Mutational Reconstruction of Crop Ideotypes

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I. Introduction

The exploitation of heterosis in the form of commercial hybrids, the enhancement of the effects of additive gene action through synthetics and composites and the development of the concept of a plant type suited to good agronomy have all helped to raise the ceiling to yield in many crop plants to a level not considered possible before. Based on an understanding of the factors governing productivity it is now possible to construct conceptual models on "ideotypes" (Donald, 1968) of crop varieties, which if realised through breeding, would help to achieve still higher yields. The following are some of the desirable attributes of crop ideotypes, particularly in the tropics and subtropics where crop growth is possible throughout the year:

a) High productivity per day

b) High photosynthetic ability

c) Low photo-respiration

d) Photo- and thermo-insensitivity

e) High response to nutrients

f) High productivity per unit of water

g) Multiple resistance to pests

h) Better protein quantity and quality

i) Population performance

j) Crop canopies that can retain and fix a maximum of Co_2

It is these new selection criteria that have provided special scope for developing mutation breeding techniques very effectively in the development of crop varieties suited for present day needs (Swaminathan, 1968, 1969). As a result, several new crop varieties developed by mutation breeding have been released in recent years for commerdial cultivation in India (Table 1). The results of some recent research at the Indian Agricultural Research Institute on the practical realisation of desirable ideotypes through mutation breeding are summarised in this paper.

2. Breeding new ideotypes of wheat for unirrigated areas

Nearly 66% of the wheat area of about 14 million hectares in India depends for crop growth only on rainfall. Asana (1970) has developed an ideotype for such areas, which is designed to achieve a maximisation of the yield of the main tiller thereby compensating for poor tillering and upon the dissociation of undesirable associations such as earliness and poor root growth and earliness and a low number of spikelets per ear. This ideotype has the following attributes:

a) a large number of spikelets and grains on the main ear through adventitious branching in the ear

b) a long peduncle which forms a substantial proportion of the length of the stem, thereby increasing photosynthesis in the peduncle and flag leaf

c) a semi-dwarf plant habit which helps to avoid lodging in fields supplied with fertilizer

d) about 7 leaves on the main axis with a large flag leaf; the leaves preferably being arranged horizontally so as to permit better retention of dew and also better light interception.

e) a good growth of roots in the 3rd and 4th feet of soil depth

and f) emergence of ears at such a time that will permit grains to develop at least for 5 weeks at a mean maximum temperature of about 25°C.

A study was initiated by Mehta and Swaminathan (unpublished) in 1967 to ascertain the possibility of isolating genotypes with the above attributes. The material for the study consisted of an induced branche -ear mutant of Triticum aestivum var. N.P. 797 (Swaminathan, Chopra and Sastry, 1966) and tetraploid branched ear material derived from crosses between T. durum and T. turgidum var. mirabile. The material was treated with both r-rays (20 Kr and 30 Kr) and ethylmethane sulphonate ( ). Recurrent selection was practised for the desirable characters in M_2 and later generations and the extent

of progress made so far is summarised in Table 2. The data indicate that the chances for realising Asana Asana's ideotype for unirrigated wheat are very high. The most promising selections are being subjected to a further cycle of mutagen treatment, selection and recombination.

3. Altering leaf characters in rice to promote better light interception

The introduction of the dwarfing gene in Oryza sativa sub sp. indica has helped to increase the yield of indica rices substantially through fertilizer application. In many high-yielding dwarf indicas, the total biological yield does not appear to be higher than in the tall indicas. The higher grain yield really arises from a higher harvest index (i.e., grain/straw ratio). The data from a study conducted by Asana and Salunke (unpublished) in Taichung Native 1 (a dwarf indica from Taiwan), Basmati 370 (a tall indica from India with long slender grains) and Jamuna (a dwarf, fine-grain variety developed at the I.A.R.I) by crossing Taichung Native 1 with Basmati 370 followed by four backcrosses to the Basmati parent) are given in Table 3. A detailed analysis of the production physiological processes in these 3 varieties by Asana and Salunke indicated that the net assimilation rate decreases with a drop in light transmission about 30 days after transplanting. The rapid fall in light intensity after 30 days appeared to affect adversely tillering and the realisation of the full sink capacity. A smaller leaf size and a lower number of leaves hence appeared to be desirable attributes for promoting a higher net assimilation rate in the population as a whole.

