Mutation Breeding Newsletter

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Report from the FAO/IAEA Plant Breeding and Genetics Section

The IAEA Technical Co-operation Programme provides an increasing number of Member States with assistance in plant breeding. Servicing these projects became a major task for the staff of the Plant Breeding and Genetics Section, e.g. a regional Asian project aiming at the genetic improvement of chickpea, mungbean, black gram, lentil, pea, groundnut, soybean, grass pea, cowpea and pigeon pea, involves Pakistan, Bangladesh, Malaysia, Thailand, Indonesia, China and the Republic of Korea. In Africa there are projects in Zambia (fruit trees), Zaire (legumes), Ghana (cacao), Uganda (roots and tubers), Algeria (cereals). In Latin America, assistance under a regional project aiming at the improvement of cereals is given to Bolivia, Brazil, Chile, Colombia, Ecuador, Guatemala, Peru, Uruguay, Paraguay, but, [redacted] there are also a number of national projects like with Costa Rice (legumes), Mexico (beans), Panama (banana), Venezuela (legumes and oil seeds). Also the number of requests for training appears to be increasing. IAEA awarded during 1986 more than 35 fellowships and supported 4 mutation breeding training courses in (China, Poland, Indonesia and at the Seibersdorf Laboratory) with a total of 69 participants.

Research for the advancement of mutation breeding technology carried out under the IAEA Research Contract Programme was for many years the main part of our programme. These efforts are now carried out at a smaller scale, due to severe financial restrictions. A new co-ordinated research programme is concerned with the use of haploids in cereal mutation breeding and the exploitation of mutant heterosis. We would like to pay more attention to mutation breeding for disease resistance using in-vitro techniques. We can, hopefully, continue research on the mutation breeding methodology for root and tuber crops, but may not be able to contribute to the technology for the improvement of oil seed and socalled industrial crops in the near future.

Root and tuber crops, as well as bananas and plantains provide the staple food for many people in developing countries. Their adaptation to tropical conditions is a most valuable asset for safety of local food supply. This group of crops therefore will receive more attention by FAO in future. At the 2nd FAO/IAEA Resarch Co-ordination Meeting on the Improvement of Root and Tuber Crops and Similar Vegetatively Propagated Crop Plants in Tropical Countries by Induced Mutations held in Vienna, 2 - 6 June 1986, researchers from 11 institutes in Uganda, Thailand, Japan, China, Pakistan, Ghana, Italy, Belgium, UK and Austria, reviewed the available technology for genetic improvements and the related in-vitro technology. A renewed co-ordinated research programme to be formed during 1987 should reflect an increased emphasis.

Nearly 15 years of IAEA sponsored research for mutation breeding of grain legumes was summed-up at a "Workshop on Improvement of Grain Legume Production using Induced Mutations" convened 1 - 5 July 1986 at Pullman, Washington (USA) just prior to the International Food Legume Conference at Spokane. The proceedings will be published by IAEA. FAO/IAEA emphasis concerning legumes will now be placed for a number of years upon improvement of symbiotic nitrogen fixation. The related research activities in Asia, Africa and Latin-America will have to involve soil microbiologists, plant physiologists and plant breeders, and they will be guided jointly by the Plant Breeding and Genetics Section and the Soil Fertility, Irrigation and Crop Production Section of the Joint FAO/IAEA Division. The first research co-ordination meeting for an UNDP sponsored regional project was held 17 - 21 November 1986 at Chiang Mai (Thailand).

An FAO/IAEA Advisory Group Meeting held 17-21 November 1986 in Vienna addressed the question whether domestication of promising plant species could be accelerated by induced mutations. This question is of equal relevance to developing and developed countries, for the much advocated diversification of cropping patterns, for the provision of renewable industrial raw materials and for the replacement of "surplus crops" by new ones with more demand. The proceedings will be published by IAEA.

The FAO/IAEA Agricultural Section of the Seibersdorf Laboratory currently is much concerned with the technology of in-vitro mutation breeding of banana for disease resistance, which hopefully soon can be transferred to laboratories in Panama and other interested countries. Dependent upon requests from Member States, emphasis of the lab work may shift to root and tuber crops or to the use of haploids in various grain crops. Several trainees under IAEA fellowship strengthen the small lab team and demonstrate the co-operative spirit between IAEA and its Member States. A major event in 1986 for the laboratory was the completion of the new agricultural wing, replacing the dilapidated old barracks. There will now be more space also for trainees and visiting scientists.

The staff situation is as follows:

Alexander Micke (FRG)	Head, Plant Breeding & Genetics Section
Miroslaw Maluszynski (POL)	Technical Officer
Nobuo Murata (JPN)	Technical Officer
Lhamo Halgand (FRA)	Secretary
Kathy Weindl (CAN)	Secretary

Frantisek Novak (CSR)	Head, Plant Breeding Unit, Seibersdorf Lab.
Helmut Brunner (AUS)	Technical Officer
R.B. Conger (USA)	Sabbatical
R. Afza (BGD)	Lab. Technician
J. van Düren (NET)	Lab. Technician
(Stefan Daskalov (BUL)	Returned 30 June to Bulgaria)

RESEARCH NEWS

Mutation breeding of cowpea and mungbean in Venezuela

A mutation breeding programme, in progress at the University of Zulia, Maracaibo, with support under IAEA Technical Co-operation Project No. VEN/5/005 resulted in several dwarf, determinate or semi-determinate mutants from the local mungbean variety "Mara-1" and the cowpea varieties "Ojo Negro" and "San Joaquin". The mutants showed increased grain yield, e.g. in 1981:

San Joaquin	815 kg/ha
mut. 40-40	917 kg/ha
mut. 50-17	933 kg/ha
Ojo Negro	1050 kg/ha
mut. 30-5	1600 kg/ha
mut. 30-6	1440 kg/ha
Mara-1	950 kg/ha
mut. 30-71	1160 kg/ha
mut. 50-25	1120 kg/ha

Ecophysiological studies with the mutants and the parent varieties suggest that the higher yield is related to changes in plant height, rate of leaf development, number of leaves, number of fruiting branches, larger duration of photosynthesis and better transfer of assimilates.

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The importance of visible mutations in practical barley breeding

Requirements of modern farming necessitate the search for new genetic resources. Experimental mutagenesis helps successfully to solve this problem, and induced variability concerns practically every trait. Some breeding centres have thousands of mutants at their disposal, but their value for practical purposes is doubtful. Much must be done to identify economically important mutant genotypes.

We divided all our mutants obtained during 20 years into two classes: 1. micromutations = forms without visible differences from a parental variety, 2. visible mutations = forms with phenotypically marked changes. Every breeder has a desire to improve a good variety without drastic changes, therefore the class of "micromutations" might be preferred in breeding. In our experiments selection among the class of visible mutations proved to be more effective. This is shown by the number of promising lines in competitive and official state demonstrated trials (Table).

