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Mutation Breeding Newsletter

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RESEARCH NEWS

Cotton mutants with better salinity tolerance

The reaction was studied of radiomutants of cotton and their initial forms to the soil salinization. The experiments were carried out on soils naturally salinized with sulphate-chlorides. It was found out that gamma irradiation of forms relatively intolerant to the salinization could provide salt-tolerant mutants. The mutants AN-402 and AN-403 developed from the wild growing form of SSP mexicanum displayed a higher salt tolerance than the initial form. The early maturing mutant AN-402 with natural defoliation and higher quality of fibre proved the most high yielding.

REFERENCE

NAZIROV, N.N., TASHMATOV, N.T. and VAKHABOV, A., Radiomutantov khlopchatnika i ikh iskhodnykh form k zasoleniyu. Dokl. Vses. Akad. S-kh. Nauk. No. 1 (1978) 9-11.

(Contributed by Nazirov, N.N., Tashmatov, N.T., Vakhabov, A., AN Uzbekskoj SSR, Tashkent, Inst. Ehksperimental'noj Biologii Rastenij, through INIS).

Induced mutations in Dolichos lablab

Genetic variability induced for flowering time, seed yield and 1000 grain weight was studied in M_2 following treatments with gamma rays, NMU and NMG. There were 15 treatments, five each with gamma rays (10, 20, 30, 40 and 50 Krad), NMU (0.01, 0.02, 0.03, 0.04 and 0.05 per cent) and NMG (0.002, 0.003, 0.004, 0.005 and 0.006 per cent). A trial was laid out in a randomised block with 4 replications. Mean and variance calculated for the 3 characters were significantly different from control. Mean values were significantly higher than the control in several treatments for seed yield per plant and grain weight. Flowering was also earlier in many

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treatments. Out of 15 treatments, 9 showed significantly higher variance value than control for seed yield and grain weight, while 14 showed enlarged variance for flowering time. In case of gamma rays, variance was maximum at 30 Krad for seed yield and flowering time whereas for grain weight maximum variance was at 40 Krad. Among NMU treatments, maximum variance was induced at 0.04 and 0.05 per cent treatments. With regard to NMG treatments, 0.005 and 0.006 per cent were the most effective. The results obtained indicate that the bean responds favourably to the induction of polygenic variability and that there is scope for selection and subsequent improvement of this crop species.

REFERENCE

RAMAKANTH, R.S., SEETHARAM, A. and PATIL, N.M., J. Nucl. Agric. Biol. 6 (1977) 128-132.

(Contributed by Ramakanth, R.S., Seetharam, A. and Patil, N.M., Department of Agricultural Botany, University of Agricultural Sciences, Bangalore, India, through INIS).

Promising barley mutant R-16

Micro-mutants were isolated from the progeny of gamma ray and nitrosomethylurea treated seeds of variety Ratna. Observations made on various quantitative and qualitative traits show that one of the mutants, designated as R-16, is superior over control in economic yield (total grain yield as well as straw to grain ratio), effective yield (consumable part of the produce computed by husk to grain weight ratio) and qualitative yield (malt extractability/unit area, protein harvest/unit area). This mutant is further characterized by its flag-leaf which forms a right angle to the main axis, a desirable trait for trapping more sunlight for CO_2 assimilation. Studies made on the photosynthetic efficiency of this mutant by feeding ^{14}C-bicarbonate showed that the mutant is more efficient in $^{14}CO_2$ assimilation in an unit time. With all these superior qualities, the mutant suffers from susceptibility to rust which is at par with the parent variety. The mutant possesses bold grains (thousand grain weight is 20% more than the parent), the number of spikelets per spike is comparatively less.

REFERENCE

SHARMA, R.P. and SUTAR, R.S., J. Nucl. Agric. Biol. 6 (1977) 114-118.

(Contributed by Sharma, R.P. and Sutar, R.S., Division of Genetics, Indian Agricultural Research Institute, New Delhi, India, through INIS).

Valuable durum wheat mutants

Considerable research work brought about the development of new mutant forms of durum wheat having a series of valuable biological and commercial properties and qualities. Gamma rays, fast neutrons, ethylenimine (EI) and diethyl sulphate (DES) were used. Among the mutants, M-H/192, M-5753/220, M-5782/176, M-4575/187 and 6322/225 may play an important role in wheat breeding and farm production as direct varieties. Some of them are particularly valuable because of very good values of the most important biochemical characteristics. Results point to the good possibility and prospect of the experimental mutagenesis as a method of durum wheat breeding.

