INIS-XA--481

Mutation Breeding Newsletter

JOINT FAO/IAEA DIVISION OF ISOTOPE AND RADIATION APPLICATIONS
OF ATOMIC ENERGY FOR FOOD AND AGRICULTURAL DEVELOPMENT
INTERNATIONAL ATOMIC ENERGY AGENCY, VIENNA

Issue No. 31
March 1988

Report from the FAO/IAEA Plant Breeding and Genetics Section

In spite of a financial crisis of the UN-system, we were able to keep up essential activities.

The co-ordinated research programme on cereal improvement using doubled-haploids but also heterosis from induced mutations started in 1986 and continued during the past year. A new regional co-ordinated research programme for Latin America, primarily for rice improvement had its first co-ordination meeting 30 March - 3 April 1987 in Quito, Ecuador. The co-ordinated research programme for identification and use of induced semi-dwarf mutants as alternative genetic sources for rice breeding completed its work with the final co-ordination meeting at Hangzhou, China, July 1987. In-vitro culture technology for mutation breeding is given high priority, e.g. for improving crop plant resistance to diseases. At the first co-ordination meeting of a new programme in September 1987, it was decided to concentrate efforts first on studying the use of toxins for in-vitro screening of resistant mutants and comparing toxin resistance with the reaction to pathogen attack under greenhouse and field conditions.

Oil seeds and industrial crops have unfortunately so far received lower priority in FAO/IAEA projects, but we now look forward with some optimism to establish a global network on sesame improvement, in co-operation with the FAO Plant Production and Protection Division. A consultants meeting for this purpose was hosted by IAEA in Vienna in September 1987. The use of mutagenesis to accelerate the domestication of new crop plants - relevant for developing as well as for developed countries - had been subject of an expert discussion already in November 1986 (see MBNL No. 29). FAO and IAEA were advised to pay attention to this important task, but we still have to see whether funds become available.

Vegetatively propagated plants like root and tuber crops, bananas and plantains, or woody perennials are looked upon frequently as a particular domaine of mutation breeding, which is not yet reflected in spectacular results. Much research for technology development has been done under co-ordinated research programmes from 1972 onwards and technology transfer is now undertaken through a number of technical assistance projects in countries such as Ghana, Panama, Zambia, Uganda, Thailand. During 1988 we may strengthen co-operative research on the use of in-vitro techniques in this field.

While most emphasis in the Section's research programmes is technology advancement, more work is actually concerned with assisting plant breeders in developing countries through training, advice and other support. The Section services 40 country projects and 3 regional projects under the IAEA Programme of Technical Assistance and Co-operation. During 1987, 33 fellowship holders completed their training abroad and two training courses were held, one at the IAEA Laboratory Seibersdorf, the other one at the National Agricultural University La Molina in Peru.

The success of mutation breeding all over the world can best be judged by the fact that the two issues of our Mutation Breeding Newsletter printed in 1987 listed 106 additional cultivars derived from mutation induction or the use of induced mutants in cross breeding.

The Plant Breeding Unit of the IAEA Laboratory at Seibersdorf (Austria) continued to place much emphasis on technology development for mutation breeding (including in-vitro culture techniques) of banana, plantain and other vegetatively propagated crops. As a service for breeders of seed propagated crops, numerous seed samples have been given mutagenic treatments with gamma rays or fast neutrons and the laboratory will now also start to work on mutation breeding using haploids. Bob Conger from the University of Tennessee (Oak Ridge, USA), during a one year sabbatical, helped us to make advances in somatic embryogenesis from single cells, which is so important for improving the efficiency of mutation breeding using in-vitro cultures.

The staff situation at present is as follows:

<u>At Headquarters</u>:

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

<u>At the Laboratory</u>:

Thorsten Hermelin (SWE)	Head, Agriculture Laboratory, Seibersdorf
Frantisek Novak (CSR)	Head, Plant Breeding Unit, Seibersdorf Lab.
Helmut Brunner (AUS)	Technical Officer
R. Afza (BGD)	Lab. Technician
J. van Düren (NET)	Lab. Technician
[R.B. Conger (USA)	Returned to USA in June 1987]

Desital: A new potato variety developed by in-vitro mutation breeding

The procedure of in-vitro mutation breeding proposed by Sonnino et al. [1] (see also MBNL No. 24, 1984) has been utilized. In-vitro grown plantlets ($M_0^cV_0^c$) of the cv. Desirée have been irradiated with gamma rays (^{60}Co source). From the irradiated plantlets the apical buds have been excised and transferred onto fresh medium, giving rise to $M_1^cV_1^c$ plantlets. Four to five buds have been excised from the basal portion of the $M_1^cV_1^c$ plantlets and transferred onto fresh medium, developing $M_1^cV_2^c$ plantlets. Ca. 1000 $M_1^cV_2^c$ plantlets have been subsequently transferred to the open field and were evaluated for morpho-physiological characters. Agronomic evaluation of the isolated mutants started at $M_1^cV_2^cV_1$ generation, and small plots of six plants per mutant were tested. The analysis was continued in $M_1^cV_2^cV_2$ - $M_1^cV_2^cV_4$ with multilocation replicated trials.

Several mutants of agronomic interest have been selected, among them a mutant producing white skinned tubers, in contrast to the red skinned tubers of the mother variety "Desirée". This mutant performs similarly to "Desirée" in terms of biological cycle, adaptability, yield, tuber dry matter content and other agronomic traits, but should be more attractive to the Italian potato market, due to its tuber skin colour. This mutant clone has been named "Desital". It has been freed from viruses with the help of the International Potato Centre, Lima (Peru) and virus free plants, maintained in-vitro, are being utilized for seed tuber production.

Our in-vitro mutation breeding programme is continuing and the described techniques seem very effective for isolation of induced somatic mutations in potato, leading to new types with slight modifications of the original variety.

REFERENCE

[1] SONNINO, A., ANCORA, G. and LOCARDI, C., In-vitro mutation breeding of potato; use of propagation by microcuttings. In: Nuclear Techniques and In-Vitro Culture for Plant Improvement (1986) 385-394, IAEA, Vienna, Austria.

(Contributed by A. Sonnino and G. Ancora, ENEA, Agrobiotechnology Dept., Casaccia Centre, P.O. Box 2400, 00100 Roma A.D., Italy).

Further progress in the utilization of yellow seeded Trombay mustard in breeding programmes

As reported previously [1,2] the yellow seeded TM (Trombay Mustard) cultivars developed at this centre have been utilized in cross breeding programmes at several other mustard breeding centres in India. According to reports of AICORPO (All India Co-ordinated Research Project on Oilseeds) these cultivars have been used during 1977-87 in over 383 crosses. Derivatives of these crosses in advanced generations were tested in Uttar Pradesh, Rajasthan and West Bengal. In Rajasthan, these derivatives have now reached multilocation trials and three selections RS.64, RS.84, and RS.104 were found promising [3]. In a yield trial under late sown conditions at Phaltan in Maharashtra with 12 varieties, yellow seeded TM-17 was the best yielder with 689 kg/ha compared to 593 kg/ha for "Varuna", the national check.

One of the objectives of mustard breeding is to evolve early maturing varieties which can be harvested in 100 days. TM-18, a selection from TM-4 x Lethbridge (Canadian cultivar) isolated at our centre, can be harvested in 75 days. It gave 1170 kg/ha seed yield at Trombay. TM-18 is the earliest maturing mustard cultivar available in India [4].

REFERENCES

[1] ABRAHAM, and BHATIA, C.R., Utilization of yellow seeded Trombay mustard in cross breeding. Mutation Breeding Newsletter No. 25 (1985) 3-4.

[2] ABRAHAM, V. and BHATIA, C.R., Progress in utilizaton of yellow seeded Trombay mustard in breeding programmes. Mutaton Breeding Newsletter No. 28 (1986) p.9.

[3] AICORPO, Annual Progress Report, All India Co-ordinated Research Project on Oilseeds, Rapeseed-Mustard Research workers group meeting held on 17-20 August (1987), Faizabad, U.P., India.

[4] ABRAHAM, V., An early maturing yellow seeded mustard. Current Science 56 (1987) 1011-1012.

(Contributed by V. Abraham and C.R. Bhatia, Nuclear Agriculture Division, Bhabha Atomic Research Centre, Trombay, Bombay 400 085, India).

Recombinant lines for less-spininess in steroid-bearing Solanum viarum using induced mutants as parents

In the domestication of the wild, spinous and steroid-bearing Solanum viarum (syn. S. khasianum var. chatterjeeanum) induced mutations play a major role. The development of 'Glaxo' and 'BARC' mutants catalysed commercial cultivation of this species for its berries containing solasodine, used in steroid industries. The commercially more popular 'Glaxo' mutant population consists predominantly of plants that are totally free of spines in aerial parts except lamina where few straight spines develop. The 'BARC' mutant still possesses spines on aerial parts including the persistent calyx. However, the laminary spines of the 'BARC' mutant are curved and vestigial.

Entry	Dry berry yield/plant (g)		Solasodine % in dried berries	
	1985	1986	1985	1986
IIHR 2n-1	189-9^{a}	172.5^{ab}	1.71^{b}	2.56
IIHR 2n-2	201.8^{a}	160.3^{abc}	2.20^{ab}	2.41
IIHR 2n-3	232.7^{a}	190.0^{a}	2.14^{ab}	2.88
Glaxo mutant	240.6^{a}	170.0^{ab}	2.19^{ab}	2.73
Pusa	201.2^{a}	220.3^{a}	2.61^{a}	3.09
RRL (B)-Y-14	217.5^{a}	200.6^{a}	2.65^{a}	2.96
RRL (J)	203.4^{a}	187.8^{ab}	1.75^{b}	3.12
F test	Sig.	Sig.	Sig.	N.S.
CD (at 5%)	52.9	71.25	0.66	-

Comparative studies on morphology, growth behaviour and agronomic characters of the two mutants, their wild progenitor and their hybrid progenies showed that the three types differ only for spine character. In F_2 generation of a cross involving the 'Glaxo' and 'BARC' mutants, a double mutant recombinant was recovered. The recombinant is devoid of spines in aerial parts like its 'Glaxo' mutant parent, but possesses laminary curved vestigial spines like the 'BARC' parent. The spine characters of the recombinant are inherited double recessive. Three advanced lines of this recombinant type (IIHR 2n - 1,2 and 3) were tested in replicated trials 1985 and 1986. They showed parity in berry yield and solasodine content with the 'Glaxo' mutant and three promising lines evolved elsewhere viz. 'RRL (Bhuhaneswar) Y-14', 'RRL (Jorhat)' and 'Pusa'.

