J. Indian bot. Soc. 62 : 106–112, 1983

# REVIEW

*Recent Researches in Plant Sciences*. 1980. Bir, S. S. (ed.) Kalyani Publishers, New Delhi, Ludhiana. pp xviii + 1-730. Price Rs. 250.00

*Recent Researches in Plant Sciences* incorporates the Proceedings of the National Symposium held at the Department of Botany, Panjabi University, Patiala, January 20-22, 1977.

The volume is divided into five sections:

1. Form and Structure of Plants, pp 1-218, 33 articles.
2. Cytogenetics and Improvement of Plants, pp 219-378, 20 articles.
3. Growth and Functions of Plants, pp 379-548, 20 articles.
4. Plant Diseases, pp 549-644, 18 articles.
5. Taxonomy and Systematics, pp 645-718, 12 articles.

The programme included Dr. A. C. Joshi Memorial Lectures, Plenary Lectures, and presentation of contributed papers. Discussion was given priority.

## RECOMMENDATIONS

The Concluding Session was devoted to framing of recommendations, and was addressed by several senior botanists of the country. Integrated approach in research, basic research, freedom in research, priorities in research, floristic studies, conservation of flora, forest resources, coordination in research in the country, balanced teaching in plant sciences, establishment of botanic gardens, and allied matters were discussed in detail and proper recommendations formulated. The need for frequent seminars, symposia and conferences was emphasized.

I am strongly of the opinion that the symposia should invariably be limited to specific themes and milestones of the last decade and furture trends in the next decade must be discussed at length. This would permit a proper retrospect and prospect. In National Symposia, there is no place for short contributed papers.

I had the pleasure and privilege of attending this well organized and very well-attended symposium, and am very pleased that Professor Bir edited such an exhaustive volume. Some of the contributors have not mentioned salient points and significant results in the 'Abstract'. Some articles do not have any 'Abstract'.

### *Dr. A, C. Joshi Memorial Lectures*

Khoshoo gave a fascinating general lecture on "Ornamental Horticulture in India : Plant Introduction / Domestrication". The most important consideration is conservation and maintenance of germplasm of our wild species of ornamental value, old cultivars, and genetic stocks. Evolution of new varieties should be the aim of nurserymen, horticulturists and breeders. Preparation of bio-aesthetic plans for our cities, towns, villages, highways, and public places like parks, railway stations, etc., should receive high priority.

Sharma discussed in great detail the "Complexity in Structure and Behaviour of Chromosomes of Eukaryota". The chromosomes have undergone extreme complexity in structure with progressive differentiation. Chromosomes control all aspect of metabolism; chromosome is the highest complex organic entity, and functional differentiation

is clearly delimited. Replication and cell division, essential properties of genes, are controlled by certain genes in the same set up. This is also true for transcription and translation responsible for its own heterocatalytic action. Mutation and recombination, which generate variability, are again under the control of certain genes.

*Algae :* Desikachary discussed the form, function and reproduction in the classification of green algae. Heterotrichous habit still represents an important step in our search for ancestors of the land palnts. But, as yet, there is no genus, or a conceptual form, or forms, which could possibly represent a form leading to developmental stages of the land habit.

R. S. Pandey and D.C. Pandey report a new species of *Oocystaenium, O. mitrae* sp. nov. It has monomorphic cells and differs markedly from *O. elegans* Gonz. *et* Mehra.

Grover and Chand and Grover and Puri state that *Anabaena* heterocysts differentiate in fluorescent and tungsten/red light; green/blue light completely inhibits differentiation. They also studied the effect of several growth regulators on differentiation and inhibition of heterocysts.

Rai and Kumar have made an interesting study of effluents of a fertilizer factory, cement factory, aluminium factory, sewage, and dairy farm on algal flora. *Oscillatoria* is a dominant form under various habitats and ecological conditions.

Sarma and Kanta report five blue-green algae: *Aulosira implexa, Calothrix clavatoides, Phormidium mucosum, Scytonema tolypothrichoides* and *Synechococcus aeruginosus* as first record from India.

*Fungi :* Sohi discusses fungal diseases of tropical and subtropical fruits-grapes, mango, papaya, banana, guava, citrus including the causative organisms, symptoms and control measures.

