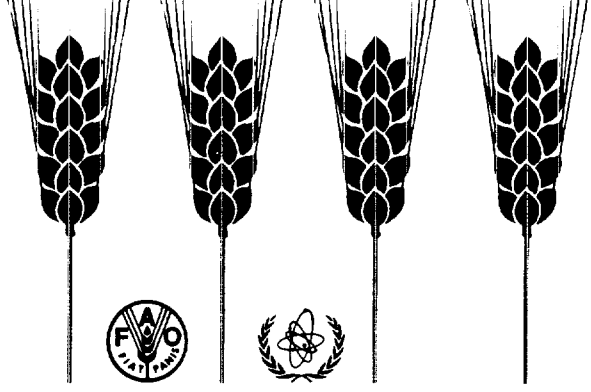

Mutation Breeding Newsletter

Joint FAO/IAEA Division of Atomic Energy in Food and Agriculture

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MESSAGE FROM THE EDITORS

With the present Issue No.5 the Mutation Breeding Newsletter goes into its third year of existence. We have received many favorable comments about its usefulness and hope therefore to continue this publication with the help of our readers.

The assistance desired would consist of the submission of "Research News" 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 or drawings 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
Margret Weiner

REPORT FROM THE PLANT BREEDING AND GENETICS SECTION

In Coordinated Research Programmes, main emphasis was placed during 1974 again on induced mutations for disease resistance and nuclear techniques for grain protein improvement. These programmes receive substantial financial support from two Member States of the IAEA, namely US$61,700 from the Federal Republic of Germany through the Gesellschaft für Strahlen- und Umweltforschung (GSF) for protein improvement, and US$36,500 from Sweden through the Swedish International Development Authority (SIDA) for disease resistance. These funds are utilized to support 24 research projects in developing countries. In addition, 21 research institutes in developed countries are cooperating in these programmes with little or no financial support from IAEA but contributing substantially from their own resources and expertise towards the aims of the programmes. The IAEA Laboratory at Seibersdorf contributes its analytical facilities and carries out a number of studies on mutagenesis and screening for protein improvement, likewise with extra-budgetary financial support

(from the Federal Republic of Germany and the USA). In 1974, the laboratory analyzed about 40000 wheat and 3000 rice samples. Our request for wheat mutants in the last issue of this Newsletter had a good response. Samples of several hundred mutant stocks have been received and will be analyzed in the near future. Anybody still having mutant stocks of wheat available which were not yet analyzed for their protein, is kindly invited to contact Dr. R. Rabson of the Plant Breeding and Genetics Section.

In June 1974, the Second Research Coordination Meeting on Improvement of Mutation Breeding Techniques was held in Vienna, and the seven participants in this programme discussed present achievements and plans for future research which will be carried out without financial support from IAEA.

In October 1974, the participants in the Coordinated Research Programme on Improvement for Vegetatively Propagated Crops and Tree Crops through Induced Mutations met for the first time at Tokai (Japan) to review the status of research in this field and outline future efforts. This programme now includes research projects on citrus, apple, cherry, peach, mulberry, banana, coconut, potato, apomictic grasses and various ornamental species such as Cryptomeria, Chrysanthemum, and Dahlia. In view of the economic importance of several vegetatively propagated plants and woody perennials for developing countries, further applications for research contracts from qualified institutes are being sought by IAEA.

As part of the seed protein improvement programme conducted by the Joint FAO/IAEA Division, a discussion was arranged in Vienna on 17 June 1974 to consider the utilization of aneuploids for seed protein improvement in wheat. Drs. Sears (USA), Driscoll (Australia), Bozzini (Italy), Röbbelen (FRG), Konzak (USA) and the staff of the Plant Breeding and Genetics Section participated. The discussions revealed that in recently published reports there is good evidence to show an association of protein and quality characters with specific chromosomes or chromosomal arms and further studies on endosperm proteins from aneuploids can provide very useful information necessary for genetic manipulation of the quality and quantity of seed proteins in wheat. The group felt that the amount of work involved is beyond the capacity and resources of any single laboratory and the progress in this field can be expedited by an international cooperative research effort. As a first step, we are compiling a list of wheat aneuploids developed and maintained at different laboratories. Over 80 wheat aneuploid workers have been approached for a list of aneuploid stocks developed or maintained by them. We have also asked for their comments on the desirability of an international cooperative research programme. Most of the comments were positive. Anyone interested in this type of work may contact the Plant Breeding and Genetics Section.