In order to examine the influence of leaf characters such as number, size, orientation ans senescence pattern on percentage light transmission and net assimilation rate, the rice varieties Taichung Native-1 and Tainan 3 were treated with a wide range of mutagens including r-rays, ethylmethane sulphonate and nitrosomethyle urea. Mutants with altered leaf characteristic were isolated in M_2, M_3 and later generations (Siddiq and Swaminathan, unpublished). There was considerable variation in the size, number, allignment and ageing pattern of leaves in the mutants (Fig.2). Some of these mutants had associated changes in panicle characters, such as density and fertility. Mutants with normal panicles but altered leaf characters are currently being used in studies of light transmission and dry matter production. Qualset et al (1970) have recently described a mmx mutant in bread wheat which influence the structure of the crop canopy and thereby affords an opportunity to evaluate x light interception and the physiological aspects of crop productivity. Evans and Dunstone (1970) have concluded from a study of the physiological changes in the evolution of yield in wheat that so far evolution has progressed through changes in grain and leaf size and in the proportion of dry weight mobilized to the grain. They further feel that while photosynthetic rate has not limited the evolution of yield up to the present, it may well limit further evolution.

The proceedings of a recent Symposium on "Physiological aspects of crop yield" (Eastin etal., 1969) also make it clear that the next major breakthrough in increasing productivity may come from the development of plant types which possess a much greater potential for biological yield.

4. Inducing photo-insensitivity in Gossypium hirsutum

Several varieties of G. hirsutum have been developed in South India which possess a good yield potential and excellent fibre properties. These strains when grown at Delhi and other parts of North India start flowering only when the day length goes below 12 hours. With the onset of short days, the temperature also goes down and the yield of the varieties is poor. In order to ascertain the possibilityfor isolating photo-incensitive mutants, Jain and Raut (unpublished) treated the long staple variety MCU-5 with different doses of r-rays. The M_2 populations were screened for flowering habit and several mutants combining good yield and staple length with an early flowering habit were isolated (Table 4). These data suggest that in addition to selection in segregating generations being carried out uhder diverse environments as suggested by Borlaug (1968) and Finlay (1968) selection in mutagen-treated populations may also prove valuable for breaking the barriers to wide adaptation based on photo- and thermal-sensitivity.

5. Improvement of grain setting in Triticale

Recent research has revealed that in hexaploid (2n = 42) Triticales, seed fertility can be improved greatly by selection, thereby indicating that sterility is under genetic control. There is evidence from the work of Dr. R. Riley and his co-workers at the Cambridge

Plant Breeding Institute that timing imbalance in meiotic stages leading to pairing and disjunctional abnormalities may be responsible for sterility in the amphidiploids between Triticum durum and Secale cereale. Timing imbalance is known to be under genetic control and hence can be remedied by selecting the appropriate gene combination.

Some promising Triticales derived from crosses between T. durum and S. cereale were treated in 1967 with different doses of r-rays and EMS. Observations were taken on the number of grains per spike, number of spikelets per spike and the yield of the main spike in the M_2 and M_3 populations. The variability in the number of grains per spike was much greater in the mutagen treated populations as compared to the control (Table 5).

Apart fromvariability for seed fertility, the M_2 and M_3 populations contained plants with plump grains, early maturity and dwarf stature. The seeds of these mutants are being multiplied for trials.

6. Induced variation for protein properties

(a) Bread Wheat

The development of rapid screening techniques such as the dye-binding-capacity (DBC) method for estimating the content of protein and basic amino acids, has made the examination of large populations of mutagen-treated material possible. Studies by Anand Kumar (unpublished) in the bread wheat variety Sharbati Sonora have shown that the variation for D.B.C. values is considerably enlarged by both X r-ray and EMS treatments (Fig.3). It is also of interest that some induced mutants, such as Pusa Lerma, the amber-grain mutant of the Mexican semi-dwarf and red-grain variety, Lerma Rojo show a striking enhancement in protein content with fertilizer application (Table 6). The data in Table 6 indicate that varieties differ in their ability to produce more protein with increased fertilizer application.

Pusa Lerma, the amber-grain mutant of Lerma Rojo has given high yields in national trials conducted under the All-India Co-ordinated Wheat trials in Central and Peninsular India. Its performance as compared to the best check, Kalyan Sona, is given in Table 7. Monosomic analysis has revealed that chromosome 3A of Lerma Rojo carries genes both for grain colour and protein content (Jha et al.)

(b) Barley

Munck et al. (1970) have studied the genetics of spontaneously occurring high protein and high protein-cum-high lysine (Hiproly) character in barley. It is clear from their study that these traits are under simple genetic control. During a study of the M_2 and M_3 populations of the 6-rowed spring barley variety N.P.113 treated with r-rays, Fast neutrons, EMS and NMU, several dwarf and early mutants were observed (Bansal, unpublished). Some of these mutants had a good yield potential and one early mutant, B.M.20, had a protein content of over 17% (Table). This high protein mutant had normal fertility and grain development and was isolated in the treatment with EMS (0.3%). (Bansal, 1970).

