

Physical Sciences

Pak. J. Sci. Ind. Res. 2009 52(2) 59-65

Extractive Separation of Al(III) and Ni(II) by Di-2-Ethylhexyl Phosphoric Acid -Kerosene System from Aqueous Fluoride Medium

Muhammad Fakhrul Islam*, Dil Afroz Begum, Muhammad Matiur Rahman and
Muhammad Saidur Rahman

Department of Applied Chemistry and Chemical Technology, University of Rajshahi, Rajshahi-6205, Bangladesh

(received January 30, 2009; revised March 6, 2009; accepted March 7, 2009)

Abstract. In the study of the extractive separation of Al(III) and Ni(II) by di-2-ethylhexyl phosphoric acid D2EHPA-kerosene from aqueous fluoride medium, about 94% Al(III) and 2% Ni(II) were extracted with 0.3 M D2EHPA (pH 2.1 and temperature 30 ± 1 °C). Extraction of Ni(II) decreased with increasing extractant concentration. D2EHPA-kerosene-fluoride system showed better extraction of Al(III) with higher extractant concentration and aqueous pH and *vice versa* for the extraction of Ni(II). The maximum separation factor ($\beta \sim 1380$) was obtained for Al(III) at 20 °C and decreased to ($\beta \sim 732$) at 60 °C. The separation of Al(III) from Ni(II) was favoured at normal temperature. Extraction followed the order Al(III) $\gg \gg$ Ni(II). About 99% stripping of Al(III) was attained from the loaded 0.20 M D2EHPA. Much faster extraction of Al(III) compared to Ni(II) and preferential loading were shown by D2EHPA-kerosene in the presence of fluoride ion in the aqueous phase. Separation of Al(III) was the most outstanding from Ni-Al-F-complex solution.

Keywords: Al-Ni separation, D2EHPA-kerosene system, fluoride medium

Studies on the Lipolytic Enzymes of *Sesamum indicum* Seed Powder

Nusrullah Akhtar^a, Salma Rahman^{a*} and Abdul Jabbar^b

^aPCSIR Laboratories Complex, Ferozepur Road, Lahore-54600, Pakistan

^bChemistry Department, Islamia University, Bahawalpur, Pakistan

(received August 27, 2008; revised March 11, 2009; accepted March 12, 2009)

Abstract. Optimum conditions for the hydrolysis of simple triglycerides and phosphoglycerides for the activity of the lipolytic enzymes (lipase and phospholipase) extracted from the defatted seeds of *Sesamum indicum* were established for use in laboratory and industry. The enzymes showed optimum activity at 40 °C and pH 7 in aqueous media. N-heptane was found to be the most satisfactory solvent for maximum activities. The activity of lipase extracted from germinated seeds increased with the stage of seed development, but was reverse for the phospholipase activity.

Keywords: lipase/phospholipase activity, solvent media, triglycerides, lipolytic enzymes

An Ecofriendly Synthesis of 4-Thiazolidinone Derivative Using Tributylammonium Bromide Under Microwave Irradiation

Muhammad Naeem^{a*}, Muhammad Nawaz Chaudhry^b and Rana Amjad^c

^aACRC, PCSIR Laboratories Complex, Ferozepur Road Lahore, Lahore-54600, Pakistan

^bCollege of Earth and Environmental Sciences, University of The Punjab, Lahore-Pakistan

^cInstitute of Chemistry, University of The Punjab, Lahore-Pakistan

(received November 17, 2008; revised February 12, 2009; accepted March 4, 2009)

Abstract. A series of new compounds 5-benzylidene-3-(4-methylphenyl)-2-(phenylimino)-4-thiazolidinone were synthesized by adopting environment friendly microwave irradiation methodology, their structures and *in vitro* antibacterial and antifungal activities are reported. The synthesized compounds exhibited different levels of antibacterial activities. Three compounds showed broad spectrum antibacterial activity.

