

Biotechnology in Agriculture and Forestry 11

**Somaclonal Variation
in Crop Improvement I**

Edited by Y. P. S. Bajaj



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Biotechnology In Agriculture And Forestry 2 Crops I

Y.P.S. Bajaj



Biotechnology In Agriculture And Forestry 2 Crops I:

Somatic Hybridization in Crop Improvement II Toshiyuki Nagata, Y.P.S. Bajaj, 2012-12-06 This richly illustrated volume describes how somatic hybrids can contribute to the improvement of crops. It comprises 24 chapters dealing with interspecific and intergeneric somatic hybridization and cybridization providing valuable tools for plant breeders. Somatic Hybridization in Crop Improvement I Y. P. S. Bajaj, 2012-12-06 Thirty five chapters on various aspects of fusion of plant protoplasts and somatic hybridization deal with the regeneration of interspecific and intergeneric somatic hybrids and cybrids in various plants: cereals, grasses, legumes, potato, tomato, eggplant, lettuce, Brassica, Datura, Hyoscyamus, Nicotiana, Catharanthus, Rauwolfia, Citrus, Poncirus, Prunus, Pyrus, Populus, algae, bryophytes and ferns. The implications of somatic hybridization in gene transfer in wide crosses and for the induction of genetic variability in various crops are discussed. The book is an invaluable source of information for advanced students, teachers and research scientists in the field of plant breeding, genetic engineering, plant tissue culture and general plant biotechnology. *Legumes and Oilseed Crops I* Y. P. S. Bajaj, 2012-12-06 *Crops II* Y. P. S. Bajaj, 2015-12-09 *Medicinal and Aromatic Plants XII* Y. P. S. Bajaj, Toshiyuki Nagata, Yutaka Ebizuka, 2002-04-24 Deals with the distribution, importance, conventional propagation, micropropagation, tissue culture study and in vitro production of important medicinal and pharmaceutical compounds in plants. *Haploids in Crop Improvement I* Y. P. S. Bajaj, 2012-12-06 Haploid plants have the gametophytic number of chromosomes. They are of great importance especially in studies on the induction of mutations and also for the production of homozygous plants; they are needed in large numbers. The conventional methods employed by plant breeders for their production are cumbersome, time consuming, laborious and rather inefficient. Sometimes it may take years to produce a pure line. However, with the introduction of in vitro techniques, especially anther culture for the induction of androgenesis, it has become increasingly evident that these methods considerably accelerate the production of haploids for plant breeding programs. During the last decade, in vitro produced haploids have been incorporated into breeding programs of many agricultural crops and positive results have been obtained, especially with rice, wheat, potato, barley, maize, asparagus, sunflower, brassica, tobacco, etc. Among these, rice and wheat are the best examples in which a number of improved varieties have been released. In wheat, the breeding cycle can be shortened by three or four generations when the pollen haploid breeding method is used instead of conventional cross breeding. The release of the wheat varieties Jinghua 1 and Florin is a typical example of what can be achieved with other crops. Taking these developments into consideration, the present volume *Haploids in Crop Improvement I* was compiled. Transgenic Crops I Y.P.S. Bajaj, 2012-12-06 Recently there has been tremendous progress in the genetic transformation of agricultural crops and plants resistant to insects, herbicides and diseases have been produced, field tested and patented. *Transgenic Crops I* compiles this information on cereals, grasses, legumes and oilseed crops. It comprises 25 chapters and is divided into two sections: I Cereals and Grasses (wheat, rice, maize, barley, sorghum, pearl millet, triticale).

Agrostis spp Cenchrus ciliaris Dactylis glomerata Festuca arundinacea Lolium spp and sugarcane II Legumes and Oilseed Crops Arachis hypogaea Brassica juncea Brassica napus Cicer arietinum Glycine max Gossypium hirsutum Helianthus annuus Lens culinaris Linum usitatissimum Sinapis alba Trifolium and Vicia narbonensis This book is of special interest to advanced students teachers and research workers in the field of plant breeding genetics molecular biology plant tissue culture and plant biotechnology in general

Crops I Y. P. S. Bajaj, 2012-12-06 Production of food to meet the demands of an ever increasing human population in the world is the major task and challenge to agriculture today The conventional methods of plant breeding alone can no longer cope with the situation The success of any crop improvement program depends on the extent of genetic variability in the base population but due to denuding of forests and agricultural land the naturally occurring pool of germplasm is being depleted An urgent need is therefore apparent to create new variability and increase the genetic base of agricultural crops Agricultural biotechnology has progressed to a stage in the production of plants where specific characteristics to improve their yield appearance disease resistance nutritional quality and adaptation to adverse soil conditions can be built into the seed This concept of built-in quality implies a continuous scientific endeavour to improve plant characters using a wide range of possibilities and it also implies a scrutiny of the materials and methods available in the world today

