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Mutation Breeding Newsletter

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Report from the FAO/IAEA Plant Breeding and Genetics Section

The year 1979 has seen a focussing of the Section's activities upon the genetic improvement of grain legumes, which are so important for a nutritionally balanced diet in many developing countries. This move followed the final review of the FAO/IAEA/GSF Coordinated Research Programme on the Use of Nuclear Techniques for Seed Protein Improvement at the International Symposium at Neuherberg (FRG) in September 1978. 27 projects for improving yield, disease resistance, adaptation, crop duration and other traits through plant breeding with induced mutations are now supported, partly with funds provided by the Swedish International Development Authority (SIDA), in 17 countries. 37 scientists gathered for a first Research Coordination Meeting at Kuala Lumpur (Malaysia), 28 May - 1 June 1979. Attempts have been undertaken to link up these plant breeding activities with large scale development projects planned by other organizations, such as the FAO/UNDP Project for Food Legumes and Coarse Grains Development in the Humid Tropics of Asia (Consultation Sri Lanka 2 - 5 October 1979) and with the activities of International Research Institutes (AVRDC, CIAT, ICRISAT).

Training was another priority of our 1979 programme. A 3-week Study Tour was organized during June - July for 21 scientists from 18 countries to learn about the use that is made of nuclear techniques and induced mutations for plant breeding in the GDR, Poland and Czechoslovakia. A 6-week Regional Training Course on the Use of Induced Mutations in Plant Breeding was held at Jakarta (Indonesia) 17 September - 26 October for 29 scientists from 10 countries. Expert services have been provided for 6 countries and training under IAEA fellowships was granted to 7 scientists (see table page 11).

At the beginning of the year Dr. R.D. Brock returned to CSIRO Canberra (Australia) and the Section suffered from a 7-month vacancy until finally Dr. T. Kawai from National Grassland Research Institute, M.A.F., Nishinasuno (Japan) could be recruited to take over the duties. This long vacancy was

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the reason why a planned follow-up of the 10 years seed protein improvement programme could not be realized. However, now with additional financial support from SIDA, cereal breeding projects with promising high protein and/or high lysine mutants will be given 3 years chance to advance these materials towards the development of cultivars with acceptable agronomic characteristics.

By the end of the year, Dr. Alberto Brunori left for the Centro Studi Nucleari Casaccia (Italy) after spending 2½ years with the Agricultural Section of the IAEA Laboratory Seibersdorf working mainly on physiological and genetic aspects of protein accumulation in the wheat endosperm.

RESEARCH NEWS

Rice breeding with induced mutants in Japan

During 1959 - 1978 in Japan, thirty radiation-induced rice mutants became candidates for registration as Norin varieties following extensive testing of their perforamnce. Two of them were ultimately released as recommended varieties, Reimei in 1966 and Miyuki-Mochi in 1979. In addition, utilizing induced rice mutants as cross parents resulted in nine released varieties (Table 1). In breeding these varieties, five different mutants were used as cross parents (Table 2). As can be seen from Table 1 and 2, "Reimei" is involved in breeding of five of the nine varieties, where the short and stiff culm of this mutant variety contributes to the improvement of lodging resistance. Two mutants of "Koshihikari" were used in breeding of two other varieties. The improved lodging resistance (short-culmness) of "Koshihikari" mutants makes it feasible to utilize this variety possessing the best grain and eating quality as cross parent. In breeding "Sachiminori", the mutant of "Pi No. 4" having improved lodging resistance was used instead of the original Pi No. 4.

These 9 varieties covered 130, 742 ha of paddy in the third year after their release. Akihikari is the largest variety covering 91,000 ha in 1979, about 3% of total paddy, and ranked fifth in cultivation area. Fujihikari is the first 80 - 100 day rice variety in Japan.

The extensive use of induced mutants in rice breeding can also be seen from the following figures: (1) Among the 23 Norin varieties which were released in 1973 - 1978, six varieties (26%) were derived from crosses using induced mutants as parents (Table 3); (2) Fifty-five "candidate strains" have been bred by utilizing induced mutants as cross parents (Reimei was used in 40 of the 55 strains); (3) In addition, 19 candidate strains have been bred by utilizing varieties and strains derived from crosses with Reimei as one of the parents.

Induced mutants obviously can play an important role in rice breeding through their direct but also through indirect use. It appears that "Reimei" is an excellent donor of a semi-dwarf gene in cross combination.