Mehrotra and Goel describe tissue degradation, maceration, and plant disease syndrome due to pectolytic and cellulolytic enzymes. The mechanisms of killing of plant cells by cell wall-degrading enzymes are not currently understood. It is emphasized that not just one but many diseases could be controlled if the genetic principles of interference could be worked out.

*Galls :* Arora and Umakant followed the effect of IAA, IBA, IPA NAA and 2, 4-D on the growth of stem gall (due to *Betousa stylophora*) and normal tissue (hypocotyl) of *Emblica officinalis*.

All the auxins tested were beneficial for growth.

Singh and Umakant studied, *in vitro* and *in vivo*, nitrogen content in normal stem and stem gall caused by *Eriophyes cernuus*. The total nitrogen-content in gall callus was higher as compared to normal callus and was much higher *in vitro* than *in vivo*.

*Nematology :* Arya, Behl and Tyagi report the effect of pH and temperature on hatching and survival of *Meloidogyne incognita* larvae which cause root-knots in *Daucus carota* and *Dolichos lablab*. At pH 7 there is higher emergence and longer duration of survival; a lower pH stimulated hatching, but was detrimental to survival of larvae.

Trivedi, Bhatnagar and Tiagi conducted histo-pathological studies on root-knot of *Capsicum annuum* caused by *M. incognita*. Masood, Husain, Mahmood and Saxena state that IAA, IBA, and IPA (applied as soil drench and foliar spray) brought about considerable plant growth in *Solanum melongena*. There was reduction in the root-knot development (due to *M. incognita*) on plants treated with IBA and IPA, and not IAA. They record

effect of different concentrations of castor, mahua, and neem oil-cakes on biochemical changes in tomato cv 'margloge', infected with different inoculum levels of *M. incognita*. Phenols, O-dihydroxy phenols, free amino acids, proteins and carbohydrates were higher in the uninoculated than inoculated plants., both in unamended soil and soil amended with oil cakes. Mahmood, Husain, Masood and Saxena refer to similar biochemical changes in tomato cv 'marglobe' infected by *Rotylenchulus remiformis*.

*Pteridophytes :*

Bhambie observed terminal and lateral fructifications in *Psilotum*.. Neither in *Psilotum* nor in *Tmesepteris* there seems to be a true synangium. I do not consider such a conclusion, based on abnormalities, to be justified.

According to Bir and Trikha, in certain Polypodiaceous ferns from the Himalayas, the common stomatal pattern is polocytic or mesoperigenous. Stomatal patterns are of taxonomic significance only at inter and intraspecific levels. On the basis of presence or absence of cuticle, hypodermis, intercellular spaces in spongy parenchyma along with the characteristics of upper epidermis of leaf, various species of the genus *Pyrrosia* can be segregated.

Kaur traces the history of classification of ferns and compares the classifications of modern taxonomists Christensen, Ching, Dickason, Copeland, Holttum, Alston, Pichi Sermoli, Mehra, Nayar, Bierhorst, Wagner and Nickel. While a good deal of agreement has been arrived at, we need further studies for a more conclusive classification. Reproduction of Fig. 1 (p 662), Classificatory Systems, is very thoughtless, and the reduction is so much that one can read in only with a powerful lens.

Bir and Basudeva founds several new cytotypes in the fern flora of Kodaikanal. For the first time, chromosome numbers of four species and four cytotypes have been reported; five species are new reports from South India. On species to species basis, several of the Kodaikanal ferns have higher polyploidy than the Himalayan species.

Loyal and Kumar studied natural populations of *Marsilea minuta*, their reproductive mechanisms, and evolutionary future. There are two morphologically indistinguishable cytotypes-diploid and a triploid. The latter is an autotriploid descendent of the diploid. The diploid cytotype is reproductively versatile. The triploid shows suppression of meiosis during sporocarp formation. Five types of sporangia occur in triploids, and only two types in diploids.

Verma and Bala discuss mating system in some diploid and polyploid homosporous ferns (Adiantaceae; Alston). Neither polyploidy *per se* favours intragametophytic mating, nor the colonizing species are predisposed for intragametophytic mating. Wet habitats enhance the chances of intergametophytic mating by longer generation times, and their high ratio of intergametophytic sperms compensates for the low percentage of pure females. In contrast, the colonizing species have a higher proportion of cordate gametophytes, far higher fecundity; the short supply of sperms of intergametophytic origin lowers the probability of intergametophytic mating which is otherwise obligatory in initially female prothalli.