The results indicate gainful use of induced mutants in hybridization leading to development of superior less-spiny lines of steriod bearing Solanum viarum.

(Contributed by R. Krishnan, D. Nanda Kumar and M. Subhas Chander, Medicinal and Aromatic Crops Division, Indian Institute of Horticultural Research, Hessaraghatta, Bangalore 560 089, India).

Genetic determinants of semi-dwarf characters induced in Oryza sativa for upland rice cultivation

Numerous semi-dwarf mutants have been obtained by applying gamma irradiation to tall upland varieties. They show better lodging resistance and retain their adaptation to upland cultivation conditions (MARIE, 1974). These mutants are also of interest as cross breeding parents. If the breeder knows the genes for semi-dwarfness, he can use different ones so as to avoid the risk of a narrow genetic base.

Five indced mutants and one deviant from a sixth one, were used in this study (Table 1). The semi-dwarf characters were analysed in two steps:

- Comparison of the stem morphology of the conventional varieties and of the induced mutants;
- Studying the behaviour of hybrid F_1 and F_2 segregations.

Table 1.

Name of parent	Varietal group*	Origin	Name of induced mutants	Place of breeding
Morobérékan	G3	Côte d'Ivoire	IRAT 115	Côte d'Ivoire
Makouta	Similar to G3	Côte d'Ivoire	IRAT 257	Fr. Guyana+Brazil
IAC 25	Similar to G4	Brazil	IRAT 194	Brazil+Fr. Guyana
IAC 5100	G4	Brazil	IRAT 250	Fr. Guyana+Brazil
63-83	G4	Senegal	IRAT 13	Côte d'Ivoire
			IRAT 177**	Fr. Guyana

* G3 and G4 are two groups of upland rice identified by JACQUOT and ARNAUD (1979).

** IRAT 177 is a deviant from IRAT 79, which is an induced mutant selected in Cameroon from the descendants of 63-83.

Three types of genetic control for induced semi-dwarfness have been found on the basis of the six mutants used:

- A recessive single-gene determinant in IRAT 115;
- A recessive single-gene determinant different from the preceding one and common to IRAT 13, IRAT 177, IRAT 250 and IRAT 257;
- A semi-dominant single-gene determinant in IRAT 194.

For his hybridization programme, the rice breeder therefore has at his disposal various upland semi-dwarf mutants, which are capable of transmitting this character in accordance with simple Mendelian rules. However, he has to test also their general cross breeding value.

IRAT 13, from which most IRAT varieties released so far originated (including IRAT 104, IRAT 170 and IRAT 112), is undoubtedly a good parent. Mutants IRAT 177, IRAT 250 and IRAT 257, which have the same gene for semi-dwarfness, have been used more recently. They exhibit an excellent ability for combination with tall upland varieties, while being differentiated by a few features (better recombination for seed shedding or resistance to Pyricularia oryzae with IRAT 257 and for grain character with IRAT 177 or 250). The recombination observed in the crosses involving IRAT 115 and conventional upland varieties seems poor. Paradoxically, IRAT 115 has been found to become an excellent parent after hybridization with upland varieties of Laos and Thailand. IRAT 194, carrier of the semi-dominant gene, seems by far the most disappointing parent.

This study is not complete. In particular, no account was taken of certain mutants of "63-83" such as M 312 A or M 327 A, whose semi-dwarf height is controlled by a recessive gene different from that of IRAT 13 (JACQUOT, 1975, 1986).

At present, all the IRAT varieties released or in the process of being released have the semi-dwarf gene of IRAT 13. The varieties obtained from IRAT 177, IRAT 250 or IRAT 257 should be available soon. It is also hoped that soon the promising recombinations observed in crosses between IRAT 115 and the Laotian-Thai varieties will contribute to solve the problem of genetic uniformity for semi-dwarfness in Asia. IRAT 194 has also been included in the crossing programme so that its value can be verified.

REFERENCES

JACQUOT, M., Taille courte de plante et bonne exsertion de la panicule chez le riz. L'Agronomie Tropicale 30 (1975) 241-244.

JACQUOT, M., Mutagenesis of upland rice at IRAT. Mutation Breeding Newsletter No. 28 (1986) 10-12.

JACQUOT, M., ARNAUD, M., Classification numérique des variéties de riz. L'Agronomie Tropicale 34(2) (1979) 157-173.

MARIE, R., La mutagenèse experimentale. L'Agronomie Tropicale 29(9) (1974) 892-900.

(Contributed by G. Clement and C. Poisson, Institut de Recherches Agronomiques Tropicales et des Cultures Vivrières (IRAT), Centre de Recherches CIRAD, Div. d'Amélioration des Plantes, B.P. 5035, F-34032 Montpellier, France).

Economic impact of mutant cotton variety in Pakistan

The Nuclear Institute for Agriculture and Biology (NIAB) at Faisalabad was inaugurated in 1972. Like the other two agricultural research centres is run by the Pakistan Atomic Energy Commission, the Atomic Energy Agricultural Research Centre Tandojam (Sind) and the Nuclear Institute for Food and Agriculture Peshawar, NIAB complements the work of other federal and provincial institutions. Its scientific activities comprise plant breeding, soil biology, food preservation, entomology, biotechnology etc. One of the tangible results of a long-term commitment to high quality research was a new cotton variety NIAB-78 (a mutant induced by gamma irradiation) [1]. It was released to farmers in 1983 became instantly popular and by 1985 accounted for almost half the area under cotton in Punjab. That year alone, it yielded an additional income of 68 crore rupees which could offset all the expenditure incurred thus far by the Commission on its three agricultural institutes.

REFERENCE

[1] Mutation Breeding Newsletter No. 23 (1983) p.18.

(Stated by Munir Ahmad Khan, Chairman, Pakistan Atomic Energy Commission, Islamabad, Pakistan).

ANNOUNCEMENT

In 1990, we are planning to organize an international symposium dealing with economic aspects of mutation breeding. This would mean to review:

a) the economic benefits derived from mutant cultivars;
b) the experiences in reaching particular breeding objectives by induced mutations;
c) the restrictions for efficient mutation breeding in certain groups of plants like polyploids, cross-pollinators, apomicts;
d) ways to improve the efficiency of mutation breeding, e.g. by optimal mutagen treatments, by choosing the appropriate material for treatment, by using in-vitro culture, by better selection methods;
e) the potential use of computer simulation for optimizing mutation breeding projects;
f) economic prospects of site specific mutagenesis, insertion mutagenesis and other kinds of gene engineering for crop improvement.

It would seem appropriate to start collecting data for the above topics now.

LIST OF CULTIVARS

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

Name of new cultivar	Place and date of release (or approval) and name of principal worker and institute	Kind and date of mutagenic treatment [treated variety, line, clone ..] or mutant crosses (mutant underlined)	Main improved attributes of cultivar
Alstroemeria sp.			
Appelbloesem	The Netherlands, 1979 M.C. van Staaveren[1)] Aalsmeer	X-rays 500 rad, 1977 [King Cardinal]	Pink flower colour with two red dots
Atlas	The Netherlands, 1984 M.C. van Staaveren[1)] Aalsmeer	X-rays 500 rad growing rhizomes, 1978 [Red Sunset]	Salmon pink flower colour, better winter production
Lilac Glory	The Netherlands, 1979 C.van Duyn and Co.[1)] Rijnsburg	X-rays 400 rad growing rhizomes, 1973 [Rosario]	Purple flower colour, rest of genotype unchanged
Jacqueline	The Netherlands, 1979 C.van Duyn and Co.[1)] Rijnsburg	X-rays 400 rad growing rhizomes, 1973 [Rosario]	Very successful cultivar with smaller but darker pink flower
Purple Joy	The Netherlands, 1979 C.van Duyn and Co.[1)] Rijnsburg	X-rays 400 rad growing rhizomes, 1973 [Carmen]	Dark purple-red flower colour, short stems

La Paz	The Netherlands, 1984 A.M. Könst, Nieuwveen	X-rays 350 rad growing rhizomes, 1981 [Rio]	Dark yellow flower colour
Pink Panther	The Netherlands, 1978 C.van Duyn and Co.[1)] Rijnsburg	X-rays 500 rad growing rhizomes, 1973 [Rosario]	Longer stems but somewhat smaller flowers
Patricia	The Netherlands, 1983 M.C. von Staaveren[1)] Aalsmeer	X-rays 500 rad, 1978 [Pink Triumph]	Improved flower colour, reduced stem length
Pink Tiger	The Netherlands, 1983 C.van Duyn and Co.[1)] Rijnsburg	X-rays 350 rad, 1979 [Pink Panther]	More heavily stripped than original cultivar, earlier flowering under winter conditions
Arachis hypogaea L. (peanut)			
B 5000	Viet Nam, 1985 Le Songdu Agric. Univ. No. 1 Hanoi	Gamma rays 5000 r dry seeds, 1974 [Bachsa]	Large seed, white testa, suitable for export, vigorous development, higher seed percentage, earlier maturity
Astragalus huangheensis (shadawang)			
Zaoshadawang	China, 1983 Institute of Soil and Fertilization Liaoning Acad. of Agric. Sciences	Gamma rays 60 kR [Local variety]	24 days earlier than the original variety, high yield; good adaptation, grown on more than 70 000 ha
Avena sativa L. (oat)			
SIR-4	USSR, 1988 Sibirian Res. Inst. of Plant Ind. & Brdg. Michurinskii 633126 Novosibirsk	1.4 Bis-diazoacetyl-butan [Selma]	High adaptability