REFERENCE

YANEV, S.H. and SAVOV, P., Agrokhimichna kharakteristika na nyakoi mutantni formi tvyrkda pshenitsa. Rastenievyd. Nauki 14 (1977) 43-49.

(Contributed by Yanev, S.H., Institut po Pamuk i Tvarda Pshenitsa, Chirpan, Bulgaria; and Savov, P., Akademiya na Selskostopanskite Nauki, Sofia, Bulgaria, Inst. po Genetika, through INIS).

Physiological studies with chloroplast mutants of rice

Radiation and chemical mutagenesis in rice results in chloroplast mutants, affecting chlorophyll content, chloroplast development and related physiological processes. Some viable chloroplast mutants were utilized to note their photosynthetic efficiency, protein content of the grain, and productivity with relation to their chlorophyll contents. Most mutants showed reduced chlorophyll contents from seedling stage till maturity, with the exception of 'alboviridis', 'virido-alba' and few of the 'zebra' type mutants having normal chlorophyll contents at later stages of growth. Various mutant seedlings assayed for their photosynthetic efficiency using ^{14}C-labelled substrates showed reduced photosynthetic efficiency, but some with increased activity were also noted. Probably, the increased photosynthetic efficiency of chloroplast mutants is not correlated with their chlorophyll content but may be due to the efficiency of the enzyme catalysing CO_2 fixation, localised in the chloroplasts. The protein content of the seed and the single plant yield of these mutants could not be correlated with chlorophyll content and photosynthetic efficiency of the plants. However, most of the mutants studied had increased protein contents. Some of the 'alboviridis' mutants showed higher photosynthetic efficienty and had more yield with high protein contents. Some of the mutants are also sensitive to low-light condition. Since many of existing high yielding Indian rice varieties have poor yield under low light condition during monsoon, induced mutagenesis producing light sensitive chlorophyll deficient mutants may be of practical interest.

REFERENCE

NANDA, A.K. and MISRA, R.N., J. Nucl. Agric. Biol. 6 (1977) 119-121.

(Contributed by Nanda, A.K., Ravenshaw Coll., Cuttack, India; Misra, R.N., Central Rice Research Institute, Cuttack, India, Div. of Genetics, through INIS).

Physical and chemical mutagenesis in Birdsfoot Trefoil (Lotus corniculatus)

Seeds of Birdsfoot Trefoil (*Lotus corniculatus* L.), cv. Mirabel, were treated with a wide range of doses of X-rays, ethyl methanesulfonate (EMS), 8-ethoxycaffeine (EC), n-hydroxyurea (HU), and 2-aminopurine (AP). M_2 selfed and crossed progeny were established and four qualitative mutant segregant types were recovered from both selfed and crossed lines. Average mutation frequencies were higher in selfed progeny by a magnitude of two (1.5 vs 0.8%) over crossed progeny, in X-ray and EMS-treated material. EC, HU, and AP-treated material showed an average mutation rate of 0.05% while controls showed a mutation rate of less than 0.001%. One mutant type, which was X-ray-induced and exhibited a unifoliate leaf condition at the first node, has been confirmed, by backcrossing, to be a tetrasomically inherited recessive character which has tentatively been given the symbol <u>ul</u>. The other three mutant types recovered are presently being test-crossed to determine the precise mode of inheritance of the characters involved.

A quantitative genetic study on mutagenesis is also underway on treated M_1, as well as selfed and crossed lines of M_2, M_3 and M_4 generations. These lines are being analysed for induced genetic variability in forage and seed yields, HCN-glucoside content, seed shattering, winter hardiness, and early and late flowering habit. Any mutant lines will be isolated and analysed for heritability of any induced quantitative characters produced.

(Contributed by M.C. Therrien and W.F. Grant, Genetics Laboratory, Macdonald Campus, McGill University, Ste. Anne de Bellevue, Quebec, Canada H9X 1C0).