Table. The effectiveness of selection from different mutant classes, Krasnodar 1965-1985

Class of mutations	Number of lines				
	Nursery		Trials		
	breeding	check	preliminary	competitive	state
		Winter barley			
Micromutations	123,850	18,820	2,490	0	0
Visible mutations	3,460	2,882	1,540	342	4
		Spring barley			
Micromutations	79,840	8,466	498	0	0
Visible mutations	2,560	1,845	1,219	292	4

Some of the "macromutants" were released and introduced into practice after direct multiplication: early-ripening spring barley "Temp" and winterhardy "Debut" (ref. MBNL 13 and 20). Besides, some very interesting "macromutants" were used as parents in hybridization. This resulted in obtaining released variety of winter barley "Novator" (ref. MBNL 20), spring barley "Kaskad" and the promising varieties: frost resistant "Radikal" and lodging resistant "Maksim".

Although the initial number of lines from micromutations was 30-40 times higher than that from visible mutations all of them were discarded at different stages of the breeding process without any profit. We conclude that for success in breeding the class of visible mutations is more preferable. This approach is less expensive and more effective.

(Contributed by V.M. Shevtsov, Barley Breeding Department, Research Institute of Agriculture, 350012 Krasnodar, USSR).

Mutation breeding at the Agricultural Institute and the University Ho Chi Minh City, Vietnam

Mutation induction by gamma rays is being used at the Agricultural Institute in breeding rice, maize and soybean. Induced mutants of IR8 were crossed with the rice cultivar Rumani-45. From the segregants two lines VN 10 and VN 20 were selected and released as cultivars to farmers. They are particularly tolerant to low temperature and are cultivated on ca. 500 000 ha in Northern Vietnam. Another rice variety VN4 was obtained after crossing an induced mutant of IR30 with a line IR-13240-10-1. The cultivar matures in 90-95 days but has still a high yielding capacity.

At the University, mutation breeding of rice and groundnut is carried out using gamma rays and NMU. A cultivar "6B" has been released, derived from a cross of IR42 with the Indonesian mutant cultivar Atomita-2. The new cultivar is better than both parents in salt tolerance and exceeds IR42 in yield by 20%, apparently due to larger panicles and a higher TGW.

(Contributed by Tran Nhu Nguyen, Agricultural Institute of South Vietnam and Tran Minh Nam, Department of Genetics and Plant Breeding, University, Ho Chi Minh City, Vietnam, during expert mission by S. Daskalov (Bulgaria).

Induced mutations in sesame

Sesame (Sesamum indicum L.) is one of the important edible oil crops in India, grown on about 2.3 million ha. Mutation research was initiated at this Research Centre in 1976, to explore the possibilities of altering the plant type and increasing productivity. Sesame crop is either grown from June to October during the rainy season or from November to March in the winter. The cultivar N62-32 (JNKVV, Jabalpur) used in our investigations is normally growing during the rainy season. However, for experimental work, two crops are grown in a year.

Mutations for seed yield and its components

In earlier studies, following gamma ray and EMS treatment of seeds, 25 true breeding mutants were obtained. Further selections among these based on higher number of capsules per plant led to 5 lines, one of which (S36-10) was significantly superior to the parent N62-32 in four out of six trials conducted between 1978-80. Its mean yield was 758 kg/ha as compared to 500 kg/ha of the parent (Murty, 1980; Murty and Bhatia, 1983). Subsequent experiments (RAO et al., 1983), using gamma ray, fast and thermal neutron treatments, led to 72 true breeding mutants (Table). They are being used in crossing programmes to combine characters contributing to yield.

Table. True breeding viable mutations established in sesame var. N62-32

Type of mutation	Number of mutants
Viable chlorophyll	9
Leaf texture	3
Leaf size and shape	8
Involute leaves	4
Other leaf mutations	9
Pigmentation	3
Growth habit	6
Flower shape, early and late flowering	4
Capsule size	13
Clustered capsule	3
Multilocular capsule	4
Capsule number (more)	3
Seed (seed size, shape, 1000 seed weight)	3

Heterosis in inter-mutant hybrids

True breeding multilocular, multicapsule and large capsule mutants in the M_4 generation were crossed to obtain better recombinants. The F_1 plants were more vigorous than the parents and this led to detailed assessment of heterosis in inter-mutant hybrids. Hybrids were obtained which were significantly superior to the better parent in seed yield/m^2, number of capsules/plant and 1000 seed weight.

Evaluation of mutants for oil content

Reliable values for oil percentage are obtained when sampling is restricted to seeds from capsules borne on the main stem. 48 mutants in the M_4 generation were screened, and their oil content ranged from 49.0 - 57.6% against the range of 49.5 - 53.1% in the parent cultivar.

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(From report by G.S.S. Murty, D.C. Joshua, N.S. Rao and C.R. Bhatia, [Biology and Agriculture Division, Bhabha Atomic Research Centre, Trombay, Bombay 400 085, India] presented at the FAO Expert Consultation on the Breeding and Agronomy of Sesame and Safflower, Viterbo, Italy, 1984. FAO Plant Production and Protection Paper 66 (1985).

Sesame mutation breeding in Korea

Seeds of the variety "Early Russian" (introduced from U.S. in 1955) were treated with X-rays or with sodium azide (2mM, 2.5 hrs.) to improve resistance to various diseases.

20 krad X-ray treatment led to the selection of mutant line 76ME-B-100-4-2, later called Suweon 55 and finally released as mutant cultivar "Ahnsanggae". Compared with the recommended variety Suweon 9 (released 1974), the new variety has the following disease readings:

	Seedling blight	Phytophthora blight	Bacterial blight	Leaf blight
	% infected plants			% leaf spot area
Suweon 9	60	25	5	52
Ahnsanggae	20	10	0	15

The grain yields are as follows:

Early Russian (1955)	410 kg/ha	47,0% oil	white seed
Suweon 9 (1974)	610 kg/ha	49,1% oil	brown seed
Danbackggae (1982)	870 kg/ha	51,9% oil	white seed
Ahnsanggae (1984)	920 kg/ha	53,0% oil	white seed

(From report by Jung Il Lee and Byung Han Choi [Crop Exp. Station Suweon, Republic of Korea] presented at Expert Consultation on the Breeding and Agronomy of Sesame and Safflower, Viterbo (Italy) 1984. FAO Plant Production and Protection Paper 66 (1985).

Selection of mutant rice lines with enhanced tolerance to NaCl through in-vitro multishoot cultures

Protoplast cultures would seem efficient for in-vitro mutant selection for its single cell system, second best would be cell suspension cultures. Callus cultures and multishoots are not ideal for mutant selection because of their multicellular nature. Unfortunately there was no successful regeneration of plants from rice protoplasts. Accordingly multishoots seem worth trying. The totipotency of multishoots could be maintained more than 5 years. Embryogenic callus cultures could maintain regenerating ability for more than a year. We wanted to see whether multishoots could constitute a system for in-vitro mutant selection. The multicellular nature of multishoots and the limited no. of individuals make screening procedures more difficult, but regeneration after mutant selection is no problem because the multishoots are already 'mini-plantlets'.

The scheme for selection to increase tolerance to NaCl is as follows:

- Mutagen treatment: Nitrosoethyl urea (NEH) 5ppm or irradiation with 1.5 krad ^{60}Co gamma rays.
- Select the survivors on 8g NaCl per liter medium.
- Propagate the survivors on 4g NaCl per liter medium.
- Repeat mutagen treatment.
- Select the survivors on 15g NaCl per liter medium.
- Propagate the survivors on 10g NaCl per liter medium.
- Repeat mutagen treatment.
- Selection for survivors on 21g NaCl per liter medium.
- Propagate the survivors on 15g NaCl per liter medium.

