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BACTERIAL CROSS-TALKS: THEIR ROLE IN PATHOGENICITY WITH REFERENCE TO MOLECULAR AND GENETIC CONTROL

M. Hussain and S. Abid Ali

International Center for Chemical Sciences, HEJ Research Institute of Chemistry, University of Karachi, Karachi 75270, Pakistan.

ABSTRACT

Bacteria were for a long time believed to exist as individual cells that sought primarily to find the nutrients and multiply. The discovery of intercellular communication among bacteria in response to the dense population has led to the realization that bacteria are capable of coordinated activity that was once believed to be restricted to multicellular organisms. This population-dependent signaling phenomenon has been termed quorum sensing. This cell to cell coordination makes bacteria to govern various phenotypic traits like biofilm formation, exoenzyme production, antibiotic production, bacteriocin production, motility and bioluminescence. Some experimental evidence implicate quorum-sensing system importance in the pathogenesis of various bacteria are discussed in this article.

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AN ADDITION TO THE EXISTING FAUNA OF THE FAMILY CUCUMARIIDAE (HOLOTHUROIDEA: ECHINODERMATA) FROM PAKISTAN

Q. Tahera

Marine Reference Collection and Resource Centre, University of Karachi, Karachi-75270, Pakistan. E-mail:qaseem_tahera@yahoo.com

ABSTRACT

Till now 36 species of the Phylum Echinodermata are reported from Pakistan. The present paper deals with the species belonging to the family Cucumariidae recorded from the northern Arabian Sea, Pakistan. Among them *Cucumaria conjungens* and *Aslia forbesi* are added to the existing local fauna and attains a new and 1st subsequent records respectively from the region. A brief account of these species is given.

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A STRUCTURAL AND HISTOLOGICAL DESCRIPTION OF NODULES OF TRIBULUS TERRESTRIS L. AND THE INFECTING MICROORGANISMS

A. Mahmood and M. Athar¹

Department of Botany, University of Karachi, Karachi-75270, Pakistan.

¹*Department of Environmental Horticulture, University of California, Davis, CA 95616, USA*

ABSTRACT

The present paper is a histological study of the nodules or nodule-like swellings found on the roots of *Tribulus terrestris* L., a xerophytic nonleguminous plant of the angiosperms. Anatomically the nodules found on this species show similarities to the tissue pattern of nonleguminous nodules. They had a central vascular system and the infected tissue occupying the cortical cells on both sides of the stele. The cytology of the proliferated tissue is described. Two types of endophytes were observed in the cortical cells of the nodules. Cells of the outer cortex were bigger showing large intercellular spaces in which clumps of rhizobia (*Bradyrhizobium* sp.) could be seen. The invasion pathway of bacteria appears to be “crack entry” and their cell to cell movement was both intercellular and intracellular. Cells of the inner cortex were smaller, compact and did not show intercellular spaces. These cells were heavily colonized by cyanobacterium. This has been described as a new taxon and is designated as *Newmania karachiensis* Mahmood and Athar gen. nov et sp. nov. The occurrence of a blue green alga as endophyte in the root nodules of an angiosperm is being reported for the first time.

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DETERMINATION OF GENETIC DIVERSITY IN COMMON BEAN (*PHASEOLUS VULGARIS* L.) BY SEED PROTEINS

A. Gulumser¹ and A. Okumus²

*Crop Science*¹, *Department of Biometry-Genetics*², *Agriculture Faculty, Ondokuz Mayıs University, Samsun, Turkey*

ABSTRACT

Seed storage protein polymorphisms of five commercial cultivars and seven hopeful landrace genotypes of common bean (*Phaseolus vulgaris* L.) collected from the region, were analysed by SDS-PAGE. The protein bands of the genotypes were scored for their absence and presence and used for genetic distances which were utilised for a similarity matrix analysis. The genotypes of common bean showed genetic similarity values changing from 42 to 100%, which the genetic diversity was illustrated by a similarity matrix and the UPGMA dendograms. Consequently, it seems that SDS-PAGE is not deal to predict the genetic similarity of selected genotypes because of the data handling from the seed storage proteins, although revealing differentiation in some *Phaseolus* species.

