chuukan-bohon Nou 3 x Chuukan-bohon Nou 5	Multiple disease resistance introduced from L. peruvianum by irradiation aided hybridization
PKM-1	India, 1980 S. Rangasamy School of Genetics Tamil Nadu Agric. University Coimbatore 641 003	Gamma rays 25 kR [Annanj]	High yield (32 t/ha), determinate plant type, well suited for transport
Momordica charantia L. (bitter gourd)			
MDU 1	India, 1984 S. Rangasamy School of Genetics Tamil Nadu Agric. University Coimbatore 641003	Gamma rays 10 kR [MC 103]	Tolerant to pumpkin beetle, fruit fly and leaf spot diseases; fruits dark green with shallow groove
Nicotiana tabacum L. (tabacco)			
Virginia 0454	Bulgaria, 1986 B. Chinchev, B. Stoyanov Institut po Tyutyuna i Tyutyunevite Izdeliya Plovdiv	Coker 347 x induced mutant line 825	Fairly resistant to Peronospora tabacina, tolerant to Erysiphe cichoracearum and Thielaviopsis basicola, resistant to potato virus Y. 136-148 cm high, 23-26 leaves; 68-70d till flowering, first leaves mature at 58-60 days
Oryza sativa L. (rice)			
Megumi-mochi	Japan, 1983 T. Kohmura et al. Aichi-ken Agric. Exp. Station	Aichi-mochi 27 x Fukei 102	Short and stiff culm, high yield as glutinous variety

Name of new cultivar	Place and date of release (or approval) and name of principal worker and institute	Kind and date of mutagenic treatment [parent variety] or mutant crosses (mutant underlined)	Main improved attribute of cultivar
Hatsukogane	Japan, 1984 E. Shimura et al. Aomori-ken Agric. Exp. Station	Fukei 102 x Matsumae	Short and stiff culm
Akichikara	Japan, 1986 H. Uchiyamada et al. Hokuriku Agric. Exp. Station	Hokuriku 101 x Akihikari	Short and stiff culm, high yield
Ibuki-wase	Japan 1986 Y. Akama et al. Sankan Gijutsu Exp. Farm Aichi-ken Agric. Exp. Station	Mineasahi x Hourei	Tolerant to cold climate
Mutsuhomare	Japan, 1986 M. Namioka et al. Aomori-ken Agric. Exp. Station	(Todoroki-wase x Akihikari) x Fuji 329	Short culm, good taste
M-102	USA, 1987 H. Carnahan Calif. Coop. Rice Research Foundation Inc. Biggs, CA 95917	M-201 x M-101	Compared with M-101 5d later, more lodging resistant, yield 16% higher, milled rice 4% less
Wei A/Jiguang 4 (hybrid)	China, 1982 Hubei Province	Hybrid cultivar Wei A x Jiguang 4 (induced mutant from laser treatment)	Mutant has good combining ability for yield; hybrid has early maturity

<u>Prunus dulcis (Mill.)</u> D.A. Webb (almond)			
Supernova (= Fascionello K)	Italy, 1987 F. Monastra, G. della Strada C. Fideghelli, R. Quarta Istituto Sperimentale per la Frutticoltura Roma	Gamma rays 3 kR buds, 1976 [Fascionello]	Flowering 12d later and therefore less frost damage
<u>Rosa sp.</u> (rose)			
Bridal Sonia	Japan, 1985 K. Ohkawa Kanagawa-ken Hort. Exp. Station	Gamma rays 15 kR 1979 [Sonia]	Flower colour changed to light pink
<u>Solanum melongena L.</u> (eggplant)			
Floralba	Italy, 1985 F. Restaino Istituto Sperimentale per l'Orticoltura Salerno	EMS (0.8%, 21°C, 13h) seeds, 1971 [Florida Market]	Shorter internodes and plants, earlier, higher yield, suitable for processing (white fruit) field tolerance to <u>Verticillium dahliae</u> in Central and Southern Italy
Macla	Italy, 1983 F. Restaino Istituto Sperimentale per l'Orticultura Salerno	EMS (0.8%, 21°C, 13h) seeds, 1970 [Florida Market] Short mutant in M_3 crossed with cv. Nagaoka	Shorter plant height; flowering and production of fruits earlier. Fruit size decreased. Adaptable to cool greenhouse conditions in Southern Italy
Picentia	Italy, 1983 F. Restaino Istituto Sperimentale per l'Orticoltura Salerno	EMS (0.8%, 21°C, 13h) seeds, 1970 [Lunga Violetta]	Slightly shorter internodes and plant height, slightly earlier, field tolerant to <u>Verticillium dahliae</u> in Central and Southern Italy
PKM 1	India, 1985 S. Rangasamy School of Genetics Tamil Nadu Agric. University Coimbatore 641003	Gamma rays [Puzhuthikathiri]	High yield (34 t/ha), drought tolerant suitable for transport and storage in room temperature