In September/October 1974 a six-week FAO/IAEA Inter-regional Training Course on Plant Breeding for Disease Resistance including the Utilization of Induced Mutation Techniques was held at the CNEN Centre Casaccia (Italy). The course was sponsored primarily by SIDA and the Italian Government. Participants came from 15 countries, 6 being plant pathologists, the others plant breeders. Fourteen scientists from Italy and 10 from abroad kindly made available their expertise as teaching staff for the course. Prof. A. Bozzini of Casaccia and Ing. E. Favret of Argentina -- presently working at Grünbach, FRG -- guided the course. Because of the success of the course, a sentiment voiced by all participants, it is hoped that funds can be obtained to provide similar training opportunities in the future.

As the terms of reference for the Joint FAO/IAEA Division do not restrict its plant breeding programme to the use of induced mutations but include other nuclear techniques as well, a survey was started during 1974 on the utilization of tracer techniques in connection with plant breeding. The response to this survey -- although not overwhelming -- gave so much evidence for useful applic-

ation that we felt it was justified to convene, in December 1974, a panel of experts in Vienna to discuss this matter further and advise FAO and IAEA on further action. The participants were Drs. Antoszewski (Poland), Cooper (UK), Denic (Yugoslavia), Dickinson (USA), Haahr (Denmark), Hänsel (Austria), Keys (UK), Lupton (UK), Mendgen (FRG), Niemann (FRG), Stoy (Sweden), Zagaja (Poland) and staff of FAO and IAEA. A report of this meeting will be compiled shortly.

The staff of the Plant Breeding and Genetics Section is presently as follows:

Section Head:	Dr. Alexander Micke (FRG) since 1969
Section Staff:	Dr. Robert Rabson (USA) since 1973
	Dr. C.R. Bhatia (India) since 1974
Laboratory Staff:	Dr. Gunnar Jansson (Sweden) since 1971
	Dr. Helmut Brunner (Austria) since 1961

Dr. Knut Mikaelsen (Norway), who worked at the Seibersdorf Laboratory since 1965, accepted an assignment as Project Manager for the UNDP Project on Development of Agricultural Education, Research and Production through the Application of Nuclear Techniques in Brazil (Piracicaba). We expect as his successor Dr. Thorsten Hermelin from Uppsala, Sweden. Dr. S.C. Hsieh (Taiwan), who joined the Plant Breeding and Genetics Section in 1970, returned to his home country, taking up duties as Professor for Plant Breeding at the Chung-Hsing University in Taichung.

Prof. Calvin F. Konzak from Washington State University, Pullman, Wash. (USA), assisted the Plant Breeding and Genetics Section during his Sabbatical year 1973-1974. He was mainly concerned with computerized storage and retrieval of germ plasm data and the possible utilization of wheat aneuploids for endosperm protein improvement, but his advice was very valuable in every other programme of the Section as well.

Recovery from ethyl-methanesulfonate induced genetical injury in barley

Storage at 30 percent seed water content of ethyl methanesulfonate (EMS) treated barley seeds resulted in a recovery from EMS induced genetical injury. The criteria used for expressing the "storage" recovery were M_1 germination, M_1 seedling height reduction, M_1 sterility and percent of M_2 chlorophyll mutants.

1. At low storage temperature the recovery from EMS induced genetical injury was either inhibited (0°C) or retarded (10°C, 15°C) as compared to recovery at 20°C and 25°C storage temperature.

2. Hypoxic conditions attained by argon or nitrogen atmosphere during seed storage as well as sodium azide applied before the storage, did not inhibit the "storage" recovery from EMS induced injury.

3. Caffeine post treatment considerably potentiated the EMS induced M_1 germination and seedling height reduction but had no influence on M_1 sterility, percent of M_2 chlorophyll mutants, and on the "storage" recovery from EMS induced genetical injury.

(Contributed by T. Gichner, J. Velemínský, Institute of Experimental Botany, Prague 6, Czechoslovakia).

A high-yielding, short-strawed mutant in barley

A mutation breeding programme on the improvement of the lodging resistance of barley was previously outlined (1). Several mutants with alterations in straw characteristics, short basal internodes, short straw and increased stem diameter were selected. Especially one short-strawed mutant seems to be very promising and will be tested in official Danish yield trials from 1975.