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DETERMINATION OF GENETIC DIVERSITY IN SOME VETCHES (*VICIA* SPP.) BY SEED PROTEINS

A. Okumus¹ and A. Gulumser²

*Biometry-Genetics Department*¹, *Department of Crop Science*², *Agriculture Faculty, Ondokuz Mayıs University, Samsun, Turkey*

ABSTRACT

Seed storage proteins of 7 landrace accessions of four vetch (*Vicia*) species collected in Turkey were analysed by SDS-PAGE. The protein bands of the genotypes were scored for their absence and presence and used for estimating genetic distances which were utilised for a similarity matrix analysis. The genotypes of *Vicia* spp. showed genetic similarity values that ranged from 33 to 83 percent. The genetic diversity exhibited by seed proteins was illustrated by a similarity matrix and the UPMGA dendrogram. Although the *Vicia* genotypes showed different seed protein patterns those of *V. pannonica*, *V. narbonensis*, *V. sativa* and *V. villosa* formed the same UPMGA cluster. Consequently, it is shown that SDS-PAGE is of no value to predict taxonomic relationships of selected genotypes because *Vicia* genotypes have very similar protein patterns, at the same time revealing considerable differentiation in some vetch species (*V. villosa* and *V. pannonica*).

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EMBRYO RESCUE IN INTER-SPECIFIC CROSSES OF *LUPINUS ALBUS* AND *L. MUTABILIS*

A. H. Shah and N. Haq

Environmental Laboratory, Department of Civil and Environmental Engineering, University of Southampton, Highfield, Southampton SO17 1BJ, United Kingdom.

ABSTRACT

Inter-specific hybridisation of *Lupinus albus* and *L. mutabilis* was attempted using exogenous plant growth regulators and *in vitro* embryo/ovule culture. Observations on pod and ovule development in reciprocal crosses revealed that the process of embryo abortion starts between 3rd and 5th day after pollination and is the appropriate stage for embryo rescue through *in vitro* embryo/ovule culture. Application of plant growth regulators had some positive effects on pod retention but did not stop pod abscission. Hybrid ovules were cultured from both the combinations and some of them developed *in vitro* into plantlets.

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SEED GERMINATION OF THREE LEGUMINOUS SPECIES AND A COMPARISON OF GERMINATION VELOCITY MEASURES

S. S. Shaukat¹ and S. Gulzar²

¹*Department of Botany, University of Karachi, Karachi-75270, Pakistan*

²*Govt. Superior Science College, Shah Faisal Colony, Karachi-75230, Pakistan*

ABSTRACT

This study focuses on methods of breaking innate dormancy of three leguminous species and also compares various germination velocity indices. Seeds of *Albizia saman* (Jacq.) F. Meuller, *Prosopis glandulosa* Torr. and *Senna occidentalis* Link. were subjected to mechanical scarification, hydrochloric acid (2N and 4N HCl) and boiling water treatments. Maximum final germination percentage was obtained by mechanical paper scarification in all three tested species, followed by boiling water treatment (*Albizia saman* and *Prosopis glandulosa*). Chemical scarification, particularly 2N HCl was least effective in breaking innate dormancy. Germination velocity was highest in mechanically scarified seeds of *Senna occidentalis* and *Prosopis glandulosa*, while highest germination velocity for *Albizia saman* was obtained in the boiling water treatment.

Comparison of three commonly used indices of germination velocity disclosed close similarity in their results. However, because of greater correlation with the other two indices as well as with the slope of the linear regression line fitted between the initial and final germination, the index developed by Djavanshir and Pourbeik (1976) appears to be superior to the other two indices.

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HISTOLOGICAL AND HISTOCHEMICAL ALTERATIONS INDUCED IN THE TESTICULAR TISSUE OF MICE INTOXICATED WITH BENOMYL

S. A. Sakr and Y. A. Okdah

*Department of Zoology, Faculty of Science, Menoufia University, Shebin El-Kom, Egypt.
e.mail: sabsak@yahoo.com*

ABSTRACT

Benomyl is a fungicide of benzimidazole group used against a wide range of fungal diseases of crops and vegetables. The effect of benomyl on the testicular tissue of mice was investigated. Treating mice with benomyl at a dose level of $1/10LD_{50}$ 3 times/week for 3 weeks significantly reduced the diameter of the seminiferous tubules and the height of the germinal epithelium. Moreover, the treatment induced many histopathological changes including degeneration of the spermatogenic cells, absence of sperm bundles and congestion of blood vessels.