(Contributed by H. Sato, Central Agricultural Experiment Station, M.A.F., Konosu, Saitama, Japan)

Table 1. Rice varieties in Japan bred by utilizing induced mutants (up to 1978)
(Mutants and characters derived from induced mutation are underlined)

	Year of Release	Breeding Station	Cross Combination	Characteristics
Mutsuhonami	1973	Fujisaka	Wakakusa x Reimei	short and stiff culm, high yield, good/quality
Kagahikari	1973	Ishikawa	Mut. of Koshihikari x Fukei 72	good grain quality, good eating quality, high yielding, susceptible to blast
Hanahikari	1974	Obanazawa	[(Stripe 136 x Dewaminori) x Dewaminori] x Reimei	early maturity, short and stiff culm, good eating quality
Akihikari	1976	Fujisaka	Toyonishiki x Reimei	short and stiff culm, very high yield, good grain quality, resistance to cold
Hayahikari	1976	Tohoku	Reimei x Toyonishiki	short culm, very stiff culm, good grain quality, less resistance to cold
Houhai	1976	Aomori	Kojonishiki x Reimei	short and stiff culm, poor grain quality, (variety for sake brewing)
Fujihikari	1977	Chugoku	R 151 x [(Fukei 71 x Fukei 67) x Koshihikari]	short-duration (extremely early maturity) type, good grain quality, good eating quality, less resistance to cold and blast
Sachiminori	1978	Hokuriku	(Manryo x R$_4$- B) x Yamanishiki	blast resistance by Pi-ta^{2} gene, good grain quality, moderately stiff culm
Katsurawase	1978	Kagoshima	[(Fukei 71 x Fukei 67) x Koshihikari] x Koshihikari	early maturity, short and stiff culm, good grain quality, good eating quality

Table 2. Rice mutants used in cross breeding in Japan

Mutant	Station	Year of Release	Original Variety and Treatment	Improved Attributes
Reimei (= Fukei 70)	Fujisaka	1963	Fujiminori, γ-ray, 20 kR	short and stiff culm, tolerance to high fertilizer application, high yield
Mut. of Koshihikari	Central Agric. Expt. Station & Ishikawa	1964	Koshihikari, γ-ray	short culm, early maturity
R-151	Central Agric. Expt. Station	1964	Koshihikari, γ-ray	extremely early maturity, short culm
Fukei 71	Fujisaka	1963	Fujiminori, γ-ray, 30 kR	extremely short and stiff culm
R_4 - B	Hokuriku	1963	Pi No. 4(1) (Tadukan x Norin 8), γ-ray	medium culm length, high yield

(1) Carrying blast resistance gene Pi - ta^2

Table 3. Recent Norin varieties and utilization of mutants in their breeding

Year of Registration	Total No. of Varieties	No. of Varieties Bred by Utilizing Mutants as Parents
1973	2	1
1974	5	0
1975	2	0
1976	5	2
1977	4	1
1978	5	2
Total	23	6 (26%)

Registration of mutant rice variety "M-101"

"M-101" rice (Oryza sativa L.) CI 9970, is a true breeding medium grain selection (experimental designations ESD7-1 and ESD7-1-A) from the cross [CS-M3 x Calrose] x D31 made at Davis, California in 1974. M-101 is a composite of homogeneous F_4 lines derived from one early maturing short stature glabrous F_2 plant. The maternal parent of the final cross was a short stature, late maturing, medium grain line with glabrous hulls and leaves except for some pubescence on the lemma keel bow and leaf blade margins. The paternal parent, D31, is early maturing, tall, pubescent, with medium grain and derived as an early flowering Cobalt-60 radiation-induced mutant from the cultivar 'Calrose'.

M-101 is a short stature, medium grain cultivar having glabrous hulls and leaves, except a few hairs on the lemma keel bow and on leaf margins. It has moderate awning. It is earlier in maturity than any other medium grain cultivar being grown in California, on the average 5 days earlier than "Earlirose", an early maturing tall cultivar presently grown in California. "M-101" ripens more uniformly than "M9" and is probably ready for harvest 10 days earlier than "M9". It lodges much less than "Earlirose" and is more yield responsive to high nitrogen fertilization. It has excellent seedling vigor, comparable to that of "Earlirose" and superior to that of other California short stature cultivars.

Weight of paddy seeds of M-101 averaged 27.5 g/1000 vs. 28.2 for those of M9. Paddy seeds of M-101 averaged 7.7 mm long and 3.2 mm wide. Brown rice seeds averaged 6.1 mm long and 2.9 mm wide. Endosperm of M-101 is non-glutinous and non-aromatic. The bran layer is light brown like that of other California cultivars. Milled rice of M-101 has translucency similar to that of other California short stature cultivars and has typical medium grain cooking characteristics. It had 17% amylose and an alkali reaction of 7 in 1.7% KOH indicating low gelatinization temperature for the starch.