This mutant, Risø mutant No.9265, was induced by partly moderated fission neutrons in the Danish spring barley variety Abed Bomi. In 1973 and 1974 the grain yield of No.9265 was 14 and 6 percent, respectively, higher than that of Bomi. As the mutant is about 30 cm shorter than the mother variety, its high grain yield is rather exceptional; all other short-strawed mutants selected by us have shown a decreased grain yield. A study of the straw characteristics has shown that the mutant has a peduncle length and a flag leaf area similar or even greater than that of the mother variety. This may be one explanation of the very good yield potential of the mutant.

The genetics and the morphological/physiological characteristics of the mutant will be studied in further investigations.

(1) V. HAAHR and D. VON WETTSTEIN, 1973. Mutation breeding for improved straw characteristics of barley. Mutation Breeding Newsletter No.2, February 1973.

(Contributed by V. Haahr and D. von Wettstein, Agricultural Research Department, Danish Atomic Energy Commission, Research Establishment Risø, Roskilde, Denmark, and Institute of Genetics, University of Copenhagen, Copenhagen K, Denmark).

Chromatin structure in interphase of the shoot apex during germination of barley seeds*

After de-husking over the embryo region to facilitate rapid and uniform germination, seeds of Fuji 2-jyo barley were allowed to germinate on moist filter paper in petri dishes. Every two hours after the initiation of seed soaking the embryos were excised from germinating seeds. These embryos were treated for 2 hours with ^{3}H-thymidine. No interphase cells incorporating ^{3}H-thymidine were observed before 12 h soaking. The labelled cells began to appear in 14 h soaked seeds. The frequencies of the nuclei in which chromatin was dispersive increased at 8-10h soaking and the period of chromosomal DNA replication. These results have led to a general attitude that cells in the shoot apex of dormant seeds stay in G_1 stage, and that a conformational change of the chromatin has to occur to allow the replication of chromosomal DNA.

* reported to Radioisotopes 23:406-408 (1974)

(Contributed by H. Yamaguchi, Laboratory of Radiation Genetics, Faculty of Agriculture, University of Tokyo, Tokyo 113, Japan).

"Radiation", a new mutant naked barley by thermal neutrons

"Radiation" is the first mutant variety of naked barley which will be released in Korea. The new variety is characterized by early maturity, short culm, stabilized high yield and having an increased number of spikes. Additionally, it has shown favorable response to heavy fertilizer application.

In 1967, seeds of Bangju were exposed to thermal neutrons for 40 hours with flux 6.25×10^{7} th/cm^2/sec. The mutant lines Radiation No.6 and No.7 were selected in the M_3 generation, and Radiation No.12 in the M_4 generation, respectively. These three lines were evaluated for three years (1971-1973) in preliminary yield tests at Kwangju, Chunlanam-Do, Provincial Rural Development Office.

Among the lines tested, Radiation No.6 demonstrated promising results as a new variety, after yield trials at 15 locations under different paddy and upland conditions (1972-1973). During 1973, Radiation No.6 was grown in demonstration fields for farmers at 14 locations in Chunlanam-Do. The Ministry of Agriculture and Fishery of the Korean Government registered the mutant line under the name of "Radiation" as a recommended naked barley variety on 13 September 1974. The new mutant variety will be released to a 5,000 ha area of Southern Korea during 1976.

(Contributed by Y.S. Kim, K.Y. Park, D.K. Lee and I.H. Kim, Office of Rural Development, Suweon, Korea).

Release of "Fuji 2-jyo II", a mutant with straw stiffness in barley

Fuji 2-jyo, derived from a cross of Plumage-Archer and Nirasaki Wase No.1, has been cultivated widely as a good malting barley in Japan, because its malting and brewing qualities are excellent. However, its resistance to lodging is not sufficient due to the supple culm.

After combined treatment (1 mM 5-bromodeoxyuridine for 1 h + 1 kR gamma rays) of 15 h soaked seeds, of which the embryonic shoot apical meristem cells were at early S period, a mutant obtained was found to be resistant to lodging. Treatment and selection of the mutant were carried out at the Laboratory of Radiation Genetics, Faculty of Agriculture, University of Tokyo, and Kirin

Brewery Co. Ltd., respectively. The high resistance to lodging is attributable to straw stiffness. It shows about 20 percent thicker culm walls, and hass somewhat more vascular bundles than the parent variety. Grain yield and quality are almost identical to the original variety. Therefore,Kirin Brewery Co.Ltd. has decided to release it under the name of Fuji 2-jyo II.

(Contributed by H. Yamaguchi, Laboratory of Radiation Genetics, Faculty of Agriculture, University of Tokyo, Tokyo 113, Japan).