Use of dwarf oat mutant in cross breeding

A major advance was made by Dr. R.I.H. McKenzie at Winnipeg in the development of an oat suitable for growing under conditions of high fertility when he isolated a dwarf mutant from "Harmon". This dwarf (OT 184D) which was produced by irradiating "Harmon" with fast neutrons, possesses a short peduncle which does not allow the panicle to emerge completely from the leaf sheath. Many basal florets, especially in the panicles of tillers, fail to pollinate and high yields of OT 184 are not realized. It was found that the peduncle could be elongated and yields increased by treatment of the plant with gibberellic acid (50-100 ppm) when it was in the flag leaf stage of growth. Because spraying of the crop at this stage of growth is not likely to be a practical solution to the problem, it was attempted to find a gene which would accomplish the same result. The gene would have to modify the rather intractible dominant dwarfing gene and elongate the peduncle at the time of flowering. After searching the progeny of 126 different hybrids, the gene(s) was found in a very tall dormoat strain. It appears to be a recessive (genetic study in progress) and to be expressed in the later stages of stem elongation. The plants are obviously dwarfed but the peduncle is elongated and the panicle is free of the leaf sheath. The new dwarf possesses a normal sized panicle carried on short thick culms. Originally, seed size was small in OT 184D x dormoat hybrid but this problem is being overcome by further breeding. The combination of the McKenzie dwarfing gene with the long peduncle gene may make it possible to subject oats to intensive management without inducing lodging.

(From Oat Newsletter, Vol. 29, 1978, V.D. Burrows Central Experimental Farm, Research Station, Ottawa, Canada).

Mildew resistant mutant lines of barley

To obtain mildew resistant mutants of the variety 'Maja', which is most popular in the Latvian SSR, seeds were treated with NMH (0.01% 12 h) and fast neutrons (1000 rad, IRT 2000). M_3 plants of 1282 M_2 families were screened in a greenhouse by inoculation in the second or third leaf stage separately with the aggressive race C_5 and the least aggressive race D_7. Resistance was evaluated 10-15 days later. Each selected line was tested again for resistance to 2-5 races by infecting leaf segments kept on a 0.004% solution of benzimidazole. Out of 220 initially selected resistant mutants only 12 were confirmed as having resistance against at least one of the mildew races used. Three mutant lines were found to be resistant against all the races used. The resistance is inherited recessively in crosses between mutant lines and the original variety "Maja". *The frequency of resistant mutants in* M_2 *was 0.95% for* NMH and 0.87% for neutrons, compared with chlorophyll mutation frequencies of 11.3% for NMH and 6.5% for neutrons.

REFERENCE

KAVACS, G.E., DISHLER, V.Y., ZOLOTAREV, M.V., Mildew resistant mutant barley lines. In: Genetic Principles of Disease Resistant Field Crops. Zinatne, Riga 1977.

(Contributed by Kavacs, G., Institute of Biology, Latvian Academy of Sciences, 229021 Salaspils Miera iela 3).

A soybean mutant variety in Algeria

A collection of induced mutants of soybean originally identified in Romania has been tried experimentally in different regions of Algeria. Several mutants proved to be drought resistant and gave better results than the presently cultivated foreign varieties. A most promising mutant was named CERAG-1 and has been released for cultivation. Its characteristics are as follows:

		CERAG-1	Parent variety B 107/10 (T)
Colour of hypocot., stem, petiole, etc.		uncoloured	violet
Flower colour		white	violet
Shape of leaves		lanceolate	oval
Type of funiculus		deciduous	indeciduous
Colour of hilum middle line		yellow	white
Resistance to cold		very resistant	resistant
Resistance to drought		very resistant	resistant
Protein (% dry matter)		41.50	44.75
Fats (% dry matter)		19.81	16.50
Grain yield kg/ha	1975	2485.0	1960.4
	1976	2390.5	2047.0
	1977	1845.1	1450.5
	1978	2566.0	1830.3

(Contributed by Nicolae, I., Centre d'Etudes et de Recherches Agronomiques, El-Harrach, Algeria).

Mutation breeding experiments with *Vicia faba*

The radiosensitivity of several legume species has been investigated before and results were utilized to give guidelines for mutation breeding experiments (MBNL No. 5, 1975, p. 7-9). As a general rule, a 20-35%

Table 1. Survival rate, fertility and frequency of chlorophyll and morphological mutants of *Vicia faba* cv. Wieselburger .