High-Tech and Micropropagation I Y. P. S. Bajaj, 2012-12-06 Presented here is another classic from this series and deals with general aspects of micropropagation of plants for commercial exploitation It includes chapters on setting up a commercial laboratory meristem culture somatic embryogenesis factors affecting micropropagation disposable vessels vitrification acclimatization induction of rooting artificial substrates cryopreservation and artificial seed Special emphasis is given on modern approaches and developing technologies such as automation and bioreactors robots in transplanting artificial intelligence information management and computerized greenhouses for en masse commercial production of plants

In Vitro Haploid Production in Higher Plants S. Mohan Jain, S.K. Sopory, R.E. Veilleux, 2013-03-09 Since the beginning of agricultural production there has been a continuous effort to grow more and better quality food to feed ever increasing populations Both improved cultural practices and improved crop plants have allowed us to divert more human resources to non agricultural activities while still increasing agricultural production Malthusian population predictions continue to alarm agricultural researchers especially plant breeders to seek new technologies that will continue to allow us to produce more and better food by fewer people on less land Both improvement of existing cultivars and development of new high yielding cultivars are common goals for breeders of all crops In vitro haploid production is among the new technologies that show great promise toward the goal of increasing crop yields by making similar germplasm available for many crops that was used to implement one of the greatest plant breeding success stories of this century i.e. the development of hybrid maize by crosses of inbred lines One of the main applications of anther culture has been to produce diploid homozygous pure lines in a single generation thus saving many generations of backcrossing to reach

homozygosity by traditional means or in crops where self pollination is not possible Because doubled haploids are equivalent to inbred lines their value has been appreciated by plant breeders for decades The search for natural haploids and methods to induce them has been ongoing since the beginning of the 20th century Brassicas and Legumes From Genome Structure to Breeding Toshiyuki Nagata, Satoshi Tabata, 2013-03-09 Genome sequence studies have become more and more important for plant breeding Brassicas and Legumes From Genome Structure to Breeding comprises 16 chapters and presents both an overview and the latest results of this rapidly expanding field Topics covered include genome analysis of a flowering plant *Arabidopsis thaliana* the sequence of the *Arabidopsis* genome as a tool for comparative structural genomics in Brassicaceae application of molecular markers in *Brassica coenospecies* the molecular genetic basis of flowering time variation in *Brassica* species quantitative trait loci for clubroot resistance in *Brassica oleracea* structural differences of S locus between *Brassica oleracea* and *Brassica rapa* *Brassica* and legume chromosomes sequence analysis of the *Lotus japonicus* genome introduction of an early flowering accession Miyakojima MG 20 to molecular genetics in *Lotus japonicus* genetic linkage map of the model legume *Lotus japonicus* construction of a high quality genome library of *Lotus japonicus* genome analysis of *Mesorhizobium loti* a symbiotic partner to *Lotus japonicus* molecular linkage map of the model legume *Medicago truncatula* genetic mapping of seed and nodule protein markers in diploid alfalfa *Medicago sativa* mapping the chickpea *Cicer arietinum* genome localization of fungal resistance genes in interspecific crosses *Trees II* Y. P. S. Bajaj, 2012-12-06 trees contribute a major part of fuel fodder and fruit and are an im of bioenergy They are now needed in large numbers more portant source than ever before for afforestation and social forestry so that fast grow ing and multipurpose trees assume great importance After extensive in discriminate deforestation and rapid depletion of genetic stocks efforts are now being made to evolve methods for clonal mass propagation of improved and elite trees Production of short duration trees with a rapid turnover of biomass and induction of genetic variability through in vitro manipulation for the production of novel fruit and forest trees which are high yielding and resistant to pests and diseases and trees which display increased photosynthetic efficiency are in demand These objectives are well within the realm of horticultural and forest biotech nology Some of the recent advances such as the regeneration of com plete trees from isolated protoplasts somatic hybridization and the *Agrobacterium* mediated transformation in various tree species have opened new vistas for the genetic engineering of fruit and forest trees This book is a continuation of the earlier volume *Trees I* and presents 31 chapters on fruit forest nut and ornamental trees such as avocado pineapple crabapple quince pistachio walnut hazelnut date palm oil palm cacao rubber maple sweet gum poplars birches Chinese tallow willows oaks paper mulberry rhododendrons Scots pine Calabrian pine Douglas fir redwood ginkgo cycads and some flowering trees *Current Catalog* National Library of Medicine (U.S.), First multi year cumulation covers six years 1965 70 *National Library of Medicine Current Catalog* National Library of Medicine (U.S.), 1990 *Wheat* Y. P. S. Bajaj, 2013-03-09 Wheat which is the second most important