Yield and agronomic characteristics of M-101 in comparison to Earlirose and M9 in eight replicated combine-size, state-wide tests conducted in 1977 and 1978 were:

Character	Cultivar		
	M-101	Earlirose	M9
Average paddy rice yield at 12% moisture, kg/ha	8270	7510	8270
Average % lodging at harvest	30	81	32
Average height, cm	89	115	89
Average days to 50% heading	92	97	99
Average seedling vigor (1 = very poor, 5 = excellent)	4.4	4.6	3.7

M-101 was also compared with Earlirose in a 1978 cultivar x nitrogen fertility trial in San Joaquin County. Also, M-101 was compared with M9 in a seeding rate x cultivar trial in Sacramento County, and in water depth x cultivar trials at Biggs and Davis. In the cultivar x nitrogen trial, M-101 gave an average yield of 8800 kg/ha vs. 7800 for Earlirose. In the comparisons of M-101 and M9, the two cultivars gave comparable average yields.

M-101 has yielded well in all parts of the rice growing area. Because of its earliness, short stature and cold tolerance in the seedling and reproductive stages it is particularly suited for the cooler areas of the state. M-101 does not appear to have a yield advantage over M9.

The percent head rice for M-101 appears to be similar to that of Earlirose, and drops considerably at low harvest moisture levels in warmer areas. Head rice appears to be a particular problem with very early maturing cultivars. Therefore, it is suggested that M-101 be harvested at 22% moisture or above in order to enhance head rice percent.

M-101 was jointly released by SEA-AR, USDA, the California Agricultural Experiment Station, and the California Co-operative Rice Research Foundation, Inc. It was approved for certification by the California Crop Improvement Association in 1979. Breeder and foundation seed of M-101 will be maintained by the California Co-operative Rice Research Foundation, Inc., P.O. Box 306, Biggs, CA 95917.

(Contributed by J.N. Rutger, M.L. Peterson, H.L. Carnahan, and D.M. Brandon Research geneticist, USDA, SEA-AR, Davis, CA 95616; Professor, Dept. of Agronomy & Range Science, UCD, Davis, CA 95616; Director of plant breeding, California Co-operative Rice Research Foundation, Inc., Biggs, CA 95917; and Extension Agronomist; Department of Agronomy & Range Science, UCD, Davis, CA 95616).

Resistance against brown plant hopper in rice

Resistance to the brown plant hopper (BPH) is known and, so far, alleles in four loci have been identified to confer resistance, two being dominantly and two being recessively inherited. [1] Furthermore, investigations into the mechanism of resistance have shown that volatile aromatic compounds present in resistant plants can kill the plant hopper [2]. From this it appears likely that mutations leading to resistance can be induced.

Seeds of a susceptible variety, Pelita I/1 were irradiated with gamma rays (10 - 40 krad). 8000 M_1 seeds per dose were sown in the greenhouse. The three day old seedlings were infested with BPH biotype 1 and caged. Two weeks later, all seedlings had died except two, one out of 35 krad and one of the 40 krad treatment. Only one of the resistant plants survived till harvest time.

50 seeds of this plant were sown as M_2 and the seedlings were infested again with BPH biotype 1. About 80% of the seedlings showed some degree of resistance. The best 7 plants were harvested separately and tested again in M_3. They showed a homogenous resistant reaction to BPH biotype 1 but differed from each other in ripening time, seed size and plant height.

REFERENCES

[1] SIDHU, G.S. and KUSH, G.S., Theor. Appl. Genet. 53 (1978) 199-203.

[2] SAXENA, R.E. and PUMA, B.L., ICIPE Annual Research Conference Nairobi (Kenya) 1979.

(Contributed by Moch Ismachin, Pasar Jumat Atomic Energy Research Centre, Jakarta, Indonesia)

Mutation frequency and spectrum in irradiated apple varieties

Winter grafts of the cultivars 'Wealthy' 'King of the Pippins' and 'Roter Jungfernapfel' were treated with gamma doses of 3,360 to 7,560 rad, and grafted onto juvenescent nine year old dwarf trees (rootstock M4). A varying negative effect of higher radiation doses on the fertility of the graft was observed in the different varieties, the main cause being lower fertility of the blossoms. Differences in the frequencies of mutations were found between the cultivars. Each cultivar had a characteristic spectrum of mutations. In the 'Parmena zlata' cultivar, negative changes were often observed even in the internal fruit traits, i.e., flavour and flesh consistence.

REFERENCES

VONDRACEK, J., BLAZEK, J. and KLOUTVOR, J., Effect of different gamma doses on fertility and mutation frequency in apple trees. Genet. Slechteni 14 (1978) 261-266.

BLAZEK, J., KLOUTVOR, J., VONDRACEK, J. and PAPRSTEIN, F., Mutation frequency increase in apple cultivar 'Wealthy' by gamma irradiation. Genet. Slechteni. 15 (1979) 5-14.

(Contributed by J. Blazek, J. Kloutvor, J. Vondracek and F. Paprstein, Vyzkumny a Slechtitelsky Ustav Ovocnarsky, Holovousy, Czechoslovakia, through INIS).