Name of new cultivar	Place and date of release (or approval) and name of principal worker and institute	Kind and date of mutagenic treatment [treated variety, line, clone ..] or mutant crosses (mutant underlined)	Main improved attributes of cultivar
Begonia sp.			
Manilla	The Netherlands, 1986 Gebr. Man, Aalsmeer	Gamma rays 25 Gy Unrooted cuttings, 1984 [Grete]	Pale pink flower colour, rest of genotype unchanged
Manita	The Netherlands, 1986 Gebr. Man, Aalsmeer	Gamma rays 25 Gy Unrooted cuttings, 1984 [Grete]	Vivid lilac flower colour, rest of genotype unchanged
Manolito	The Netherlands, 1986 Gebr. Man, Aalsmeer	Gamma rays 25 Gy Unrooted cuttings, 1984 [Grete]	Orange-red flower colour, rest of original pink-flowering genotype unchanged
Saanred	Canada, 1983 Saanichton Res. & Plant Quarantine Station, Sidney, BC	X-rays, 1974 [Renaissance]	Red flower colour, double flowers, good keeping quality
Beta vulgaris L. (fodder beet)			
Timiryazevskaya	USSR, 1988 Timiryazev Agric. Academy 127550 Moscow	Chemical mutagens [Ekkendorfer]	Beet root yield 103 t/ha, dry matter - 12 t/ha
Bougainvillea sp. (Bougainvillea)			
Pallavi	India, 1986 B.K. Banerji, S.K. Datta Nat.Bot.Res.Inst. Lucknow-226001	Gamma rays 1 kR stem cuttings, 1982 [Roseville's Delight]	Chlorophyll variegated leaves

Brassica juncea L. (rai, Chinese mustard)			
RL 1359	India, 1987 K.S. Labana Dept. of Plant Breed. Punjab Agric. Univ. Ludhiana	*RLM 514* x Varuna	Short duration, high yield 2,1 t/ha in 147 d; bold seeded TGW 6.6 g; oil content 43%; erect plant type; rel. more tolerant to aphids than RLM 619
Calathea crocata (ornamental pot plant)			
Esther	The Netherlands, 1987 J.A. Arkestejn[1)] Den Hoorn	X-rays 9 Gy young plants, 1982	orange petals with green tips, flower "umbrella-shaped" and larger than the original
Chrysanthemum morifolium Ramat. (chrysanthemum)			
Babette gelb	FRG, 1988 W. Süptitz[2)] D-2000 Hamburg 54	X-rays 18 Gy unrooted cuttings, 1986 [Babette (white)]	Yellow flower colour
Yellow Bettina	FRG, 1988 W. Süptitz[2)] D-2000 Hamburg 54	X-rays 18 Gy unrooted cuttings, 1985 [Bettina (white)]	Yellow flower colour
Bronze Byoux	The Netherlands, 1985 Fides/CBSH B.V.,[1)] De Lier	Gamma rays 1.75 krad rooted cuttings, 1984 [Byoux]	Bronze flower colour, rest of genotype unchanged
Golden Byoux	The Netherlands, 1985 Fides/CBSH B.V.,[1)] De Lier	Gamma rays 1.75 krad rooted cuttings, 1984 [Byoux]	Yellow flower colour, rest of genotype unchanged
Lilac Byoux	The Netherlands, 1985 Fides/CBSH B.V.,[1)] De Lier	Gamma rays 1.75 krad rooted cuttings, 1984 [Byoux]	Lilac flower colour, rest of genotype unchanged
Salmon Byoux	The Netherlands, 1985 Fides/CBSH B.V.,[1)] De Lier	Gamma rays 1.75 krad rooted cuttings, 1984 [Byoux]	Salmon flower colour, rest of genotype unchanged

Name of new cultivar	Place and date of release (or approval) and name of principal worker and institute	Kind and date of mutagenic treatment [treated variety, line, clone ..] or mutant crosses (mutant underlined)	Main improved attributes of cultivar
Colchi Bahar	India, 1985 S.K. Datta Nat.Bot.Res.Inst. Lucknow-226001	Colchicine 0.0625% rooted cuttings, 1981 [Sharad Bahar]	terracotta red flower instead of purple
Apricot Deholta	The Netherlands, 1983 Hoek Breeding B.V.[1)] The Hague	X-rays 1.75 krad rooted cuttings, 1980 [Delta]	Apricot flower colour, rest of genotype unchanged
Cherry Deholta	The Netherlands, 1985 Hoek Breeding B.V.[1)] The Hague	X-rays 1.75 krad rooted cuttings, 1982 [Dark Delta]	Cherry-red flower colour, rest of genotype unchanged
Cream Deholta	The Netherlands, 1985 Hoek Breeding B.V.[1)] The Hague	X-rays 1.75 krad rooted cuttings, 1981 [Pearl Delta]	Pale yellow flower colour, rest of genotype unchanged
Goldbronze Deholta	The Netherlands, 1983 Hoek Breeding B.V.[1)] The Hague	X-rays 1.75 krad rooted cuttings, 1980 [Delta]	Goldbronze flower colour, rest of genotype unchanged
Golden Deholta	The Netherlands, 1984 Hoek Breeding B.V.[1)] The Hague	X-rays 1.75 krad rooted cuttings, 1981 [Pearl Delta]	Dark yellow flower colour, rest of genotype unchanged
Lemon Deholta	The Netherlands, 1985 Hoek Breeding B.V.[1)] The Hague	X-rays 1.75 krad rooted cuttings, 1982 [White Delta]	Lemon yellow flower colour, rest of genotype unchanged
Peach Deholta	The Netherlands, 1985 Hoek Breeding B.V.[1)] The Hague	X-rays 1.75 krad rooted cuttings, 1982 [Pearl Delta]	Peach flower colour, rest of genotype unchanged

Dark Gaby	FRG, 1988 W. Süptitz[2] D-2000 Hamburg 54	X-rays 18 Gy unrooted cuttings, 1985 [Gaby (pink)]	Dark pink flowers, smaller blooms, shorter stems
Apricot Impala	The Netherlands, 1984 Fides/CBSH B.V.,[1] De Lier	X-rays 1.75 krad rooted cuttings, 1983 [Impala]	Apricot flower colour, rest of genotype unchanged
Cream Impala	The Netherlands, 1984 Fides/CBSH B.V.,[1] De Lier	X-rays 1.75 krad rooted cuttings, 1983 [Impala]	Cream flower colour, rest of genotype unchanged
Orange Impala	The Netherlands, 1984 Fides/CBSH B.V.,[1] De Lier	X-rays 1.75 krad rooted cuttings, 1983 [Impala]	Orange flower colour, rest of genotype unchanged
Pink Impala	The Netherlands, 1984 Fides/CBSH B.V.,[1] De Lier	X-rays 1.75 krad rooted cuttings, 1983 [Impala]	Pink flower colour, rest of genotype unchanged
Salmon Impala	The Netherlands, 1984 Fides/CBSH B.V.,[1] De Lier	X-rays 1.75 krad rooted cuttings, 1983 [Impala]	Salmon flower colour, rest of genotype unchanged
Kumkum	India, 1987 S.K. Datta, H.M. Jugran, H.M. Jugran Nat.Bot.Res.Inst. Lucknow-226001	Gamma rays 2.0-2.5 krad rooted cuttings, 1984 [M-71]	Lighter terracotta or garet brown flower colour instead of pink-purple
Franky Lane	The Netherlands, 1985 Fides/CBSH B.V.,[1] De Lier	Gamma rays 1.75 krad rooted cuttings, 1984 [Penny Lane]	Darker pink flower colour than original genotype, rest of genotype unchanged
Hoof Lane	The Netherlands, 1985 Fides/CBSH B.V.,[1] De Lier	Gamma rays 1.75 krad rooted cuttings, 1984 [Penny Lane]	Dark yellow flower colour, rest of genotype unchanged

Name of new cultivar	Place and date of release (or approval) and name of principal worker and institute	Kind and date of mutagenic treatment [treated variety, line, clone ..] or mutant crosses (mutant underlined)	Main improved attributes of cultivar
Main Lane	The Netherlands, 1985 Fides/CBSH B.V.,[1)] De Lier	Gamma rays 1.75 krad rooted cuttings, 1984 [Penny Lane]	Pale yellow flower colour, rest of genotype unchanged
Golden Luck	FRG, 1988 W. Süptitz[2)] D-2000 Hamburg 54	X-rays 18 Gy unrooted cuttings, 1985 [BFA-seedling T 83/404/2 (bronze)]	Yellow flower colour
Orange Lymon	The Netherlands, 1985 Flaton, Naaldwijk[1)]	X-rays 1.75 krad rooted cuttings, 1983 [Lymon]	Orange flower colour, rest of genotype unchanged
Dark Lymon	The Netherlands, 1985 Flaton, Naaldwijk[1)]	X-rays 1.75 krad rooted cuttings, 1983 [Lymon]	Dark pink flower colour, rest of genotype unchanged
Red Lymon	The Netherlands, 1985 Flaton, Naaldwijk[1)]	X-rays 1.75 krad rooted cuttings, 1983 [Lymon]	Red flower colour, rest of genotype unchanged
Salmon Lymon	The Netherlands, 1985 Flaton, Naaldwijk[1)]	X-rays 1.75 krad rooted cuttings, 1983 [Lymon]	Salmon flower colour, rest of genotype unchanged
Yellow Lymon	The Netherlands, 1985 Flaton, Naaldwijk[1)]	X-rays 1.75 krad rooted cuttings, 1983 [Lymon]	Yellow flower colour, rest of genotype unchanged
Marconi	Belgium, 1985 G. and D. Pieters[1)] Staden-Oostnieuwkerke	X-rays 17.5 Gy rooted cuttings, 1982 [Pink cultivar]	Dark pink flower colour, rest of genotype unchanged