Treatments		M_1 Survival %	M_1 Fertility %	Frequency of M_2 Mutants in 0/00 Chlorophyll Greenhouse	Chlorophyll Field	Morphological Field
Gamma rays	0 Krad	100.0	100.0	0.2	0.9	1.8
	2 "	89.2	92.9	2.0	5.9	14.0
	3 "	81.9	74.9	2.6	7.0	18.0
	4 "	70.4	62.5	4.8	8.6	25.6
	5 "	48.5	59.4	5.6	13.6	29.3
	6 "	29.8	50.0	7.9	13.8	23.8
	7 "	14.9	38.7	6.5	-	-
Fast Neutrons	0 Rad	100.0	100.0	0	0.2	2.4
	100 "	87.6	85.1	4.1	7.5	8.6
	150 "	74.5	76.1	5.0	9.0	13.5
	200 "	60.4	60.0	8.2	9.2	11.9
	250 "	48.9	59.3	8.7	11.3	18.7
	300 "	35.4	52.2	14.1	14.0	29.0
	350 "	24.7	46.0	18.0	15.0	32.5
	400 "	15.7	41.3	16.3	11.7	17.8
	450 "	7.2	34.4	15.5	11.0	16.5
EMS[1)] Wet	0	100.0	100.0	0.1	0.3	1.5
	0.1%	91.3	86.3	4.7	8.6	6.4
	0.3%	85.7	81.1	5.1	10.0	14.8
	0.5%	78.2	75.5	6.2	11.5	12.0
	1.0%	65.9	55.5	9.7	12.5	17.5
EMS[2)] dryback	0	100	100.0	0	0.4	3.6
	0.1%	96.5	87.4	8.1	11.3	11.3
	0.3%	90.5	78.6	12.2	13.3	17.8
	0.5%	82.6	74.4	11.7	17.5	14.7
	1.0%	72.8	53.6	19.0	19.2	21.7

1) 3^h soak.in H_2O at 20°C, 2^h EMS treatment at 20°C, 3^h postwash in dem. H_2O.

2) As 1 but 24^h dryback at room temperature.

growth reduction of the epicotyl was considered indicative of an optimal dose range for mutation breeding. For *Vicia faba*, consequently, doses of 50-100 Rad fast neutrons and 2-4 kR gamma rays were recommended. To test the validity of the dose recommendations, the experiment with *Vicia faba* was extended till M_5 generation.

Dry seeds of cv. "Wieselburger" had been treated with 2-7 Krad ^{60}Co gamma rays and 100-450 rad fast neutrons (Standard Neutron Irradiation Facility of the ASTRA swimming pool type reactor). In addition, two series of EMS treatments were performed (4 concentrations each of a "wet" and of a "dryback" series). Totally, about 50,000 M_1 seeds including controls were sown. Results on M_1/M_2 effects are compiled in Table 1. The frequency of M_2 chlorophyll mutants was highest after the strongest EMS treatments, still having good survival and fertility. Physical mutagens yielded the highest frequency of morphological mutants in the field at doses which were higher than those recommended earlier and which caused rather low survival and reduced fertility.

Plant progenies were scored in M_2 for visibly altered traits ("Macromutations"). Only some lines selected were true breeding in M_3. The majority was further segregating and types not observed in M_2 were identified later on. Data on macromutants selected in M_2 and M_3 and confirmed in M_4 are given in Table 2.

The highest frequency of confirmed macromutants was obtained from fast neutron doses between 300-450 rad and gamma doses ranging from 5-6 Krad. EMS treatments have yielded essentially lower macromutant frequencies.

54 confirmed mutant lines have been tested in the M_5 for seed yield and crude protein content in a replicated trial. None of the mutant lines was exceeding the yield of control lines. Seed protein %, however, was increased in about a fourth and decreased in about half of the macromutant lines tested (Table 3).

A "micromutant" population was formed by selecting in the M_2 generation 100 vigorous plants from each treatment including controls. The aim was to increase the yielding capacity. Selection for improved yield was based on pods/plant, seeds/plant and harvest index. Data on plant height, HI, seed weight, seeds/plant, seeds/pod, pods/plant and podded nodes/plant were recorded in each generation on the basis of individual plant observations taking 10 plants in every family. Variability was increased compared with control lines. The highest variability was recorded at 4-5 Krad and 150-250 rad fast neutron treatments, i.e., at doses yielding 50-70% survival. EMS induced variability was lower than variability induced with physical mutagens. This indicates that EMS treatments have been in sub-optimal range. The best 15% treated and control lines were selected in the M_3 and M_4 generation. 14 best "micromutant" progenies and one best control progeny were tested in the M_5 in randomized replicated trials for seed yield and protein content. Three lines were significantly higher in yield (114.6-123.2%) than the best control (100%) while crude protein content determined by the Kjeldahl method did not differ significantly.