Different response of oat varieties to mutagen treatment

Five oat varieties were studied for the effect of X-rays on the degree of survival, on the rate of mutations, and on the possibility of obtaining improved forms for further breeding work. Oats were treated with doses of 20,000 and 40,000 R and the latter dose was found to be highly lethal. For this reason, further studies were performed with doses of 15,000 and 25,000 R. The 'Diadem' variety (CSSR) showed the highest sensitivity to irradiation. The varieties 'Tiger' (West Germany) and 'Diane' (Belgium) showed medium susceptibility and the 'Permit' and 'Pollux' varieties (both W. Germany) were the least sensitive. In selection oriented mainly to culm shortening and to higher resistance to lodging, the greatest number of useful mutations was obtained from the 'Permit' variety after exposure of dry seeds to a dose of 20,000 R. The most promising mutant forms obtained in this variety were sent to some breeding stations of the Plant-Breeding and Seed-Production Enterprise Oseva for further breeding use.

REFERENCE

VELIKOVSKY, V., Zhodnoceni a vyuziti mutantnich forem ovsa. Genet. Slechteni 14 (1978) 117-125.

(Contributed by V. Velikovsky, Vyzkumny a Slechtitelsky Ustav Obilnarsky, Kromeriz, Czechoslovakia, through INIS).

Germplasm of induced mutants in lemongrass

The chief source of lemongrass oil in India is *Cymbopogon flexuosus*. The oil is a valuable ingredient of perfumes, cosmetics, confectionary and disinfectants. It is also used as the source for synthesis of Vitamin A. Citral is the dominant constituent of the oil. The local improved variety of lemongrass (OD.19) grown extensively in the south western corner of India (Kerala) is only moderate in oil yield (0.3%), though the oil is high in citral content (85%-90%). Crop improvement in this semi-perennial aromatic grass therefore aims at increasing the oil yield per unit area. The low genetic variability in the species is a serious limitation for genetic improvement. The grass is well adapted for propagation, through seeds as well as slips, and hence offers opportunities for breeding through induced mutations.

Seeds (fluff) of the variety OD.19 were irradiated with gamma rays at a dose range of 0 to 30 krad during 1976. The M_1 population was screened and nearly 90 chimeric plants were identified and selected. They were split into single slips and carried forward to MV_1 clonal progenies. 49 mutants which exhibited variation in respect of one or more morphological characters were selected and carried forward to MV_2 clonal progenies. These clones were homogenous but differ in a number of morphological characters such as flowering habit, tiller compactness, leaf type, sheath and leaf colour. Twenty-one clones were subjected to a detailed evaluation for productive characters such as plant height, tiller number, grass yield and essential oil content. Eleven clones gave higher grass yield, the highest being 740g per plant per cutting as against 479g in the standard. Similarly, seven clones gave higher oil yield, the highest being 0.42% as against 0.23% in the standard. The quantitative data relating to the more important mutant clones are presented below.

Mutant clone no.	Plant height at cutting (cm)	Tiller number	Grass yield per plant per cutting (g)	Essential oil content (ml.%)
OD.19	136	48	479	0.23
2	163	52	627	0.25
4	161	41	572	0.23
7	149	43	560	0.34
11	143	50	490	0.40
14	141	55	740	0.18
18	127	41	413	0.35
19	133	22	194	0.42
20	141	56	726	0.18
23	125	43	408	0.35
37	140	53	574	0.10

Further evaluation and field testing are being conducted for eventually releasing a mutant variety in lemongrass giving a higher oil yield per hectare per year.

All the 49 mutant clones are being maintained as germplasm.

REFERENCE

NAIR, V.G., Productive mutants in lemongrass induced by gamma rays. Presented at the symposium on "the role of induced mutations in crop improvement" at Hyderabad, India during September 1979.

(Contributed by V. Gopinathan Nair, College of Agriculture, Vellayani, Trivandrum, India).

Improvement of essential oil quality

The presence of methyl-eugenol in the oil and the difficulty experienced in its separation was considered to be a negative attribute in the Var. RRL-59 of Cymbopogon flexuosus. A mutation breeding programme was initiated to rectify this essential oil-bearing plant. A massive screening of irradiated vegetative slips resulted in the isolation of a methyl-eugenol deficient mutant. The results show that once the methyl-eugenol is absent, the oil as such closely resembles the oil of citronella (Java type) and can be a good substitute for the same.

REFERENCE

CHOUDHARY, D.K., KAUL, B.L., Radiation induced methyl-eugenol deficient mutant of Cymbopogon flexuosus (Nees ex Steud) Wats. Proc. Indian Acad. Sci., Section B. 88 (1979) 225-228.

(Contributed by D.K. Choudhary and B.L. Kaul., Regional Research Laboratory, Jammu, India, through INIS).