In the M_2 progeny of EMS (0.3%) treated N.P.113, a mutant characterised by a depression on the dorsal side of the grain was isolated. This "Notched grain" mutant was late by 8 to 10 days, had normal fertility and a 30% lower 1000-kernel weight. This mutant had over 17% protein content and it has been crossed with the parent strain to ascertain whether the notched grain character can be separated from the high protein trait.

(c) Panicum miliaceum

This millet has excellent protein properties (Table), but its yield potential is low. Hence, seeds of a few cultivars of this millet have been treated with mutagen, in order to isolate dwarf and fertilizer-responsive strains.

7. Induction of mutations at the haploid level

With the standarisation of a technique for the raising of haploids from anther cultures by Guha and Maheshwari (1966) a way is now open for the large scale production of haploids and their use in mutation breeding. While the original finding was made in Datura, subsequent research has shown that haploids of Nicotiana tabacum (Nakata and Tanaka, 1968, Tanaka and Nakata, 1969, Nitsch and Nitsch, 1969, Sunderland and Wicks, 1968) and of Oryza sativa (Niizeki and Oono, 1968, Guha et al, 1970), can be produced by invitro anther culture. Nitsch (19) has used mutagens in culture media for inducing mutations at the haploid level in tobacco.

For using this technique successfully, it is necessary to standardise techniques for getting consistently a large number of haploids. Since genotypic differences in the ability of pollen to form embryoids seem to exist, Guha and Swaminathan (1970) carried out a study with 20 different rice varieties.

Table 1

Commercial varieties released in India through mutation breeding

Crop	Name of the variety		Mutagen and year of release	Characteristics	Reference
	Parent	Mutant			
1. Wheat	N.P.799	N.P.836	X-rays 1961	Fully awned and about 10% more yield	Jagatheesan et al. (1961)
2x	Sonora 64	Sharbati Sonora	UV + r-rays 1967	Amber grain, High protein	Varughese and Swaminathan (1967)
2. Rice	T.141	Jagannath	X-rays 1969	Fertilizer responsive short stature with an average height of 95 cms in contrast to 140 cm of T.141	S.K. Sinha (Unpublished
3. Castor	H.C. 6	Aruna	Thermal Neutrons 1968	120 days duration in contrast to 250 days in H.C.6; high yield	Bala-Narasiah and Kulkarni (1969)
4. French Bean	Wax podded	Pusa Parvati	X-rays 1969	Early, bush type with attractive light green pods	Vishnu Swarup and Gill (1968)
5. Tomato	Sioux	S.12	r-rays 1969	Dwarf, 30% more yield than Sioux	K.S. Nandpuri (Unpublished)
	Meeruti	Pusa Lal Meeruti	X-rays 1969	Uniform red colour	Jain, Sur and Raut (1962)

Table 2

Progress made in the development of a branched-ear wheat strain through mutation breeding.

Plant part	Characteristics of the initial material in 1967.	Characteristics of selections in mutagen-treated populations in 1970.
Ear	Erratic branching, low spikelet fertility and low 1000 kernel weight.	Good branching with as many as 19 adventitious branches per spike, good fertility with as many as 207 grains per spike, good 1000-Kernel weight.
Peduncle	Poor peduncle exertion	Peduncle index high, promoting greater photosyn thesis in the peduncle.
Plant height	Semi-dwarf to dwarf (less than 100 Cms)	Semi-dwarf to dwarf (less than 100 Cms).
Leaves	Leafy types with 14 to 15 leaves on the main stem	Two single leaf and several reduced leaf number mutants were isolated.
Roots	Variable depths	Deep root system, reaching the 3rd and 4th feet of soil depth.
Ear	Very late, taking about 117 to 120 days from sowing to earing	Early mutants taking about 105 days from sowing to earing were isolated.

Table 3

Yield characteristics in dwarf and tall *indica* rice varieties.

Character	Variety		
	Taichung Native-1	Basmati-370	Jamuna
Field			
Grain yield (Q/Ha)	74.4	31.1	52.8
Straw yield (Q/Ha)	73.3	121.0	63.7
Total biological yield (Q/Ha)	147.7	152.1	116.5
Pot			
Grain yield (gm/plant)	91.0	72.5	84.7
Straw yield (gm/plant)	73.4	116.4	91.2
Harvest index	55.4	38.4	48.2

Table 5

Variation for grain fertility in the M_3 generation of of mutagen - treated Triticale

Strain	Treatment	No of Plants studied	No of seeds per spike	
			Range	Mean
6456-3-1	Control	1000	0-70	40.08
	EMS(0.2%)	1000	0-90	45.52
6450-2-1	Control	200	25-73	50.54
	20 Kr. gamma rays	1000	0-86	36.76
	EMS(0.2%)	1000	0-86	37.47
5027	Control	200	8-78	47.87
	20 Kr. gamma rays	1000	0-101	48.36