Useful mutations obtained in rice

From a three-year mutation breeding programme involving the three varieties IR8, Jhona 349 and Basmati 370, widely grown in Haryana (India), 40 promising mutants showing improvement over the initial lines have been obtained. Mutagens used were gamma rays, ethyl methane sulfonate and diethyl sulfate, singly and in sequences. These mutants include 17 early maturing lines of IR8 (maturing 10-29 days earlier), of which as many as 16 show finer grains as well (grain length/breadth in mutants being 2.98 to 3.57 as compared to 2.90 in IR8). Improving the unacceptable coarse grains in the otherwise excellent plant type of IR8 should result in more acreage to this high yielding variety.

The selected lines of Jhona -- an easily lodging variety -- include dwarf and stiff-culmed plant types showing resistance to lodging. Basmati mutants with much higher yield (in one mutant showing 200 percent increase in yield) need yield trials on a larger scale.

The mutant lines are being re-checked in M_4 for improved characters and detrimental pleiotropic attributes, if any.

(Contributed by A.K. Bhan and M.L.H. Kaul, Department of Botany, Kurukshetra University, Kurukshetra 132119, India).

Useful rice mutants in Europe

Mutant No.10 induced by R. Marie and A. Tinarelli in the Italian rice variety "Maratelli" under a French/Italian cooperation project which started in 1971, is expected to be included in the official catalogue of plant varieties in Italy under the name "Fulgente". The mutant was chosen because of its high productive and commercial qualities. It is one of several mutants which showed good performance in the international rice blast nursery at Los Baños (Philippines).

The mutant variety "Delta", induced in 1961 by R. Marie through gamma ray treatment of "Cesariot" and released in France in 1970, accounted for more than half of the area under rice in France in 1974. The variety is famous for its very long grains combined with good yielding ability, and is most suitable for the European Common Market.

(Contributed by R.A. Marie, INRA, Plant Breeding Station, Montpellier, France).

Induction of chromosomal male sterile mutants in bread wheat

Three putative male sterility mutants have been isolated in the past year. Two of these involve chromosome 4A and one involves chromosome 5D. These were isolated from 127 F_1 plants derived from monosomic 4A, 4B, 5A or 5D gamma-irradiated euploid pollen (gamma rays, 250 R or 500 R). A

further five male sterile F_1's of this group showed a marked departure from normal vigor. By comparison, ten steriles were obtained from the cross euploid x irradiated euploid pollen (gamma rays, 250 R); nine of these showed a marked departure from normal vigor and the tenth was probably female sterile as it had been scored as shedding normal pollen. The above data illustrates the efficiency of this technique for selecting recessive mutants in the F_1 generation. Further data of this type is being obtained. The three male sterility mutants were maintained by pollination with euploid pollen and offspring with 21 pairs of chromosomes (or 19" + 1iv) have been obtained in each case. These heterozygotes are to be selfed and crossed to tester stocks.

(Contributed by C.J. Driscoll, School of Botany, University of New South Wales, Kensington, N.S.W., Australia).

Mutants with high crude protein content in pea

One hundred and thirty mutants of pea selected according to their morphological characters have been analyzed for crude protein content in grain. Fifty mutants with high protein content have been identified on the basis of analyses for two years. Most mutants exceed the initial variety in protein content by 5–15% (crude protein content in initial variety was taken as 100), while some mutants exceed the initial variety by 16–27%. Mutants with compact stem and mutants with large pods belong to this group.

Mutants with high protein obtained from variety Ramonsky 77 are the most desirable since this is a highly productive, widely cultivated variety, but is low in grain protein content. Mutants produced in this variety exceed the parent by 5–28% in crude protein content.

There was no correlation between the mutant phenotype and the level of crude protein in grain.

(Contributed by K.K. Sidorova, Institute of Cytology and Genetics, U.S.S.R. Academy of Science, Novosibirsk, Siberia, U.S.S.R.).

Radiosensitivity of grain legume species

Improved production of grain legumes could substantially contribute to better nutrition of man, particularly in developing countries. As induced mutations have a potential for providing genetic variability for crop improvement, a series of tests were carried out to determine the optimal dose range for mutagens. Seeds of the following legume species were used in this test: Vicia faba minor and major, Pisum sativum, Lens esculenta, Lupinus albus, Phaseolus vulgaris, Glycine max, Phaseolus lunatus, Cicer arietinum, Phaseolus aureus, Vigna sinensis and Cajanus cajan.