Mutagen treatment was carried out when the growth reached 40-80% of the normal multishoots growing on NaCl-free medium. Altogether the selection procedures required over two years. The best tolerant line growing on medium containing 15g NaCl per liter reached a growth of 49% compared with the control line on NaCl-free medium.

The transfer of multishoots from high to low salt concentration affected the survival. Albinos appeared with high frequency. When growing on low salt medium the selected salt tolerant multishoot lines have a higher growth rate. On hormon-free medium salt tolerant lines have a better rooting and leaf-forming ability. When potted and grown under natural conditions, no variability of the plant height was observed. The height of tolerant lines was similar to that of the parental line not cultivated in-vitro. The fertility of salt tolerant plants was higher than that of plants from control multishoots. Seeds harvested from tolerant lines tested on "Sandwich blotters" using salt solutions had a higher percentage of germinating seeds and better growing seedlings than the control line.

The results let us conclude that it is possible to use multishoots for in-vitro mutant selection. However, a lower fertility of all multishoot originated plants prohibits their use directly as a cultivar, the lines could constitute components for cross-breeding of rice.

(Contributed by Trinh Manh Dung and Le Dac Lieu, Div. of Radiobiology, Centre of Nuclear Techniques, Ho Chi Minh City, Vietnam).

Mutant variety of papaya developed at the Indian Agricultural Research Institute

Growing of papaya is riddled with problems. A serious one is virus diseases. Another problem is that papaya growers are never sure of the number of female plants they get from the seeds they sow, since often more than half of the population turns out to be male and hence unproductive. To overcome some of the problems, the IARI Regional Station at Pusa (Bihar) did papaya breeding for nearly two decades and this resulted in five cultivars, namely Pusa Dwarf, Pusa Delicous, Pusa Giant, Pusa Majesty and Pusa Nanha.

Pusa Nanha is a dwarf mutant evolved by gamma irradiation. It is dioecious, very uniform approx. 106 cm tall. About 6400 plants can be accommodated per hectar compared to about 2300 of other presently cultivated varieties. About 60-65 t of fruits are produced per ha as compared to 40-50 t from existing tall varieties.

(From IARI News Vol.6, No. 2, 1984).

Performance of high-yielding mungbean lines from mutant crosses

The large-seeded version of the multifoliata mutant we previously reported about continues to produce outcross segregates with high yield potential. A number of them were tested in the field for maturity, lodging resistance and other important attributes. Final selection and evaluation resulted in the development of 4 mungbean lines, 3 of them with grain yields higher than the recommended varieties.

The large-seeded multifoliata was named PAEC 2. Trifoliata plants that emerged from PAEC 2 were purified and the line was named PAEC 1. PAEC 3, PAEC 5 and PAEC 7 also derived from PAEC 2 progenies. They had better yield than PAEC 1 and PAEC 2. We conducted several field trials from 1979-1985. We used 4 Seedboard recommended varieties as checks. The results are summarized in Table 1.

In experimental plots the mutant derived lines PAEC 3, PAEC 5 and PAEC 7 had higher average grain yields than the best recommended varieties. They had better yield per plant and had non-shattering pods. Grain quality, seed size and maturity days were comparable to the recommended varieties. Due to their good performance these lines were offered to the Philippine Seedboard for further trials. PAEC 3 was accepted for the national yield trials. Table 2. showed the performance of PAEC 3 in the trials by the Philippine Seedboard 1981-83. Unfortunately, the yield of PAEC 3 was inferior in many locations. Further efforts are made to obtain lines with higher and more stable yield.

Table 1. Experimental plot performance of 5 mungbean lines derived from mutant crosses and recommended varieties (mean 1979-1985)

lines and varieties	Days to maturity	Plant height (cm)	Yield per plant (g)	Yield (t/ha)	Pods per plant	Seeds per pod	Pod lenght (cm)	1000 seed wt. (g)
PAEC 1	63	86	6.3	0.860	11.2	11.6	8.9	55.7
2	65	82	4.4	0.911	8.9	11.6	8.7	54.5
3	52	53	6.5	1.208	10.6	11.2	10.7	65.2
5	54	55	5.7	1.211	16.1	11.6	9.8	42.2
7	50	53	6.3	1.192	11.3	9.5	9.4	79.4
recommended varieties								
CES 28	53	49	3.0	1.123	7.0	12.0	9.5	75.0
87	47	43	4.3	1.128	8.1	10.8	9.3	69.3
CES 1D-21	49	36	3.8	0.998	10.2	11.6	8.5	52.5
MG 50-10A	47	43	5.9	1.034	11.5	10.7	9.0	66.5

Table 2. Performance of mutant cross derived line PAEC 3 in Philippine Seedboard national yield trials, wet and dry season (t/ha).

	Testing Stations						
	1981-1982						
Entries	BPI EG	UPLB	Davao	Ilagan	USM	Sarangani	PNAC
CES 1D-21	0.91	1.27	1.11	0.99	0.83	1.81	0.96
MG 50-10A	1.09	1.05	0.83	0.70	0.55	1.51	0.82
PAEC 3	0.98	1.16	-	-	0.79	1.55	0.72

	1982-1983								
Entries	BPI EG	UPLB	Davao	Ilagan	USM	Tupi	Visca	CMU	SCF
CES 1D-21	0.76	1.06	0.85	1.23	1.06	1.09	0.69	0.41	1.90
MG 50-10A	0.83	1.14	0.87	1.43	1.12	1.40	0.66	0.24	1.73
PAEC 3	0.56	0.96	0.67	1.13	0.91	1.12	0.67	0.67	0.93

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(Contributed by A.O. Grafia, I.S. Santos, A.C. Barrida and J.M. Casyao, Agricultural Research Division, Philippine Atomic Energy Commission, Diliman, Quezon City, Republic of Philippines).

Semi-cultivated type mutants from a Phytophthora-resistant sample of currant tomato

Considerable damage is caused to the tomato crop by *Phytophthora infestans* (Mont.) de Bary. Breeding resistant varieties would be the most effective control. The main source for resistance are the wild-growing relatives of the cultivated tomato. The hybrids, however, receive from the wild forms not only useful properties. Repeated backcrossing is therefore necessary, but there are other means of solving this breeding problem. Using stepwise mutation breeding in conjunction with selection, it is possible to assure evolution from wild to cultivated forms. The potential of this technique was first shown by H. Stubbe [1], and was subsequently confirmed by Soviet researchers. The intermediate mutants method involves the induction of mutants of wild forms and their subsequent crossing with cultivated forms. In this case, the mutants of the wild forms act as a link in the transfer of characters from the wild-growing to the cultivated forms.

The object of research conducted in the Department of Radiation Genetics and Radiobiology of the All-Union Scientific Research Institute of Plant Growing (VIR) (Moscow Branch), was the currant tomato, VIR sample no. k-4053, originally from Argentina. A phytopathological study has shown this strain to be resistant to *Phytophthora* and to mosaic virus.