Mutant peanuts in Argentina

Peanuts are grown almost exclusively in an area near the city of Cordoba. Most peanut research is conducted at the Manfredi Experiment Station, which is located in the peanut producing area. The breeding efforts at Manfredi have yielded several very successful oil-rich varieties. The most wide spread is "Colorado Manfredi". In recent years, a variety produced by mutation breeding following irradiation is gaining in acreage: "Colorado Irradiado" is now grown on about 20% of the area. "Colorado Irradiado" is also used in cross breeding.

Interest in Virginia type cultivars with jumbo pods has been rising due to export potential. Two new Virginia cultivars have been released recently:

Virginia No. 5 - selected from segregating material from Florida(USA)

Virginia No. 3 - a bunch selection from material obtained following irradiation of "NC2" at Raleigh, N.C.(USA).

REFERENCE

Mutation Breeding Newsletter No. 7 (1976) 13.

(Contributed by A. Ashri, FAO Consultant. The Hebrew University of Jerusalem, Rehovot, P.O.B. 12, Israel).

Seedling tests in leguminous plants after irradiation of seeds

Determination of radiation effects in M_1 generation is of importance in mutation breeding for predicting appropriate mutagenic dosages. Seedling growth reduction tests are commonly used. In monocotyledonous plants, the length of the first leaf is usually measured, which is not very practicable in dicotyledonous plants. Therefore, other seedling tests have been tried.

The radiosensitive cv. Sinmejiro and the radioresistant cv. Tachisuzunari of soybean were chosen for the experiment. Air dry seeds were irradiated with gamma rays, in the range between 0 and 22 kR. Irradiated seeds were sown into sterilized soil and placed in controlled environment. Two weeks old seedlings were rinsed with water and placed on moistured paper towels. The measurements included hypocotyl and epicotyl length, with the seedling height being calculated as the sum of the two. The primary leaf areas were determined with an electric area meter, manufactured by Hayashi Denko Co.

Both the cultivars examined showed significantly different reaction to the irradiation treatments applied, in all the criteria analyzed. The primary leaf area of the radiosensitive cultivar Sinmejiro decreased rapidly after dosages exceeding 4 kR, whereas the radioresistant cv. Tachisuzunari showed no changes up to 10 kR. The 50 per cent reduction level was achieved in the cv. Sinmejiro at the dosages between 6 and 8 kR, and between 12 and 14 kR in the cv. Tachisuzunari. The correlation coefficient between the primary leaf area and the epicotyl length as well as between the primary leaf area and the seedling height, were very high for both cultivars. The correlation coefficients between the primary leaf area and the hypocotyl length were lower. We conclude that the primary leaf area reduction test can be used as the criterion of radiation damage in the M_1 generation of dicotyledonous plants like soybean.

The number of chlorophyll-less spots, which occur abundantly after seed irradiation in leguminous plants was also determined. The seed spotting likewise showed strong dependence on the gamma rays dosages in the lower dose range, as well as on the genetic constitution of the cultivars analyzed. It was also highly correlated to the other criteria. The leaf spotting, can therefore be used as an additional criterion to monitor the radiation effects in the small dosage range, where a growth depression can hardly be determined.

The authors obtained similar results with other leguminous plants.

REFERENCES

MUSZYNSKI, S., DABROWSKA, A. and HUCZKOWSKI, J., Chlorophyll-less spot number as the criterion of radiogenetical damage after neutron irradiation of soybean seeds. Bull.Ac.Sci.Polon. Cl. II sci.biol. (1979) (in print).

MUSZYNSKI, S., DABROWSKA, A. and HUCZKOWSKI, J., The effects of fast neutron irradiation of soybean seeds. (In Polish). Proc. Symp. Neutron Applic. in Biol. and Agric. Cracow 1978 (1979) (in print).

TAKAGI, Y., Studies of varietal differences of radiosensitivity in soybean. Acta Radiobotanica et Genetica 3 (1974) 45-87.

(Contributed by S. Muszynski, Institute of Genetics and Plant Breeding, Warsaw Agric. University., Warsaw, Poland; S. Hiraiwa and S. Tanaka, Institute of Radiation Breeding, NIAS-MAF, Ohmiya-Machi, Ibaraki-ken, Japan).

NEW PUBLICATIONS

Induced Mutations for Crop Improvement in Africa

Proceedings of a Regional Seminar held 23 - 27 October 1978 at the International Institute of Tropical Agriculture, Ibadan, Nigeria. IAEA-TEC-DOC-222, 1979.

Seed Proteins of Dicotyledonous Plants

Proceedings of a Symposium held 30 June - 2 July 1977 at Gatersleben (GDR) Akademie-Verlag, Berlin 1979, 38.- M.