Histochemical results revealed reduction in total carbohydrates and total proteins in the spermatogenic cells. These alterations were time-dependent and were obvious in mice treated with benomyl for 3 weeks. It is speculated that one or more metabolite of benomyl may have endocrine disrupting effects resulting in the inhibition of spermatogenesis.

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INFLUENCE OF SALINITY AT SEEDLING STAGE AND ON YIELD AND YIELD COMPONENTS OF DIFFERENT RICE LINES

Y. Ali and A.R. Awan

Nuclear Institute for Agriculture and Biology, P. O .Box 128, Faisalabad, Pakistan

ABSTRACT

Rice lines were screened using rapid screening technique for salinity tolerance. Out of the lines tested, eight were found tolerant; five were graded as moderately tolerant and five were susceptible or highly susceptible. Two lines showed higher root /shoot ratio and were found tolerant. It appeared that screening at seedling stage and higher root/shoot ratio provides a clue about salt tolerance potential of a genotype. Based on the results of above study, further comparative studies for salt tolerance in different rice genotypes were made under the artificial salinity conditions. In general, salinity caused a marked reduction in yield and yield components in all the genotypes except a recombinant Jhona-349x Basmati-370 where a little effect was observed. Jhona-349x Basmati-370 seems to possess better potential than other lines tested under saline environments.

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A HIGH YIELDING AND SALT TOLERANT NEW COTTON VARIETY-NIAB-999

Y. Ali, Z. Aslam, and M. Asif¹

Nuclear Institute for Agriculture and Biology P.O. Box-128, Faisalabad, Pakistan

¹*District officer on farm water management, Gojra, T.T.Singh*

ABSTRACT

The problem of increasing salinity implicates the selection and development of salt tolerant crop varieties in Pakistan. This study reports relative salt tolerance of fourteen cotton varieties in Petri dishes, solution culture, ion uptake behavior and field performance in rising salinity level. Cotton variety NIAB-999 showed maximum seed germination even on EC = 25 dSm-1 i.e. 60% followed by CIM-707 which showed 58 percent seed germination. The results of solution culture indicated that the cotton variety NIAB-999 had highest relative growth rate i.e. 0.282 gg⁻¹ day⁻¹ followed by CIM-707 which had 0.239 RGR. The lowest RGR was found in Strain PIM-80 (0.049). If Na⁺ is lower and K⁺ is high in shoot the variety is called salt tolerant. If Na⁺--K⁺ ratio is narrow then the variety is tolerant and if the Na⁺, K⁺ ratio is higher then it is called sensitive. The mean performance for salinity rating, Na⁺, K⁺ and Na⁺, K⁺ absorption ratio of cotton in shoot indicated that strain NIAB-999 and CIM- 707 posses tolerance,. CIM-499 was sensitive in which Na⁺/ K⁺ ratio was 0.159, 0.159 and 0.350 respectively. In field NIAB-999 out yielded all other cultivars tested and gave seed cotton yield 2930 kg/ha with 43.23 percent boll bearing.

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EFFECTS OF GROWTH HORMONES GA3, IAA AND KINETIN ON THE INTERNAL STRUCTURE OF SHOOT OF *LENS CULINARIS* L.

Iram Bhatti¹, M. Naeem², R. H. Ahmad¹, S. Zafar³ and M. Y. Ashraf⁴

¹*Institute of Environmental Biology, University of the Punjab, Lahore.*

²*Government College Jaranwala.*

³*Dept. of Botany, University of Agriculture, Faisalabad.*

⁴*Nuclear Institute for Agriculture and Biology, P.O. Box 128, Jhang Road, Faisalabad.*

ABSTRACT

In the internal morphology GA3 had inhibitory effect on the diameter of epidermal and cortical cells, xylary region, metaxylem elements, pith region and pith cells. The decrease in the number of xylem cells and metaxylem elements was also observed. In all the treatments the cortical layers remained unchanged. IAA caused expansion in the diameter as well as increase in the diameter along with increase in number of xylem cells and metaxylem elements. The combined use of GA3 + IAA and GA3 + kinetin showed a significant increase in the diameter and the number xylem and metaxylem elements. In IAA + kinetin remarkable expansion in the diameter and number of xylem cells and metaxylem elements was observed. The combine use of GA3 + IAA + kinetin caused significant increase in diameter of pith and pith cell.