Conclusion:

The useful dose range for mutation breeding as recommended in MBNL No. 5, 1975, p. 7-9), has been tested with regard to the frequency of recoverable mutants with both large and small phenotypic

Table 2. Number of "macromutants" selected and confirmed

Treatment	Number of "macromutants" selected	Confirmed*	In % of surviving M_1 plants Selected	Confirmed
2 Krad γ	32	6	1.79	0.34
3 "	28	5	1.71	0.31
4 "	28	7	1.99	0.50
5 "	30	10	3.09	1.03
6 "	24	9	4.02	1.51
100 Rad Nf	21	5	1.20	0.29
150 "	19	7	1.28	0.47
200 "	24	6	1.99	0.50
250 "	32	7	3.27	0.72
300 "	36	9	5.08	1.27
350 "	41	9	8.30	1.82
400 "	25	6	7.96	1.91
450 "	28	3	19.44	2.08
0.1% EMS wet	17	3	1.86	0.33
0.3% "	6	1	0.70	0.12
0.5% "	4	4	0.51	0.51
1.0% " "	2	2	0.68	0.46
0.1% EMS dryback	13	2	1.35	0.21
0.3% "	24	5	2.66	0.55
0.5% "	10	3	1.21	0.36
1.0% "	16	5	2.20	0.69

* Most dwarf mutants were lethal.

Table 3. M_5 "macromutant-lines and their seed protein content

	Total No.	Range of protein %	Compared with controls +	-
Controls	6	27.6-28.8	0	0
Changed leaf morphology (unfoliate, lancet leaf, etc.)	10	26.5-32.7	4	5
Changed plant height (dwarfs, giants)	15	31.7-25.3	3	8
Changed flower colour (pink or white without black stigma)	3	30.9-26.3	1	2
Changed leaf pigmentation	5	26.9-24.8	0	5
Changes in flowering and maturity time (early, late)	9	30.6-26.2	1	4
Non-shattering pods	8	31.2-25.8	3	5
Determinate growth	4	30.6-26.6	2	2

deviations. It was found that the doses should be higher than previously recommended. 50% survival in M_1 would be indicative of a most effective dose. This would correspond to about 50% growth reduction of the seedling epicotyl.

(Contributed by H. Brunner, IAEA Laboratory, Seibersdorf, Austria).

FORUM

In the last issue we suggested to our readers to utilize the Newsletter as a "Forum" for calling attention to controversial issues and for providing factual information to bring us closer towards solutions of problems. We had proposed topics and invited our readers to comment by referring to experimental observations, unpublished results, or literature references. We have received a number of replies, including also suggestions for additional topics, however, we would like to have more response from our readers with practical experience in plant mutations before going into the first review of comments. Therefore, please look again at the questions raised in MBNL No. 13 page 23. Let us have your opinion, let others share your experience.

A. Micke

Mutant Germplasm

It is encouraging to see that induced mutants are more and more used in cross breeding. Often the mutants are named and released as varieties before they are used in crosses, and it is not difficult to follow-up the results of such crosses. However, in many cases, mutants are used in crosses before they are released and named. Other mutants may never be released as varieties but are incorporated in cross breeding programmes because of some specific, valuable characteristics (e.g., the barley mutant No. 1508 from Risö). To be able to identify germ plasm derived from mutation induction one would have to know the stock number, nursery number or CI number. Therefore, we request those of our readers who have released mutant varieties to give us also the pre-release identification number of their mutant varieties. Furthermore, we would be willing to supplement our "Mutant Variety File" by a "Mutant Germ Plasm File", in which we would incorporate all induced mutants of crop plants that have been used successfully in cross breeding, although they themselves were not successful enough to be released as varieties.

A. Micke

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
Avena sativa			
Bates (C.I. 9211)	1977 USA D. Sechler, J.M. Poehlman Missouri Agricultural Experiment Station Columbia	Cross Pettis x Florida 500 (from Florad x Coker 58-7)	two days later than Pettis, 10 cm shorter, 7% less lodging, 445 kg/ha higher yield. More resistant to BYDV, crown rust, smut.
Bob (C.I. 9261)	1977 USA F.C. Collins, J.P. Jones Arkansas Agr. Exp. Station Fayetteville	Cross Nora x Florida 501 (from Florad x Coker 58-7)	higher yield than either parent, heavier test weight, better crown rust resistance, 5-7 cm shorter, higher protein level. Intermediate regarding winter-hardiness and maturity.
Hordeum vulgare			
Markeli 5	1976 Bulgaria T. Stephanov, Ch. Gorastev N. Mersinkov, N. Lazarov St. Navustanov Inst. of Barley Karnobat	40 kR gamma rays 1967 [Beta ketsoras]	6-8 days earlier heading, higher productivity, large and uniform sized grain, better brewing properties.