Table 4

Characteristics of some induced mutants in Gossypium hirsutum var. MCU-5

Material	r-ray dose	days to flower	Yield in gms per plot	Staple length (mm)
M.C.U.5	-	120	25	29.0
Mutant No.1	5 Kr.	66	165	26.0
" 2	5 Kr.	62	300	27.5
" 4	20 Kr.	64	250	28.7
" 6	"	69	200	31.6
" 8	30 Kr.	69	150	29.0
" 9	40 Kr.	66	120	26.0
" 10	50 Kr.	63	240	26.0

Table 6

All India Co-ordinated National Trial, 1969-70

Percentage of protein (on oven dry basis)*

Variety	Treatment		
	M_0	M_1	M_2
Kalyansona	11.30	12.11	12.38
HD 1941	12.23	12.61	14.13
HD 1944	12.32	12.61	12.70
HD 1949	12.02	13.00	13.20
HD 1539	11.94	13.33	15.06
HD 1674	11.52	13.16	13.25
Pusa Lerma	11.77	14.85	16.45
EA 222-1	11.73	12.36	12.78
D.2117	12.91	13.08	13.75
WL 202	13.63	13.79	14.09
NI 5645	12.32	13.46	14.26
UP 301	12.87	13.92	14.55

M_0 - No fertilizer

M_1 - N 135 + P 67 + K 34 Kg/ha.

M_2 - N 200 + P 100 + K 50 Kg/ha.

* Data of A. Austin, H.D. Singh and V.K. Hanslas.

Table 7

Yield of Pusa Lerma (in Q/Ha.) in National Trials (1969-70)

	Central Zone										Peninsular Zone							
	M. Pradesh				Gujarat				Zonal Mean				Maharashtra				Zonal Mean			
	M_1		M_2		M_1		M_2		M_1		M_2		M_1		M_2		M_1		M_2	
	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R	Y	R
Pusa Lerma	38.5	3	41.0	1	27.5	2	30.8	1	35.8	2	38.5	1	43.1	1	41.7	1	43.1	1	41.7	1
Kalyan Sona	38.2	4	40.5	3	27.6	1	23.7	5	35.6	3	36.3	3	37.6	3	33.7	7	37.6	3	33.7	7

Y: Yield
R: Rank

M_1: N 135 + P 67 + K 34 Kg/ha

M_2: N 200 + P100 + K 50 Kg/ha

Table 8

Characteristics of some barley mutants

Material	Grain yield (Q/Ha)	Days to Maturity	1000-kernel weight(gms)	Protein content(%)
N.P. 113(control)	54.1	120	42.0	11.2
B.M. 10	52.6	100	37.5	11.2
B.M. 20	43.9	95	36.3	17.6
B.M. 21	55.5	96	38.4	14.4

Table 9

Protein content of Notched Mutant in Barley var.N.P.113.

Material	Protein (%)	DBC Value
N.P. 113 (control)	(a) 10.23	0.21
	(b) 11.24	0.22
Notched Mutant	(a) 18.29	0.305
	(b) 17.45	0.30

Table 10

Amino acid composition of high protein mutant in barley

(gm / 100 gm protein)

Amino acid	Parent (NP-113) 10.23%	Mutant(Notch ear) 18.29%
Aspartic acid	6.75	7.46
Threonine	3.78	3.26
Serine	5.06	5.37
Glutamic acid	26.36	28.99
Proline	8.14	8.64
Glycine	4.01	4.28
Alanine	4.26	3.50
Valine	5.22	4.97
Cystine	2.44	3.17
Methionine	2.31	1.12
Isoleucine	4.72	3.55
Leucine	8.76	8.79
Tyrosine	4.83	4.22
Phynylalanine	5.27	4.49
Ammonia	1.66	2.59
Lysine	4.36	3.49
Histidine	2.78	2.02
Arginine	6.44	4.79

Table 11

Protein properties of some minor millets

Species and variety	Protein (%)	Lysine (Gm/100 gm Protein)	Tryptophan (Gm/100 gm protein)
Eleucine coracana			
I.E. 903	6.23	2.13	1.44
I.E. 901	7.97	2.63	1.36
Setaria italica			
I.S. 711	10.02	2.29	0.81
I.S. 263	11.56	2.58	1.05
Panicum miliaceum			
I. PM 1640	11.60	4.35	1.10
I. PM 1639	12.19	4.15	1.18
Paspalum Scrobiculatum			
I. Ps. 261	11.56	3.55	0.92
I. Ps. 19	12.62	3.78	1.14.

