

Dynamics of Agricultural Biotechnology

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A S Chandel and R M Kamal



SAARC Agricultural Information Centre (SAIC)

**SAARC Agricultural Information Centre (SAIC)
BARC Complex, Farmgate, Dhaka 1215, Bangladesh**

Published : 1995

Cover design : Mafruha Begum

**Price : US\$ 10.00 for SAARC countries
US\$ 15.00 for other countries**

Chandel, A S and Kamal, R M

Dynamics of agricultural biotechnology: SAARC bibliographical database. Dhaka: SAARC Agricultural Information Centre, 1995.

ii, 321, liii p.

1. Biotechnology, bibliography. 2. Agricultural biotechnology, bibliography. 3. SAARC Agricultural Information Centre. i. Jt. Author. ii. Title.

Published by : Director, SAARC Agricultural Information Centre (SAIC)

Printed at : Panir Printers, 9 Nilkhet, Dhaka 1205

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1742 SINGH, O; PARODA, RS; SINGH, O. 1986. Association analysis of grain yield and its components in chickpea following hybridization and a combination of hybridization and mutagenesis. *Indian Journal of Agricultural Sciences*, 56: 2, 139-141; 5 ref.

Half of the seeds from the 36 F1s from a 9 X 9 half diallel cross were treated with 30 kR gamma rays and half were used as the control. The F2 of the control and the F2M2 of the irradiated set of seeds were planted in replicated randomized blocks. Analysis of the data collected on seed yield/plant and 4 related traits revealed (1) significant and positive correlations between all traits except 100-seed weight, which showed negative correlations with the other traits; (2) reduction in the negative correlations of 100-seed weight following irradiation, particularly with seed yield/plant, from significant to nonsignificant; and 3) reductions following irradiation in the various negative direct and indirect effects of different yield components on seed yield/plant, revealed by path analysis. It is suggested that mutagenic treatment of F1 seeds may help to break undesirable linkages.

1743 SINGH, RP; SINGH, BD. 1989. Recovery of rare interspecific hybrids of gram *Cicer arietinum* X *C. cuneatum* L. through tissue culture. *Current Science*, 58: 15, 874-876; 5 ref.

Ovaries from *C. arietinum* X *C. cuneatum* crosses were cultured on B5 medium containing 0.5 mg benzyladenine, 0.1 mg NAA and 100 ml coconut milk/litre. Eight of the cultures had callus formation while 2 had shoot-bud formation. The shoot buds produced 10-15 shoots/culture tube after 8-10 days, with plantlet formation within 20 days. Root regeneration occurred on medium containing 1 mg NAA/litre. The hybrid plants were morphologically similar to *C. cuneatum* and failed to flower.

1744 SWAMY, AVSR; KHANNA, VK. 1990. Application of special techniques to improve seed-set in interspecific crosses in *Cicer*. *International Chickpea Newsletter*, No. 23: 8-10; 3 ref.

Various methods were tried to overcome a stigmatic barrier which prevents seed-set. In a comparison of crosses between cultivated chickpea and 5 annual wild *Cicer* sp, maximum seed-set was obtained in *C. arietinum* X *C. reticulatum*. Application of IAA or GA increased pod and seed set in *C. arietinum* X *C. bijugum*.

1745 VERMA, MM; SANDHU, JS; BRAR, HS; BRAR, JS. 1990. Crossability studies in different species of *Cicer* (L) - Research Note. *Crop Improvement*, 17: 2, 179-181.

1746 WALDIA, RS; CHHABRA, AK; SOLANKI, IS; TOMAR, RPS. 1992. Inheritance studies of speed of plumule emergence in chickpea. *Journal of Genetics and Breeding*, 46: 3, 209-214.

Mushrooms

1747 BALASUBRAMANYA, RH. 1981. An edible mushroom crop on cotton stalks. *Indian Soc. Cotton Imp.* 6: 104-106.

1748 BALASUBRAMANYA, RH; BHATAWDEKAR, SP. 1988. Bioenrichment of agricultural wastes with a free-living nitrogen fixing bacterium and a mushroom fungus. *Indian J. Microbiol.* 28: 220-225.