Copper Marconi	Belgium, 1985 G. and D. Pieters[1)] Staden-Oostnieuwkerke	X-rays 17.5 Gy rooted cuttings, 1982 [Pink cultivar]	Bronze flower colour, rest of genotype unchanged
Red Marconi	Belgium, 1985 G. and D. Pieters[1)] Staden-Oostnieuwkerke	X-rays 17.5 Gy rooted cuttings, 1982 [Pink cultivar]	Red flower colour, rest of genotype unchanged
Dark Red Marconi	Belgium, 1985 G. and D. Pieters[1)] Staden-Oostnieuwkerke	X-rays 17.5 Gy rooted cuttings, 1982 [Pink cultivar]	Dark red flower colour, rest of genotype unchanged
Blue Redemine	The Netherlands, 1984 Chrysanthemum Brdg. Assoc., Ter Aar[1)]	X-rays 1.75 krad rooted cuttings, 1983 [Redemine]	Dark pink flower colour, rest of genotype unchanged
Bronze Redemine	The Netherlands, 1986 Chrysanthemum Brdg. Assoc., Ter Aar[1)]	X-rays 1.75 krad rooted cuttings, 1984 [Redemine]	Bronze flower colour, rest of genotype unchanged
Funny Redemine	The Netherlands, 1984 Chrysanthemum Brdg. Assoc., Ter Aar[1)]	X-rays 1.75 krad rooted cuttings, 1983 [Redemine]	White flower colour with red center, rest of genotype unchanged
White Redemine	The Netherlands, 1984 Chrysanthemum Brdg. Assoc., Ter Aar[1)]	X-rays 1.75 krad rooted cuttings, 1983 [Redemine]	White flower colour, rest of genotype unchanged
Yellow Redemine	The Netherlands, 1986 Chrysanthemum Brdg. Assoc., Ter Aar[1)]	X-rays 1.75 krad rooted cuttings, 1984 [Redemine]	Yellow flower colour, rest of genotype unchanged
Coral Refla	The Netherlands, 1986 Chrysanthemum Brdg. Assoc., Ter Aar[1)]	X-rays 1.75 krad rooted cuttings, 1984 [Refla]	Coral flower colour, rest of genotype unchanged
Orange Refla	The Netherlands, 1985 Chrysanthemum Brdg. Assoc., Ter Aar[1)]	X-rays 1.75 krad rooted cuttings, 1983 [Refla]	Orange flower colour, rest of genotype unchanged

Name of new cultivar	Place and date of release (or approval) and name of principal worker and institute	Kind and date of mutagenic treatment [treated variety, line, clone ..] or mutant crosses (mutant underlined)	Main improved attributes of cultivar
White Refla	The Netherlands, 1985 Chrysanthemum Brdg. Assoc., Ter Aar[1)]	X-rays 1.75 krad rooted cuttings, 1983 [Refla]	White flower colour, rest of genotype unchanged
Yellow Refla	The Netherlands, 1986 Chrysanthemum Brdg. Assoc., Ter Aar[1)]	X-rays 1.75 krad rooted cuttings, 1984 [Refla]	Yellow flower colour, rest of genotype unchanged
Pale Remember	The Netherlands, 1985 Chrysanthemum Brdg. Assoc., Ter Aar[1)]	Gamma rays 1.25-1.75 krad rooted cuttings, 1984 [Remember]	Pale flower colour, rest of genotype unchanged
White Remember	The Netherlands, 1985 Chrysanthemum Brdg. Assoc., Ter Aar[1)]	Gamma rays 1.25-1.75 krad rooted cuttings, 1984 [Remember]	White flower colour, rest of genotype unchanged
Dark/Royal Rendez-Vous	The Netherlands, 1986 Chrysanthemum Brdg. Assoc., Ter Aar[1)]	Gamma rays 1.25-1.75 krad rooted cuttings, 1985 [Rendez-Vous]	Flower completely violet (original genotype has only a violet center), rest of genotype unchanged
Funny Rendez-Vous	The Netherlands, 1986 Chrysanthemum Brdg. Assoc., Ter Aar[1)]	Gamma rays 1.25-1.75 krad rooted cuttings, 1985 [Rendez-Vous]	Flower covered with violet stripes, rest of genotype unchanged
Yellow Rendez-Vous	The Netherlands, 1986 Chrysanthemum Brdg. Assoc., Ter Aar[1)]	Gamma rays 1.25-1.75 krad rooted cuttings, 1985 [Rendez-Vous]	Yellow flower colour, rest of genotype unchanged

White Ronny	FRG, 1988 W. Süptitz[2)] D-2000 Hamburg 54	X-rays 18 Gy unrooted cuttings, 1985 [Ronny (pink)]	White flower colour
Yellow Samba	FRG, 1988 W. Süptitz[2)] D-2000 Hamburg 54	X-rays 18 Gy unrooted cuttings, 1985 [Samba (white)]	Yellow flower colour
Shabnam	India, 1987 S.K. Datta Nat.Bot.Res.Inst. Lucknow-226001	Gamma rays 1.5 krad rooted cuttings, 1978 [D-5]	Magnolia purple flower-heads like 'D-5'; a small appendage-like structure develops at the tip of each floret
Sheela	India, 1985 S.K. Datta Nat.Bot.Res.Inst. Lucknow-226001	Gamma rays 2.0-2.5 krad rooted cuttings, 1981 [Himani]	Canary yellow flower instead of white
Torino	Belgium, 1985 G. and D. Pieters[1)] Staden-Oostnieuwkerke	X-rays 17.5 Gy rooted cuttings, 1982 [Pink seedling]	Darker pink flower colour as compared to the original genotype; rest of genotype unchanged
Dark Torino	Belgium, 1985 G. and D. Pieters[1)] Staden-Oostnieuwkerke	X-rays 17.5 Gy rooted cuttings, 1982 [Pink seedling]	Dark pink flower colour, rest of genotype unchanged
Yellow Torino	Belgium, 1985 G. and D. Pieters[1)] Staden-Oostnieuwkerke	X-rays 17.5 Gy rooted cuttings, 1982 [Pink seedling]	Yellow flower colour
Tulika	India, 1985 S.K. Datta, B.K. Banerji, M.N. Gupta Nat.Bot.Res.Inst. Lucknow-226001	Gamma ray 1.5 krad rooted cuttings, 1977 [M-24]	Purple like 'M-24'; length of the tubular portion of flower became reduced to give a brush like appearance of the florets

Name of new cultivar	Place and date of release (or approval) and name of principal worker and institute	Kind and date of mutagenic treatment [treated variety, line, clone ..] or mutant crosses (mutant underlined)	Main improved attributes of cultivar
Citrullus lanatus (Thunb.) Manst. (watermelon)			
Gibrid 218	USSR, before 1984 K.P. Sincha Bakhchevaya Selekt- ionnaya Opytnaya Stantsiya Bykovo	Gamma rays 50 kR [hybrid Bykovskii 22 x Melitopolskii 143] and subsequent cross with Yubileinyi 72	
Cucumis sativus L. (cucumber)			
Altay	USSR, 1981 V. Visochkin Y. Tulupov West-Sibirian Potato Breed. Stn. Barnaul 656029 Altay region	Altay rannii x Din-zo-cin	For field production, early, high yield
Dianthus caryophyllus L. (carnation)			
Accent	The Netherlands, 1982 West Select Rijsenhout[1)]	X-rays 80 Gy unrooted cuttings (base shielded), 1979 [Benoni]	Heavier purple striping and higher yield than original cultivar
Cerise Kortina	The Netherlands, 1985 Th. Köhler Sons Honselersdijk[1)]	X-rays 80 Gy unrooted cuttings (base shielded), 1983 [Kortina]	Cerise flower colour, rest of genotype unchanged (original cultivar was purple)
Lavendel Kortina	The Netherlands, 1985 Th. Köhler Sons Honselersdijk[1)]	X-rays 80 Gy unrooted cuttings (base shielded), 1983 [Kortina]	Lavendel flower colour, rest of genotype unchanged

Pink Kortina	The Netherlands, 1985 Th. Köhler Sons Honselersdijk[1)]	X-rays 80 Gy unrooted cuttings (base shielded), 1983 [Kortina]	Pink flower colour, rest of genotype unchanged
Red Kortina	The Netherlands, 1985 Th. Köhler Sons Honselersdijk[1)]	X-rays 80 Gy unrooted cuttings (base shielded), 1983 [Kortina]	Red flower colour, rest of genotype unchanged
Royal Red Kortina	The Netherlands, 1985 Th. Köhler Sons Honselersdijk[1)]	X-rays 80 Gy unrooted cuttings (base shielded), 1983 [Kortina]	Red flower colour, rest of genotype unchanged
White Kortina	The Netherlands, 1985 Th. Köhler Sons Honselersdijk[1)]	X-rays 80 Gy unrooted cuttings (base shielded), 1983 [Kortina]	White flower colour, rest of genotype unchanged
Fagopyrum esculentum Moench (buckwheat)			
Aromat	USSR, 1985 All-Union Res. Inst. of Legumes & Coarse Grain Streletskoe 303112 Orel	Ethylenimine 0.01% 12 h seeds [hybrid 1597/69 x Mayskaya]	Lodging resistance, high yield
Ficus benjamina exotica			
Golden Princess	Belgium, 1980 M. Depandelaere and A. Simoens[3)] Merelbeke	X-rays 25 Gy, rooted cuttings, 1975 and re-irradiated gamma rays 20 Gy 1977 [Green Ficus]	Variegated leaves with white-yellow margin; fast and compact growing; tolerant to various pests and diseases
Golden King	Belgium, 1980 M. Depandelaere and A. Simoens[3)] Merelbeke	X-rays 25 Gy rooted cuttings, 1975 and re-irradiated gamma rays 20 Gy 1977 [Green Ficus]	Variegated leaves with white-yellow margin; fast and compact growing; tolerant to various pests and diseases