Table 10

Amino acid composition of high protein mutant in barley
(gm / 100 gm protein)

Amino acid	Parent (NP.113) 10.23%	Mutant(Notched grain) 18.29%
Aspartic acid	6.75	7.46
Threonine	3.78	3.26
Serine	5.06	5.37
Glutamic acid	26.36	28.99
Proline	8.14	8.64
Glycine	4.01	4.28
Alanine	4.26	3.50
Valine	5.22	4.97
Cystine	2.44	3.17
Methionine	2.31	1.12
Isoleucine	4.72	3.55
Leucine	8.76	8.79
Tyrosine	4.83	4.22
Phynylalanine	5.27	4.49
Ammonia	1.66	2.59
Lysine	4.36	3.49
Histidine	2.78	2.02
Arginine	6.44	4.79

Radiation Botany

Published by PERGAMON PRESS New York London Paris Los Angeles

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June 19, 1970

To Members of the Editorial Board

At our last Editorial Board meeting at Cortina, it was decided an effort should be made to improve the over-all quality of papers being published in Radiation Botany. It is my feeling that there is still a wide range of quality in manuscripts and some borderline papers are still being accepted. While I sit in the key position as Editor-in-Chief, much of the decision-making process is performed by referees (many of whom are members of the Editorial Board).

I wish at this time to again solicit your help in trying to improve the quality of our journal. It frequently happens that two referees do not agree about a particular manuscript and I cast the deciding vote (sometimes I send it out for a third opinion). It occasionally happens that we are short of manuscripts and I decide to take a paper which I would really prefer not to publish, because of an inadequate manuscript supply. This would not be necessary if I received a larger and more uniform flow of manuscripts. Occasionally, the reverse has been true and authors become annoyed because of slow publication. During the past several months the flow of manuscripts has been about normal, but if it increased more could be rejected.

I therefore, need your help and advice in improving both the flow of manuscripts and, ultimately, the over-all quality of those that are published. I would, therefore, request that each of you examine carefully the following list of action items to see if closer attention to these suggestions could help solve some of our editorial problems.

1. Submit manuscripts in suitable areas of investigation carried on in your own laboratory and/or encourage your colleagues to do so (some members of the Editorial Board, so far as I can tell, have done neither of these things).

2. Encourage, if possible, the submission of manuscripts in sub-disciplines which are presently not well represented, e.g., biochemistry, cellular radiobiology, and certain areas of genetic effects.

3. Be more critical of manuscripts of poor quality and spell out in considerable detail needed corrections and changes, or at least use new review forms. General comments only about the quality of a paper make it very difficult for an author to do an adequate job of revision.

4. Some feed-back to me from the Editorial Board commenting on published papers which you think should not have been accepted because of poor quality, would be very helpful to me. Also critical comments meant to be constructive are welcome at any time.

5. Occasionally members of the Editorial Board (as well as non-members) balk at making changes recommended by the referees. It would be a great help to me if authors who choose not to accept recommendations would offer some rebuttal for those

yield

suggested changes which they have not accepted. I do not think that authors should be required to make suggested changes, but likewise do not think it appropriate for them to completely ignore recommendations of referees without providing any comment or explanation.

6. On the whole, members of the Editorial Board have performed heroically in refereeing manuscripts. However, on a few occasions manuscripts have been held up unduly before being returned. This, in turn, leads to a delay in editing and publication and the possible loss of future manuscripts from the same author. I would prefer, in most cases, having a manuscript returned promptly without any review, than to have it held up for 2 or 3 months.

7. Lastly, if any of you feel that your interests or other commitments are not compatible with serving on the Editorial Board, I would like to hear from you whether the reason is lack of time or disagreement with general policy or its execution.

The above items and those listed on the enclosed agenda will be discussed on Tuesday, June 30th. Please come with an armful of suggestions--I need your help.

Yours very sincerely,

Arnold H. Sparrow

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8/14/70

Members of the Editorial Boards of Radiation Botany:

Your comments on the enclosed Report of Meeting of Editorial Boards of Radiation Botany, held on June 30, 1970, in Evian, France, would be appreciated. Please complete the following and return by September 8 to Dr. A. H. Sparrow.

New Referee Forms (Item #3 of Report)

I would like to see a set of new forms: ____ yes ____ no

Suggestions for improvement:

Suggestions for additions to Editorial Board (Item #4(b) of Report)

Field	Suggested name
Radiation biochemistry	_____
Photobiology	_____
Botanical microbiology	_____
Other suggestions	_____
Book Review Editor	_____

Suggestion to broaden scope of Journal (Item #5(h) of Report)

____ for ____ opposed

Suggestions for new Journal title:

_____

_____

Suggestions for policy changes: (Item #4(c) of Report)

_____

_____

_____

Other comments:

_____

_____

Name: _____ Date: _____

AGENDA FOR MEETING

EDITORIAL BOARDS OF RADIATION BOTANY.