The plants were exposed to chronic radiation in the ^{60}Co gamma-field. This was done during the period between initial budding and full fruit ripening. The total radiation doses ranged from 3.7 to 18.8 krad. Irradiation was carried out for a period of 18 h daily (16 h at night and 2 h during the day). Altered forms were selected from the progeny of the irradiated plants, particular attention being given to short and very branchy plants of a semi-cultivated type. Non-bolting plants were selected, which ensured simultaneous fruit ripening and large numbers of fruit per plant (up to 600-800). Plant progenies were cultivated separately and subsequently propagated as an independent line. (Detailed information on their characteristics has already been published [2]). The following is a short description of the lines produced. (The number given to each line contains the experimental details. The first figure indicates the year of irradiation (1971 in all cases); the next two numbers indicate the distance in meters from the gamma-radiation source; the following three numbers are the field number of the plant. The number following the oblique stroke is that of the plant selected from the progeny).

Line 108059/3. Plant: indeterminate, vigorous, compact, leafiness abundant, downiness low. Number of shoots: 5-9 of which 3-4 are fruit-bearing. First raceme above third to fifth leaf. Plant height: 60-70 cm. Raceme: simple and intermediate, loose and short, although some long. Flowers: large, overall quantity small. Fruit: rounded. Unripe: green with small spot at the pedicle. Ripe: red, 33.4 g in weight. Weight of large fruit: 60 g. Each fruit has 3-5 cells. Facultative parthenocarpy.

Line 108059/13. Plant: determinate type. Height: 70 cm. Medium developed creeping (close to ground), leafiness low, downiness low. Number of shoots: 6-10, of which 6-8 are fruit-bearing. First raceme above fifth leaf. Raceme: simple and intermediate, short and of average size, compact. Abundant flowering, flowers average in size, with petals turned back. Fruit: rounded. Unripe: green with small spot at the pedicle. Ripe: red. Average weight of fruit: 14.7 g. Each fruit has 3-4 cells. Facultative parthenocarpy.

Line 108059/15. Plant: determinate type, semi-spreading, medium development, downiness: low, leafiness average. Height: 40-60 cm. Number of shoots: 7-10, all fruit-bearing. First raceme above fifth to seventh leaf. Raceme: simple or intermediate, loose and long, although some medium sized or short. Flowers: medium sized, petals turned slightly back, average flowering. Unripe fruit: green with a small spot at the pedicle, elliptical form, 2-3 cells. Facultative parthenocarpy. Ripe fruit: red. Average fruit weight: 4.8 g. Weight of large fruit: 15 g.

Line 108-59/5. Plant: determinate, medium developed, semi-spreading with creeping shoots. Leafiness average, downiness low. Plant height: 50-60 cm. Number of shoots: 12-16, all fruit-bearing. First raceme above fifth or sixth leaf. Raceme: loose, short and medium-sized, simple and intermediate. Abundant flowering with large flowers. Fruit: rounded. Unripe: green with a small spot at the pedicle. Two or three cells. Facultative parthenocarpy. Ripe: red. Average fruit weight: 7.3 g. Weight of large fruit: 20.0 g.

Line 108059/12. Plant: determinate type, semi-spreading, medium developed, leafiness average, downiness low. Plant height: 60 cm. Number of shoots: 16-27, all fruit-bearing. First raceme above fifth to seventh leaf. Raceme: simple, short or medium-sized, loose. Abundant flowering with large flowers. Fruit: elliptical. Unripe: green with small spot at the pedicle, 2 or 3 cells. Facultative parthenocarpy. Ripe fruit: red. Average fruit weight: 12.9 g. Weight of large fruit: 20 g.

Line 108059/10. Plant: determinate type, vigorous, pronounced leafiness, semi-spreading, downiness low. Plant height: 55-60 cm. Number of shoots 9-15, all fruit-bearing. First raceme above third or fourth leaf. Raceme: loose, simple, short, medium-sized or long. Abundant flowering with large flowers. Unripe fruit: green with a small spot, rounded. Ripe fruit: red. Average fruit weight: 12.7 g. Weight of large fruit: 30 g. Each fruit has 2 or 3 cells. Facultative parthenocarpy.

Line 108059/17. Plant: determinate type, medium-developed, semi-spreading, leafiness average, downiness low. Plant height: 50-70 cm. Number of shoots: 7-13, all fruit-bearing. First raceme above third or fourth leaf. Raceme: simple or intermediate, compact, although can be loose, short, medium-sized or long. Abundant flowering with large flowers. Unripe fruit: green with a small spot at the pedicle, rounded. Ripe fruit: red. Average fruit weight: 9.3 g. Weight of large fruit: 17 g. Each fruit has two or three cells. Facultative parthenocarpy.

Line 108059/1-4. Plant: determinate type, semi-spreading, leafiness average, downiness average. Plant height: 50-60 cm. Number of shoots: 14-16, all fruit-bearing. First raceme above sixth leaf. Raceme: simple and intermediate, loose, medium-sized or long, although short racemes possible. Average flowering with medium-sized flowers. Unripe fruit: colour green, small spot at pedicle, rounded. Ripe fruit: red. Average fruit weight: 16.3 g. Weight of large fruit: 20 g. Each fruit has two or three cells. Facultative parthenocarpy.

Line 112140/2-1. Plant: determinate type, semi-spreading, leafiness average, downiness low. Plant height: 40 cm. Number of shoots: 7-9, all fruit-bearing. First raceme above fourth or fifth leaf. Raceme: simple or intermediate, short or medium-sized, loose. Abundant flowering with medium-sized flowers. Unripe fruit: bright green, without spot, elliptical. Ripe fruit: red. Each fruit has two cells. Average fruit weight: 7.7 g. Weight of large fruit: 10 g.

The total fruit yield from a single plant from the selected mutant lines varied from 1200 to 1800 g. By comparison with varieties of cultivated tomato, these lines were noteworthy for their early ripening. The fruit contained a considerably higher quantity of dry matter and sugar than the control. It was noted that the fruit displayed increased resistance to Phytophthora, both under field conditions and following artificial inoculation.

Studies carried out at the French National Institute for Agricultural Research (INRA, Montfavet) showed samples 108059/2 and 108059/7 to be resistant to French Phytophthora pathotypes [3], while sample 108059/2-(5) proved to be a good pollen-producer at low temperatures [4].

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(Contributed by 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).

Good performance of new rices derived from mutant cross breeding

The mutant variety "Jaganath" derived from X-ray treatment of the variety T.141, used in cross breeding by the Central Rice Research Institute Cuttack, led to a number of promising recombinants with the variety Pankaj. They were evaluated for their suitability for direct seeding in waterlogged areas and where there is early flooding. CR 1017 yielded highest with 3.6 t/ha, followed by CR 1010 and CR 1018. CR 1017 had maximum panicle-bearing tillers/m^2 and less sterility.