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NITROGEN FIXATION IN *ALBIZIA LEBBECK* INOCULATED WITH TEMPERATURE TOLERANT NATIVE RHIZOBIA

M. Athar¹ and S. M. Nasir²

¹Department of Environmental Horticulture, University of California, Davis, CA 95616, USA

²Ministry of Environment, Capitol Development Authority, Block IV, Islamabad, Pakistan.

ABSTRACT

Nodulation, biomass production, and symbiotic nitrogen fixation were studied in *Albizia lebbek* seedlings inoculated with five temperature tolerant rhizobial isolates under greenhouse conditions. All rhizobial isolates effectively nodulated *A. lebbek* seedlings and three of the isolates AL 10, AL 21, and AL 27 significantly ($P < 0.05$) increased shoot height, biomass production and total nitrogen content as compared with uninoculated control treatment. After 4 months, all the inoculated plants showed marked growth-promoting effect with a shoot height two to three times than uninoculated control plants. Improved growth of inoculated *A. lebbek* seedlings demonstrates the potential of *Rhizobium* sp. inoculation in the reforestation of degraded land in the tropics.

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STUDIES ON COURSE OF *LISTERIA* INFECTION IN MICE

Omm-e-Hany¹, R. Siddiqi², M. Ali khan¹ and M. Altaf Khan¹

¹Institute of Environmental Studies, University of Karachi, Karachi 75270, Pakistan

²Department of Microbiology, University of Karachi, Karachi 75270, Pakistan

ABSTRACT

Bacteria account for 72% of deaths associated with food borne transmission. Five pathogens account for over 90% of estimated food-related deaths, out of which 28% is due to *Listeria*.

Listeriosis, is a serious infection caused by food contaminated with the *Listeria monocytogenes*. It has recently been recognized as an important public health problem in the world. The present study was conducted to determine the course of *Listeria* infection in mice. It was found out that circulating *Listeria* from the blood stream were cleared by the resident macrophages of liver and spleen. Approximately 80% of bacteria were destroyed within liver cells during the first 6 hours of infection. Virulent strains, however, are able to leave the phagolysome and infect adjacent cells e.g. hepatocytes. The bacterial cells within the hepatocytes grow exponentially resulting in the progress of infection with focal necrosis. It was observed that some of the mice infected with low doses seemed to have established a host- parasite balance without showing symptoms of acute illness. In conclusion, it can be argued that infection with sublethal dose (2.01×10^4) may provide protection against *Listeria* infection.

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SCREENING OF SOME SPONGES FOR THEIR NEMATICIDAL ACTIVITY AGAINST *MELOIDOGYNE INCOGNITA ACRITA*

M. Abid, J. Tanaka, T. Higa and M. Javed Zaki¹

Department of Chemistry, Biology and Marine Science, University of the Ryukyus, Okinawa 903-01, Japan

¹*Department of Botany, University of Karachi, Karachi-75270, Pakistan*

ABSTRACT

Methanol extracts of 24 different sponge species collected from Okinawa Islands, Japan were tested for their nematicidal properties against root-knot nematode, *Meloidogyne incognita acrita*. Some extracts showed significant nematicidal activity. Among these extracts, the methanol extract of sponge (*Xestospongia exigua*) exhibited highest nematicidal activity and was selected for the purification of compounds responsible for larval mortality. The structural determination of the compound (s) is being carried out. However, The NMR and mass spectral data indicate that the compounds responsible for nematicidal activity belong to 3-alkylamino pyridine class of compounds. Some synthetic compounds belong to pyridine class were tested against root knot nematodes exhibited strong nematicidal activity in term of larval mortality and hatching of nematode eggs.