EVIAN, France JUNE 30, 1970.

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1.- Report by Mr. LOWE Pergamon Press).

2.- Report of general status of Journal (Rad.Bot.) by Editor

a/ Status of current issues

b/ Backlog of Mss.

c/ Quality of Mss. see § 6

3.- Procedural Matters - editors office.

a/ New reference forms - how well are they doing ?
- Summary of comments received by editor.
- Suggestions for improvement welcome
- Form letters available from Edi. in Chief if wanted

b/ Faster Handling of Mss needed

- At 1966 meeting : 6 ½ mos. then vs recent issues - almost 9 mos.
- Explanation of delays.
  i.e. 5½ mos. at Oxford for 10:2
- Possibility of more issues per year.
- Statement by Mr. LOWE re. possible improvement at P.P.

c/ Handling of translations of abstracts.

- Can galley-proofs of translations be collected ?
- Translations into English to be checked by Editor
- Procedure for regional editors
- Should titles be translated as well as text ?

d/ Indexing.

- General comments by editor
- Need for Keywords
- 10 years cummitative index promised

e/ References : must be checked for accuracy and format before going to Oxford.

f/ List of other journals to be provided ?
- where Ms content not appropriate for Rad. Bot.

g/ Announcements of forthcoming symposia or meetings
- please send in such well in advance.

4.- Editorial Boards (Composition, responsibilities, etc.)

a/ Recent changes

b/ Suggestions for additions

- Regional
- Discipline-oriented
- Book review editor.

c/ Suggestions for policy changes are welcome.

d/ Duties of regional editors

- Screening vs. forwarding
- Encourage colleaques to send in high quality Mss.
- See § 6 and letter of June 17th to Ed. Bds.

e/ Editorial assistant needed.

f/ Incidental expenses

- e.g. stamps, stationery are reimburseable

5.- Editorial Policies

a/ General comments by editor

b/ Quality of Mss. - see § 6

c/ Review articles - quality, number, new topics
- honorarium for authors

d/ Bk. reviews - What to do ?

e/ Publication privileges of members of editorial bd. ?

f/ Soft (?) policy for Mss from developing countries and first publications i.e. from dissertation ?

g/ English corrections - responsabilies of Editor's Office vs. Editorial Bd and referees

h/ Journal title - possible change ?

6.- Quality and quantity of Mss (See letter of 19th to Ed. Bd)

- Summary of letter
- Report of % of Mss rejected or withdrawn.

7.- New Business.

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REPORT OF MEETING OF EDITORIAL BOARDS OF RADIATION BOTANY
HELD ON JUNE 30, 1970, AT THE HOTEL DU PARC IN EVIAN, FRANCE

Pergamon Press was represented by Mr. A. S. Lowe and by Mr. J. E. Jones. Members of the Editorial Boards attending included: Drs. Bourdeau, D'Amato, deSerres, Evans, Gopal-Ayengar, Heslot, Latarjet, Moutschen, Smith, Yamaguchi, Wolff, Zimmer and Sparrow.

The meeting consisted of cocktails and dinner followed by a business meeting which lasted until after midnight. Unfortunately, there was a rather long agenda (see attached copy) and some of the items did not receive the attention they deserved. A brief report of the items considered and/or conclusions or recommendations reached follows:

1. Report by Mr. Lowe

Mr. Lowe gave details of current production schedules for 10:3 and 10:4. (10:3 has just been issued and 10:4 is scheduled for late July).

The present status of the subscription list is about 900 being sold out of 1100 being printed. (About 100 copies - gratis and promotion and 100 copies in reserve).

2. Report of general status of Journal by Editor

(a) and (b) The Editor reported that publication time has gone up to almost 9 months but should decrease to between 7 and 8 shortly. This is not as good as a year or two ago--causes are mainly printer hold-up and a change of subeditor at Oxford.

(c) Quality of manuscripts. See #6.

3. Procedural matters - Editor's office

(a) New referee forms. Editor thinks form for "Editors use only" is O. K. but other form needs further improvement. Users more or less agree. Suggestions for changes or improvement will be welcome. Editor offered to send form letters to any members of Editorial Board requesting them.

(b) Faster handling of manuscripts needed. Covered in #2 above. Mr. Lowe stated that he felt that present average publication time on the Journal could not be improved appreciably while bi-monthly publication continued. He pointed out that if authors' proofs of an article were received just after an issue had gone to press the resulting two month delay before publication increased the average production time for the issue. Monthly publication would cut this delay but after discussion it was agreed that the Journal was not yet ready for this.