Spartan	1977 CSSR F. Minařík, K. Domkář VŠÚO Kroměříž Plant Breeding Station Hrubčice	Diamant x ((Valtický x Monte Christo) x Ekonom)	shorter straw, altered vegetation rhythm, high yield, top malting quality (1979 250 000 ha = 35% of barley acreage).
Safir	1978 CSSR F. Minařík, K. Domkář VŠÚO Kroměříž Plant Breeding Station Hrubčice	Cross ((Valtický x Kneifel) x Diamant) x Arabische G	shorter straw, altered vegetation rhythm, good tolerance to drought, high yield, top malting quality. (1979 45 000 ha = 15% of barley acreage).
Triticum aestivum			
Odesskaja 75	1975 USSR S.F. Lyfenko, N.I. Erinyak V.P.Fedchenko, A.A. Sozinov A.M. Heifets All-Union Institute for Breeding and Genetics Odessa	Cross Karlik 1 (NMH induced) x Odesskaia 51	semidwarf type, lodging resistance, high productivity.
Odesskaia Polukarlikovaja	1975 USSR S.F. Lyfenko, N.I. Erinyak V.P. Fedchenko, A.A. Sozinov A.M. Heifets All-Union Institute for Breeding and Genetics Odessa	Cross Karlik 1 (NMH induced) x Odesskaia 51	semidwarf type, lodging resistance, high productivity.
Glycine max			
Cerag Nr. 1	1979 Algeria I. Nicolae, B. Ougouag F. Nicolae, T.F. Benabaad CERAG El-Harrach	30 kR gamma rays 1972 [B 107/10] (mutant selected in Romania 1974 by I. Nicolae)	early, resistant against spring cold, very productive, drought resistant, short plant type, white flowers, yellow seeds.

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
Alstroemeria			
Red Sunset	1979 The Netherlands M.C. van Staaveren Aalsmeer*	± 500 rad X-rays 1975 Actively growing rhizomes [seedling; unnamed]	improved flower colour. Extended duration of flowering period.
Bougainvillea			
Jayalakshmi variegata	1977 India V. Abraham, B.M. Desai Biol. and Agric. Div. Trombay Bombay	6.5 krad ^{60}Co γ-rays; chronic; potted cuttings 1973-1975 (cv. Jayalakshmi]	variegated leaves.
Chrysanthemum			
Bronze Clinspy	1978 The Netherlands Fa. L.A. Hoek 's-Gravenhage	X-rays; 1750 rad; rooted cuttings 1976	bronze flower colour
Yellow Clinspy	"	[Clinspy] (pale pink colour)	yellow " "
White Clinspy	"	"	white " "
Pink Clinspy	1978 The Netherlands Fa. L.A. Hoek 's-Gravenhage	"	pink flower colour
Bright Lameet	"	X-rays; 2500 rad; rooted cuttings 1976 [Lameet]	bright yellow flower colour without antho- cyanin pigment

Cream Clingo	1979 The Netherlands Fa. L.A. Hoek 's-Gravenhage	X-rays, 1750 rad; rooted cuttings 1977 [Clingo] (white colour)	cream flower colour
Yellow Clingo	"	"	yellow " "
Golden Clingo	"	"	dark yellow flower colour
Purnima	1978 India National Botanic Gardens Lucknow	γ-rays [Otome-Zakura]	white flower colour
Pitambar	"	γ-rays [Otome-Zakura]	yellow " "
Pitaka	"	γ-rays [Kansya]	yellow " "
Yellow Damusia	1977 The Netherlands* C.B.S.H., De Lier Lyraflor	1.75 kR X-rays; rooted cuttings 1975 [Damusia]	dark pink flower colour
White Damusia	"	"	white flower colour

<u>**Chrysanthemum (Cont'd)**</u>

Kraski oseni (Autumn colours)	1976 USSR Nikitskii Botanical Garden Yalta	Rooted cuttings, 0.5 krad γ-rays [Violet color]	Dull pink-crimson with bronze center
Yalta	"	"	Dark salmon inflorescence with golden reverse, tortoise shell
Dalekaya zoezda (Distant star)	"	"	Crimson-violet inflorescence with silvery reverse

* In cooperation with the Association Euratom-ITAL, Wageningen.

