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Scope and target readership: The *International Journal of Plant Breeding* deals with all issues related to plant breeding, in theory or in practice.

The primary themes that the journal covers include:

- 1) Understanding of plant reproductive systems that advance our knowledge of plant breeding concepts;
- 2) Breeding for disease resistance (and elucidation of immunity, resistance, susceptibility and tolerance);
- 3) Molecular markers and molecular techniques for selection of new traits (marker-assisted selection);
- 4) Breeding for innovative traits, improved quality (flavour, nutrition, aroma, or other);
- 5) Breeding for enhanced stress resistance (biotic and abiotic);
- 6) Gene flow from cultivated to wild populations, and screening of wild relatives for breeding programmes;
- 7) Effect of breeding systems on the environment and biodiversity;
- 8) Hormonal, physiological, environmental, genetic, biophysical, developmental or molecular approaches to the study of plants used in breeding systems

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Cover photo: *Colchicum autumnale* flowers from which colchicines is extracted. More details on its application polyploidy breeding of African nightshade in Ojiewo *et al.*, pp 10-21.

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I.N. Xynias (Greece), N.O. Kozub, I.A. Sozinov, A.A. Sozinov (Ukraine) Biochemical Markers in Wheat Breeding (pp 1-9)

ABSTRACT

Invited Mini-Review: Biochemical markers and specifically isozymes and seed storage proteins have been proved to be a very effective tool in wheat breeding and seed certification. Isozyme investigation contributed towards a better understanding of bread wheat (*T. aestivum*) genome structure (AABBDD). This investigation was also important in revealing the genome structure of related species and thus contributing to wheat evolution. Wheat storage proteins, i.e. gliadins and glutenins, due to their greater polymorphism, were found to be more informative in solving practical problems, especially in breeding for grain quality. Allelic variants of the high-molecular-weight and the low-molecular-weight glutenin subunits proved to be the most effective markers for grain quality breeding and were employed by most breeders in developing high-quality wheat cultivars. They were also effective markers in detecting lines possessing resistance genes to winter tolerance, to biotic, and to abiotic stress conditions. The revealed genes were recently employed in genetic engineering approaches for improving grain quality. Biochemical markers were informative in population-genetic studies and in analyses of the genetic diversity of the wild wheat species. Furthermore, their application enabled the identification of alien genetic material into the wheat genome. The close association between biochemical markers with productivity and adaptability was beneficial in producing advanced wheat germplasm. In conclusion, application of biochemical markers played an important role in investigating evolution, breeding and certification of cultivated wheats. Finally, they contributed to the increased employment of molecular markers in wheat breeding.

Christopher Ochieng Ojiewo, Kenji Murakami (Japan), Peter Wafula Masinde, Stephen Gaya Agong (Kenya) Polyploidy Breeding of African Nightshade (*Solanum* section *Solanum*) (pp 10-21)

ABSTRACT

Invited Review: The perception of African nightshades (*Solanum* section *Solanum*) as "healthy" foods, supported by documentation of their high nutritional and medicinal benefits, has led to a sudden and steady upsurge in their consumption, demand and monetary value in Africa and most parts of South-East Asia. However, due to very low leaf yields, production of these vegetables remains on small-scales, resulting in acute shortages and escalating prices, especially in urban areas. Apart from local variants or landraces selected in some regions where these plants are utilized as food and/or medicinal plants, there are no improved cultivars developed through conventional plant breeding techniques. Species belonging to this section, generally referred to as "*Solanum nigrum*-complex" are predominantly autogamous, favouring production of many small fruits and seeds, which compete with leaves for photosynthates. *S. nigrum*-complex constitutes a polyploid series, with diploid ($2n=2x=24$), tetraploid ($2n=4x=48$), hexaploid ($2n=6x=72$) and rarely, octoploid ($2n=8x=96$) species, a trait that can be exploited for cultivar development. This review outlines the possible evolutionary mechanisms and modes of origin of the polyploids, breeding strategies to produce heteroploids such as triploid ($2x=3x=36$), pentaploid ($2n=5x=60$) and heptaploid ($2n=7x=84$) from existing or induced polyploids and envisaged advantageous properties of the novel polyploids or heteroploids over their wild-type progenitors. With few exceptions, heteroploidy is known to cause sterility or highly reduced fertility of both pollen and ovules. The African nightshade heteroploid series would putatively be male- and female-sterile, thus eliminating fruit- and seed-set and enhancing leaf productivity.