(c) Translations of abstracts were discussed and it was decided that French and German abstracts will no longer be printed (after volume 10:6). Manuscripts in French and German will have an English abstract only and an English title. This was agreed to by all present. (Dr. Latarjet is opposed--but was not present during this discussion).

(d) Keywords will be requested by Editor (authors to be asked to suggest keywords) starting with volume 11:1 (back page of Journal to be changed accordingly).

Dr. Sparrow informed the meeting of the present method of preparation for the yearly indices by Mrs. Sparrow and it was agreed that a cumulative index covering volumes 1-10 of the Journal should be prepared and published.

(e) All references must be checked for format before sending manuscripts to Oxford. If members of the Editorial Board are unable to do this themselves, the paper can be sent to the Editor's office where this will be done (members of Editorial Board please note).

(f) A list of other journals is to be provided for referees who want to suggest publication of manuscripts elsewhere. (Requested by Dr. A. Conger).

(g) Members of Editorial Board are requested to send in announcements of forthcoming symposia or meetings - please send these in well in advance.

4. Editorial Boards (composition, responsibilities, etc.)

(a) Recent changes

Retired from Honorary Editorial Advisory Board

Dr. Maurice Errera
Dr. N. H. Giles
Dr. M. Westergaard

Additions to Honorary Editorial Advisory Board

Dr. Walton C. Gregory
102 Williams Hall, North Carolina State College, Raleigh, North Carolina 27607

Dr. Alan H. Haber
Biology Division, Oak Ridge National Laboratory, Oak Ridge Tennessee 37830

Dr. J. Moutschen
Laboratoire de Genetique, 15, rue Forgeur, Liege, Belgium

Dr. E. R. Sears
Genetics Building, University of Missouri, Columbia, Missouri 65201

Dr. Harold H. Smith
Biology Department, Brookhaven National Laboratory, Upton, New York 11973

(b) Possible additions suggested by Sparrow are:

Dr. M. J. Constantin, University of Tennessee, UT-AEC Agricultural Research Laboratory, P.O. Box 1067, Oak Ridge, Tennessee 37832

Dr. J. R. K. Savage, Medical Research Council, Radiobiological Research Unit, Harwell, Didcot, Berkshire, England

Both of these are excellent reviewers and should be valuable additions. It was also felt that additional members of the board are needed to represent radiation biochemistry, photobiology and botanical microbiology. Suggestions for these openings will be appreciated.

The question of a Russian editor was discussed and on the recommendations of Dr. Zimmer was tabled for future consideration.

It was announced that Dr. Solon Gordon has resigned as Book Review Editor and suggestions for this opening were requested. Two names suggested were: Dr. Alan D. Conger and Dr. John A. Heddle. Additional suggestions would be welcome in case Conger and Heddle do not wish to serve. Sparrow reported that he is currently trying to handle the job of being Book Review Editor but is anxious to be relieved because of the heavy work load of regular editorial work.

(c) Suggestions for policy changes by members of the Editorial Board will be welcome at any time. Major changes will be voted on by mail or considered at the next meeting of the Editorial Board.

(d) Duties of regional editors. Sparrow advised that it is desirable that regional editors who accept manuscripts screen the manuscript themselves or get a minimum of one outside referee to evaluate the paper. If possible, two sets of referees' comments would be desirable. The preferred procedure would be for copies of the manuscripts and referees' comments to be forwarded to the Editor's office but it is felt that some leeway is permissible and that those members of the board who have had appreciable experience in editorial work should have the privilege of making the final decision themselves on forwarding high quality manuscripts directly to Oxford for publication. For members of the Editorial Board with less experience in editing, or whenever there is a manuscript of questionable quality, final decision should probably be made by the Editor-in-Chief. Specific suggestions as to how referees and members of the Editorial Board can be more helpful to the Editor and also help to upgrade the overall quality is outlined in the attached letter of June 19. Please take time to read this letter carefully if you have not already done so.

(e) An editorial assistant in addition to secretarial help (already provided) is needed in the Editor's office for a variety of reasons. Several members of the Editorial Board and Mr. Lowe were highly sympathetic and it was decided that the Editor should look for part-time help as soon as possible. If such a suitable person cannot be found some other solution to reducing the work load of the present Editor will be necessary. It was pointed out that the editor of Radiation Research has a full time Ph.D. as an editorial assistant in addition to secretarial help.

(f) The Editor stated that it is possible for members of the Editorial Board to be reimbursed for incidental expenses such as stamps and stationery.

5. Editorial policies

(a) It was stated by the Editor that the decisions made at the Cortina meeting seem to be working out well. The number of papers on techniques have decreased and it is felt that papers on radioecology should be encouraged. Suggestions were also made that papers on radionuclide cycling should be encouraged.

(b) See #6.