Keywords: microwave irradiation, tributylammonium bromide, 4-thiazolidinone, environment friendly, antibacterial compounds

Biological Sciences

Pak. J. Sci. Ind. Res. 2009 52(2) 75-79

Salicylic Acid Induced Physiological and Biochemical Changes in Wheat Under Drought Stress Conditions

Sami Ullah Khan^a, Asghari Bano^b, Jalal Ud Din^{a*} and Suba Sadiq Tahir^c

^aPlant Physiology Program, CSI, NARC, Islamabad, Pakistan

^bDepartment of Plant Sciences, Quaid-i-Azam University, Islamabad, Pakistan

^cEnvironmental Analytical Laboratory, NPSL, PCSIR, H-8, Islamabad

(received August 25, 2008; revised February 11, 2009; accepted February 13, 2009)

Abstract. Experiment for finding the effect of pre-soaking of wheat seeds varieties, viz Wafaq-2001 and Punjab-96, in salicylic acid (SA) solution on the drought tolerance of wheat, revealed increase in the total biomass and grain yield per plant as well as in spikes per plant, 100 seed weight, proline, total soluble sugars, membrane stability index (MSI), superoxide dismutase (SOD) and ascorbate peroxidase (APOX) activity in both the tested varieties. The yield increase in drought tolerant variety Wafaq-2001 was more as compared to drought sensitive Punjab-96. Results signify the role of SA in regulating the drought response of wheat and that SA could be seed primed and used as a potential growth regulator under drought stress conditions.

Keywords: wheat, salicylic acid, drought resistance

Micronutrient (Zn) Role in Stimulating Root Nodules and Yield of Chickpea

Abdur Rashid

Arid Zone Research Institute, Pakistan Agriculture Research Council (PARC), Dera Ismail Khan, Pakistan

(received April 4, 2007; revised March 14, 2009; accepted March 16, 2009)

Abstract. In the study of the effect of zinc (Zn) on root nodule stimulation and yield of chickpea under the climatic condition of D.I. Khan, Pakistan, significant effect of application of varying levels of zinc was noted. Plant height was significantly more as compared to the control. The plants receiving 7.5 kg/ha Zn had the highest weight of nodules/plant and produced maximum grain yield of 1185 kg/ha.

Keywords: *Cicer arietinum* L.; zinc application, nodule formation, grain yield, Pakistan

Status of Plant Available Sulphur and Its Relationship to Other Soil Characteristics in Pothwar Soils

Rizwan Khalid^{a*}, Khalid Saifullah Khan^b, Ghulam Shabbir^b, Muhammad Yousaf^b and Shahid Yaqub Naz^a

^aSoil Fertility Institute, Rawalpindi, Pakistan

^bDepartment of Soil Science and SWC, University of Arid Agriculture, Rawalpindi, Pakistan

(received October 4, 2008; revised February 23, 2009; accepted February 26, 2009)

Abstract. Assessment of the amount of plant available sulphur ($\text{SO}_4\text{-S}$) in soils of Pothwar, Pakistan revealed the average S contents in the soil to range from 5.7 to 21.7 $\mu\text{g/g}$. Five out of fifteen soil series were deficient ($< 10 \mu\text{g S/g}$) in $\text{SO}_4\text{-S}$ with a range of 5.0 to 9.0 $\mu\text{g/g}$, six were deficient only at upper (0-15 cm) soil depth while, the remaining four had satisfactory level (10-30 $\mu\text{g S/g}$) at both the soil depths. Sulphur exhibited significant positive correlation with clay ($r = 0.77^{**}$), EC_e ($r = 0.77^{**}$), organic C ($r = 0.82^{**}$), total N ($r = 0.88^{**}$) and extractable P ($r = 0.72^{**}$) contents in soil. Correlation coefficients of $\text{SO}_4\text{-S}$ with sand ($r = -0.41$), soil pH ($r = -0.49$) and CaCO_3 ($r = -0.60^*$) contents were negative. Organic C and N had the most pronounced effects ($R^2 > 65$) on S availability in soil.

Keywords: soil sulphur, soil characteristics, Pothwar

Technology

Pak. J. Sci. Ind. Res. 2009 52(2) 91-99

A Weak Current Amperometric Technique in Physiological and Bioelectromagnetic Measurements

Masroor Hussain Shah Bukhari^{ab*}, John H. Miller Jr.^a and Zahoor Hussain Shah^c

^aDepartment of Physics, University of Houston, Houston, Texas 77204, USA

^bUnit of Experimental Physiology and Biophysics, Department of Physiology, Dow University of Health Sciences, Karachi-74200, Pakistan

^cDepartment of Chemistry, Faculty of Marine Sciences, Lasbela University, Uthal, Lasbela 90150, Balochistan, Pakistan

(received January 5, 2009; revised March 3, 2009; accepted March 4, 2009)