1749 BALASUBRAMANYA, RH; KHANDEPAR-KAR, VG. 1989. Edible mushroom crop on spent cotton stalks. *Indian Soc. Cotton. Imp. J.* 14: 85-86.

1750 BALASUBRAMANYA, RH. 1988. Mushroom crop on willow-dust. *Indian J. Microbiol.* 28: 131-132.

CROP DISEASES

1751 BRAR, DS; VIDHYASEKARAN, P. 1990. Tissue culture - a tool to develop disease resistant plants. *Basic research for crop disease management*/edited by P Vidhyasekaran. New Delhi: Daya Publishing House, p. 19-26; 26 ref.

The principles of tissue culture are discussed under the headings: in vitro selection at cellular level; somaclonal variation; meristem or shoot-tip culture; embryo rescue and protoplast fusion; and cell culture and recombinant DNA technology.

1752 DEVI, SAI; DIVAKAR, BJ; PAWAR, AD. 1983. A note on the rearing and storage of *Trichogramma embryophagum* (Hartig) and *Trichogramma cacoeciae pallidum* Meyar. *Plant Protection Bulletin, India*, 35: 3/4, 34.

The egg parasites *Trichogramma embryophagum* and *T. cacoeciae pallidum*, introduced for the biological control of the apple pest *Cydia pomonella* in Jammu and Kashmir, India, were mass-reared on eggs of an alternative host, *Corcyra cephalonica*. Rearing techniques for the parasites are described. Studies indicated that host eggs parasitized by both trichogrammatids could be stored at 5°C for nearly 3 months. Parasitized eggs could be stored at sub-zero temperatures for up to 10 days if the eggs were placed in the freezer not later than 72 h after parasitization.

1753 GUPTA, BC; PARSHAD, VR; GURAYA, SS. 1984. **Morphological and histochemical studies on the ovarian development and oogenesis in *Paramphistomum cervi* (Digenea: Paramphistomatidae).** *Folia Parasitologica*, 31: 2, 147-156; 33 ref.; 2 pl. (unpaged).

The ovary in a 4-week-old *P. cervi* contains undifferentiated germ cells. Oogonial differentiation, together with the appearance of some PAS-positive material in the ooplasm occurs in the ovary of 8-week-old worms. The ovary of 16-week-old worms contains only oogonia and oocytes and no germ cells. In adult worms, the oocytes reach the pachytene stage and further development is arrested at this stage. Nucleolar fragmentation and subsequent transport of nuclei to the ooplasm were observed. The ooplasm contains nutritive material rich in proteins, carbohydrates and lipids. Its amount varies with different stages of oogenesis. The localization of various phosphatases and dehydrogenases was studied during oogenesis and their functional significance discussed.

1754 KHURAD, AM; RAINA, SK; PANDHARI-PANDE, TN. 1991. **In vitro propagation of *Nosema locustae* using fat body cell line derived from *Mythimna convecta* (Lepidoptera: Noctuidae).** *Journal of Protozoology*, 38: 6, 915-935.

1755 LOPES, UG; WIRTH, DF. 1986. **Identification of visceral *Leishmania* species with cloned sequences of kinetoplast DNA.** *Molecular and Biochemical Parasitology*, 20: 1, 77-84; 31 ref.

Cloned subfragments of minicircle kinetoplast DNA (kDNA) isolated from *L. donovani* (WR35)2 were identified which showed different taxonomic specificities. A significant sequence diversity within the kDNA minicircle was demonstrated. One cloned fragment was present in all visceral *Leishmania* species tested, but was not present in any of the cutaneous *Leishmania* species. Another cloned fragment was only found in the strain from which it had been derived. In experiments with the New World visceral leishmanias (*L. chagasi*, WR518) several different cloned kDNA fragments were found to react with all isolates of the *L. chagasi* tested, but not with any cutaneous *Leishmania* species, either from the Old World or the New World. These cloned *L. chagasi* kDNA fragments reacted with isolates of African visceral *Leishmania* species but not with isolates from India.