EXPERTS AND CONSULTANTS 1978/79

Ahnström, G. (Sweden)	-	Bandung (Indonesia)
Blixt, S. (Sweden)	-	Piracicaba (Brazil)
Broertjes, C. (Netherlands)	-	Piracicaba (Brazil)
Brunner, H. (IAEA)	-	Bandung (Indonesia)
Dilworth, M.J. (Australia)	-	Jakarta (Indonesia)
Ehrenberg, L. (Sweden)	-	Mymensingh (Bangladesh)
Evans, D.A. (USA)	-	Piracicaba (Brazil)
Gaul, H. (FRG)	-	Kuala Lumpur (Malaysia)
Haq, S. (Bangladesh)	-	Maracaibo (Venezuela)
van Harten, A.M. (Netherlands)	-	Piracicaba (Brazil)
Mikaelsen, K. (FAO/IAEA)	-	Jakarta (Indonesia)
	-	Lima (Peru)
Murty, B.R. (India)	-	Maracaibo (Venezuela)
Nakai, H. (Japan)	-	Mymensingh (Bangladesh)
Niemann, E. (FRG)	-	Tanzania and Mali
Oram, R. (Australia)	-	Mymensingh (Bangladesh)

FELLOWSHIP TRAINING 1978/79

Balazs, E. (Hungary	-	Ithaca NY (USA)
Casyao, A. (Philippines)	-	Illinois Urb. (USA)
Gecheff, K.I. (Bulgaria)	-	Casaccia (Italy)
Gopala Krishna, T. (India)	-	Durham (UK)
Grafia, A. (Philippines)	-	East Lansing, Mich. (USA)
Khan, R.I. (Bangladesh)	-	Durham (UK)
Krishna Sainis, J. (India)	-	Rothamsted (UK)
Muszynski, S. (Poland)	-	Ohmiya (Japan)
Pawar, S.E. (India)	-	Columbia, Miss. (USA)
Rajput, M.A. (Pakistan)	-	Glen Osmond (Australia)
Sehara Khanum (Ms.) (Bangladesh)	-	Pullman, Wash. (USA)
Shaikh, M.A.Q. (Bangladesh)	-	Svalöv (Sweden)
Sümer, S. (Turkey)	-	Risö (Denmark)

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 attributes of variety
<u>Oryza sativa</u>			
Miyama Nishiki	1978 Japan M. Toda, T. Hata Nagano Prefectural Agric. Exp. Station	30 kR gamma rays 1972 [Takane-nishiki]	large grain, high frequency of white-core grain, optimal white-core size, suitable for "sake"-breeding
Miyuki-mochi	1979 Japan M. Toda, T. Sakai, T. Hata Nagano Prefectural Agric. Exp. Station	20 kR gamma rays 1974 [Toyonishiki]	glutinous endosperm without change of main characteristics of parent variety such as high yield, disease resistance
Calmochi 201	1979 USA H.L. Carnahan, C.W. Johnson, S.T. Tseng Calif. Coop. Rice Res. Found Inc. Biggs, Ca. Univ. of California, SEA-USDA Davis, Ca.	20 kR gamma rays 1974 [S6]	glutinous endosperm

M-101	1979 USA J.N. Rutger, M.L. Peterson, H.L. Carnahan, D.M. Brandon USDA-SEA, Univ. of California, Davis, Calif.; Coop. Rice Res. Foundation Inc. Biggs, Ca.	Cross (CS-M3 x Calrose 76) x D31	short stature and early maturity, 10% yield in- crease
Pisum sativum			
Hans	1979 India B. Sharma Division of Genetics, IARI New Delhi	E.I. 1967 [P1163]	higher yield
Wasata	1979 Poland J.K. Jaranowski Inst. Gen. and Plant Breed. Acad. of Agric. Poznan J. Mikolajczyk, K. Korlub, M. Pedzinski Plant Breed. Station Przebedowo	50 krad gamma rays 1965 [line 5/2]	change of leaflets to tendrils (high harvest index), early maturing (ca. 103 days), high yield, lodging resistant, fodder pea. Suitable for combine harvest, in 1980 250 ha seed multiplication
Sum	1979 Poland J.K. Jaranowski Inst. Gen. and Plant Breed. Acad. of Agric. Poznan J. Mikolajczyk, M. Kielpinski Pland Breed. Station Przebodowo J. Styczynska, Inst. of Plant Breed., Radzikow	Cross Porta x Wasata	shorter plant type, larger seed than Wasata, very high yield potential, edible pea, in 1980 50 ha seed multiplication
Mentha arvensis			
Rose mint	1977 Japan Seiroku Uno Faculty of Agriculture Okayama University	Gamma rays, cell culture [Japanese mint]	improved yield and quality of oil with fragrance very similar to rose oil, price of oil from mutant is 20 times as high as ordinary mentha oil