Name of new variety	Date and place 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
Privet Frantsii (Welcome to France)	"	Rooted cuttings, 0.5 krad γ-rays [Excellence]	Dull red inflorescence with cherry tinge, bronze reverse
Mirazh (Mirage)	"	Rotted cuttings, 0.5 krad γ-rays [lilac-pink cv.]	Spidery inflorescence with tubular flowers, light lilac
Tsezii (Cesium)	"	Rooted cuttings, 0.6 krad γ-rays [Charodeika]	Dull crimson inflorescence with gray tubes
Orion	"	"	White inflorescence with lilac streaks
Sputnik (Satellite)	"	"	White inflorescence with cream center
Saturn	"	"	Dark crimson inflorescence with bronze casts, flowers ligulate and long-bladed
Radii	"	Rooted cuttings, 0.75 krad γ- rays. [Springdawn at Suti dam]	Pale yellow inflorescence with rose tubes.
Selena	"	Rooted cuttings, 1.75 krad γ- rays. [Springdawn at Suti dam]	Yellow inflorescence.
Sointse (Sun)	"	Rooted cuttings, 0.7 krad γ- rays [Modnitsa]	Yellow inflorescence

Yupiter (Jupiter)	"	Rooted cuttings, 0.5-1 krad γ-rays [Privet zime]	Cream-yellow inflorescence
Merkurii (Mercury)	"	"	Lilac-violet inflorescence
Miechnyi put (Milky way)	"	"	White inflorescence
Mars	"	"	Orange inflorescence
Plutonii	"	"	Pale pink inflorescence
<u>Dahlia</u>			
Pride of Sindri	1978 India Fertilizer Promotion and Agric. Research Centre, Sindri, Dhanbad, Bihar	Tubers, 2-3 krad γ- rays, 1972-73 [Kenya]	Plant 82 cm tall; stem light green colour devoid of pink pigmentation as that of parent; leaf lighter shade than parent; flower prim rose yellow colour, more compact than parent, 35 cm diameter, flowers more freely.
Bichitra	"	"	Plant 75 cm tall; stem light green colour; leaf lighter shade; flower mimosa-yellow, reddish tinge develops witt age; petals (ray floret) narrow and arrangement compact.
Jyoti	"	"	Plant 83 cm tall; mallow purple flowers of good form and habit.

Name of new variety	Date and place 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
Twilight	"	"	Plant 80 cm tall; bloom 35 cm diameter; a purplish red flowering mutant.
Jubilee	"	"	Plant 75 cm tall; bloom 35 cm diameter; orange yellow flower colour with occasional pink stripes.
Netaji	"	[Eagle Stone]	Plant 50 cm tall; colour of bloom light prim rose yellow; attractive bloom.
Pearl	"	"	Plant 50 cm tall; bloom 15 cm diameter; bloom pearl white colour.
Black Beauty	1978 India Fertilizer Promotion and Agric. Res. Centre, Sindri, Dhanbad, Bihar	[Black Out]	Plant 47 cm; bloom darkest crimson colour with neyron rose stripes, size of bloom like that of parent, very attractive
Vivekananda	"	[Croydon Master]	Plant 1.2 m tall; bloom 28 cm diameter, spirea red colour; ray florets are divided at the tips
Happiness	"	[Croydon Monarch]	Plant 40 cm tall; bloom sa same size as that of parent deep ruby red colour
Jayaprakash	"	[Croydon Apricot]	Plant 45 cm tall; bloom 25 cm, phlox pink in colour, compact form and attractive

<u>Malus</u>			
Dovar	1978 The Netherlands Institute of Horticultural Plant Breeding, Wageningen*	Scions, 3-3.5 krad X-rays 1969-70 [John Downie]	Variegated leaves
<u>Polyanthes</u> <u>tuberosa</u> L.			
Rajat Rekha	1973-1975 India National Botanic Gardens Lucknow.	γ- rays [single flowered cv.]	Leaves with silvery white streaks
Swarna Rekha	1973-1975 India National Botanic Gardens Lucknow.	γ- rays [double flowered cv.]	Leaves with golden yellow streaks.
<u>Portulaca</u>			
Jhumka	1973 India National Botanic Gardens, Lucknow.	1 kR γ- rays [Karna Pali]	Flowers about 2.5 cm in diameter with nearly 48 dissected obtuse-tipped petals per flower.
Karna Pali	"	?	Flowers about 3 cm in diameter with about 47 acutely tipped dissected petals per flower.
Lalita	"	[Vibhuti]	Flowers incurving, about 2.5 cm in diameter, with about 55 petals.
Mukta	"	?	Flowers about 2 cm in diameter and almost round, each having about 43 incurved petals with white tips.