1756 MUMMIGATTI, SG; RAGHUNATHAN, AN. 1990. **Influence of media composition on the production of delta-endotoxin by *Bacillus thuringiensis* var.**

thuringiensis. *Journal of Invertebrate Pathology*, 55: 2, 147-151; 17 ref.

Powders of edible leguminous seeds, green gram (*Vigna radiata*) or soyabean were used as the major protein source with different combinations of soluble starch and/or sugarcane molasses as the major carbohydrate source for the production of delta-endotoxin by *Bacillus thuringiensis* subsp. *thuringiensis* serotype 1 in submerged fermentation. The primary product (lyophilized with 6 g of lactose) yield was 8.7 to 9.1 g/litre from media with dehusked green gram powder and 9.7 to 10.3 g/litre from media with defatted soyabean powder in basal medium. The toxicity of primary products was assayed against 5th-instar larvae of *Bombyx mori* by force-feeding. The primary product from the medium containing defatted soyabean powder and soluble starch gave a maximum viable spore count of 91.3×10^6 /mg, with a corresponding potency of 35 800 IU/mg, whereas the medium containing dehusked green gram powder and cane molasses gave a spore count of 49.5×10^6 /mg, with a highest potency of 38 300 IU/mg. Either legume protein in combination with cane molasses yielded primary product 2.1 to 2.4 times more potent than the US standard. The combined carbohydrate source consisting of soluble starch and cane molasses, irrespective of the source of protein in the media, drastically reduced delta-endotoxin production, thereby reducing the potency of the primary products compared to the US standard.

1757 RAMAKRISHNA, SV; JAMUNA, R; EMERY, AN. 1992. **Continuous production of thermostable alpha-amylase by immobilized bacillus cells in a fluidized-bed reactor.** *Applied Biochemistry and Biotechnology*, 37: 3, 275-282.

1758 ROY, P. 1992. **Genomic amplification and expression of delta-endotoxin fragment of *Bacillus thuringiensis*.** *Biochemical and Biophysical Research Communications*, 187: 2, 641-647.

Delta-endotoxin gene of *Bacillus thuringiensis* HD-1 var kurstaki codes for the insecticidal crystal protein (ICP) specific for lepidopteran insects. Since the N-terminal half of the toxin is sufficient both for insect specificity and toxicity, the coding sequence of this part of the gene CryIA(b) was amplified by PCR and cloned in pUC19. As there was no expression of immunologically detectable delta-endotoxin in this clone in *E. coli*, the amplified ICP gene was transferred to an expression vector pGEX2T. Restriction mapping and immunoblotting confirmed the presence and expression of the CryIA(b) gene. This insert should be suitable for

expression in plant system if it is mobilized into a plant binary vector.

1759 SEN, C; KHATUA, DC. 1990. **Genetic engineering in plant disease management - problems and prospects.** *Basic research for crop disease management*/edited by P Vidhyasekaran. New Delhi: Daya Publishing House, p. 1-12; 55 ref.

The principles and major techniques of genetic engineering relevant to disease management are reviewed, including gene cloning and vectors used in gene cloning, genes for disease resistance, biological control and cross protection of crops. Crown gall control, the use of antagonists, frost control and transmissible hypovirulence are described. Various examples of the successful use of genetic engineering in overcoming plant diseases are given.

1760 SHARMA, AN. 1984. **Histochemical localization and functional significance of some enzymes in various tissues of *Ceylonocotyle scoliocoelium* cultured in vitro.** *J. of Helminthology*, 58: 3, 201-206; 11 ref.

ATPase and SDH activities were studied in various tissues of *C. scoliocoelium* maintained in vitro in medium A for 15 days, using standard histochemical techniques. Results were compared with the normal activities of these enzymes in the tissues of worms freshly collected. Low ATPase and SDH enzyme activities in the tissues of cultured flukes indicated their low metabolic rate. Intensity of enzymatic reactions was also found to be tissue specific. The suitability of culture medium 'A' for the in vitro cultivation of amphistomes is discussed.