Resting seeds of these species were equilibrated over 60% glycerol to 12–14% moisture content and exposed to ^{60}Co gamma radiation and to fast neutrons derived from the Standard Neutron Irradiation Facility (SNIF) of the ASTRA swimming-pool type reactor (depleted fission spectrum). An attempt was made to relate early observable M_1 criteria to survival, fertility and mutation frequency. The following early observable M_1 effects were determined:

1. Measurements of total shoot length 15–30 days after germination
2. Measurements of epicotyl and/or hypocotyl length
3. Measurements of the length of one of the primary leaves.

Seeds were planted in a greenhouse on a wet peat/sand (1:3) medium in four replications. Growth was measured in % of non-treated control. For the species with epicotylous type of germination (e.g. Phaseolus vulgaris, etc.), epicotyl length seems to be the most sensitive criterion for radiation damages, followed by total shoot height. The length of the primary leaf is rather insensitive to radiation. For species with hypocotylous type of germination (e.g. Vicia faba), total shoot height was the most useful criterion. A counting of leaf spots does not seem to be practical for measuring mutagen response. Tests on the third to sixth leaf have shown the expected dose response only in some species and only in the lower dose ranges.

Adapted species were grown in fields at Seibersdorf, Lower Austria. Tropical species, i.e. Phaseolus aureus, Vigna sinensis and Cajanus cajan, were transplanted to greenhouses. Survival rate at harvest, fertility per plant (i.e. No.of pods/plant and No.of seeds/pod) was determined. Chlorophyll and morphological deviants in M_2 were screened in Vicia and Pisum. Orthogonal regression analyses were used to correlate early observable M_1 criteria with survival, fertility and mutation frequency.

Relative shoot and/or epicotyl length was in all species significantly positively correlated with survival and negatively with sterility. Shoot or epicotyl reduction of 20-35% in M_1 plants is considered indicative for an efficient dose range useful for breeding; it has to be stressed, however, that the use of higher mutagen doses would be restricted by the increasing sterility. The table shows results obtained so far on radiosensitivity of grain legume species.

SPECIES/VARIETY	Doses causing 50% shoot height reduction		Estimated useful dose range for breeding	
	N_f(Rad)	gamma (Kr)	N_f(Rad)	gamma (Kr)
Vicia faba major	150	4.5	50-100	2-4
Vicia faba minor				
Kornberger	340	10.0	150-250	5-7
Pisum sativum				
Kelvedon	830	10.8	350-500	4-6
Rheinländerin	1080	13.0	400-600	5-8
Lens esculenta				
RY-04	1050	18.0	600-900	10-14
SZ-311	1330	21.0	700-1000	13-17
Lupinus albus	2500	40.0	1000-1500	15-25
Phaseolus vulgaris (Navy pea bean)				
Seafarer	2100	13.0	800-1200	5-8
Phaseolus vulgaris				
Saxa	1380	14.0	500-800	6-9
Glycine max.				
Merit	4000	20.0	1500-2500	12-16
B_2-4	2300	18.0	1000-1500	14-18
Phaseolus lunatus				
Baby potato bush	2650	13.7	1000-1700	6-10
TPI-1 giant	1680	8.5	500-900	3-6
Cicer arietinum				
JAM 12-071	4800	22.5	2000-3000	13-17
Vigna sinensis				
NRZ	3400	32.5	1500-2500	10-25
Phaseolus aureus				
TVAU 31	6900	68.0	3000-4500	30-45
Cajanus cajan				
CME	3200	17.0	1500-2000	8-12

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

Modifying effect of indole acetic acid on the frequency of X-rays and EMS-induced mutations in Acer negundo

The plant hormone indole acetic acid (auxin) has different modifying effects on radiation (X-rays) induced and chemically (EMS) induced mutagenesis when used in pre-irradiation and post-irradiation treatments of Acer negundo L. seeds. The maximum modifying effect on somatic mutagenesis was found in the case of pre-irradiation treatment of seeds with 1% indole acetic acid, whereby the frequency of chlorophyll and morphological mutations in leaves rose from $7.5\pm1.1\%$ to $18.0\pm2\%$. Post-irradiation treatment of seeds with indole acetic acid (1.0%) increased the frequency only of chlorophyll mutations from $7.5\pm1.1\%$ to $12.4\pm1.4\%$ but did not affect the frequency of mutations in leaf shape. Treatment of seeds with a weak concentration of indole acetic acid (0.01%) reduced the frequency of induced mutations in leaf shape from $7.5\pm1.1\%$ to $1.0\pm0.4\%$ and hardly affected the frequency of chlorophyll mutations at all.