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 attributes of variety
Bougainvillea			
Arjuna	1976 India M.N. Gupta, R. Shukla National Botanical Research Institute, Lucknow 226001	Gamma rays - 500 rad 1970 (Partha)	variegated leaves
Chrysanthemum			
Aruna	1974 India M.N. Gupta, R. Shukla National Botanical Research Institute, Lucknow 226001	Gamma rays - 1.5 kR 1967 + 1.5 kR 1968 (Undaunted)	dark reddish flower-heads
Ashankit	"	Gamma rays - 1.5 kR 1967 + 1.5 kR 1968 (Undaunted)	semi-quilled and fringed ray-florets
Gairik	"	Gamma rays - 1 kR 1966 (Belur Math)	salmon-light flower-heads
Kansya	"	Gamma rays - 1.5 kR 1967 (Rose Day)	bronze flower-heads
Kunchita	"	Gamma rays - 1.5 krad 1969 (Undaunted)	incurved flower-heads
Pingal	"	Gamma rays - 1 krad 1971 (Pink Casket)	terracotta flower-heads with larger number of spoon-type ray-florets
Shukla	"	Gamma rays - 1.5 kR 1968 (Mrs. H. Gubby)	white flower-heads
Shveta	"	Gamma rays - 2 krad 1969 (Fish Tail)	almost white flower-heads at full bloom stage

Tamra	"	Gamma rays - 1.5 krad 1970 (Goldie)	ray-florets having more intense coppery red (Apricot) colour on yellow background
Himani	"	Gamma rays - 2 krad 1969 (E-13)	white flower-heads at full bloom stage
Kapish	"	"	brown flower-heads
Lohita	"	"	dark reddish flower-heads
Asha	1975 India M.N. Gupta, R. Shukla National Botanical Research Institute, Lucknow 226001	Gamma rays - 1.5 kR 1967 (Hope)	creamish white flower-heads
Basant	"	Gamma rays - 1 kR 1966 (Paul)	yellow flower-heads
Kanak	"	Gamma rays - 1.5 kR 1967 (Undaunted)	dark brown flower-heads
Jhalar	"	Gamma rays - 1.5 krad 1969 (Undaunted)	almost flat and fringed ray-florets
Nirbhaya	"	Gamma rays - 1.5 kR 1967 (Undaunted)	lighter mauve, semi-quilled and fringed ray-florets
Nirbhik	"	Gamma rays - 1 krad 1970 (Undaunted)	lighter mauve, almost flat and fringed ray-florets
Shafali	"	Gamma rays - 1.5 kR 1967 + 1.5 kR 1968 (Undaunted)	light reddish, incurving to incurved flower-heads
Svarnim	"	Gamma rays - 1.5 krad 1968 (Undaunted)	light brown flower-heads
Anamika	"	Gamma rays - 2 krad 1969 (E-13)	light reddish flower-heads

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 attributes or variety
Dark Deep Tuneful	1969 The Netherlands S. de Bruyn Jr, Maasdijk*	1.5 krad X-rays 1967 [Tuneful]	red flower colour; other characters unchanged
Gamma	1969 Hungary J. Simon	1.5 krad γ-rays 1966 [Obuda]	?
Uncle Danny	1973 The Netherlands Riviera Plant Co., De Lier*	1.75 krad X-rays 1971 [Beamsville Pink]	yellow flower colour; growth and flower form same as in mother cultivar
Danny Boy	"	"	"
Danny's Cape	"	"	"
Danny's Pearl	"	"	"
Blue Winner	1975 The Netherlands Fides, De Lier*	1.75 krad X-rays 1973 [Pink Winner]	flower colour mutant; other characters unchanged
Bronze Winner	"	"	"
Coral Winner	"	"	"
White Winner	"	"	"
Yellow Winner	"	"	"
Mikrop	1976 The Netherlands Chryveco, 's Gravenzande*	1.5 krad X-rays 1975 [Pinkish sport of Horim]	pink flower colour
Middelry	"	"	bright yellow flower colour
Milava	"	"	cream-yellow flower colour
Milonka	"	"	white flower colour

Dark Westland	1976 The Netherlands C.B.S.H., De Lier*	1.75 krad X-rays 1975 [Westland]	dark pink flower colour
Bright Westland	"	"	pale pink flower colour
Bronze Westland	"	"	bronze flower colour
Dark Charmette	"	1.75 krad X-rays 1975 [Charmette]	dark pink flower colour
Bronze Charmette	"	"	bronze flower colour
Dark Oriette	"	1.75 krad X-rays 1975 [Oriette]	dark pink flower colour
<u>Euphorbia fulgens</u>			
Albora	1976 The Netherlands Kwekerij "Albatros" B.V., Ter Aar, in co-operation with the Foundation ITAL	X-rays, 4 krad 1973 Rooted cuttings [Euph. fulgens]	bright orange flower colour
<u>Populus trichocarpa Hork</u>			
Donetskii Zolotoi (Donetsk Golden)	1977 Ukrainian SSR Shchepotev et al., Donetsk	Cuttings were irradiated with 50-150 R γ-rays [P. trichocarpa]	variegated leaves; annual height increment 1.5-1.8 m under dry conditions and over 3 m under wet conditions
<u>Portulaca grandiflora perennial</u>			
Ratnam	1974 India M.N. Gupta National Botanical Research Institute, Lucknow 226001	Gamma rays - 4 kR 1965 Perennial Portulaca Double	flower diameter 4.5 cm, single flowers with 5-8 petals. Cross fertile
Vibhuti	"	"	flower diameter 3.0 cm, with incurved petals having 5 mm white margin when temperature and humidity are high