Loyal and Chopra, working on perennial gametophytes of *Anogramma leptophylla* and short-lived gametophytes of *Ceratopteris pteridoides*, both sexual ferns, observed apogamy in 1½ year old gametophytes (*Aregramma*) raised in sugar-

free medium, and in 4-month-old gametophytes (*Ceratopteris*) on medium containing 3.5% sucrose.

Shirshagar and Mehta mention that in *Acrostichum aureum* the spores produce crowding of gametophytes leads predominently to male prothalli, and neutral or alkaline pH to female.

Sharma and Bohra describe a petrified gleicheniaceous petiole, *Actinotelopteris*, from Pakur in the Rajmahal Hills (Jurassic). The stele is typically C-shaped with an adaxial concavity. The petrified rhizome, *Solenostelopteris*, is solenostelic and resembles Loxosomaceae, Dennstaedtioideae and Marsileaceae in amphiphloic nature of stele.

*Gymnosperms :* Dogra emphasizes the exploration and utilization of natural gene resources of the Himalayan blue pine (*Pinus wallichiana*). Strong and weak reproductive barriers regulate gene flow between widely separated populations. Selection, and selective breedings for wood and oleoresin can be very useful. The blue pine is valuable for interspecific breeding within the white pine group, and is crossable with a group of fast-growing clite timber species of the western countries.

*Angiosperm Taxonomy :* Sadhukhan and Sen discuss a molecular approach to taxonomy. Many examples of relationships in different groups of plants are cited, and are informative.

Johri and Babu discuss all aspects taxonomy from inception to current trends. The major aim of all classificatory systems is to arrange taxa in a sequence which should also be phylogenetic. While broad relationships can be derived from such a classification, other disciplines like anatomy, embryology, palynology, cytology, etc., are useful in taxonomic assignments at various levels or order, family, genera and species. 'Real' taxonomy is an organismal approach and is a lens-based field science, which persists today, and will do so in future. The application of comparative data from newer disciplines will no doubt help in resolving disputed assignments of taxa.

On the basis of floral anatomy, Murty and Raghava Ram conclude that the outer whorl in the flowers of *Saraca asoca* represents five sepals; petals have been suppressed. This is also true of *S. cauliflora* and *S. thaipiorgensis*. *S. cauliflora* appears to be more primitive than *S. thaipingensis*, and *S. asoca* is intermediate between the two.

Arora and Tiagi identified 17 umbellifierous genera on the basis of epidermal characters-stomata, hairs, glands and multicellular emergences. While qualitative analysis leads to identification of genera, quantitative data is useful in determination of species. While this may be true *sensu stricto*, I do not agree with its general applicability.

Ahmad, Siddiqui, Jamal & Ghouse estimate the area of secondary phloem in tropical trees; it constitutes about 12-36% of total cross-sectional area of conducting phloem.

*Cytology :* Bir & Kumar report cytological studies of wild and cultivated populations of 66 taxa of legumes of Panjab plains. *Medicago polymorpha* and *Clitoria ternata* show cytological races. *Lathyrus aphaca* has significant karyotypic variations. White-flowered trees of *Derris indica* are cytologically normal, but the blue-flowered trees show meiotic abnormalities. Maximal polyploidy occurs in Caesalpiniaceae followed by Mimosaceae, and is correlated with predominantly woody habit.

Bir & Sidhu investigated the cytology of 63 weed species of orchards of Patiala. About 39.68% are polyploids and 32% of these are perennial.

Gill and Gupta comment that North-West Himalayan *Taraxacum officinale* has euploid and aneuploid cytotypes. The triploids and tetraploids, which are apomicts, are widely distributed. It is suggested that structural heterozygocity, or some genetic factors, affect synapsis in some pairs of chromosomes.

Gill, R. C. Gupta and Kaur studied 25 species of Compositae. In *Ageratum conyzoides* diploid and tetraploid ecotypes show that structural changes are actively operative as one of the evolutionary processes in the species. The difference in morphology of chromosomes between *Bidens, Carpesium, Launaea* and *Senecio* indicate the role of karyotypic rearrangement in speciation. Intraspecific polyploidy and/or aneuploidy exist in *Siegesbeckia orientalis Erigeron bonariensis,* and *Bidens trip-artida.*

P. K. Gupta mentions an interesting study of high temperature on meiosis in rye with and without B-chromosomes. The duration (0-28 days) before the onset of meiosis produced failure or pairing of chromosomes, induction of interchanges, and spindle abnormalities.