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

Name of new variety	Date and place 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
Ratnam	"	?	A profusely blooming type with 4.5 cm wide, single, cross-fertile flowers having only 5-8 petals.
Vibhuti	"	?	Incurved flowers, about 3 cm in diameter with nearly 50 petals having 5 mm wide white margin in summer only. Occasional branch on mutants producing normal double flowers needs to be removed.
Rhododendron			
Aleida	1978 The Netherlands Dr. Ir. J. Heyting. Research Station for Arboriculture Boskoop.*	1500 rad X-rays; plants; 1967 [Vuyck's Scarlet]	Bright-orange flower colour; flower diameter 6-7.5 cm.
Rosa			
Milena	1964 ČSSR L. Večeřa	seeds treated with γ-rays? [Elizabeth-Rose]	a warmer pink colour than the parent cultivar
September Wedding	1964 Canada J. Schloen	a sport through radiation [Montezuma]	flowers deep pink, reverse darker

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Angara	1973-1975 India National Botanic Gardens Lucknow.	[Montezuma]	Very vigorous, compact and profuse blooming; darker reddish orange in colour. Slightly more fragrant than the parent
Madhosh	1975 India Indian Agric. Res. Inst. New Delhi	0.25% EMS treatment of budwood [Gulzar]	Petals have mauve coloured stripes contrasting with the deep red base.
<u>Streptocarpus</u>			
Neptun rosa	1978 FRG Gerhard Fleischle, Vaihingen/E. - Ensingen*	3 krad X-rays (1975) [Neptun]	Pink flower colour; other characteristics unchanged
Juwel	"	3 krad X-rays (1975) [Laura]	White flower colour. Relatively small leaves and short flower stalks
Gloria rot	"	3 krad X-rays (1975) [Gloria rosa]	Red flower colour; other characteristics unchanged
Burgund	"	3 krad X-rays (1975) [Juwel]	Flower colour; rather compact statue of the plant
Rosalinda	"	"	Pink flower colour
Weisse Glocke	"	3 krad X-rays (1975) [Helle Glocke]	White flower colour; rather compact growth habit

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FUTURE EVENTS

1979

FAO/IAEA Regional Training Course on the Use of Induced Mutations in Plant Breeding, Jakarta, Indonesia, 8 October - 16 November.

1980

2nd EUCARPIA/OILB (= IOBC) Meeting of Working Group for Resistance to Insects and Mites, Kent, U.K. Contact: J.H. Parker, East Malling Res. Stat., Maidstone, Kent ME19 6BJ, U.K.

EUCARPIA General Congress "Genetic resources and the problem of breeding for resistance", Leningrad, USSR, May

10th International Cereal Chemistry Congress, Vienna, Austria, 7 - 9 May. Contact: Int. Association for Cereal Chemistry, Schmidgasse 3-7, A-2320 Schwechat, Austria.

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

FAO/IAEA Training Course on Applied Mutagenesis in Plants, Seibersdorf, Austria, May - June.

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

1981

4th Bi-annual Plant Resistance to Insects Workshop, Pacific Groove, California, U.S.A., 19 - 22 February. Contact: A.C. Waiss, USDA Western Reg. Res. Centre, 800 Buchanan Street, Berkeley, Cal. 94710, U.S.A.

4th International Congress of SABRAO, Kuala Lumpur, Malaysia, April/May. Contact: MARDI, P.O. Box 202, Serdang, Selangor, Malaysia.

2nd Symposium on Seed Proteins in Plants, Gatersleben, GDR, 25 - 27 June. Contact: K. Müntz, Zentralinstitut für Genetik und Kulturpflanzenforschung, 4325 Gatersleben, GDR.

4th International Barley Genetics Symposium, Edinburgh, Scotland, U.K., 22 - 29 July. Contact: W. Campbell, Univ. of Edinburgh, 16 George Square, Edinburgh EH8 9LD, UK.

13th International Botanical Congress, Sydney, Australia, 21 - 28 August. Contact: W.J. Cramm, Univ. of Sydney, N.S.W. 2006.

FAO/IAEA International Symposium on Induced Mutations as a Tool for Further Crop Plant Improvement. Location and date not yet determined.

FAO/IAEA/SIDA Research Coordination Meeting on Induced Mutations for Disease Resistance in Crop Plants. Location and date not yet determined.

FAO/IAEA Research Coordination Meeting on Improvement of Vegetatively Propagated Plants and Tree Crops through Induced Mutations. Location and date not yet determined.

FAO/IAEA/SIDA Regional Training Course on the Use of Induced Mutations in Plant Breeding, Maracaibo, Venezuela. Date not yet determined.

NEW PUBLICATIONS

Seed Protein Improvement in Cereals and Grain Legumes
Proceedings of a Symposium
Neuherberg (FRG), 4-8 September 1979
2 Volumes US$ 95.- IAEA 1979 STI/PUB/496

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.

A. Micke
L. Shawa
L. Wahl

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International Atomic Energy Agency
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