* In co-operation with the Association Euratom-ITAL, Wageningen

FUTURE EVENTS

1980

4th FAO/IAEA Research Coordination Meeting on Improvement of Vegetatively Propagated Crops and Tree Crops through Induced Mutations at the Sugarcane Breeding Institute, Coimbatore, India, 11 - 15 February.

FAO/IAEA/GSF/SIDA Research Coordination Meeting on the Use of Nuclear Techniques for Cereal Grain Protein Improvement, Nicosia, Cyprus, 21 - 25 April.

International Wheat Conference, Madrid, Spain, 26 - 28 May. Contact: V.A. Johnson, University of Nebraska, Lincoln, Nebraska 68583, U.S.A.

5th European and Mediterranean Cereal Rusts Conference, Bari, Italy, 28 May - 3 June. Contact: Cereal Rusts Foundation, Wageningen, Netherlands.

2nd Symposium on Seed Proteins: Regulation of Protein Biosynthesis during Embryogenesis and Germination of Plant Seeds, Gatersleben, GDR, 25 - 27 June. Contact: K. Müntz, Zentralinstitut für Genetik und Kulturpflanzenforschung der Akademie der Wissenschaften der DDR, 4325 Gatersleben, GDR.

EUCARPIA General Congress on Genetic Resources and Plant Breeding for Resistance, Leningrad, USSR, 16 - 20 September. Contact: N.I. Vavilov, Institute of Plant Industry, Herzen-str. 44, 190000, Leningrad, USSR.

Training Course on Crop Improvement of Tropical Species through Tissue Culture, Piracicaba, Brazil, at Centro de Energia Nuclear na Agricultura (CENA) - U.S.P., 29 September - 20 October. Contact: O.J. Crocomo, CENA - Caixa Postal 96, 13400 - Piracicaba - SP., Brazil.

FAO/IAEA Advisory Group on the Use of Induced Mutations for Improving Oil-Seed and Other Industrial Crops, Vienna, Austria, 27 - 31 October.

FAO/IAEA/SIDA Regional Training Course on the Use of Induced Mutations in Plant Breeding, Maracaibo, Venezuela, 3 November - 5 December.

ANNOUNCEMENT

FAO/IAEA International Symposium on Induced Mutations as a Tool for Crop Plant Improvement, 9 - 13 March 1981, Vienna, Austria.

Plant mutation research did not only produce valuable results in terms of crop varieties, it also stimulated progress in related sciences, such as plant genetics or plant physiology and through this has indirectly made a contribution towards improvement of plant production, which in its value may exceed the economic gain from mutant cultivars.

The symposium is planned to review the achievements that have been made or could be made in various fields of plant science by the use of induced mutations as a research tool, to make this information available to agronomists, geneticists, physiologists, taxonomists, plant pathologists and others being concerned with cultivated plants and to stimulate researchers to make more use of induced mutations as a tool in their endeavours.

Member States of FAO and IAEA will be invited to nominate participants for presenting papers or contributing to the discussions on the following topics:

- mutants to study photosynthesis, translocation and biochemical pathways in plants
- mutants to study the relevance of plant architecture for maximizing yield and reducing crop losses
- mutants to study regulatory mechanisms in plants affecting important aspects of production such as time of flower or crop duration
- mutants to study physiology of fruit, seed or tuber development with the aim of developing better varieties
- mutants to study symbiosis such as for nitrogen fixation
- mutants to study host plant/parasite interactions and mechanisms of resistance against pathogens
- mutants to study means for improving environmental adaptation and stress resistance
- mutants in genetic, cytological and evolutionary studies related to crop improvement
- mutants for *in vitro* studies of physiological and biochemical problems related to plant improvement
- mutants for studies on better *in vitro* systems for cell and tissue culture and for *in vitro* plant generation.

Interested persons are kindly requested to contact the IAEA Conference Service Section or the Plant Breeding and Genetics Section of FAO/IAEA, V.I.C., P.O. Box 100, A-1400 Vienna, for obtaining further information.

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
Lhamo WAHL
Leila SHAWA

Mutation Breeding Newsletter
Joint FAO/IAEA Division of Isotope and Radiation
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