1761 SINGH, US; SHARMA, AK; PANDEY, BK. 1989. **Growth of biotrophic plant parasites and symbionts in tissue culture.** *Perspectives in phytopathology*/edited by NP Agnihotri, N Singh, HS Chaube, US Singh, TS Dwivedi. New Delhi: Today and Tomorrow's Printers & Publishers, p. 113-139; 71 ref.

Terminology and basic techniques, the establishment of dual cultures and potential applications of dual cultures are considered. Standard protocols are presented for tobacco - *Phytophthora parasitica* [*P. nicotianae*] var. *nicotianae*, *Brassica-Plasmodiophora brassicae*, *Brassica-Peronospora parasitica*, tobacco-*P. tabacina*, *Pennisetum americanum-Sclerospora graminicola*, *sugarcane-Peronosclerospora sacchari*, *Juniperus-Gymnosporangium juniperi-virginianae*, *sunflower-Puccinia helianthi*, vesicular arbuscular mycorrhizas in root organ culture and plant parasitic nematodes. A table of formulations of some plant tissue culture media,

a list of biotrophic fungi grown on callus of their host plant, a list of plant parasitic nematodes which have been successfully grown in dual culture and a list of biotrophic fungi are given.

1762 SRIVASTAVA, KM; RAIZADA, RK; SRIVASTAVA, A; CHANDRA, GOVIND; SINGH, BP. 1992. **Rapid generation of probe for a ss DNA plant virus directly from total DNA of infected tissue.** *Current Science*, 62: 6, 481-482; 7 ref.

The procedure described for generating radiolabelled probe for ss DNA viruses, using total DNA from infected leaves, works well for detection of individual geminiviruses and can be used for establishing relationships among different geminiviruses affecting plants.

1763 STROBEL, GA; BARASH, I. 1990. **Microbial phytotoxins and plant diseases.** *Basic research for crop disease management*/edited by P Vidhyasekaran. New Delhi: Daya Publishing House, p. 65-73; 20 ref.

Phytotoxins are defined and the basic concepts related to the role of phytotoxins in pathogenesis and their potential application in agricultural biotechnology are considered. Examples of phytotoxins, their chemical group and source and examples of host-specific toxins are tabulated. Uses of phytotoxins for the development of disease resistance, in the synthesis of effective herbicides and in the detection of disease causing organisms are outlined.

1764 SUR, B; MISRA, AK; BASU, SK. 1989. **Identification of a small plasmid having role in delta-endotoxin production in *Bacillus thuringiensis* (H14) by curing analysis.** *Journal of Microbial Biotechnology*, 4: 1, 48-53; 14 ref.

Bacillus thuringiensis subsp. *israelensis* (VCRC Acc. No. B-17) was screened for the presence of extrachromosomal genetic elements. The strain was found to contain a complex plasmid array. A total of 6 plasmids were detected by agarose gel electrophoresis. The approximate sizes of these plasmids were found to be 20, 10, 6.6, 5.6, 4.3 and 3.6 MDa on comparison with standard plasmids of known sizes (*Escherichia coli* V 517). In order to study the role of these plasmids in biocide synthesis, toxin-deficient strains were isolated using high temperature as a curing agent. Six strains having different plasmid pattern were selected. Comparison of plasmid DNA preparations of these cured and parent strains demonstrated involvement of at least one plasmid (3.6 MDa) in delta-endotoxin production.

1765 TRIANTAPHYLLOU, AC. 1988. **Biochemical approaches in nematode taxonomy and identification.**

Advances in plant nematology: Proceedings of the U.S.-Pakistan International Workshop on Plant Nematology. (Karachi: 1986: April 6-8)/edited by MA Maqbool, AM Golden, A Ghaffer, LR Krusberg. National Nematological Research Centre, University of Karachi, Karachi, Pakistan. p. 113-121; 28 ref.

The use of DNA, soluble proteins and enzymes as taxonomic characters in nematology is discussed. These features can be used in the identification of species or forms below species level and can assist in assessing nematode phyletic relationships in terms of biochemical evolution.