The modifying effect of indole acetic acid with EMS differs greatly from its effect with X-irradiation. Pre-treatment of the seeds with indole acetic acid in various concentrations combined with EMS had no effect on the frequency of chlorophyll mutations, but substantially increased the frequency of leaf shape mutations from $5.7\pm1.2\%$ to $13.4\pm2.1\%$. A more marked and differently directed effect on the frequency of mutations of the two groups studied was obtained by treating the seeds with indole acetic acid after EMS had been used. A high concentration (1.0%) stepped up the chlorophyll mutation frequency considerably from $12.5\pm1.8\%$ to $22.0\pm2.5\%$ but reduced the number of leaf shape mutations from $5.7\pm1.2\%$ to $2.0\pm0.8\%$. As a result of post-treatment of the seeds with indole acetic acid (0.1%), the frequency of leaf shape mutations dropped to zero. It may be assumed that the difference in the modifying influence of the same plant hormone on the frequency of induced mutations affecting different characteristics of the phenotype, is associated with its unequal effect on processes of replication and transcription of the corresponding genetic loci.

(Contributed by C.F. Privalov, Institute of Cytology and Genetics, U.S.S.R. Academy of Sciences, Siberian Branch, Novosibirsk, U.S.S.R.).

Production of solid mutants in citrus, utilizing new approaches and techniques

Conditions for embryoid differentiation in Shamouti orange ovular callus were studied. Lines differing in embryogenic capacity were established. Age of callus has an important effect on embryoid formation. A pronounced habituation effect has been found in many cultures. Transferring embryoids into agar + sucrose and GA_3 and a further transfer after 10 days into agar + sucrose, GA_3 and adenine has given best results as to rooting and survival of plants.

Protoplasts have been obtained from callus after treatment with cellolytic enzymes (by Aliza Vardi of the Division of Fruit Tree Breeding and Genetics in collaboration with the authors and Prof. Galun of the Weizmann Institute of Science). Effect of irradiation on protoplasts is under study.

So far, only callus was obtained by culturing lemon ovules and nucelli in vitro. The technique of using decapitated nucellar seedlings for mutagenic treatment has been further developed, also with other varieties than Shamouti (Valencia and Marsh Seedless). Irradiation 48 hrs after decapitation with 2 kR and in many cases 4 kR, gave rise to new shoots and subsequently plants, from callus. Irradiation with 6 kR and in some cases 4 kR, significantly reduced the number of plants regenerating new shoots in comparison to control.

Shamouti MV_2 plants, originating from irradiated budwood, have fruited. There is a tendency for earlier maturity and more color in some plants obtained from buds of budwood irradiated with 4 kR and especially 8 kR. A larger percentage of mutations seems to be obtained in citrus vegetative material when irradiated by the near lethal doses of 7.5-8 kR.

(Contributed by P. Spiegel-Roy and J. Kochba, Division of Fruit Tree Breeding and Genetics, Agricultural Research Organization, Bet Dagan, Israel).

High lysine mutants of sorghum

High-lysine mutants of sorghum, Sorghum bicolor (L.) Moench, have been identified from mutagenized populations of two colorless pericarp vitreous endosperm lines. The mutagenic agent was diethyl sulfate.

The initial selection process was a visible one where seeds were selected for the opaque character using a light box. M_3 seeds from 23,000 M_2 heads were screened; some 500 putative opaque mutants were selected in this way. Seeds of the two classes (opaque and vitreous) segregating on heads were analyzed for protein and lysine content. Of these, several opaque types with increased lysine content were identified. Some had serious physiological abnormalities or other defects while others appeared normal. The most interesting mutant (P-721) has plump kernels with an average protein and lysine level of 17.5% and 2.8 g lysine/100g protein, respectively. The parental line averaged 15.4% protein and 1.7 g lysine/100 g protein. These findings could well be important in providing good germ plasm for upgrading the protein of sorghum through breeding.

(According to a report by D.P. Mohan and J.D. Axtell, Agronomy Department, Purdue University, Lafayette, Ind., USA, presented in November 1974 at a meeting of the Crop Science Society of America held in Chicago, Ill., USA).