Name of new cultivar	Place and date of release (or approval) and name of principal worker and institute	Kind and date of mutagenic treatment [parent variety] or mutant crosses (mutant underlined)	Main improved attribute of cultivar
Triticum aestivum L.	(wheat)		
Longfumai No. 2	China, 1985 G. Sun, Y. Chen Y. Zhang, Z. Shang Inst. Applic. Atomic Energy Acad. Agric. Sciences Harbin	Gamma rays 13 kR F_1 seeds, 1977 [Longxi No. 35 x Ke 250]	Early maturity, good quality, high yield (+ 10%); resistance to scab and powdery mildew, lodging resistant, tolerant to late sowing. 1987: ca. 4000 ha
Longfumai No. 3	China, 1986 G. Sun, Y. Chen, Y. Zhang Z. Shang Inst. Applic. Atomic Energy Acad. Agric. Sciences Harbin	Longfu 77-4096 (Gamma rays 13 kR, 1978) x S-A-25	High yield (+ 12%) good quality, drought tolerance, stem rust resistance. 1987: ca. 3500 ha
Lu Mai No. 4	China, 1983 Agricultural Institute of Heze Municipality	CO_2-laser, 900 J/cm^2 [70-4-92-1]	Early maturity, develops quickly, lodging resistance, high tillering rate, adapted to late planting
Lu Mai No. 5	China, 1984 Shandong Agric. Univ.	Short Mengniu x Fu 66	Short stem, lodging resistance, strong resistance to stripe rust and powdery mildew, dry hot wind tolerance
Lu Mai No. 6	China, 1984 Agric. Institute of Dezhon Municipality	CO_2-laser, 192 J/cm^2 [70-4-92-1]	Weak winter habit, early maturity, short stem, good quality, adapted to late planting
Lu Mai No. 8	China, 1985 Shandong Agric. Univ.	Short Mengniu x Fu 66	Short stem, lodging resistance, bigger kernel, disease resistance

Wei Fu 6757	China, 1986 Agric. Institute for Weifang Municipality	Gamma rays 30 kR [F_1Taishan No.1 x Shanqian mai]	Rust resistance, tolerance to adverse soil conditions (salinity, alkalinity), better adaptability
Qicheng 115	China, 1985 Station for the Reproduction of Improved Varieties of Zibo Municipality	Gamma rays 2.5 kR [F_1 Qifu 04 x Yaan 74-550]	Strong stem, lodging resistance, bigger ear, more kernel, high yield
Xinchun No. 2	China, 1984 Inst. Applic. Atomic Energy Xinjiang Acad. Agric. Sci.	Gamma rays 8 kR F_1 seeds [Siete Cerros x Qichun No. 4]	Lodging resistant, drought tolerant, high yield 1986: 66 000 ha cultivation
Zhemai No. 3	China, 1983 Inst. Applic. Atomic Energy Zhejiang Acad. Agric. Sciences Hangzhou	CO_2 laser, 50 J dry seeds [E 70]	Early (180d), 95 cm, tolerant to scab, higher yield
Zlatostrui	Bulgaria, 1985 P. Savov Institute of Genetics Sofia	Gamma rays 10 krad F_2 seeds [Mexican 225 x Sadovo 1]	Yield 14% higher than Sadovo 1; resistant to rust and powdery mildew; tolerant to drought
<u>Vitis vinifera L</u>. (grape)			
Fikreti (AZ U66-22)	USSR, 1986 I.K. Abdullaev G.G. Pirieva Institute of Genetics Apheron Expt. Station Azerbaijan	Gamma rays 5 kR seeds seedlings treated with 0.1% colchicin [Marandi]	Ripens end of September, yields 8.2 kg/plant

Name of new cultivar	Place and date of release (or approval) and name of principal worker and institute	Kind and date of mutagenic treatment [parent variety] or mutant crosses (mutant underlined)	Main improved attribute of cultivar
Zea mays L. (maize)			
KNEJA-HP-556 (hybrid)	Bulgaria, 1981 P. Hristova K. Hristov K. Schopova et al. Maize Research Institute Kneja	Cross with mutant inbred line XM-532 Rf_3 Rf_4 (DMS 0.2%)	High protein (11.9%) FAO 500 yield 5 year average up to 14 t/ha 1984: 4000 ha 1987: 70 000 ha
KNEJA-HP-633 (hybrid)	Bulgaria, 1980 P. Hristova, K. Hristov K. Schopova et al. Maize Research Inst. Kneja	Cross with mutant inbred line XM-532 Rf_3 Rf_4 (DMS 0.2%)	High protein (11.5%) yield 6 year average 10.4 t/ha 1985: 3000 ha
KNEJA-M-712 (hybrid)	Bulgaria, 1987 P. Hristova, K. Hristov St. Zaneva et al. Maize Research Institute Kneja	Cross of mutant inbred lines XM-552-1-C and XM-552-1 rf_3 rf_4 NMU 10^{-4}	Yield up to 16 t/ha, 3 year average 8.99 t/ha without irrigation FAO 700
KNEJA-510 (hybrid)	Bulgaria, 1982 P. Hristova, K. Hristov I. Ivanova L. Gerginov Maize Research Institute Kneja	Cross of mutant inbred line XM-521-rf_3 Rf_4 NMU 10^{-4}	Yield up to 14 t/ha, 10.7% prot. FAO 500 1987: 50 000 ha