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ROLE OF BUSPIRONE IN LITHIUM TREATED RATS

S.P. Ahmed, A. B. Rahman, R. A. Khan, Mahay-Rookh and S. Haider¹

Department of Pharmacology, University of Karachi, Karachi-75270, Pakistan

¹*Department of Biochemistry, University of Karachi, Karachi-75270, Pakistan*

ABSTRACT

Lithium is antimanic and mood stabilizing drugs. It is used for the prevention of mood swings in patients of with bipolar disorder. Lithium probably affects electrolyte and ion transport that modulates neurotransmitter release. Lithium influences second messenger mediating transmitter action, it affects mainly inositol triphosphate and Diacylglycerol system (IP₃/DAG). Lithium toxicity occurs at when lithium concentration becomes high. Lithium intoxication can manifest in a number of ways. Lithium may cause serotonin syndrome a state of hyperexcitability. Lithium can increase serotonin metabolite. Buspirone is 5HT_{1A} agonist and atypical anxiolytic. Busiprone specifically blocks presynaptic 5HT autoreceptors and reduce post synaptic 5HT_{1A} receptor mediated neurotransmission. It also reduces density of 5HT₂ receptor. Buspirone is also a weak D₂ antagonist. Present work was designed to assure the role of this anxiolytic in hyper activity and hyperexcited condition induced by lithium and the effect on some anxiolytic assessment tests.

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THE RISK OF HEPATOCELLULAR CARCINOMA IS INCREASED TWO FOLD BY THE USE OF TOBACCO

F. Imtiaz and T. Fatima¹

Department of Pathology and Microbiology, ¹Department of Biological and Biomedical Sciences, The Aga Khan University Karachi, Pakistan.

ABSTRACT

It is estimated that cigarette smoking kills over 1,000,000 people worldwide, every year causing various kinds of cancer. Cigarette smoking, chewing of pan with tobacco and consumption of alcohol may also contribute to the development of Hepatocellular Carcinoma (HCC). HCC is one of the most common cancers in the world. The Hepatitis B virus (HBV) and Hepatitis C virus (HCV) are the major agents causing chronic liver disease, which leads to HCC. The aim of this study was to find out the association of HCC with cigarette smoking and habit of chewing betel nut and quid, HBV and HCV infections. Present study is a retrospective study in which the data of 200 individuals including 122 males and, 78 females suffering from chronic liver disease and HCC were obtained from different hospitals of Karachi. The data provides the information about gender, presence of HBV, HCV infections, history of cigarette smoking, and chewing pan with tobacco. Analysis was done using the statistical software SPSS version 10.0 for Windows. The Cox model for survival was applied to demonstrate the effect of smoking and chewing pan with tobacco as a risk factor for HCC. The result showed that after controlling for age and gender by the use of Cox model, the hazard ratio were obtained to be as 38.30 with 95% confidence interval: 10.89, 129.98, at $P < 0.01$ for HCV seropositive patients and 7.21 at 95% confidence interval: 1.40, 35.61 at $P < 0.05$ for HBs Antigen positive patients, respectively. In conclusion, tobacco smoking or chewing both were found to be significantly ($P < 0.05$) associated with increased risk of HCC. This risk enhanced two folds with the presence of HBV and HCV infections.

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PHYSIOLOGICAL AND BIOCHEMICAL CHANGES IN RESISTANT AND SUSCEPTIBLE TO LEAF CURL VIRUS (CLCuV) COTTON VARIETIES AT GERMINATION AND EARLY SEEDLING STAGES: CHANGES IN LIPASE, OIL CONTENT, PROTEIN AND SOLUBLE SUGARS

M. Y. Ashraf¹, S. Mahmood², G. Sarwar¹, M. Ashraf², M. Naeem³ and S. Zafar²

¹*Stress Physiology Lab., Nuclear Institute for Agriculture and Biology, P.O. Box 128, Jhang Road, Faisalabad, Pakistan. E.mail: myashraf58@hotmail.com*

²*Dept. of Botany, University of Agriculture, Faisalabad, Pakistan.*

³*Govt. College Jaranwala, Faisalabad, Pakistan.*

ABSTRACT

Biochemical changes in resistant and susceptible to leaf curl virus of two cotton cultivars were assessed by a series of laboratory experiments. All the growth attributes proved S-12 (CLCuV Susceptible) superior to CIM-446 (CLCuV Tolerant). Oil content along with its hydrolyzing enzyme lipase were significantly higher in S-12 than that of CIM-446. The higher germination of S-12 seemed to be determined by higher oil content and oil hydrolyzing enzyme lipase. High protein content in all the embryonic parts of CIM-446 might play an important role in providing better fulfillment of structural requirements to resist virus at vegetative growth stages by contributing to higher composition of antibodies or some other physiological responses associated with proteins.