cereal crop in the world is being grown in a wide range of climates over an area of about 228 945 thousand ha with a production of about 535 842 MT in the world Bread wheat *Triticum aestivum* L accounts for 80% of the wheat consumption however it is attacked by a large number of pests and pathogens rusts and smuts cause enormous damage to the crop and reduce the yield drastically in some areas The major breeding objectives for wheat include grain yield earliness resistance to lodging and diseases spikelet fertility cold tolerance leaf duration and net assimilation rate fertilizer utilization coleoptile length nutritional value organoleptic qualities and the improvement of characters such as color and milling yield The breeding of wheat by traditional methods has been practiced for centuries however it has only now come to a stage where these methods are insufficient to make any further breakthrough or to cope with the world's demand Although numerous varieties are released every year around the world they do not last long and long term objectives cannot be realized unless more genetic variability is generated Moreover the introduction of exotic genetic stocks and their cultivation over large areas results in the depletion and loss of the native germplasm pool

Cryopreservation of Plant Germplasm I Y. P. S. Bajaj, 2013-03-09 The germ plasm of numerous plant species especially those of forest trees some agricultural crops and medicinal plants is endangered and threatened with extinction This depletion of germplasm pools and the shrinkage of naturally occurring genetic resources have caused international concern Conventionally the germplasm of plants is conserved through seeds tubers roots corms rhizomes bulbs cuttings etc However the germ plasm of a number of trees and plantation crops such as coconut cacao coffee oil palm rubber mango horse chestnut etc cannot be preserved since their seeds are short lived recalcitrant Likewise germplasm of vegetatively propagated crops such as potato and cassava cannot be stored on a long term basis and has to be grown and multiplied periodically in nurseries and fields The plants are thus exposed to unpredictable weather conditions and diseases with the result that instances are known where entire genetic stocks are lost Therefore unconventional methods are being developed for the storage and international exchange of germplasm For this purpose in vitro cultures have been employed but they can only enable short to medium term preservation moreover cell cultures upon repeated subculture undergo genetic erosion In view of the recent developments in the in vitro induction of genetic variability through somaclonal variation somatic hybridization recombinant DNA technology etc new methods need to be employed for the storage of desirable cultures In this regard freeze preservation of cells in liquid nitrogen 196 0q like that of semen enables long term storage theoretically for an indefinite period of time

Plant Protoplasts and Genetic Engineering I Y. P. S. Bajaj, 2012-12-06 Isolated protoplasts are a unique tool for genetic manipulation of plants Since the discovery of a method for the enzymatic isolation of protoplasts by Professor E C Cocking in 1960 tremendous progress has been made in this very fascinating area of research I have witnessed the struggle in the 1960s and early 1970s when obtaining a clean preparation of protoplasts was considered an achievement I also shared the pioneering excitement and enthusiasm in this field during the 2nd International Congress of Plant Tissue Culture held at

Strasbourg in 1970 where Dr I Thkebe of Japan presented his work on the induction of division in tobacco protoplasts This was followed by my participation in three international conferences devoted to plant protoplasts held in 1972 in Salamanca Spain and Versailles France and then in 1975 in Nottingham England The enthusiasm shown by plant scientists at these meetings was ample proof of the bright future of protoplast technology and it became evident that protoplasts would play a major role in plant biotechnology especially in genetic engineering Since then we have never looked back and now the methods for isolation fusion and culture as well as regeneration of somatic hybrids have become routine laboratory procedures for most plant species Currently the focus is on cereal and tree protoplasts In order to bring about any genetic manipulation through fusion in corporation of DNA and transformation the regeneration of the entire plant through manipulation of protoplasts is a prerequisite

High-Tech and Micropropagation III Y. P. S. Bajaj, 2013-04-17 Presenting the state of the art of tissue culture and in vitro propagation of vegetable and tuber crops medicinal and aromatic plants fibre and oilseed crops and grasses this book complements the previous two volumes on High Tech and Micropropagation which concentrated on special techniques Vol 17 and trees and bushes of commercial value Vol 18 The specific plants covered here include asparagus lettuce horse radish cucumber potato cassava sweet potato artichoke yams cardamom fennel celery thyme leek mentha turmeric lavender agave yucca cotton jute sunflower ryegrass zoysiagrass and various species of Aconitum Artemisia Camelia Centaurium Digitalis Dioscorea Glehnia Levisticum Parthenium and Pinella The book is of use to advanced students teachers and research workers in the field of pharmacy horticulture plant breeding and plant biotechnology in general and also to individuals interested in industrial micropropagation

Transgenic Crops II Y.P.S. Bajaj, 2012-12-06 There has been tremendous progress in the genetic transformation of agricultural crops and plants resistant to insects herbicides and diseases have been produced field tested and patented This book compiles this information on various fruits and vegetables

Plant Protoplasts and Genetic Engineering II Y. P. S. Bajaj, 2012-12-06

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