	Plant height cm	grain per panicle	TGW g	Panicle bearing tillers/m^2	grain yield t/ha
CR 100[1)]	98	179	20	183	3.0
CR 1010[1)]	112	217	23	173	3.3
CR 1011[1)]	101	122	22	159	2.2
CR 1017[1)]	116	167	23	186	3.6
CR 1018[1)]	115	203	24	169	3.3
CR 1013[2)]	113	137	20	169	2.8

[1)]Pankaj x Jaganath   [2)]Jaganath natural cross

REFERENCE

PUSHKARAN, K. and BALAKRISHNA RAO, M.J., [Agric.Res.Station Mannuty, Trichur, Kerala and Central Rice Research Institute, Cuttack, Orissa, India]. Evaluation of new rices for Kharif planting. International Rice Research Newsletter 10(5) (1985) p.3.

Dwarf and non-aromatic mutants of "Randhunipagal"

"Randhunipagal" is a tall (152 cm) aromatic indica rice with 150 - 160 d crop duration. Seeds were treated with EMS (0.25 - 1%, 24 h), to obtain a dwarf aromatic slender grain mutant line. Mutants (CNM-RDP-35 to CNM-RDP-50) selected in M_2 showed 118-139 d crop duration and plant heights of 79-138 cm. Of 13 mutants selected 8 have lost its aroma.

REFERENCE

AHMED, J. [Rice Research Station, Chinsurah 712 102 India], In t. Rice Research Newsletter 10(5) (1985) 5-6.

Downy mildew resistant mutant for pearl millet hybrid production

Seeds of Tift 23 DB, a maintainer line highly susceptible to downy mildew, were irradiated with 30 krad of gamma rays. Progenies were grown head to row in a downy mildew disease nursery. Dwarf vigorous and disease-free plants were both selfed and crossed with Tifton 23 DA (an A_1 system male-sterile line with proven high general combining ability). For those Tift 23 DB selections that completely maintained sterility on Tift 23 DA, the process of selection and backcrossing into A_1 cytoplasm was repeated twice a year for six generations in the downy mildew disease nursery at ICRISAT. The ICM A1 and ICM B1 pair was chosen on the basis of phenotypic similarity, vigor, seed-set, downy mildew resistance, and the results of preliminary combining ability tests. The lines were recommended by the All-India Co-ordinated Millets Improvement Project (under the synonym 81A and 81B) in 1981 for large scale distribution and utilization in the production of experimental hybrids.

In two preliminary yield trials of hybrids made with common pollinators on ICM A1 and 5141 A, the ICM A1 hybrids yielded significantly more. They were also slightly taller and later in maturity, with less tillering but longer heads and larger seeds. They tended to lodge less. The lines are susceptible to ergot similar to the released and widely used male-sterile lines 5141 A and 111 A.

REFERENCES

ICRISAT Plant Material Description no. 4 (1985).

KUMAR, A., ANDREWS, D.J., JAIN, R.P. and SINGH, S.D., ICM A1 and ICM B1 pearl millet parental lines with A_1 cytoplasmic-genic male sterility system. Crop Science 24 (1984) p.832.

Rice mutation breeding in California

Rice cultivation began in America in 1686, based upon seeds from Madagascar. Later rice germplasm was introduced from Japan and China and several cultivars like Caloro, Colusa, Calrose and Earlirose were developed in this century. However, rice growers in California did not have many choices of cultivars before 1969, when the California Co-operative Rice Research Foundation was established by State law. The rice genetics and breeding programme at the UC Davis was inaugurated the same year with consultation by Chao-Hwa Hu from Taiwan under a one-year grant from the International Atomic Energy Agency. Dr. Hu had used at home in co-operation with H.W. Li, x-rays, gamma rays and thermal neutrons to obtain semi-dwarf mutants similar to Taichung Native 1.

A proposal to use induced mutations in California was accepted. In co-operation with L.M. Peterson, Professor at UC Davis and J.N. Rutger, Rice Geneticist of USDA, seeds with 14% moisture of Calrose and Colusa were gamma irradiated. The M_1 was harvested plantwise. In M_2 a number of short stature and early maturing mutants were selected (Rutger et al. 1976). M_3 plants were grown in a greenhouse at UC Davis and in a winter nursery at Puerto Rico. The most promising M_4 lines underwent preliminary yielding tests the following spring at UC Davis. One of these mutants "D7" was later named "Calrose 76". It was the first semi-dwarf table rice cultivar in USA with improved grain yields of 15%. It was immediately also used in cross breeding (Rutger 1984).

Table Performance of new mutant lines

Variety or line	grain class	Plant height	Seedling vigor	Days to heading	lodging %	grain yield t/ha	
						100	200
						kg N/ha	
Calperal	S	93	4.4	89		9.0	12.2
Calpearl S-1 (mut.)	S	85	3.8	90		9.4	12.6
Calpearl S-2 (mut.)	S	86	3.8	90		10.7	11.2
Calpearl M-1 (mut.)	M	95	4.5	90		10.9	11.0
California Belle	L	113	4.1	92	43	9.6	10.0
C.B. R-16 (mut.)	L	96	4.0	95	5	9.0	10.6
C.B. R-31 (mut.)	L	107	4.3	94	20	8.6	10.6
C.B. R-34 (mut.)	L	82	4.5	98	1	8.0	10.6
M-201 (check)	M	95	2.9	100	1	10.1	9.6
L-202 (check)	L	88	4.4	100	1	9.7	8.6

A medium grain size variety "Calpearl" derived from a cross Calrose 76 x (Earlirose x IR1318-16) and released in 1981 was subjected to gamma irradiation and shorter grain mutants Calpearl S-1 and Calpearl S-2, possessing also better lodging resistance were developed.

The long grain size variety "California Belle" was derived from a cross of the tall CI 11032 (from IR456, cool tolerant selection) with the early maturing long grain Texas variety "Bluebelle". Shortening of the culm was desirable and following gamma irradiation, promising mutants R-16, R-31 and R-34 were selected. R-16 appears allelic to Calrose 76 (sd_1), but R-34 may be different from sd_1, sd_2, and sd_4. R-31 is only 5cm shorter and is useful because of stiffer culms.

For development of modern aromatic rice varieties, the variety "Azucena" was irradiated in 1981. Induced semi-dwarf and early maturing mutants were crossed and a wide range of variation was obtained in F_2. Promising scented lines NFD 137-127-3, NFD 137-127-4, NFD 137-131-2 and NFD 137-131-3 with plant heights of 91-98 cm are under further testing.

REFERENCE

HU, Chao-Hwa [N.F. Davis Drier & Elevator Inc. Firebaugh CA]. Modernization and diversification of rice varieties in California and possible alternative genetic resources for semi-dwarfism. Paper presented at Int.Symp. on Exploration and Utilization of Plant Genetic Resources, Taichung District Agric.Station, Taiwan, 7-11 December 1986.