Name of new cultivar	Place and date of release (or approval) and name of principal worker and institute	Kind and date of mutagenic treatment [treated variety, line, clone ..] or mutant crosses (mutant underlined)	Main improved attributes of cultivar
Gladiolus sp.			
Showwinner	The Netherlands, 1984 A.G. Bakker, Ens.[1)]	X-rays 40-70 Gy corms, 1979 [Applause]	Salmon-orange flower colour, better corm production. Rest of genotype unchanged
Glycine max L. (soybean)			
Arkadiya Odesskaya	USSR, 1986 V. Sichkar All-Union Inst. of Gen. & Plant Brdg. 270036 Odessa	Dimethylsulfate 1mM seeds [VNIMK 9186]	Early ripening, good for rainfed conditions
Bisser	Bulgaria, 1984 Institute of Genetics Sofia	Gamma rays 10 krad and EMS 0.1% seeds [Beeson]	High yield, higher content of protein, early, stem resistant to lodging
Gossypium sp. (cotton)			
Agdash 3	USSR, 1983 Inst. of Genetics & Brdg. of Academy of Science of Azerbaidzhan SSR 374200 Kirovobad	Gamma rays 20 kR [Mutant line 9/1]	High yield
Oktyabr (October)	USSR, 1984 Inst. of Exp.Biol. Acad. of Science Uzbek SSR Akkavak 702133 Tashkent	L-281 (Radiat.induced mutant) x Tashkent 1	Compact habits, resistant to wilt

Hibiscus rosa-sinensis L. (Chinese rose)			
Anjali	India, 1987 S.K. Datta, B.K. Banerji Nat.Bot.Res.Inst. Lucknow-226001	Gamma rays 4 krad stem cuttings, 1982 [Alipore Beauty]	Colour light carmin red like Alipore Beauty but five petalled single type instead of double flower type
Hordeum vulgare L. (barley)			
Accord	USSR, 1987 H. Shvedov All-Union Inst. of Genetics & Plant Brdg. 270036 Odessa	12/70 x Vogelsanger Gold	Winter type, early, frost resistance, six-rowed
Araraty	USSR, 1983 Armenian Res. Inst. of Agric. 378310 Achmiadgin	Ethylenimine, seeds [Kaler]	Winter type, lodging resistance, six-rowed
Bonus	CSSR, 1984 F. Minarik OSEVA Breeding Station Hrubcice	Several sources of disease resistance x Diamant	High and stabile yield, resistance to stem breakage and lodging, resistance to diseases, very good brewing quality
Fatran	CSSR, 1980 C. Haray SLOVOSIVO, Breed.Stn. Sladkovicovo	Cross with Diamant	High yield, resistance to lodging
Harkovskii 84	USSR, 1988 V. Manzuk Ukrainian Res. Inst. of Plant Industry & Genetics, 310044 Kharkov	Ethylenoxide 0.02% 18 h [Union]	Early, high yield
Horal	CSSR, 1982 C. Haray SLOVOSIVO, Breed.Stn. Sladkovicovo	Cross with Diamant	High yield, resistance to lodging

Name of new cultivar	Place and date of release (or approval) and name of principal worker and institute	Kind and date of mutagenic treatment [treated variety, line, clone ..] or mutant crosses (mutant underlined)	Main improved attributes of cultivar
Jarek	CSSR, 1987 L. Zenisceva OSEVA, Res.and Breed. Inst.of Cereal Growing Kromeriz	(KM1192 x Sladar) x Opal	High yield, resistance to leaf diseases
Jaspis	CSSR, 1986 F. Minarik OSEVA, Breed. Stn. Hrubcice	ST 6984 x Opal	High yield, resistance to diseases, 1986: 7% of barley acreage in CSSR
Karat	CSSR, 1981 F. Bruckner OSEVA, Res. and Breed. Inst. of Cereal Growing Kromeriz	several sources of diseases x Diamant	High yield suitable for intensive conditions, fully resistant to powdery mildew, 1986: 8% of barley acreage in CSSR
Kaskad	USSR, 1984 V. Shevtsov Res. Inst. of Agric. 350012 Krasnodar	Trumpf x Temp	Spring type, two-rowed, lodging resistance
Kazbek 1	USSR, 1983 S.G. Tedoradze Georgian Res. Inst. of Agric. 383400 Mtsheta	Gamma rays 15 kR seeds [Dzveltesly]	Winter type, high yield, six-rowed
Koral	CSSR, 1978 F. Minarik OSEVA, Breed. Stn. Hrubcice	Hana x (CFU x Alsa x Celechovicky x I 25)	High yield, resistant to powdery mildew, resistant to lodging, 1986: 9% of barley acreage in CSSR

Kredit	CSSR, 1984 F. Minarik OSEVA, Breed. Stn. Hrubcice	Nadja x KM 1192 (both from Diamant crosses)	High yield, high yield stability, resistance to leaf diseases, 1986: 5% of barley acreage in CSSR
Krystal	CSSR, 1981 F. Minarik OSEVA, Breeding Stn. Hrubcice	Koral x Rapid	High yield, resistance to powdery mildew, very good brewing quality, 1986: 23% of barley acreage in CSSR
Mars	CSSR, 1983 S. Benc OSEVA, Breed. Stn. Stupice	Station line x Diamant	High yield, resistant to lodging, 1986: 4% of barley acreage in CSSR
Opal	CSSR, 1980 F. Manarik OSEVA, Breed. Stn. Hrubcice	(Ametyst x Palestine) x Sladar	High resistance to leaf diseases, resistant to lodging, very good brewing quality
Orbit	CSSR, 1986 C. Haraj SLOVOSIVO, Breed. Stn. Sladkovicovo	SK 783 x CE DC/74 (CE DC/74= /Diamant x M. Cristo/ x /Valticky x Ekonom/)	High yield, resistant to lodging, resistant to leaf diseases
Perun	CSSR, 1987 J. Bouma OSEVA, Breeding Stn. Hrubcice	HE 1728 x Karat	High yield, high stability of yield, resistant to lodging, resistant to leaf diseases
Radikal	USSR, 1988 V. Shevtsov Res. Inst. of Agric. 350012 Krasnodar	(Paoly x 52M1) x Novator	Winter type, frost resistance, short straw, two row type

Name of new cultivar	Place and date of release (or approval) and name of principal worker and institute	Kind and date of mutagenic treatment [treated variety, line, clone ..] or mutant crosses (mutant underlined)	Main improved attributes of cultivar
Rubin	CSSR, 1982 J. Bouma OSEVA, Breed. Stn. Hrubcice	station line x Diamant	High yield with good stability, high brewing quality, 1986: 10% of barley acreage in CSSR
Shirokolistnii	USSR, 1987 M. Pavlishin Res. Inst. of Agric. & Animal Husbandry Obrochino 292084 Lvov area,	Nitroso-ethyl urea [Obroshinskii 1]	Winter type for silage, very tall, late maturing
Zenit	CSSR, 1985 L. Zenisceva OSEVA, Res. and Breed. Inst. of Cereal Growing Kromeriz	KM 1402 x Karat	High yield, resistance to stem breakage and lodging, resistance to leaf diseases
Hoya carnosa (decorative pot plant)			
Compacta	USA, 1980(?) B.L. Cobia Inc., Wintergarden, Florida	X- or gamma rays 50 Gy, rooted cuttings(?)	Yellow green incurved (curled) leaves
Compacta Regalis	USA, 1980(?) B.L. Cobia Inc., Wintergarden, Florida	X- or gamma rays 50 Gy, rooted cuttings(?)	White-edged curved leaves

Mauna Loa	USA, 1980(?) B.L. Cobia Inc., Wintergarden, Florida	X- or gamma rays 50 Gy, rooted cuttings(?)	White-green variegated leaves
Rubra	USA, 1980(?) B.L. Cobia Inc., Wintergarden, Florida	X- or gamma rays 50 Gy, rooted cuttings(?)	Green-reddish leaves
Juncus effusus L. (mat rush)			
Fukunami	Japan, 1984 Hiroshima Prefect. Agric. Exp. Station	Gamma rays, seedlings [Asanagi]	High yield, longer, thicker and harder stems than 'Asanagi', highly resistant to Rhizoctonia solani
Kalanchoe sp. (Kalanchoë)			
Flores	The Netherlands, 1985 Research Station for Floriculture[1)] Aalsmeer	X-rays 10-30 Gy detached leaves [Singapur]	Compact and branching growth habit, very free flowering, rest of genotype unchanged
Lombok	The Netherlands, 1985 Research Station for Floriculture[1)] Aalsmeer	X-rays 10-30 Gy detached leaves [Singapur]	Pure red flower colour and rather upright growth habit
Sumba	The Netherlands, 1985 Research Station for Floriculture[1)] Aalsmeer	X-rays 10-30 Gy detached leaves [Singapur]	Strongly branching growth habit, colour of the star-shaped flowers like "Singapur"
Lantana depressa (wild sage)			
Lantana depressa variegata	India, 1986 S.K. Datta Nat.Bot.Res.Inst. Lucknow-226001	Gamma rays 1 krad stem cuttings, 1981	Yellow flowers like original but variegated instead of green leaves

Name of new cultivar	Place and date of release (or approval) and name of principal worker and institute	Kind and date of mutagenic treatment [treated variety, line, clone ..] or mutant crosses (mutant underlined)	Main improved attributes of cultivar
Lepidium sativum (cress)			
Vest (News)	USSR, 1988 Ukrainian Res. Inst. of Vegetable Prod. Merefa 312155 Kharkov	Electrons 3.000 rad [Uzkolistnyi 3]	Good plasticity, high quality, 30 days vegetation
Linum usitatissimum L. (fiber flax)			
Zarya 87	USSR, 1988 Res. Inst. of Agric. and Animal Husbandry Obrochino 292084 Lvov area	Ethylenimine [LD142 x Complex]	Late flowering, high yield
Lupinus albus L. (white lupin)			
Druzhba	USSR, 1984 V. Golovchenko Ukrainian Res. Inst. of Agric. Chabany 255205 Kiev and Exp.Breed.Stn. Borghof GDR	EMS 0.05% [local line]	High yield
Pichevoy	USSR, 1987 V. Golovchenko Ukrainian Res. Inst. of Agric., Chabany 255205 Kiev	Chemical mutagens [local line]	Good plasticity