Improved screening procedures for protein mutants

Out of the work on the improvement of analytical procedures for the FAO/IAEA/GSF Seed Protein Improvement Programme have come two promising advances for rapidly screening grain for protein improvement. At the IAEA Seibersdorf Laboratory, the conventional dye-binding procedure has been modified to increase the daily through-put. By the use of a special shaking device the need for the grinding of the grain is eliminated, thus reducing the time of analysis. Furthermore, the use of specially designed manifolds for sample handling expedites the analyses. The routine analysis of 800 wheat samples daily has been achieved.

At the Institute of Biophysics located at the University of Hanover, FRG, a new specific method has been designed for directly measuring lysine in seeds. The method does not require hydrolysis and takes advantage of a specific complexing reaction between lysine residues in protein and a dansyl reagent. The complex formed fluoresces and the intensity of fluorescence gives an accurate estimate of the amount of lysine in the protein. The equipment for performing the analysis is being simplified to reduce costs. Other modifications could well make this method a routine secondary screening procedure for the determination of lysine content.

(Contributed by R. Rabson, Plant Breeding and Genetics Section, Joint FAO/IAEA Division, IAEA, Vienna, Austria).

FUTURE EVENTS OF INTEREST

Third FAO/IAEA/GSF Research Coordination Meeting on Nuclear Techniques for Seed Protein Improvement (Hahnenklee, FRG, 5-9 May 1975).

Second International Winter Wheat Conference (Zagreb, Yugoslavia, 9-19 June 1975).

XIIth International Botanical Congress (Leningrad, USSR, 23-30 June 1975).

International Symposium on Current Topics in Plant Pathology (Budapest, Hungary, 24-27 June 1975).

Third International Barley Genetics Symposium (Munich, FRG, 8-12 July 1975).

XIIIth Pacific Science Congress (Vancouver, Canada, 18-30 August 1975).

VIIIth International Plant Protection Congress (Moscow, USSR, 21-27 August 1975).

Symposium on Advances in Mutation Breeding Techniques and Practical Achievements (Nicosia, Cyprus, or Vienna, Austria, 8-12 September 1975, tentatively).

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

RECENT PUBLICATIONS

Polyploidy and Induced Mutations in Plant Breeding (Proceedings of a Meeting jointly organized by FAO, IAEA and EUCARPIA, Bari, Italy, 1972). STI/PUB/359, IAEA, Vienna, 1974. US$18.--

Induced Mutations for Disease Resistance in Crop Plants (Report of an FAO/IAEA/SIDA Research Coordination Meeting, Novi Sad, Yugoslavia, 1973). STI/PUB/388, Vienna, 1974. US$10.--

LIST OF MUTANT 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]	Main improved attributes of variety
FLAX			
Redwood 65	Canada, 1965 E.N. Larter, University of Saskatchewan, Saskatoon, Sask.	X-rays (1951) [Redwood]	Higher oil content
BARLEY			
Radiation	Korea, 1974 Y.S. Kim, K.Y. Park, D.K. Lee, I.H. Kim, Office of Rural Development, Suweon	Thermal neutrons (1967) [Bangju]	Naked barley with earlier maturity, short culm, resistance to lodging, increased fertilizer response and stable high yield
Amei	Federal Rep.of Germany,1966 K. von Rosenstiel, Nordsaat Ges.m.b.H., Waterneverstorf	[Haisa I x (Imperial x x H 204)] x Svalöf erectoides 12 (X-ray mutant [Maja])	straw stiffness (withdrawn from the market in 1967 because of breakdown of mildew resistance)
Allasch	Federal Rep.of Germany,1963 K. von Rosenstiel, Nordssat Ges.m.b.H., Waterneverstorf	[Haisa I x (Imperial x x H 204)] x Svalöf erectoides 12 (X-ray mutant [Maja])	straw stiffness (withdrawn from the market in 1971 because of breakdown of mildew resistance)

Name of new variety	Place and date of release (or approval) and name of principal worker and institute	Kind and date of mutagenic treatment/ [Parent variety]	Main improved attributes of variety
		CORRECTIONS	
BARLEY			
Balder J	Finland, 1960 R. Manner, O.Pohjanheimo Dept.of Plant Breeding, Agric. Research Center, Jokivinen	soaked seeds 6 kR X-rays (1946) [Balder]	high yielding ability, resistance to drought and ear sprouting
STREPTOCARPUS			
Purple Nymph	Netherlands, 1969 C. Broertjes, Institute of Atomic Sciences in Agric., Wageningen	leaves, X-rays (1966) [Constant Nymph]	larger flower and more purple color, sturdier plant (rest of genotype unchanged)
SPINACH			
Früremona	p l e a s e d e l e t e		

NOTE: Readers are kindly requested to report to us any information about commercial mutant varieties including varieties which have induced mutants in their pedigree. Of particular interest is information about the commercial value of such varieties (acreage covered, amount of certified seeds produced, date of withdrawal from commercial production).