*Colchiploidy :* Bairathi and Athawat studied diploid and polyploid cells in mexoploid primary and lateral root meristem of *Crotalaria juncea,* in root tips form colchichine-treated seeds. Besides polyploidy, growth of treated roots was temporarily inhibited. Frequency of polyploidy was high with higher dosage and/or prolonged treatment.

*Mutation :* Dnyansagar and Jahagirdar used gamma rays and EMS as mutagenic agents to study essential oil-content in induced-mutant fruits of *Foeniculum vulgare.* With lower dosage of gamma rays the oil-content in small-seeded mutants was appreciably more than the controls.

Kaliyar and Roy report effect of gamma rays on several species of *Citrulus, Cucumis* and *Momordica.* Seedling lethality and growth injury were dose-dependent. Post irradiation of storage of dry seeds enhanced lethality and injury significantly than did radiation alone. *Cucumis* is the most radiosensitive and radioresistant.

Raghuvanshi and R.R. Singh treated soaked seeds of *Trigonella foenum-graecum* with EMS. Diploid controls germinated first, different dozes delayed germination, but otherwise, $2x$ and $4x$ remained unaffected. In both, increased duration of treatment affected root growth and emergence.

Raghuvanshi and A.K. Singh compared radiosensitivity of diploid and polyploid *Portulaca grandiflora.* Tetraploids were resistant to 2 K rads gamma rays; in male fertility, tetraploids were resistant to all dozes.

Raghuvanshi and D. Singh used alkylating and non-alkylating mutagens, individually as well as in combinations, on seeds of *Capsicum annuum* cv NP 46A. Both physical and chemical mutagens affected seed germination and seedling emergence.

Siddiqui and Khan, using EMS and DES, obtained larger and heavier fruits in some of the cvs of *Solanum melongena.*

*Pollen :* Bhandari and Parveen state that Zygophyllaceae is eurypalynous, pollen is 3-zonicolpate, colporoidate, colporate or polyporate. *Tribulus* is more advanced. On the basis of pollen morphology, Zygophyllaceae is closely related to Geraniaceae through *Vivinia.* In modern classification, it is inappropriate to discuss phylogeny on the basis of such restricted areas of study. Pollen, however, does have conservative characters which have phylogenetic significance. In another paper, Parveen and Bhandari discuss pollen morphology of Rhamnaceae in relation to its taxonomic assignment,

and conclude that Rhamnaceae is closer to Vitaceae than to Celastraceae.

S.P. Singh, Jos and Sharma raised inter-specific crosses of *Nicotiana*. The hybrid between *N. tabacum* and *N. glutinosa* morphologically resembled the former parent, pollen sterility was almost 100%, and mature ovaries lacked ovules. In pollen mother cells, lack of pairing and presence of univalents in diakinesis is because there are 24 chromosomes in *N. tabacum* and only 12 from *N. glutinosa*. The abnormal behaviour of chromosomes in microspore mother cells results in high pollen sterility. Seven other interspecific crosses were also not very successful.

M. H. Parabia, D. M Parabia and Shah have described the pollen morphology of several members of Cyperaceae of Gujarat. There is much uniformity in ornamentation of exine, and colpus number. The variability in shape, position of colpus, and size of grain, taken together, appear to be taxonomically useful.

Chhabra, Malik and Lamba gave short exposure of red light to pollen of *Arachis hypoguea*. This enhanced elongation, and the effect could be reversed by far red light. Cyclohexamide inhibited red light-induced tube elongation. Blue light markedly reduced tube length; this could be partially annulled by red light. Malik also reviews metabolic changes during pollen germination, and pollen tube growth.

Nair has made novel suggestions on the basis of apertural evolution in pollen grains and spores. He states that angiosperms should comprise three divisions: Primorphosporatae (Thallophyta), Trimorphosporatae (Archegoniatae), and polymorphosporatae (Angiospermae). Triphyletic origin of angiosperms is proposed Monocots, Magnolian Dicots, and Ranalian dicots. This is carrying the significance of apertural evolution too far, and there would not be many adherents to this proposal.