(c) Consensus was that review articles are a good idea and should be continued. Suggestions for authors and/or titles will be helpful to the Editor. Price per page for reviews can be as high as $20.00 but total is not to exceed $1000. per volume.

(d) See 4(b) above.

(e) It was stated by the Editor that members of the Editorial Board should not expect any special privileges in the handling of their manuscripts. However, the Editor does try to expedite them and, in this respect, perhaps they receive some preferential treatment. It was pointed out that submission of manuscripts by members of the Editorial Board or associates is to be encouraged.

(f) The Editor discussed the problem of manuscripts of below average quality which sometimes come from developing countries or from first publications of graduate students or recent Ph.D.s. It was felt that such manuscripts should not receive special

consideration but that the Editor recommend either further work or a condensation to a short note if this seems appropriate. It was also suggested that perhaps regional editors could be more helpful in screening to prevent the rejection of some substandard papers. Dr. Gunckel suggested by letter, that regional editors could do much more along these lines than has been done in the past. The Editor concurs.

(g) The Editor frequently receives manuscripts in which the English composition is nothing less than atrocious. The help of referees in correcting the English is much appreciated but it is hoped that part of this manuscript revision can be performed by the hoped-for editorial assistant.

(h) Possible changes in the Journal title were suggested by the Editor. The object is to broaden the scope and coverage to include the broader area of biophysics and photobiology. This was one of the items on which discussion had to be cut off for lack of time. One possible title change was to "Radiation Botany and Biophysics". Another possible change would be "Plant Radiobiology and Biophysics". Your written comments concerning this proposal and specific title suggestions would be very much appreciated. There was general support of the proposal and it was pointed out that, if adopted, considerable revision of the Editorial Board would be necessary.

6. Quality and quantity of manuscripts (See letter of June 19 to Editorial Board)

The problem of improved quality of manuscripts was discussed and a summary of the letter mentioned above given by the Editor-in-Chief. It may not be obvious to all that the quality of manuscripts published is inevitably related to the number of manuscripts submitted. At present the flow of manuscripts is about average for the past several years but it was pointed out that a heavier flow of manuscripts would allow more selection and more rejection.

A summary of the percentage of manuscripts rejected or withdrawn for the past several volumes indicates an average of between 15 and 20%. Specific comments from the Editorial Board on this matter would be very welcome and especially remarks concerning published manuscripts of substandard quality. The Editor considers it very difficult, if not impossible, to apply uniform standards, partly because of the great variability in the "toughness" of referees. For instance, it frequently happens that the same manuscript will be rejected by one referee but accepted by another. Likewise, two tough reviews can result in rejection of a manuscript of better quality than some of those accepted as a result of recommendations by less critical referees. The Editor attempts to compensate for these uneven standards of acceptability shown by different members of the Editorial Board or different referees, but cannot compensate as much as some members think would be desirable.

7. New business. Due to the lateness of the hour no new business was forthcoming and the meeting was adjourned shortly after midnight.

A. H. Sparrow

August 14, 1970.

Genotypic differences in the initiation of embryoids from rice pollen

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The authors are grateful to Dr. E.A. Siddiq for the supply of different varieties of rice and to Mr. R.D. Iyer and Mr. Narendra Gupta for their assistance.

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DRAFT TYPING

VARIETAL DIFFERENCES IN THE ABILITY OF RICE POLLEN TO GIVE RISE TO HAPLOIDS IN ANTHER CULTURES

G. Akineedu & L.G. Kulkarni (1968) # Short duration Castor mutant .. Indian Farming · Vol XVII No. 12 March 1968 Page 6, 15

Soaked seeds of HC-6 were exposed to different doses of gamma rays and thermal neutron in June 1962. A number of desirable mutants were in breed for for early flowing and short duration mutant ~~Obtainable~~ Obtained from the treatment 0.87×10^{13} n/cm^2 of thermal neutrons gave the desired results of increased yield over parent HC-6.

D. Bala Narsaiah and L.G. Khalkarni (1969) Castor NPH1 Scores over HC-6. Indian Farming. Vol XVIII No. 10 Jan 1969 page 11-13

--- By utilising different ionising radiation, on the present improved long duration variety HC-6 out of it, treatment 0.87 x 10^{13} n/cm^2 of Thermal neutron gave the new NPH1 (New Pusa Hyderabad Castor-1))

Salient features - Early flowering - 35-40 days. Low node number - 10-14/plant. Quick, successive development of secondary, tertiary and quarternary order of shoots each terminating into a spike, high female tendency in the different order of spikes, with interspersed male flowers throughout the spike, uniform maturity, capacity of every auxilliary bud on its main axis to develop into a secondary shoot under optimum conditions, and high response to irrigation and fertilizer.

Duration - 150 days