Promising mutants in Brassica campestris

Dry seeds of selfcompatible yellow seeded diploid variety YS-52 of *Brassica campestris* L. were exposed to gamma rays and presoaked seeds were treated with EMS to develop mutants with high seed and oil yielding capacity having resistance to Alternaria blight. Maximum variation was observed in M_2 generation following 70 krad of gamma rays . A two chambered and resistant mutant line selected from 70 krad of gamma rays was found promising but the mutant segregated further in M_3 and was separated into BINA-1 early and resistant and BINA-2 late and moderately resistant. The mutants have 17% higher seed yield over the mother variety YS-52. In M_4 these two mutants were included in comparative yield trials at three locations of Bangladesh along with the mother line and the recommended varieties Sampad, Sonali Sarisha and Tori 7 as checks. On average BINA-1 gave 23 percent higher seed yield over the mother line, 13 percent over Sampad, 17 percent over Sonali Sarisha, 62 percent over Tori 7. BINA-2 gave 20 percent higher seed yield over the mother line, 10 percent over Sampad, 14 percent over Sonali Sarisha and 57 percent over Tori 7 (Table). Both the mutants were found tolerant to Alternaria blight whereas the mother line and other check varieties were susceptible. The mutants were taller in plant height, did not lodge, the plants were erect with 3-4 primary branches at the top. These characteristics helped to accommodate more number of plants per unit area compared to the checks. Seed colour of the mutants remained yellow and they had 2-3 percent higher oil content than the checks. It is expected that after yield trials at more locations and after agronomic trials on spacing, seed rate and methods of seeding for at least two more years one of the mutants may be released as a variety for commercial cultivation by the farmers in Bangladesh.

The work was supported by IAEA under research contract no. 2991/RB.

Table Percent increase in yield of the mutants BINA-1 and BINA-2 (M_4) compared to mother line and check varieties

Location & mutants Compared to	Location -1		Location-II		Location-III		Average of 3 location	
	BINA-1	BINA-2	BINA-1	BINA-2	BINA-1	BINA-2	BINA-1	BINA-2
Mother line	21	18	21	19	28	22	23	20
Sampad	22	9	12	10	15	9	13	10
Sonali Sarisha	16	13	12	10	24	18	17	14
Tori 7	73	68	53	49	61	53	62	57

(Contributed by A. Rahman, M.L. Das, M.A.R. Howlider and M.A. Mansur, Plant Breeding Division, Bangladesh Institute of Nuclear Agriculture, P.O. Box 4, Mymensingh, Bangladesh).

Early maturing mutant variety of rice, B-fu-1

BG 90-2 is a variety introduced to China in 1976 primarily because of its high resistance to bacterial blight. Its growth duration in Nanjing, however, exceeds 150 days. This was the reason for a mutation induction experiment using ^{60}Co gamma rays. A mutant variety B-fu-1 developed by the Jiangpu County Institute of Agricultural Sciences. Nanjing, matures in 126 days. Compared with the parent variety the plant height is reduced from 113 to 106 cm, panicle length unchanged, no. of grain per panicle reduced from 161 to 111, thousand grain weight increased from 27 to 36, grain yield decreased from 8.2 to 7.6 t/ha. The resistance to bacterial blight is unchanged.

REFERENCE

YING, C.S., [China Nat.Rice Research Institute Hangzhou], H. Jiang [Jiangsu Prov.Acad. of Agric.Sciences, Nanjing], D.B. Fei [Jiangsu County Inst.of Agric.Sciences, Nanjing]. New varieties derived from BG 90-2, Int.Rice Research Newsletter 11(1) (1986) p.4.

Mutation induction in safflower (Carthamus tinctorius L.)

The local safflower cultivar Giza-1 was irradiated with 2-16 krad of gamma rays. In M_2 and M_3 appreciable variability was generated in negative and positive direction regarding plant height, number of effective branches, no. of fertile heads and seed yield per plant. Ten promising mutant lines with superiority in no. of seeds per plant were chosen in M_5.

Full details will be published in Bulletin of Desert Institute, Egypt, 24/85.

REFERENCE

EL-GAYAR, M.A. and HEGAB, M.T., [Desert Institute, El-Matariya, Cairo, Egypt]. Sesame and Safflower Newsletter 2/86 p.95.

Mutation induction for variability in sunflower

Sunflower oil contains no long-chain fatty acids with more than 18 C-atoms and linoleic acid only in little proportion. For use as edible oil high percentage of linoleic acid is demanded, but a high content of oleic acid is of more interest for the food industry. Therefore, it would be interesting to have two different types of sunflower, one with high linoleic acid and another one with high oleic acid content, perhaps to substitute for the expensive olive oil.

After selfing the open pollinated variety VNIIMK 8931 the resulting variability for oil and protein content, hull percentage and fatty acid composition was investigated. Parallel to this investigation seeds of the variety were treated with 20-30 krad X-rays or 1% EMS for 20 hours. Fatty acid composition was tested in M_2 and M_3 by the half-seed-method using a gas-chromatograph. An increased variability for all the characters searched was obtained.

REFERENCE

SCHUSTER, W. and KÜBLER, I. [Inst.f. Pflanzenbau und Pflanzenzüchtung d. Univ. Giessen, FRG]. Possibilities of increasing the genetic variability of sunflower due to seed quality composition. Helia No. 6 (1983) 5-12.

IAEA TRAINEES AND FELLOWSHIP HOLDERS IN 1986

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Bambang Sriyadi	Bandung
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Hazizul Hakim	Padang
Sahabuddin Achmad	Ujung Pandang
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LIST OF VARIETIES

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 varieties 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 variety does not imply its recommendation by FAO/IAEA.

Name of new variety	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 variety
Arachis hypogaea L. (peanut)			
Fu 21	China, 1981 Jiang Xienan Kotaru Asai Zhou Yongxing Agric. Science College of Guandong Province Guangzhou	seeds, 20 krad gamma rays 1968 [Yue You 22]	higher yield (10% over Yue You 22); short stem, more branched, better resistance to bact. wilt
Cajanus cajan (L.) Millsp. (pigeon pea)			
Co 3	India, 1977 Tamil Nadu Agric. Univ. Coimbatore	seeds, EMS 0,6% [Co 1]	high yield, bold seeded, higher shelling, field dormancy for 15-20 days
Co 5	India, 1984 Tamil Nadu Agric. Univ. Coimbatore	seeds, gamma rays 16 krad [Co 1]	early maturity, daylength insensitive, drought tolerant

Cannabis sativa L. (hemp)			
Hei Ya No. 4	China, 1978 Heilongjiang Acad. Agric.Sci. Beet Research Institute	cross γ-67-1-681 x 6409-640	early maturing, lodging resistant, damp tolerant, tolerant to saline alcalic soils
Ning Ya No. 10	China, 1982	seeds, gamma rays 10 krad [Yan Za No. 10]	early maturing, good branching, high yield and quality, lodging resistant
Cicer arietinum L. (chickpea)			
Pusa 408 (Ajay)	India, 1985 M.C. Kharkwal, H.K. Jain IARI, New Delhi	60 krad gamma rays [G-130]	highest yielding in N.W. India average yield 2.28 t/ha, potential 3.5 t, resistant to Ascochyta blight, semi-erect, profuse branching; 140-155 days till maturity
Pusa 413 (Atul)	India, 1985 M.C. Kharkwal, H.K. Jain IARI, New Delhi	60 krad gamma rays [G-130]	highest yielding in N.E. India average 1.88 t, potential 3.5 t resistant to wilt, moder. res. to Ascochyta blight, stunt virus, foot rot, root rot; semi-erect, profusely branched, high no. of pods, more than 2 grains/pod, matures in 130-140 d
Pusa 417 (Girnar)	India, 1985 M.C. Kharkwal, H.K. Jain IARI, New Delhi	60 krad gamma rays 1977 [BG 203]	highest yielding in Central India, short, semi-erect, profusely branched, high pod no., matures 110-130 d. 2.1 t/ha, yield potential 3.6 t highly wilt resistant, moderately resistant to stunt virus, collar rot, foot rot, root rot; low pod borer and nematode damage