**Oilseeds**

Khanna and K.K. Gupta discuss problems concerning the cultivation of sunflower in India.

T. Singh and D. Singh state that the mycelium of *Macrophomina phaseoli* enters the seeds of sesame through micropyle, aggregates in the endosperm spaces between endosperm and embryo, and between cotyledons. Initially intercellular, it becomes intracellular in heavily infected seeds. The mycelium runs longitudinally and horziontally, and corrodes and binds the seed-coat, endosperm, and embryo. Infected seeds are studded with small, black pinhead-like microsclerotia.

Behl and Tiagi point out that the pericarp (exo-, meso- and endocarp) in Phaseoleae (= Cajaneae) shows lignified hypodermis, tannin,-filled hypo-or subhypodermal cells, comb-like fibres, and bulbous trichomes. They conclude that Cajaneae is a natural subtribe.

Puri states that on the basis of macromorphology, seeds of *Trigonella* can be segregated into three groups. SEM studies of outer surface of seed-coat can be linked to the primitive or advanced nature of the seed. In primitive forms, the seed-coat acts as a water-tight compartment and water can enter the seed only under certain physiological and physical conditions. In advanced forms, the seed surface is modified to increase the general surface area for maximal absorption.

*Physiology :* Afridi, Samiullah and Ahmad treated barley grains with aqueous pyridoxine. In 50% plants raised from these grains, 50 days after showing, roots and shoots were analyzed for growth characteristics, carbohydrate and protein contents. The remaining plants were

grown to maturity and analyzed for yield and grain quality. The treatment had beneficial effect on root, shoot, ear, grain-yield and quality. Afridi and Wasiuddin review the subject of foliar sprays as a means of providing fertilizer to crop plants.

Mohnot and Soni report a naturally-occurring growth factor in aqueous extract of air-dried leaves of *Amaranthus*, and studied its effect on seed germination and seedling growth of *Sorghum vulgare*. Growth of root and shoot was severely inhibited; the degree of inhibition is directly proportional to the concentration of extract and period of treatment.

N. Sawhney and S. Sawhney point out that in two branched plants of *Impatiens balsamina* (raised by decapitation) the flower-inducing factors do not pass from induced branch to non-induced one, even when the latter is defoliated. If apical and axillary meristems are removed from the branch exposed to 8-hr inductive photoperiods, it flowers under 24-hr noninductive photoperiod. $GA_3$ caused induction of floral buds.

N. Babbar, Varghese and S. Babbar point out that in sunflower, morphactin caused retardation of growth and derangement of apical dominance resulting in production of several capitula, retardation of lateral roots, reduction in stomata and epidermal cells. Anatomically, there was all round reduction of tissues.

Rawla, A. Singh and Saini mention that *Pythium aphanidermatum* is partially auxoheterotrophic for several compounds and auxotrophic for some others. The deficiency of Fe, Cu, and Mo and vitamins affects the growth.

Rawla and Chahal state that *Penicillium crustosum* requires Fe, Zn, Cu, Mo, B, D (+) biotin for optimal growth. It does not require Mn, Ca, Co, W, Ga, Sc, thiamine HCl, pyridoxine HCl, adenine sulphate, nicotin amide, folic acid, riboflavin, uracil, choline chloride, and xanthine.

*Biochemistry* : Bhatia and Malik studied distribution of some enzymes and metabolites in leaf epidermal peels of *Phaseolus mungo* grown in bright sunshine and dark. Nineteen enzymes were localized in guard and subsidiary cells. Acid phosphatase and ATP-ase exhibited less activity in open than in close stomata. Bhatia and Malik suspect the role of cyclic photophosphorylation in availability of ATP, and thereafter cyclic AMP.

Nanda points out that in stem cuttings, adventitious root formation is mediated through a chain of biochemical reactions localized in the nucleus and cytoplasm, and involves qualitative and quantitative changes in subcellular molecular components. Auxin acts at the transcriptional level whereas nutrition as a carbon source helps in translation, both having multifold effects.

On the whole, the printing is quite good, but the quality of paper and halftone reproductions do not keep up the high standard. The price is rather exhorbitant. The publisher should have added running 'title' and/or authors' name (s) on each page to facilitiate consultation. There are several misprints eg. epidemal' for epidermal' (p xviii, line 1). This volume is useful for reference purposes and should be on the shelf of every worker.

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