Start	USSR, 1983 Timiryazev Agric. Academy 127550 Moscow	Gamma rays [White 7]	Ripening 15 days earlier than the standard, disease resistant
Lupinus luteus L. (yellow lupin)			
Narochanskii	USSR, before 1983 T.P. Polkanova M.I. Lukashevich Belorusskii Institut Zemledeliya Zhodino, Minsk	Gamma rays [Polish variety R 6025]	Fusarium resistant, early, high yield, good fodder quality
Martin 2	USSR, 1984 V. Golovchenko Ukrainian Res. Inst. of Agric., Chabany 255205 Kiev and Exp.Breed.Stn. Borghof, GDR	hybridization of mutant forms resistant to Fusarium	Resistant to diseases, green mass yield from 50-70 t/ha
Kopilovskii	USSR, 1985 V. Golovchenko Ukrainian Res. Inst. of Agric. Chabany 255205 Kiev,	Niko x mutant line	Fusarium resistant
Lycopersicon esculentum Mill. (tomato)			
Rannii Nush	USSR, 1983 V. Nushikyan Armenian Brdg. Stn. of Vegetable Crops, Darakert 378376 Masiskii Area	Ethylenimine 0.01% 12 h Gamma rays 10 kR [Araks 322]	Early, high yield

Name of new cultivar	Place and date of release (or approval) and name of principal worker and institute	Kind and date of mutagenic treatment [treated variety, line, clone ..] or mutant crosses (mutant underlined)	Main improved attributes of cultivar
Malus domestica Borkh (apple)			
Golden Haidegg	Austria, 1986 F. Strempl, H. Keppl Fruit Res. Station Haidegg A-8047 Graz and H. Brunner IAEA Laboratory Seibersdorf	Gamma ray 50 Gy dormant five bud scions, 1972 [Golden Delicious]	Larger fruits, concentrated fruit maturing, non russeting, smooth sheen fruits, 2 weeks extended cold storability, improvement in taste, fruit colour: faint yellow basis with a dump redish cover
Shamrock (8C-1-15)	Canada, 1986 W.D. Lane R.A. Mac Donald K.O. Lapins Research Station Agriculture Canada Summerland BC VOH 1Z0	(irradiated McIntosh clone 10 C-8-43-1) x (Golden Delicious, strain "Starkspur") 1970	Similar to "Granny Smith" in appearance, texture, taste but 6 weeks earlier with a more favourable tree growth habit, can be grown in more Northern regions than "Granny Smith"
Onobrychis viciifolia Scop. (sainfoin)			
Kirovogradskij 13	USSR, 1986 E.I. Tyugina V.D. Chiplyaka O.I. Il'chenko Kirovogradskij Scien. Industrial Union ELITA	Nitroso-methyl-urea 0.012-0.025% 6 h 1969 [Peschanyj 1251] 1978 polycross of best mutant lines	More branches and leaves, green mass 14% higher, hay 16% more and seed amount comparable to the original variety

Oryza sativa L. (rice)			
Binasail	Bangladesh, 1987 A.J. Miah, M.A. Azam, L. Hakim and M.A. Mansur Bangladesh Institute of Nuclear Agric. Mymensingh	Gamma ray, 1973 [Nizersail]	Taller, stronger culm, erect larger flag leaf, longer panicle with more grains, 2-4 w earlier maturing, daylength tolerant, 20% higher yield, higher hulling recovery, higher protein content, more resistant to brown plant hopper, green leaf hopper and tungro virus
Dalris 11	USSR, 1988 Primorskii Branch of All-Union Res. Inst. of Rice Novoselskoe 692214 Primorskii	Nitroso-methyl urea 0.25%, 16 h, seeds [Malish]	Early ripening
Hongtu 31	China, 1980 Ye A Bao Zhoushan Prefecture Inst. of Agric. Sci. Zhejiang Province	Electron beam, 6-8 sec/grain germinating seeds [Hong 410]	Higher grain quality, compact plant type, more tillering, resistant to blast yield 6.6-8.3 t/ha
Jingnou No. 6	China, 1986 Jingzhou Regional Inst. of Agric. Sci. Hubei Prov.	Gamma rays 30 krad seeds [Guizao No. 2]	Resistant to blast and blight, good grain quality, higher grain yield
Marjan	USSR, 1987 Akbar Kuramisov Kurmanbek Bakirov Kazah Res. Inst. of Rice 468514 Kzil-Orda,	Gamma rays [KZR05356]	Lodging resistance, high yield
Qiufu No. 1	China, 1977 Guizhou Acad. of Agric. Sci. Guizhou	Gamma rays 35 krad seeds [Qiu quai]	81-93 cm, large panicle, cold resistant, good yield

Name of new cultivar	Place and date of release (or approval) and name of principal worker and institute	Kind and date of mutagenic treatment [treated variety, line, clone ..] or mutant crosses (mutant underlined)	Main improved attributes of cultivar
R 817	China, 1981 Zhang Mingxian, Luo Rongting Xu Baocai Inst. for Appl. of Atomic Energy Zhejiang Acad. of Agric. Sci. Hangzhou	Gamma rays 35 krad [Aishungnou]	Glutinous variety with higher yield, 3 d earlier maturity, 85-90 cm plant height, large panicle, suitable for making high quality rice wine
Weiyouji	China, 1983 Biol. Dept. Hubei Univ. Hubei Province	Wei 20A x Jiguang No.4 (= laser induced mutant of IR 8)	23 days earlier; maximum yield over 9.0 t/ha
Xindao No. 1	China, 1986 Xinjiang Acad. of Agric. Sci. Ulumoqi	Gamma rays, seeds [F_2 (Ningxi 62-2 x Panjin No.1)]	Disease resistant, cold tolerant, good quality, 7d earlier than parent Ningxi 62-3, good yield
6 B	Vietnam, 1986 Dept. of Genetics and Plant Breeding University Ho Chi Minh City	IR42 x Atomita 2	Exceeds IR42 in yield by 20%, larger panicles, higher TGW, better than both parents in salt tolerance
7404	China, 1977 Lixiane Inst. of Agric. Sci. Jiangsu	Gamma rays 35 krad seeds [Xinan 175]	Short culm, lodging resistant, higher yield, resistant to bacterial blight and blast

Phaseolus vulgaris L. (bean)			
Harkovskaya 8	USSR, 1985 Ukrainian Res. Inst. of Plant Industry & Genetics 310044 Kharkov	Gamma rays 15 kR, seeds [F_1 *Sanilac* x 6590]	White seeds, early ripening, high yield
Mogano	Italy, 1985 A. Allavena, A. Fadda, G.P. Soressi Istituto Sperimentale per l'Orticoltura Montanaso Lombardo	EMS [P224]	Uniform beige seed coat instead of variegated, dwarf habit, resistant to bean common mosaic virus like parent, earlier and higher yielding than Cannelino, Impero or Opal
Montalbano	Italy, 1985 A. Allavena, A. Fadda, G.P. Soressi Istituto Sperimentale per l'Orticoltura Montanaso Lombardo	EMS [P106]	Uniform white seed instead of variegated, otherwise like parent line (same characters as Mogano)
Pisum sativum L. (pea)			
Nemchinovskii 85	USSR, 1986 G. Debely Res. Inst. of Agric. for Non-Chernozem Zone, Nemchinovka 143013 Moscow	Nemchinovskii 766 x *Shtambovy mutant*	High yield, good plasticity
Streletskii 11	USSR, 1985 All-Union Res. Inst. of Legumes & Coarse Grain Streletskoe 303112 Orel	Ethylenimine 0.01% 12 h, seeds [Zernograd 2]	Early ripening, moderate resistance to lodging

Name of new cultivar	Place and date of release (or approval) and name of principal worker and institute	Kind and date of mutagenic treatment [treated variety, line, clone ..] or mutant crosses (mutant underlined)	Main improved attributes of cultivar
Prunus avium L. (sweet cherry)			
Burlat C_1	Italy, 1983 Istituto Sperimentale Frutticolt., Rome	Gamma rays, scions(?) [Bigarreau Burlat]	Compact growth habit (80-70%)
Nero II C_1	Italy, 1983 Istituto Sperimentale Frutticolt., Rome	Gamma rays, scions(?) [Durone Nero II]	Compact growth habit (60-45%)
Rhododendron simsii Planch. (= Azalea indica) (azalea)			
Ingana	Belgium, 1984 R. De Loose Rijksstation voor Sierplantenteelt Melle	Gamma rays recurrent irradiation, 1977-1980 [Inga]	Flower colour change from blue-red with white edge to yellow-red with white edge
Rosa sp. (rose)			
Pink Contempo	India, 1986 S.K. Datta Nat.Bot.Res.Inst. Lucknow-226001	Gamma rays 3 krad 1980 [Contempo]	Pink flowers instead of "copper orange" with yellow eye
Curio	India, ca. 1986 S.K. Datta Nat. Bot. Res. Inst. Lucknow-226001	Gamma rays 3 krad 1982 [Imperator]	Flower colour cherry red like "Imperator", flower morphology different (middle of the flowers is occupied by a number of small flowers)

Pink Hat	USA, 1960	Gamma rays terminal buds [Unnamed floribunda]	Two-tone pink flower colour, dramatic increase in floriferousness, almost immune to mildew
Ji Guang	China, 1986 Acad. Agric. Sci. Beijing	Gamma rays 30 Gy green branches, 1982	Improved leaf and flower characteristics
Nan Hai Lang Hua	China, 1986 Acad. Agric. Sci. Beijing	Gamma rays 30 Gy green branches, 1982	Improved leaf and flower characteristics
Paula	USA, ca. 1960	Gamma rays terminal buds [Queen Elisabeth]	Dusty coral flower colour, rest of genotype unchanged
Twinkle	India, 1986 S.K. Datta Nat. Bot. Res. Inst. Lucknow-226001	Gamma rays 3 krad 1982 [Imperator]	Striped flowers (pink stripe on 'cherry red' background) instead of 'cherry red'
Xia Guang Wan Dao	China, 1986 Acad. Agric. Sci. Beijing	Gamma rays 30 Gy green branches, 1982	Improved leaf and flower characteristics
Zhen Jie	China, 1986 Acad. Agric. Sci. Beijing	Gamma rays 30 Gy green branches, 1982	Improved leaf and flower characteristics
Saccharum officinarum L. (sugar cane)			
Co 85017	India, 1985 Sugar Cane Breeding Institute Coimbatore 641007 Tamil Nadu	[Co 740]	For midlate planting in the peninsular zone, resistant to Ustilago scitaminea, exceeds Co 740 for cane yield and sucrose percentage