1766 VIDHYASEKARAN, P. 1990. Basic research for crop disease management. New Delhi: Daya Publishing House, viii + 410 p.

The book contains 33 contributions arranged under the headings: genetic engineering and tissue culture; physiological and molecular plant pathology; virus disease management; bacterial disease management; epidemiology and forecasting; resistance breeding; biological control; and the management of diseases of national (Indian) importance. Articles have been contributed from USA, Israel, Philippines and India.

1767 VIDHYASEKARAN, P. 1990. Genetic engineering for virus disease management. *Basic research for crop disease management*/edited by P Vidhyasekaran. New Delhi: Daya Publishing, p. 13-18; 24 ref.

The use of genetic engineering methods for virus disease management is outlined with examples of the application of the techniques. It is concluded that genetic engineering, although still in its infancy could provide an efficient means of virus control.

INSECT PESTS

1768 ANANTHAKRISHNAN, TN; RAMAN, A. 1988. Dynamics of insect-plant interaction: recent advances and future trends. New Delhi: Oxford & IBH Publishing, 223 p.

The series of articles presented in this volume aims to highlight recent advances and future directions for the study of insect-plant interactions. The introductory chapter outlines various avenues involved in such research. Areas such as biophysical and biochemical resistance mechanisms, natural plant products in relation to the behavioural physiology of insects and of the nature of changes in insect-plant mutualism, the dynamics of cecidogenous insects in relation to their hosts as well as prospects of genetically engineered plants for enhanced protection from insects are discussed.

1769 ANNAMALAI, P; LALITHAKUMARI, D. 1993. Biochemical changes and mechanism of resistance in *Bipolaris oryzae* to edifenphos. *Zeitschrift Fuer Pflanzen. Und Pflanzenschutz*, 100: 5, 497-507.

Physiological changes and mode of resistance in *Bipolaris oryzae* to edifenphos was evaluated. Due to development of resistance, protein, DNA, RNA, total lipid and phospholipid contents were altered. Rate of efflux of electrolytes was decreased and reduced membrane permeability was suggested as the mechanism of resistance. Due to reduced membrane permeability, rate of uptake of edifenphos was also less in resistant strains of *B. oryzae*.

1770 BABU, TR; AZAM, KM. 1987. Residual toxicity of different insecticides to the adult *Cryptolaemus montrouzieri* Mulsant (Coccinellidae: Coleoptera). *Tropical Pest Management*, 33: 2, 180-181; 6 ref.

In connection with the possibility of using the predacious coccinellid *Cryptolaemus montrouzieri* as a biological control agent against *Maconellicoccus hirsutus* on grapevines in Andhra Pradesh, India, the toxicity and persistence of 8 insecticides and one acaricide to adults of the coccinellid were investigated in the laboratory. Dichlorvos at 0.1% was found to be the safest insecticide; synthetic pyrethroids were highly toxic and more persistent. The acaricide dicofol was also toxic. Hence sprays of 0.1% dichlorvos could be integrated with release of the predator.

1771 BALOCH, AA. 1982. Embryogenesis studies of *Anacridium aegyptium* L. (Catantopidae: Orthoptera). *Pakistan Journal of Zoology*, 14: 2, 185-190; 9 ref.

In the laboratory in Pakistan 17 stages of embryonic development in the eggs of *Anacridium aegyptium* were observed; they are described in detail. At a rearing temperature of 34-36°C, the egg stage lasted 20 days, and morphological changes on each of these days are recorded.

1772 BANERJEE, S; SAHAI, YN. 1983. Neuroendocrine control of oocyte development in *Poecilocus pictus* Fabr. (Acrididae, Orthoptera). *Current Science*, 52: 9, 432-434; 20 ref.

The respective roles of the *Corpora allata* (CA) and the median neurosecretory cells (mNSC) in the oogenesis of *Poecilocus pictus* (F.) was investigated in the laboratory in India by cautery of the mNSC, ovariectomy or implantation of extra CA. From the results it was concluded that both the CA and the mNSC were necessary for successful oocyte development and oviposition. The NSC hormone affected previtellogenic growth of