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PROPERTIES OF GLUCOAMYLASE FROM A MESOPHILIC FUNGUS ARACHNIOTUS CITRINUS PRODUCED UNDER SOLID-STATE GROWTH CONDITION

M. Niaz¹, M. Y. Ghafoor², A. Jabbar³, A. Wahid⁴, E. Rasul⁴, R. Ahmed⁵ and M. H. Rashid^{2*}

¹*Department of Botany, GC University, Faisalabad, Pakistan*

²*National Institute for Biotechnology and Genetic Engineering (NIBGE), P O Box 577, Faisalabad, Pakistan*

³*Department of Chemistry, GC University, Faisalabad, Pakistan*

⁴*Department of Botany, University of Agriculture, Faisalabad, Pakistan*

⁵*Department of Crop Physiology, University of Agriculture, Faisalabad, Pakistan*

ABSTRACT

Starch, a polymer of α -D glucose, is the commonest storage carbohydrate in plants, and a great diversity of enzymes is able to catalyze its hydrolysis. Starch from almost all natural sources is a mixture of amyloses and amylopectins. For industrial processing acid hydrolysis of starch has been the conventional method, and now enzymatic processes have largely replaced it. The diversity in occurrence and characteristics make the search of a novel glucoamylase an

imperative for its industrial application. Therefore, here we report for the first time properties of a glucoamylase from a novel fungal strain *Arachniotus citrinus*. The glucoamylase [(Exo-1,4 α -D-glucan glucanohydrolase) (E.C.3.2.1.3)] was produced under solid-state growth condition on wheat bran and purified to apparent homogeneity by four-step purification procedure comprised of ammonium sulfate precipitation, FPLC Hiload anion-exchange, hydrophobic interaction and Mono-Q anion-exchange chromatography. Temperature optimum of glucoamylase was dependent on enzyme concentration and was 35°C at 0.39 mg ml⁻¹ and 55°C at 1mg ml⁻¹ enzyme concentration. The pH optima range was 3.5 to 5.5. The pK_{a1} and pK_{a2} of active site residues involved in V_{max} were 2.7 and 6.3, respectively. The K_{cat} at 50°C was 8.3 sec⁻¹, while K_m for soluble starch was 0.05 mg ml⁻¹. Glucoamylase of *A. citrinus* was very unstable because its half-life for irreversible thermal stability at 55°C was only 7 min. Furthermore; its stability against proteolysis by α -chymotrypsin was very low compared to subtilisin as its half-life was only 39 min compared to 5.8 h for subtilisin.

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IMMOBILIZATION OF A FUNGAL CARBOXYMETHYLCELLULASES BY GEL ENTRAPMENT AND ITS IMPACT ON OPERATIONAL STABILITY

A. Jabbar*¹, M.H. Rashid², M.A. Malana³, Amanullah¹, M. Saleem², M. Niaz⁴, and M.Z. Yasin²

¹Department of Chemistry, GC University, Faisalabad, Pakistan

²National Institute for Biotechnology and Genetic Engineering (NIBGE), PO Box 577, Faisalabad, Pakistan

³Department of Chemistry, Bahauddin Zakariya University, Multan, Pakistan

⁴Department of Botany, GC University, Faisalabad

ABSTRACT

Slightly acidic form of purified CMCases (13.97 μ mg⁻¹ protein) was immobilized in 13.6 % (w/v) acrylamide in the presence of cross linker Bisacrylamide which is 2 % of the monomer acrylamide, 0.02 ml TEMED and 0.01g ammonium per sulfate per ml was added to reaction mixture which initiated polymerization. 71.34 % protein was immobilized while 28.34 remain unbound. The polymerized gel containing CMCases was cut and sliced into 1×1 mm fragments. It is stored at 4° C. its operational and recycling activity was observed for consecutive four operations. Enzymes were heated in a solution two hours each times. Immobilized CMCases showed V_{max} (49 μ mol mg⁻¹ mL⁻¹), K_m (4.54 mg mL⁻¹), and specificity constant (V_{max}/K_m) 10.78 in its fourth operation and consecutive application.