Name of new cultivar	Place and date of release (or approval) and name of principal worker and institute	Kind and date of mutagenic treatment [treated variety, line, clone ..] or mutant crosses (mutant underlined)	Main improved attributes of cultivar
Co 85035	India, 1985 Sugar Cane Breeding Institute Coimbatore 641007 Tamil Nadu	[Co 740]	For early planting in the east coast zone, resistant to Ustilago scitaminea, exceeds Co C671 for cane yield and sucrose percentage
Saintpaulia sp. (African violet)			
Halley	The Netherlands, 1985 J.N.R. Alkemade Noordwijk	Gamma rays 20-30 Gy leaves, 1984 [Superba]	Purple flower colour ("Superba" has a blue flower colour), rest of genotype unchanged
Solanum tuberosum L. (potato)			
Desital	Italy, 1987 A. Sonnino ENEA, Dip. Agrobiotech. Casaccia/Rome	Gamma rays 30 Gy in-vitro grown plantlets [Desirée]	White skinned tubers in contrast to red skinned "Desirée", otherwise similar in yield, biological cycle, adaptability, dry matter content
Sorghum bicolor (L.) Moench var. sudanense (Sudan grass)			
Donetskaya 5	USSR, 1984 Donetsk Agric.Exp.Stn. Peski 242404 Donetsk	Dimethylsulfate, [Krupnosemyannaya 3]	170-190 cm, 3-4 days earlier than Mironovskaya 10, growth period 118 d, resistant to drought, pests, diseases, max. yield 52.3 t/ha, 2.5 t/ha over Mironovskaya

Stenotaphrum secundatum (Walt.) Kuntze (St.Augustinegrass)			
TXSA 8202	USA, 1985 Texas Agric.Exp.Stn. Texas	Gamma rays 58.3 Gy stolon sections, 1973 [Floratam]	Resistant to Panicum mosaic virus and Blissus insularis like "Floratam". The mutants are also moderately resistant to various other diseases
TXSA 8212	USA, 1985 Texas Agric.Exp.Stn. Texas	Gamma rays 58.3 Gy stolon sections, 1973 [Floratam]	Resistant to Panicum mosaic virus and Blissus insularis like "Floratam". The mutants are also moderately resistant to various other diseases
Streptocarpus sp.			
Minidor	FRG, 1987 C. van Doorn[1)] Kleve-Donsbrüggen	X-rays 30 Gy leaves, 1983 [Mini Nymph]	Pale blue flower colour, shorter flower stalks and leaves than orginal cultivar
Blue Windor	FRG, 1986 C. van Doorn[1)] Kleve-Donsbrüggen	X-rays 30 Gy leaves, 1983 [Margaret]	Pale blue flower colour, rest of genotype unchanged
Dark Windor	FRG, 1987 C. van Doorn[1)] Kleve-Donsbrüggen	X-rays 30 Gy leaves, 1983 [Margaret]	Dark blue flower colour, free flowering; smaller leaves
White Windor	FRG, 1985 C. van Doorn[1)] Kleve-Donsbrüggen	X-rays 30 Gy leaves, 1982 [Margaret]	White flower colour, rest of genotype unchanged
Vando	FRG, 1987 C. van Doorn[1)] Kleve-Donsbrüggen	X-rays 30 Gy leaves, 1982 [Cynthia]	Deep red flower colour, shorter leaves, more and smaller flowers than original cultivar

Name of new cultivar	Place and date of release (or approval) and name of principal worker and institute	Kind and date of mutagenic treatment [treated variety, line, clone ..] or mutant crosses (mutant underlined)	Main improved attributes of cultivar
Triticum aestivum L. (wheat)			
Albidum 12	USSR, 1984 Inst. of Cytol. & Genet. of Siber. Branch of USSR Acad. of Sciences 630090 Novosibirsk	Gamma rays 20 kR seeds [Triticum-Agropyron hybrid 870]	High frost resistance
Deda	USSR, 1983 Goga Hutcishvily Georgian Research Inst. of Agric. 383400 Mtsheta	Nitroso-methyl urea (0.01%) 18 h, seeds [Motsinava]	Winter wheat, early, high yield
Kormovaya 30	USSR, 1983 Vladimir Pilnev All-Union Inst. of Genetics & Plant Brdg. 270036 Odessa	Nitroso-methyl urea seeds [Belotserkovskaya 198]	Winter wheat for silage, tall plant, high tillering capacity
Shchedraya Polesya	USSR, 1987 Ukranian Res. Inst. of Agric. Chabany 255205 Kiev,	Nitroso-methyl urea 0.006% [Polesskaya 70]	Lodging resistance, high yield

Tulipa sp. (tulip)			
Orange Charles	The Netherlands, 1985 Friesche Mij van Landbouw. Kwekerij[1)] Ropta, Metslawier	X-rays 3 Gy bulbs, 1972 [Charles]	Red flower with orange edge, other characteristics unchanged
Dominique	The Netherlands, 1985 Institute for Hort. Plant Breeding[1)] Wageningen	X-rays 2.5 - 3.5 Gy dormant bulbs, 1965 [Lustige Witwe]	Violet flowers with larger white edge than 'Success' and better bulb production
Ivette	The Netherlands, 1985 Institute for Hort. Plant Breeding[1)] Wageningen	X-rays 2.5 - 3.5 Gy dormant bulbs, 1965 [Lustige Witwe]	Rose-red flower with white edge (new colour)
Yvonne	The Netherlands, 1985 Institute for Hort. Plant Breeding[1)] Wageningen	X-rays 2.5 - 3.5 Gy dormant bulbs, 1965 [Lustige Witwe]	Darker fuchsin purple flower colour than 'Frederica' and better bulb production
Vicia faba L. (horse bean)			
Chabanskii	USSR, 1985 Vladimir Golovchenko Ukrainian Res. Inst. of Agric. Chabany 255205 Kiev	Nitroso-ethyl urea [Uladovskii x Fribo]	Early ripening, grain yield 5 t/ha, green mass 47 t/ha, dry matter 10.3 t/ha
KIU-82	USSR, 1987 Vladimir Golovchenko Ukrainian Research Inst. of Agric. Chabany 255205 Kiev	Chemical mutagens	Disease resistance, high yield
Stego (RAH 282)	Poland, 1987 St. Starzycki M. Tkaczyk IHAR Radzikow	Gamma rays 7 kR [Nadwislanski]	Short stem, ca. 4 days earlier, smaller TGW ca. 50 g

Name of new cultivar	Place and date of release (or approval) and name of principal worker and institute	Kind and date of mutagenic treatment [treated variety, line, clone ..] or mutant crosses (mutant underlined)	Main improved attributes of cultivar
Dino (RAH 182)	Poland, 1987 St. Starzycki M. Tkaczyk IHAR Radzikow	Gamma rays 7 kR [Nadwislanski]	Short stem, ca. 4 days earlier, smaller TGW ca. 50 g
Weigela Thunb. (weigela)			
Courtadur	France, 1980 L. Decourtye, INRA Beaucouze	Gamma rays 40 Gy in vitro plantlets, 1976 [Bristol Ruby]	Very compact growing, long flowering period
Zea mays L.(maize)			
Lauyu No. 5 (hybrid)	China, 1985 Institute for Appl. of Atomic Energy Shandong Academy of Agricultural Sciences Shandong Province	Yuan 7123 x Yuanqi 123	Early matures in 85-90 days, high yield, good quality, resistant to leaf spot
Longfuyu No. 1 (hybrid)	China, 1983 Inst. Appl. Atomic Energy Heilongjiang Academy of Agric.Sciences Harbin	Diangu 11A x Fu 746 (Fu 746 = mutant induced by 10.8 krad gamma irradiation of dry F_1 seeds of T 133 x C 103)	Early, cold tolerant, higher yield potential, 12% protein, 0.32% lysine, leaf blight resistance, yield 7,5 t - 10 t/ha

1) in co-operation with the Association Euratom-ITAL, Wageningen
2) in co-operation with the Federal Research Centre for Horticultural Plant Breeding, D-2070 Ahrensburg
3) in co-operation with R. De Loose, Melle, Belgium

IAEA EXPERTS AND CONSULTANTS IN 1987

Ahnström, G. (Sweden)	FAO/IAEA Lab. Seibersdorf (Austria)
Ashri, A. (Israel)	FAO/IAEA Vienna
Awan, M.A. (Pakistan)	Bogota (Colombia)
Baenziger, P.S. (USA)	Quito (Ecuador)
Buddenhagen, I. (USA)	Panama City (Panama); San Pedro, Sula (Honduras)
Dolezel, J. (CSSR)	Kwabenya, Tafo (Ghana)
Donini, B. (Italy)	Suweon (Rep. of Korea);
Espino, R.R. (Philippines)	FAO/IAEA Vienna
Gale, M.D. (UK)	Quito (Ecuador); La Paz (Bolivia)
Goldsmith, M.R. (USA)	Suweon (Rep. of Korea)
Gustafson, P. (USA)	Lima (Peru); Asuncion (Paraguay); Quito (Ecuador)
Foroughi-Wehr,B. (FRG)	Piracicaba (Brazil); Suweon (Rep. of Korea); FAO/IAEA Vienna
Lommel, S.A. (USA)	FAO/IAEA Vienna
Madanasinghege Manial, M. (USA)	Lima (Peru)
Maluszynski, M. (FAO/IAEA)	La Paz (Bolivia); Teheran (Iran); Guatemala City (Guatemala); Quito (Ecuador); Lima (Peru);
Malik, I.A. (Pakistan)	Chainat (Thailand)
Metz, S.G. (USA)	Lima (Peru)
Micke, A. (FAO/IAEA)	Sofia (Bulgaria)
Moldenhauer, K. (USA)	Bangi (Malaysia)
Murata, N. (FAO/IAEA)	Panama City (Panama); Soroti (Uganda)
Novak, F. (IAEA)	Kuala Lumpur (Malaysia); Suweon (Rep. of Korea)
Oono, K. (Japan)	Suweon (Rep. of Korea)
Pamperl, W. (Austria)	Soroti (Uganda); Kitwe (Zambia)
Patil, S.S. (USA)	FAO/IAEA Vienna
Perea Dallos, E.M. (Colombia)	Lima (Peru)
Read, P.E. (USA)	Kitwe (Zambia)
Scott, B.J. (Australia)	Jakarta (Indonesia); Kuala Lumpur (Malaysia); Tandojam (Pakistan)
Shanmugasundaram, S. (AVRDC)	Manila (Philippines); Jakarta (Indonesia); Kuala Lumpur (Malaysia); Bangkok (Thailand)
Shaikh, M.A.Q. (Bangladesh)	FAO/IAEA Laboratory Seibersdorf (Austria)
Schmidt, J. (Austria)	Soroti (Uganda)
Thompson, K.F. (UK)	Suweon (Rep. of Korea)
Thorpe, T.A. (Canada)	Suweon (Rep. of Korea)
Ullrich, S.E. (USA)	Quito (Ecuador); Viacha (Bolivia)
Wang, L. (China)	FAO/IAEA Laboratory Seibersdorf (Austria) Sofia, Plovdiv, Chirpan, Karnobat (Bulgaria)
Zapata, F.J.A. (IRRI)	Lima (Peru)