Abstract. A technique for measuring ultra-low electric currents from living cells, using electrodes, biosensors or magnetic detectors is reported, based on the design of a sensitive, ultra-low-noise trans-impedance amplifier. This technique offers a low-noise, low current measurement capability down on the order of 2×10^{-14} amperes, with specifications such as input leakage current of less than 1×10^{-15} amperes and a dynamic range of $30\text{-}100 \times 10^{-14}$ amperes. Maximum bandwidth of roughly 10KHz was observed, while working in the specified dynamic range. This set of specifications is quite satisfactory and desirable for many low-frequency applications in bioelectromagnetism and bio-amperometry. The technique finds numerous applications in studying intrinsic cellular fields and induced currents originated in cells under physiological conditions. A few applications envisaged for its possible utility include bio-sensing amperometry, general studies in bioelectromagnetism and ion transport studies in plasma membrane and mitochondrial inner membrane, by incorporation of the amplifier with suitable micro-electrodes or nano-scale electrical, magnetic or optical sensors.

Keywords: intrinsic currents, biosensors, bio-amperometry, bioelectromagnetic measurement

Heterologous Expression of *Chaetomium thermophilum* Xylanase 11-A (CtX 11-A) Gene

Saiqa Wajid^{ab*}, Shafiq Shahid^a, Farooq Latif^a, Zahid Mukhtar^a, Sher Afzal^a and Shahid Mansoor^a

^aNational Institute for Biotechnology and Genetic Engineering (NIBGE), Faisalabad, Pakistan

^bc/o Wajid Arshad Abbasi, Programme Officer/IT Focal Person/PS to PM, Prime Minister Secretariat,
Muzaffarabad, Azad Kashmir, Pakistan

(received September 24, 2008; revised February 19, 2009; accepted February 23, 2009)

Abstract. *Chaetomium* has a potential source of xylanase and cellulase enzymes, both of which are required in the treatment of fibre in the poultry feed. The titre of the enzymes needs to be enhanced by using recombinant DNA technology for fulfilling the requirement of the industries. Efforts are made to construct prokaryotic and eukaryotic expression cassettes that can be cloned under specific strong promoters i.e., T7 and AOX1, respectively, and the enhancer elements to get the maximum gene expression. In the present study BL21 *E. coli* and GS115 *Pichia pastoris* strains are used as model organisms to express the CtX 11-A gene in the presence of 1 mM IPTG and 100% methanol upto final concentration of 0.5. In case of BL21 expression, the maximum xylanase activity was observed after 1.5 h in the presence of 1% xylose, which was 2.302 U/ml and after 7 h in the presence of 0.5% lactose, was 1.708 U/ml. However, in *Pichia pastoris* the maximum production of xylanase was 2.904 and 0.006 U/ml as compared to control 0.484 and 0.06 U/ml, respectively.

Keywords: thermophilic fungi, *Chaetomium thermophilum* xylanase A (CtXA), cloning and gene expression, *Escherichia coli*, *Pichia pastoris*

Review

Pak. J. Sci. Ind. Res. 2009 52(2) 107-116

Lobsters from Northern Arabian Sea (Pakistan Coast)

Razia Sultana^{a*}, Quddusi Begum Kazmi^b and Shahid Amjad^c

^aFood and Marine Resources Research Center, PCSIR Laboratories Complex, Karachi-75280, Pakistan

^bMarine Reference Collection and Resource Center (MRC), University of Karachi, Karachi, Pakistan

^cLasbella University of Agriculture Water and Marine Sciences, Uthal, Balochistan, Pakistan

(received July 26, 2008; revised February 7, 2009; accepted February 21, 2009)

Abstract. Pakistan is situated between latitude 24° and 37° North and longitude 62° and 75° East, on the eastern part of the Arabian Sea with a coastline of about 900 km. Lobsters are found both on its northwest (Balochistan) and southeast coasts (Sindh). Important fishing grounds of lobsters are located along Ormara, Pasni Gwader and Jiwani besides Karachi coast. To date, 16 species of lobsters have been recorded from Pakistan. The only predominant commercial species is *Panulirus polyphagus*, which constitutes 83% of the catch. The paper provides an identification key for northern Arabian Sea lobsters and outlines the available information on the biology, fisheries and management of the lobster species from Pakistan. Most of the studies have been focused on *P. polyphagus*.

Keywords: Arabian Sea lobsters, *P. polyphagus*, Arabian Sea, lobsters