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KINETIC AND THERMAL STABILITY OF SOLUBLE AND IMMOBILIZED CARBOXY-METHYLCELLULASES FROM ARACHNIOTUS CITRINUS

A. Jabbar*¹, M.H. Rashid², M.A. Malana³, Amanullah¹, M. Saleem², M. Niaz⁴, and M.Z. Yasin²

¹Department of Chemistry GC University Faisalabad, Pakistan

²National Institute for Biotechnology and Genetic Engineering (NIBGE), PO Box 577, Faisalabad, Pakistan

³Department of Chemistry Bahauddin Zakariya University, Multan, Pakistan

⁴Department of Botany GC University Faisalabad

ABSTRACT

Slightly acidic carboxymethylcellulases were immobilized in polyacrylamide gel. The specific activity of free and immobilized CMCase were 13.98 and 7.27 μmg^{-1} . The pH optimal range shown by immobilized SAC was 5-7.5. Immobilization made the CMCase more thermostable and its temperature optimum was enhanced to 10 C, i.e., from 55°C. Ea for CMC hydrolysis both at and above temperature optimum was 39.32 and 103.42 kJmol^{-1} . Michaelis constants at 50°C for soluble and immobilized CMCase were: Vmax (161, 53.3 $\mu\text{mol mg}^{-1}$), Km (11.76, 100 mg CMC ml^{-1}) and Vmax/Km (13.69 and 0.533 $\mu\text{mol mg}^{-1}$ protein min^{-1} mg^{-1} of CMC ml^{-1}), respectively. At 90°C Vmax of soluble and immobilized CMCase were 81 and 92 $\mu\text{mol mg}^{-1}$ protein min^{-1} , Km 10 and 50 mg CMC ml^{-1} and Vmax / Km 8.1 and 1.84 $\mu\text{mol mg}^{-1}$ protein min^{-1} mg^{-1} of CMC ml^{-1}), respectively. Immobilized SAC showed constant functional / operational stability repeatedly. At 4th cycle of its application, Vmax, Km and Vmax / Km of immobilized CMCase were 49 $\mu\text{mol mg}^{-1}$ protein min^{-1} ml^{-1} , 4.54 mg CMC ml^{-1} and 10.79 ($\mu\text{mol mg}^{-1}$ protein min^{-1} ml^{-1} mg^{-1} of CMC ml^{-1}), respectively. Immobilized CMCase proved to be more thermostable. It retained 90% its residual activity in first 45 minutes at 80°C without substrate and 14% after 90 minutes of continuous heating at the same temperature.

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THE EFFECTS OF DIFFERENT FEEDING PROGRAMMES ON GROWTH PERFORMANCE AND CARCASS CHARACTERISTICS OF BROILER CHICKS

S. K. Saylam

Department of Animal Science, Faculty of Agriculture, Ondokuz Mayıs University, 55139 Samsun, Turkey

ABSTRACT

The effects of different feeding programs on growth performance and carcass characteristics of broiler chicks were investigated in the present study. Day old 1200 Ross PM₃ commercial broiler chicks were divided into 5 experimental groups (I, II, III, IV and V). Group I birds were fed with starter diet (0-2 weeks) + finisher diet (3-6 weeks) while Group II birds were fed starter diet (0-3 weeks) + finisher diet (4-6 weeks). Group III birds were fed with starter diet (0-4 weeks) + finisher diet (5-6 weeks) while Group IV birds were fed with starter diet (0-5 weeks) + finisher diet during last week of growing period (6th week) and Group V birds with starter diet for 6 weeks. Starter diet contained 23 % crude protein (CP) and 3050 Kcal ME kg^{-1} while finisher diet had 20 % CP and 2950 Kcal ME kg^{-1} . At the end of study (42-d), body weights, feed intakes, feed conversion ratios (feed:gain), and mortality rates of five experimental groups (I, II, III, IV and V) were, respectively determined as 1883.48, 1958.25, 1919.58, 1887.08 and

1861.0 g ($P < 0.05$); 3568.52, 3644.91, 3648.87, 3557.12 and 3325.10 g ($P > 0.05$); 1.93, 1.90, 1.94, 1.92 and 1.82 ($P > 0.05$); 6.24, 11.70, 9.59, 11.14 and 5.81% ($P > 0.05$). With respect to the relative abdominal fat weights (ranged 2.97-4.11 %), there was no significant difference between treatments. The present results show that Group II had the best performance to dietary shift (3 weeks starter + 3 weeks finisher diet) in comparison to other groups subjected to various feeding programmes.