Name of new variety	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 variety
Citrus sp. (orange)			
Xue Gan 9-12-1	China, 1983 Xin Guang Farm Guang Xi Reclamation Bureau Orange Research Institute Guang Xi Province	gamma rays bud twigs [Xue Gan]	less seed or seedless, high rate of bearing fruit, parthenogenesis
Curcuma domestica Val. (turmeric)			
BSR 1	India, 1986 Tamil Nadu Agric. Univ. Coimbatore	X-rays 10 kR [Erode local]	orange yellow, thick and long internode, high curcumin content and increased curing percent
Co 1	India, 1983 Tamil Nadu Agric. Univ. Coimbatore	X-rays 5 kR [Erode local]	bright orange yellow, attractive rhizome with higher curing perecent (19.5) and curcumin content (2.6 - 3.1%); field tolerant to common diseases
Dolichos lablab L. (hyacinth bean)			
Co 10	India, 1983 Tamil Nadu Agric. Univ. Coimbatore	seeds, gamma rays 24 krad [Co 6]	high yielding, bushy type with greenish white tubular pods
Gossypium sp. (cotton)			
MCU 10	India, 1982 Tamil Nadu Agric. Univ. Coimbatore	seeds, gamma rays 30 krad [MCU 4]	long staple (25 mm), drought tolerant; resistant to black arm, Rhizoctonia and Alternaria

Hordeum vulgare L. (barley)			
Robin	Austria, 1986 B.V. Landbouwbureau Wiersum NL-9717CB Groningen Netherlands	cross Trumpf x Maris Mink	two row feed barley, high yieding, lodging resistant, late maturing
Carmen	Austria, 1986 Saatbau Linz GmbH A-4021 Linz	cross Trumpf/4/Aramir 3/ Nota/Volla/Annmarie	two row feed or brewery barley, high yield under intensive conditions, very good lodging resistance
Jutta	Austria, 1983 Saatbau Linz GmbH A-4021 Linz	cross Trumpf/Malta/Aramir	good two row brewery barley, high yield under good condition; very good lodging resistance
Lycopersicon esculentum Mill. (tomato)			
Co 3 (Marudham)	India, 1981 Tamil Nadu Agric. Univ. Coimbatore	seeds, EMS 0.1% [Co 1]	compact dwarf determinate, lending itself for higher density planting, fruits round and smooth, high vitamin c content (25 mg/100 g)
Oryza sativa L. (rice)			
Au-1	India, 1976 Tamil Nadu	seeds, gamma rays [IR8]	early, 75 d till flowering
B-fu 1	China, 1982 Jiangpu County Inst.of Agric.Sciences	seeds, gamma rays [BG 90-2]	shorter culm, earlier, larger grain; maintained bact. blight resistance

Name of new variety	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 variety
Oryza sativa L. (rice) contd.			
Biraj (CNM 539)	India, 1982 West Bengal	seeds, X-rays [OC 1393]	late, daylength sensitive, yield 4-5 t/ha, suitable for lowlands, where water depth varies between 50 and 70 cm, submergence tolerant
Fushenongken 58	China, 1973 Yueyang Regional Inst.of Agric. Research Hunan	seeds, gamma rays 30 krad [Nongken 58]	1985: 40 000 ha
HPU 8020 (= IET 5878)	India, 1984 K.D. Sharma, R.P. Kaushik, S.L. Sharma Plant Breeding Department Himachal Pradesh Agric. Univ. Palampur 176062	seeds, gamma rays 20 krad [Bala]	matures 10-13 d later, synchronous tillering; yield potential 7.3 t/ha
Indira	India, 1980 Orissa	seeds, EMS [Tainan-3]	earlier (90-95 d to ear emergence)
Iratom 24	Bangladesh, 1970	seeds, gamma rays [IR8]	23 days earlier than IR8
Keshari	India, 1980 Orissa	cross T90/IR8//Jagannath	short plant height, early maturing (60 d till ear emergence); short slender grain
K84	India, 1967	seeds, gamma rays? [T65]	earlier (75 d to ear emergence)

MI-273(m)	Sri Lanka, 1971 P. Ganashan Agric.Res. Station Maha-Illuppallama	seeds, gamma rays 35 krad [H4]	50% shorter culm, erect, 32% increase in panicle number, higher yield than IR8
PL-56	India, 1975 Punjab and Haryana	seeds, EMS 0.2% [C-164]	high tillering, superior in yield, suited for rainfed areas
Prabhavati (= PBN-1)	India, 1984 M.B. Misal, Y.S. Nerkar Marathwada Agric.Univ. Parbhani M.S.	seeds, EMS 0.2% 12 h pre-soaking 6 h treatment [Ambemohor local]	short culm, lodging resistant, tolerant to iron chlorosis, higher yield; 1985: 20 000 ha
Sattari (CRM 13-3241)	India, 1983 Orissa	hybrid seeds gamma rays [NSJ 200 x Padma]	early, high yield under upland (rainfed) conditions
Savitri (= Ponmani) (CR 210-1009)	India, 1983 Orissa	cross Pankaj x Jagannath	daylength sensitive, late maturing, high yield, suitable for submergence up to 40 cm water depth; good milling recovery and cooking quality
Vellayani	India, 1968 Kerala	seeds, neutrons [PTB-10]	
Yeng-Hsing-1	China, 1963 Taiwan	cross Taichung N 1 x SH-30-21	high yield, early maturity
Yen-Hsing-2	China, 1967 Taiwan	cross Taichung N 1 x KT 20-74	erectoid type
VN 4	Vietnam, 1975 Tran Nhu Nguyen Plant Breeding Dept. Inst. of Agriculture Hochiminh City	cross IR-1324010-1 x C2-13 (20 krad gamma rays, [IR-30])	matures in 90-95 days

Name of new variety	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 variety
Oryza sativa L. (rice) contd.			
VN 10	Vietnam, 1975 Tran Nhu Nguyen Plant Breeding Dept. Inst. of Agriculture Hochiminh City	cross A5 x Rumani-45 (10 krad gamma rays, [IR8])	
VN 20	Vietnam, 1975 Tran Nhu Nguyen Plant Breeding Dept. Inst. of Agriculture Hochiminh City	cross A5 x Rumani-45 (10 krad gamma rays, [IR8])	
Ribes nigrum L. (black currant)			
Burga	France, 1979 B. Lantin L. Decourtye INRA Stat.d'Arboriculture Fruitière F-49000 Angers	gamma rays [Noire de Bourgogne]	one week earlier bearing, allowing extension of harvest and processing period; quality like the parent
Sesamum orientale DC. (sesame)			
Ahnsanggae (= Suwon 55)	Rep. of Korea, 1984 J.I. Lee C.W. Kang S.T. Lee Industrial Crops Division Crop Exp.Station RDA Suweon	X-rays 20kR 1974 [Early Russian]	less seedling damping off, leaf blight, Phytophthora stem rot and Fusarium wilt, better yield than standard variety