KNEJA-641 (hybrid)	Bulgaria, 1982 P. Hristova, K. Hristov L. Gerginov et al. Maize Research Institute Kneja	Cross with mutant inbred line XM-568 rf_3 Rf_4 NMU 10^{-4}%	Yield up to 16 t/ha; 9.4% prot. FAO 700 1987: 20 000 ha
KNEJA-666 (hybrid)	Bulgaria, 1987 P. Hristova, K. Hristov T. Tacova et al. Maize Research Institute Kneja	Cross with mutant inbred line XM-199 rf_3 Rf_4 EMS+DAB	Silage maize; grain yield up to 15 t/ha with, 10% protein biomass dry matter up to 32 t/ha with 3.9% protein

NEW PUBLICATIONS

Semi-dwarf cereal mutants and their use in cross breeding III
Proceedings of the final FAO/IAEA Research Co-ordination Meeting, 16-20 December 1985, Rome, Italy, IAEA TECDOC 455.

Improvement of grain legume production using induced mutations
Proceedings of FAO/IAEA Workshop, Pullman, Wash. (USA), 1-5 July 1986. IAEA Proceedings Series, 1988. STI/PUB/766.

Plant Biotechnology: Somaclonal Variation
1986 Plant Science Lectures Series at Iowa State University
The topics covered in this publications are:

1. Somaclonal variation: history, method, and meaning
2. An *in vitro* mutagenesis/selection system for *Brassica napus*
3. Regeneration of calli and plants follwoing protoplast fusion in *Lycopersicon*
4. Evaluation of phosphorus efficiency in somaclones of red clover
5. Genetic instability in celery tissue and cell cultures

Copies can be purchased for $7.00. Prepaid orderfs should be sent to Darlene Kauffman, Agronomy Department, Iowa State University, Ames, IA 50011. Make checks payable to the "Iowa State Journal of Research". Orders from outside the U.S. should be prepaid by international money order.

MICKE, A., DONINI, B. and MALUSZYNSKI, M., Induced mutations for crop improvement - a review, Tropical Agriculture 64, No. 4, 1987, 259-278.

BORLAUG MEDAL FOR K.A. SIDDIQUI

Dr. Khushnood Ahmed Siddiqui, Head, Plant Genetics Division, Atomic Energy Agricultural Research Centre, Tandojam, has been awarded the coveted Dr. Borlaug Medal for Agricultural Research for 1986 in recognition of his outstanding contribution in the field of agriculture.

Dr. Siddiqui is an accomplished researcher: he has initiated a vigorous programme on mutation breeding of wheat and successfully evolved several improved varieties. His work at the AEARC is characterised by its practical orientation: it has reached the doorsteps of the farmer in Sind and led to plentiful harvests. He is also responsible for developing new genetical approaches to the evolution of improved varieties of wheat, rice, cotton, sugarcane, bajra and soybean with the collaboration of colleagues and researchers at national and international levels. He has over 90 publications to his credit of which 50 have appeared in international books and research journals.

VACANCIES

In 1989 there will be a vacancy in the Plant Breeding and Genetics Section of the Joint FAO/IAEA Division as well as in the Plant Breeding Unit of the IAEA Seibersdorf Laboratory. Plant geneticists, plant breeders and plant pathologists with experience in us of "nuclear techniques" (tracers, mutagenesis) may contact the IAEA Division of Personnel (A-1400 Vienna, P.O. Box 100) for details.

LAST BUT NOT LEAST

Please submit your contribution to the Newsletter by 1 June and 1 December of each year.

Authors are kindly requested to take into account that the readers want to learn about new findings and new methods but would also like to see the most relevant data on which statements and conclusions are based. Conclusions should be precise and distinguish facts from speculation. The length of contributions should not exceed 2-3 typewritten pages including tables. We regret that photographs cannot be accepted for technical reasons. References to publications containing a more detailed description of methods or evaluation of findings are welcome but should generally be limited to one or two.

Alexander MICKE

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