FAO/IAEA TRAINEES AND FELLOWSHIP HOLDERS IN 1987

ALGERIA	
Bennaceur, Mohamed	France 6m
Nemmar, Mahdi	Scientific visit Italy, IAEA
Touzi, A.	Scientific visit, IAEA
BRAZIL	
Mendes, Beatriz Madalena Januzzi	USA 6m
BULGARIA	
Filev, Kostadin Alexandrov	Scientific visit Sweden, UK, Netherlands
Perfanova Trifonova,Adelina Sabeva	Canada 6m
Rodeva, Velichka	Netherlands 12m

CHINA, PEOPLE's REPUBLIC OF	
Tang, Xiaolang	IAEA 12m
COLOMBIA	
Alvarez Faracco, Adolfo Leon	Brazil 12m
Fandino Garcia, Tito Julio	Costa Rica 3m
Perea Dallos, Elisa Margarita	IAEA 9m
COSTA RICA	
Madriz Muñoz, R.A.K.	Argentina 6m
EGYPT	
Amer, Ibrahim Mohamed Ahmed	USA 12m
Moustafa, Raafat Anwar Kamal	USA 12m
Ragab, Abd-el Shafy Ibrahim	FRG 12m
GUATEMALA	
Montepeque Roldan, Romeo	Argentina 8m
INDONESIA	
Abdullah Wahid, Rosmiarty Emmi	Japan 7m
Soeranto, Human	Norway 12m
KOREA, REPUBLIC OF	
Kwon, Shin Han	Scientific visit USA
MALAYSIA	
Jalani, Bin Sukaimi	Scientific visit Sri Lanka, Korea, Bangladesh, Thailand
NIGERIA	
Mbanaso, Egbichi N. Adaoha	IAEA 6m
PANAMA	
Pons Fernandez, Susana	Scientific visit IAEA
PAKISTAN	
Altaf, Nafees	UK 13m
Aslam, Muhammad	USA 6m
Haq, Ahsanul Muhammad	Scientific visit Philippines, China
Khattak, Amal Badshah	USA 12m
Rajput, Mushtaque Ahmed	Scientific visit China, Korea, Indonesia
Siddiqui, Khushnood Ahmed	Scientific visit Italy, UK, Canada, USA
PERU	
Romero-Loli, Marino Juan	Scientific visit IAEA, UK, Sweden, Poland
PHILIPPINES	
Engle, Liwayway Murillo	Scientific visit Canada, USA
POLAND	
Czerwinski, Tomasz	FRG 12m
Madajewski, Roman	France 3m
Szarejko, Iwona	Canada 12m
Tomaszewski, Zygmunt	IAEA 3m
Wolko, Bogdan	USA 13m

SRI LANKA	
Jayawardene, S.D. Gerry	Scientific visit China, India
Pathirana, Ranjith	Scientific visit USA
SUDAN	
Mohamed, Mohamed Salih	USA 3m
Abdel-Rahim, A.M.	Denmark 10m
THAILAND	
Chinchest, Amnart	Scientific visit Bangladesh, India, Pakistan
Kanlong, Somchai	UK 3m
Lavapaurya, Tavat	USA 7m
Panichsukpatana, Chuteemun	USA 6m
Silayoi, Benchamas	USA 6m
Sittigul, Chatree	USA 3m
UGANDA	
Khizzah, Bill Williams	USA 12m
VENEZUELA	
Delgado, Pedro Ramon	USA 4m
VIETNAM	
Le Dac Lieu	Scientific visit IAEA, Hungary
Nguyen Tien, Think	Italy 12m
YUGOSLAVIA	
Soltes-Rak, Erika I.	UK 6m
ZAMBIA	
Simwanda, Lovemore Samson	Italy 9m

6th FAO/IAEA Interregional Training Course on the Induction and Use of Mutations in Plant Breeding, Seibersdorf (Austria) 22 September - 5 November 1987

Amet, T.M.	Liberia
Benslimani, N.	Algeria
Campos Roque, A.J.	Cuba
Chan, B.M.	Korea, DPR
Davalos Rojas, A.	Colombia
Ebiyau, J.	Uganda
Esseh-Yovo, M.	Togo
Fazli, H.H.	Afghanistan
Franco, E.O.	Guatemala
Kola, V.	Albania
Kosturkova-Antonova, G.P.	Bulgaria
Matibiri, A.E.	Zimbabwe
Mbanaso, E.N.A.	Nigeria
Nuñez, J.R.	Dominican Republic
Rivera Coto, G.	Costa Rica
Safo-Kantanka, O.	Ghana
Shirdon, M.F.	Somalia
Tang Xiaolang	China, People's Republic of
Te-Chato, S.	Thailand
Zapata, A.	Bolivia

FAO/IAEA Training Course on the Use of Mutation techniques in Connection with Cereals in In-vitro Cultures, Lima (Peru) 16 November - 4 December 1987

Gutierrez Alvarez, A.	Guatemala
Huaman Sandoval, J.L.	Peru
Madriz Muñoz, J.A.	Costa Rica
Montepeque Roldan, R.	Guatemala
Navarro Alvarez, W.	Costa Rica
Puicon Añazco, C.A.	Peru
Rivadeneira, M.E.	Ecuador
Serri Gallegos, H.E.	Chile
Silveira Mairesse, L.A.	Brazil
Velasco Hurtado, R.	Bolivia
Zacher de Martinez, M.	Paraguay

PLEASE NOTE:

Our training courses are financed under the IAEA Technical Co-operation Programme and therefore are open primarily to plant breeders from developing countries. We could also, however, accept a certain number of trainees from developed countries. There is no course fee, but the participants from developed countries would have to take care of their travel costs and subsistence allowance.

FUTURE EVENTS

1988

19 - 23 June — 3rd International Symposium on Genetic Aspects of Plant Mineral Nutrition, Braunschweig, FRG
Contact: M. Dambroth
Institute of Crop Science and Plant Breeding, FAL
Bundesallee 50
D-3300 Braunschweig (FRG)

4 - 9 July — EUCARPIA Symposium on Rye Breeding, Leningrad, USSR
Contact: V.D. Kobyljanskij
N.I. Vavilov All-Union Institute of Plant Industry
44 Herzen Street
Leningrad 190000 (USSR)

3 - 5 August — EUCARPIA Meeting on Biometrics in Plant Breeding, Aas, Norway
Contact: B.I. Honne
The Norwegian State Agric. Res. Station
P.O. Box 100
N-1430 Aas (Norway)

14 - 19 August — 4th International Congress of Cell Biology, Montreal, Quebec, Canada
Contact: Ken Charbonneau
Conference Services Office
National Research Council of Canada
Ottawa, Ontario, Canada K1A 0R6

5 - 9 September	EUCARPIA 4th Allium Symposium, Wellesbourne, Warwick, U.K Contact: AFRC, Institute of Horticultural Research Wellesbourne, Warwick CV35 9EF (UK)
5 - 9 September	EUCARPIA 15th Meeting on Breeding of Ornamentals, Erfurt, GDR Contact: A. Hielscher VEG Saatzucht Zierpflanzen Gorkistrasse 9 DDR-5010 Erfurt
30 Oct. - 5 Nov.	8th International Symposium on Tropical Root Crops, Bangkok, Thailand Contact: R.H. Booth FAO - AGS Rome (Italy)

1989

27 Feb. - 4 March	12th EUCARPIA Congress "Science for Plant Breeding", Göttingen, FRG Contact: G. Röbbelen Institut für Pflanzenbau und-züchtung Von Siebold Strasse 8 D-3400 Göttingen (FRG)
18 - 22 June	10th International Chromosome Conference, Uppsala, Sweden Contact: 10th International Chromosome Conference c/o Ingrid Fagerström Uppsala University Box 256 S-751 05 Uppsala (Sweden)
4 - 6 July	Third International Workshop on Septoria Diseases of Cereals, Zürich - Reckenholz, Switzerland Contact: P.M. Fried Swiss Federal Res. Centre for Agronomy CH-8046 Zürich-Reckenholz (Switzerland)
9 - 13 July	2nd International Safflower Conference, Hyderabad, India Contact: Project Director (Oilseeds) Directorate of Oilseeds Research Rajendranagar, Hyderabad 500030 Andhra Pradesh (India)
21 - 25 August	6th International Congress of the Society for Advancement of Breeding Researches in Asia and Oceania (SABRAO), Tsukuba, Japan Contact: The Secretariat of the 6th International Congress of SABRAO c/o Japan Convention Services, Inc. Nippon Press Centre Bldg. 2-2-1, Uchisaiwai-cho Chiyoda-ku, Tokyo 100 (Japan)

LAST BUT NOT LEAST

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

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

Alexander MICKE

Mutation Breeding Newsletter
Joint FAO/IAEA Division of Isotope and Radiation Applications
of Atomic Energy for Food and Agricultural Development
International Atomic Energy Agency
Wagramerstrasse 5, P.O. Box 100
A-1400 Vienna, Austria

Printed by the IAEA in Austria
March 1988

88-01225