Experts and Consultants employed in connection with the programme of the Plant Breeding and Genetics Section during 1973/74

Name	Home Country	Duty Station
G. Ahnström	Sweden	Vienna, Austria
G. Ahnström	Sweden	Budapest, Hungary
S.G. Blixt	Sweden	Piracicaba, Brazil
L. Ehrenberg	Sweden	Zemun, Yugoslavia
S. Haq	Bangladesh	Rangoon, Burma
A. Kleinhofs	U.S.A.	Seibersdorf, Austria
C.F. Konzak	U.S.A.	Vienna, Austria
K. Mikaelsen	IAEA	Piracicaba, Brazil
K. Mikaelsen	IAEA	Jakarta, Indonesia
?. Rabson	U.S.A.	Vienna, Austria

Fellowship Training 1973/74

Name	Home Country	Training Station
A. Ando	Brazil	Casaccia, Italy
A. Ando	Brazil	Seibersdorf, Austria
M. Botula-Manyala	Zaïre	Zemun, Yugoslavia
O. Chita	Romania	Seibersdorf, Austria
G.A.K. Fernando	Sri Lanka	Bombay, India
K. Hendratno	Indonesia	Knoxville, Tenn., U.S.A.
G. Michalopoulos	Greece	Brookhaven, N.Y., U.S.A.
B. Skarka	C.S.S.R.	Paris, France
T. Stefanov	Bulgaria	Grünbach, F.R.G.
M. Thein	Burma	Pullman, Wash., U.S.A.
A. Tulman Neto	Brazil	Mayaguez, Puerto Rico

W A N T E D

Plant Breeding Expert for Nuclear Center Kinshasa, Zaïre. Assignment up to one year. Knowledge of French essential.

Plant Breeding Expert (wheat) for Nuclear Institute for Agricultura and Biology, Lyallpur, Pakistan. Duration: 3 missions of one month each.

Plant Breeding Expert (rice) for Atomic Energy Agricultural Research Centre Tandojam, Pakistan. Duration: 3 missions of one month each.

Plant Breeding Expert (grain legumes) for Pasar Jumat Research Centre, Pasar Jumat, Indonesia. Duration: several missions of a total of four months.

Plant Breeding Expert (sugarcane and other vegetatively propagated plants) for Educational Institute for Estate Crops, Yogjakarta, and Research Institute of Horticulture, Pasar Minggu, Indonesia. Duration: several missions of a total of four months.

Interested persons please contact the IAEA Experts Section, IAEA, Vienna, Austria.

SORRY...

FAO/IAEA Symposium on Advances in Mutation Breeding Techniques and Practical Achievements

After we had made the announcement in No.4 of the Mutation Breeding Newsletter about our plans to organize such a symposium in Nicosia, Cyprus, in April 1975, events on the island forced us to at least temporarily suspend those plans. Upon request of the Government of Cyprus, later on a new date for the symposium was set, namely 8 - 12 September 1975. For the event that circumstances would prevent our holding the symposium at that date in Cyprus, IAEA Headquarters in Vienna is being considered as an alternative meeting site.

Official invitations for nominating participants have not yet been sent to Member States but will be sent through the normal official channels as soon as the main uncertainties are cleared up.

For those who are interested in attending the symposium, we recommend to maintain contact with their relevant Government authorities and possibly also with IAEA for obtaining the nomination documents as soon as they are issued.

HELP -- WE ARE GETTING TOO BIG!

The demand for our Mutation Breeding Newsletter has been increasing from issue to issue so that it has now reached more than 400 copies. This figure includes, to a considerable extent, several copies being sent to different individuals at the same institute.

We hope you will understand that we will have to limit the number of copies sent to any one institute in order to keep the costs of the Newsletter at a reasonable level. We would very much appreciate it, therefore, if those who receive the Newsletter would share it with their colleagues either by placing it in the institute library, by circulation, or any other suitable means.

Thank you.

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Joint FAO/IAEA Division of Atomic Energy in Food and Agriculture
International Atomic Energy Agency
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