Setaria sp. (millet)			
Changwei 74	China, 1975 Changwei Reg.Inst. of Agric.Science Shandong Province	seeds, gamma rays 35 krad [Shuilihun]	glutinous, early maturing, good taste; high yield, disease resistant
Changwei 75	China, 1975 Changwei Reg.Inst. of Agric.Science Shandong Province	seeds, gamma rays 35 krad [Changwei 69]	resistant to Pyricularia setaria; good quality
Sorghum bicolor L. (sorghum)			
Co 21	India, 1977 Tamil Nadu Agric. Univ. Coimbatore	seeds, X-rays 40 krad [CSV 5]	tall and high yielding, grain and fodder type sweet stem; tolerant to major insects and pathogens
Triticum turgidum (L.) Thell. (durum wheat)			
Unidur (H 438)	Austria, 1984 Landwirtschaftsbetrieb Neuhof-Rohrau Pflanzenzucht A-2471 Rohrau	cross Hercules/3/ Castelnuovo/Leeds/ Cocorit 71/Crane	lodging resistant, very short culm, suitable for good conditions
Vicia faba L. (faba bean)			
Karna (H 448)	Austria, 1983 Bundesanstalt f.Pflanzenbau Wien and Bundesversuchsanstalt Wieselburg A-3250 Wieselburg	seeds, gamma rays [Kornberger Kleinkönige]	high yield, erect, indeterminate; TGW 400-450 g, for grain and fodder
Vigna unguiculata (L.) Walp (cowpea)			
Co 5	India, 1986 Tamil Nadu Agric.Univ. Coimbatore 641003	seeds, gamma rays 30 krad [Co 1]	forage cowpea, more nutritive, 16% higher yield, compatible for intercropping with fodder cereals

Name of new variety	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 variety
Vigna mungo L. (black gram)			
Co 4	India, 1978 Tamil Nadu Agric.Univ. Coimbatore 641 003	seeds, MMS 0.02% [Co 1]	early maturing, erect, compact, determinate, day-length tolerant
Vigna radiata (L.) Wil. (mungbean)			
NIAB Mung 13-1	Pakistan, 1986 I.A. Malik, G. Sarwar Y. Ali NIAB Faisalabad	seeds, gamma rays 10 krad [6601]	earlier (56 d), shorter, more pods, harvest index 28%; TGW 40.5 g, 44% higher yield than 6601 suitable as catch crop
NIAB Mung 20-21	Pakistan 1986 I.A. Malik, G. Sarwar Y. Ali NIAB Faisalabad	seeds, gamma rays 40 krad [Pak 22]	earlier (56 d), shorter than NMB-1, more pods, harvest index 31%; TGW 38.6 g. 65% higher yield than Pak 22, better tolerant to yellow mosaic and Cercospora leaf spot; suitable as catch crop
Co 4	India, 1982 Tamil Nadu Agric.Univ. Coimbatore	seeds, gamma rays 20 krad [Co 1]	high yield, matures in 85 days; drought tolerant

NEW PUBLICATIONS

Widening of Genetic Variation by Tissue Culture
Gamma Field Symposia No. 23, 1984
(Inst.of Radiation Breeding, NIAR-MAFF, Ohmiya-machi, Naka, Ibaraki, Japan). Includes among others the following papers:

- H. Kukimura, O. Yatou
  In-vitro mutation breeding in medicinal plants.
- K. Oono, K. Okuno, T. Kawai
  High frequency of somaclonal mutations in callus culture of rice, *Oryza sativa* L.
- K. Yamamoto
  Sexual transfer of a portion of paternal genome by means of irradiated pollen.

In-Vitro Technology for Mutation Breeding
(Report of two FAO/IAEA Research Co-ordination Meetings 1983 and 1985).
58 pages. IAEA-TECDOC 392, 1986.

Rice Genetics
Proceedings of Int.Rice Genetics Symposium, 27 - 31 May 1985 (incl. sessions on "Mutagenesis", "Tissue and Cell Culture" and "Genetic Engineering")
IRRI 1986, ISBN-971-104-148-0).

Bangladesh Journal of Nuclear Agriculture
Editor: M.A.Q. Shaikh, Plant Genetics Division, BINA, P.O. Box 4, Mymensingh, Bangladesh

Mutation Research in Finger Millet (Eleusine coracana Gaertn.)
by S.B.S. Tikka
Sharda Publishing Academy, Ahuja Chambers, Sidhpur 384151 (Gujarat) India, 110 pp. US$ 30.-

In-Vitro Mutageneis
by M. Smith (Vancouver)
in Annual Review of Genetics 19 (1985) 423-462.

Genetic Manipulation in Plant Breeding
(Proceedings of EUCARPIA Meeting 8-13 September 1985, Berlin [West])
De Gruyter Berlin, New York 1986. ISBN 3-11-010596-9.

FUTURE EVENTS

1987

30 Mar. - 3 Apr.	First FAO/IAEA Research Co-ordination Meeting on Improvement of Rice and other Cereals through Mutation Breeding in Latin America. Quito, Ecuador.
6 - 10 Jul.	3rd FAO/IAEA Research Co-ordination Meeting on Semi-dwarf Mutants for Rice Improvement in Asia and the Pacific, Hangzhou, China.
20 - 30 Aug.	16th Pacific Science Congress, Seoul, Rep. of Korea. Contact: Organizing Committee, K.P.O. Box 1008, Seoul 110, Rep. of Korea.
30 Aug. - 4 Sep.	18th Annual Meeting of ESNA, Stara Zagora, Bulgaria.
22 Sep. - 5 Nov.	FAO/IAEA Interregional Training Course on the Induction and Use of Mutations in Plant Breeding, Seibersdorf (Austria) and Olomouc (CSSR).
26 - 30 Oct.	Int. Symposium on Experimental Mutagenesis in Plants, Plovdiv, Bulgaria. Contact: K. Filev, Institute of Genetics, 1113 Sofia, Bulgaria.
16 - 21 Nov.	2nd Int. Symposium on Mungbean, Bangkok, Thailand. Contact: S. Shanmugasundaram, AVRDC, P.O. Box 42, Shanhua, Tainan 74199, Taiwan, Rep. of China.

AWARD

J. Neil Rutger, USDA-ARS rice geneticist, University of California, Davis and Chao-Hwa Hu, chief agronomist, N.F. Davis Drier and Elevator Inc. Firebaugh, received the "1986 RICE INDUSTRY AWARD". Dr. Hu was an IAEA fellow and visiting scientist at the University of California, on sabbatical leave from National Chung-Hsing University, Taiwan in 1970, when he and Dr. Rutger selected an induced short stature mutant from the irradiated tall variety "Calrose". The short stature mutant was then developed into "Calrose 76" by Dr. Rutger and his colleagues. "Calrose 76" was also used in the development of other improved short stature varieties that had an even greater impact on Californian rice production.

C o n g r a t u l a t i o n s !

LAST BUT NOT LEAST

Please submit your contributions 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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