Hae Keun Yun, Kyo Sun Park (South Korea) Grape and Grapevine Rootstock Breeding Program in Korea (pp 22-26)

ABSTRACT

Invited Mini-Review: Several Korean wild *Vitis* species have been collected mainly from mountain areas all over the country, maintained in the vineyard, and used for improving grape cultivars at National Horticultural Research Institute (NHRI), Rural Development Administration (RDA). During the early 1960's, NHRI had developed and released eight table grape cultivars, namely: 'Cheongsoo', 'Hongdan', 'Hongisul', 'Tamnara', 'Jinok', 'Heukgoosul', 'Heukboseok', and 'Suok'. An additional 4 grape cultivars, namely: 'Jarang', 'Sujeong', 'Heukjinjoo', and 'Topas' were developed by the Provincial Grape Experimental Stations and the Gangwon National University. Evaluation and screening procedures for major disease resistance had also been developed for grape seedlings and germplasms. The genetic analysis of seedlessness in berries and application of molecular biology techniques for disease resistance screening provided a viable tool in ensuring a highly efficient grape breeding program.

The demand for grafted scions on resistant rootstocks increased with the growing popularity of growing grapes under vinyl houses as well as minimizing vine damage from crown gall and phylloxera infection. Yet, there had been no serious breeding program for grapevine rootstocks being implemented. It was only until the late 1990s that interests and efforts were undertaken by NHRI to develop rootstocks from the native wild grape germplasm suitable to Korean growing conditions.

Kamol Lertrat, Taweesak Pulam (Thailand) Breeding for Increased Sweetness in Sweet Corn (pp 27-30)

ABSTRACT

Invited Mini-Review: Sweetness, a creamy texture and aroma, along with desirable kernel color, good germination, and high yield, are the important traits for sweet corn. Various recessive mutants in corn expressed in the endosperm e.g. sugary1 (*su₁*), sugary enhancer (*se*), shrunken2 (*sh₂*), brittle1 (*bt*) etc., which improve quality traits such as sweetness, flavor and nutritive value have been used either singly or in combination for developing new commercial hybrids. In single mutant varieties, at harvest (20 days after pollination), the sugar (sucrose) concentration in *su₁* and *sh₂* sweet corn is 3 and 8 times higher than wild type, respectively. For *se*-type when in combination with *su₁* the sucrose level is as high as that in *sh₂*. After harvest, the sugar in kernels of *su₁* and *se* types is rapidly converted to starch, but this conversion occurs more slowly in *sh₂* type. However, both *su₁* and *se* sweet corn have more phytoglycogen or creamy texture, than *sh₂* variety without difficulties in germination. The details of breeding methods using a combination of endosperm genes for sweetness improvement are disclosed in the U.S. Patents Nos. 3,971,161 and 4,630,393. To date, two new high sugar types of commercial sweet corn, synergistic and augmented sweet varieties have been developed and released by U.S. seed companies. Synergistic has a combination of *su₁*, *se*, and *sh₂* kernels on each ear. It carries the seed quality and vigor of *su₁* varieties, the enhanced sweet corn flavor of *se* and harvest-ability and shelf life approaching supersweet (*sh₂*) type. Augmented sweet varieties, *sh₂* type, carry *se* modifier genes for tenderness and sweetness and the *sh₂* gene for high sugars and long shelf life.

Pranab Hazra, Samsul Haque Ansary, Debasis Sikder, K.V. Peter (India) Breeding Tomato (*Lycopersicon esculentum* Mill.) Resistant to High Temperature Stress (pp 31-40)

ABSTRACT

Invited Review: The evidence of global warming has increased interest in the cause of yield declines at temperatures only slightly above optimal in many crops including tomato. It has been well documented that heat stress can occur in tomato at mean daily temperatures of 28-29°C, which are just a few degrees above the optimum temperature range of 21-24°C. Such moderately elevated temperature stress may not disrupt biochemical reactions fundamental for normal cell functioning but may reduce fruit set as a common response to such elevated temperatures. This review article highlights different adverse effects of heat/high temperature and gene action governing various characters under high temperature conditions and breeding methods for the development of heat resistant tomato varieties.

Pranab Hazra, Tarak Roy, Jayanta Choudhury (India), Bistra Attanasova (Bulgaria) Male Sterility in Tomato (*Lycopersicon esculentum* Mill.) and Brinjal (*Solanum melongena*) (pp 41-50)

ABSTRACT

Invited Review: Normal development of the male reproductive organ (stamen) and male gametophyte (pollen grain) is essential for the successful completion of sexual reproduction in the angiosperms. Abnormalities at any stage of stamen and pollen development can result in male sterility and it may result from nuclear encoded gene action (GMS, or genic male sterility), cytoplasmic influence (CMS, or cytoplasmic male sterility), nuclear gene action and cytoplasmic influence (G-CMS, or genic-cytoplasmic male sterility), chromosomal aberrations and interspecific or intergeneric hybridization. This review article highlights the fundamentals of genic or nuclear male sterility in tomato and brinjal and their utilization in hybrid breeding programmes.

Pranab Hazra, Alok Kumar Mandal, Avijit Kumar Dutta, Hari Har Ram (India) Breeding Pumpkin (*Cucurbita moschata* Duch. ex Poir.) for Fruit Yield and Other Characters (pp 51-64)

ABSTRACT

Invited Review: Pumpkin (*Cucurbita moschata* Duch. ex Poir.) with its origin in the north western part of South America is the most important and extensively cultivated cucurbit in India, Africa, Latin America, Southern Asia and the United States and

occupies a prominent place among the vegetables owing to its high productivity, nutritive value, good storability, long period of availability and better transport potentialities. This review article orients on origin and taxonomy, breeding behaviour, inheritance of important characters, breeding methods and biotechnological applications in breeding pumpkin for fruit yield and quality.

Rakesh K. Dubey, Hari Har Ram (India) Graphical Analysis (Vr-Wr) and Numerical Approach for a Diallel Analysis of Yield Components in Bottlegourd (*Lagenaria siceraria* (Mol.) Standl.) (pp 65-69)

ABSTRACT

Original Research Paper: A Hayman analysis for eleven characters of yield and related traits of eight parent half-diallel set of crosses was conducted in bottlegourd (*Lagenaria siceraria* (Mol.) Standl.). Vr-Wr graphical analysis demonstrated that dominant genes were responsible for earliness while a recessive gene accounted for the round shape of fruit. The components of variation indicated that the dominance components H_1 and H_2 were significant for all the characters while additive genetic variance (D) was significant for all the characters except for fruit weight, suggesting the involvement of both additive and non-additive gene action.

Guillermo Raúl Pratta, Roxana Zorzoli, Liliana A. Picardi, Estela M. Valle (Argentina) Induction of Ammonium Metabolizing Enzymes is Related with Fruit Shelf Life in Tomato Crosses among Cultivated, Mutant and Exotic Germplasms (pp 70-73)

ABSTRACT

Short Communication: In a previous report, glutamine synthetase (GS) and glutamate dehydrogenase (GDH) were found to be differentially induced in fruits at two ripening stages among tomato lines with different shelf life (SL). The objective of the present research was to analyze SL and the induction of GS and GDH in the pericarp tissue at the mature-green and the red ripe stages in different tomato genotypes, including a set of hybrids and their parents. The *L. esculentum* parents were the standard ripening cultivar 'Caimanta', which produces round fresh-marketable fruits, and two inbred lines, N and R, which are recessive for the *nor* and *rin* mutations, respectively. The exotic parent 'Ceras' belonged to the wild *L. esculentum* var. *cerasiforme*. Four crosses were assayed: F_1 ('Caimanta' x N), F_1 ('Caimanta' x 'Ceras'), F_1 (N x 'Ceras'), and F_1 (N x R). The concomitant presence of GS and GDH was found in the pericarp of mature-green and red ripe tomato fruits from N, R, 'Ceras', F_1 ('Caimanta' x 'Ceras'), F_1 (N x 'Ceras'), and F_1 (N x R). All these genotypes had a long SL. Particularly, in red ripe fruits of N and R, the genotypes with the longest SL, two isoforms of GDH were detected. The F_1 ('Caimanta' x N) had a quite shorter SL and presented a differential induction pattern: while GS was found just in mature-green fruits, GDH was present at both ripening stages. In 'Caimanta', the genotype with shortest SL, GS was present only at the mature-green stage and GDH at the red ripe stage.