ISSN 2221-6413 (Print), ISSN 2223-2559 (Online)
Coden: PJSIB5 54(2) 59-116 (2011)

Pakistan Journal of Scientific and Industrial Research

Series A:Physical Sciences

Vol. 54, No.2, May-June, 2011

(for on-line access please visit web-site http://www.pjsir.org)

Published by
Scientific Information Centre
Pakistan Council of Scientific and Industrial Research
Karachi, Pakistan

Pakistan Journal of Scientific and Industrial Research
Series A: Physical Sciences

Pakistan Journal of Scientific and Industrial Research started in 1958, has been bifurcated in 2011 into:

Series A: Physical Sciences [ISSN 2221-6413 (Print); ISSN 2223-2559 (online)] (appearing as issues of January-February, May-June and September-October) and
Series B: Biological Sciences [ISSN 2221-6421 (Print); ISSN 2223-2567 (online)] (appearing as issues of March-April, July-August and November-December).
Each Series will appear three times in a year.

This Journal is indexed/abstracted in Biological Abstracts and Biological Abstracts Reports, Chemical Abstracts, Geo Abstracts, CAB International, BioSciences Information Service, Zoological Record, BIOSIS, NISC, NSDP, Current Contents, CCAB, Rapra Polymer Database, Reviews and Meetings and their CD-ROM counterparts etc.
Subscription rates (including handling and Air Mail postage): ***Local:*** Rs. 2000 per volume, single issue Rs. 350; ***Foreign:*** US$ 400 per volume, single issue US$ 70.
Electronic format of this journal is available with: Bell & Howell Information and Learning, 300, North Zeeb Road, P.O. 1346, Ann Arbor, Michigan 48106, U.S.A; Fax.No.313-677-0108; http://www.umi.com.
Photocopies of back issues can be obtained through submission of complete reference to the Executive Editor against the payment of Rs. 25 per page per copy (by Registered Mail) and Rs. 115 per copy (by Courier Service), within Pakistan; US$ 10 per page per copy (by Registered Mail) and US$25 per page per copy (by Courier Service), for all other countries.

Printed and Published by: PCSIR Scientific Information Centre, PCSIR Laboratories Campus, Shahrah-e-Dr. Salimuzzaman Siddiqui, Karachi-75280, Pakistan.

Editorial Address

Executive Editor
Pakistan Journal of Scientific and Industrial Research, PCSIR Scientific Information Centre,
PCSIR Laboratories Campus, Shahrah-e-Dr. Salimuzzaman Siddiqui, Karachi-75280, Pakistan
Tel: 92-21-34651739-40, 34651741-43; Fax: 92-21-34651738; Web: http://www.pjsir.org, E-mail: info@pjsir.org

Editorial

Pakistan Journal of Scientific and Industrial Research, a bimonthly sponsored by the Pakistan Council of Scientific and Industrial Research, started publication in 1958. It has been bifurcated in 2011 into:

- *Pakistan Journal of Scientific and Industrial Research Series A: Physical Sciences* [ISSN 2221-6413 (Print); ISSN 2223-2559 (Online)] (appearing as issues of January-February, May-June and September-October) and

- *Pakistan Journal of Scientific and Industrial Research Series B: Biological Sciences* [ISSN 2221-6421 (Print); ISSN 2223-2567 (Online)] (appearing as issues of March-April, July-August and November- December),

both appearing as alternate issues of the Journal, each three times a year, and publish full papers, reviews and short communications.

For *Series A: Physical Sciences,* original contributions are entertained in the fields of biochemistry, organic, inorganic, physical, analytical and pharmaceutical chemistry, physics, geology and environmental sciences.

For *Series B: Biological Sciences,* original contributions are entertained in the fields of biology, agriculture, bio-diversity, bio-information, bio-technology and environmental sciences.

Abstracts of papers are available online and full papers, in PDF format.

(Dr Kaniz Fizza Azhar)
Executive Editor

Pakistan Journal of Scientific and Industrial Research
Series A: Physical Sciences
Vol. 54, No.2, May - June, 2011

Contents

Short Communication

Pak. j. sci. ind. res. Ser. A: phys. sci. 2011 **54** (2) 59-67

Facile Synthesis and Characterization of Substituted Pyrimidin-2(1*H*)-ones and their Chalcone Precursors

Olayinka Oyewale Ajani*, Ruth Itoroabasi Ituen and Ayorinde Falomo
Chemistry Department, College of Science and Technology, Covenant University, Canaanland, Km 10, Idiroko Road, P.M.B. 1023, Ota, Ogun State, Nigeria

(received May 7, 2010; revised December 28, 2010; accepted December 29, 2010)

Abstract. A new and efficient method has been developed for the quantitative transformation of chalcones to pyrimidine frame work *via* solid support catalysis. Silica supported sulphuric acid (SSA) efficiently catalyzed the reaction of α-β-unsaturated carbonyl, chalcones (**1-10**) with urea to afford substituted pyrimidin-2(1*H*)-ones (**11-20**) in good to excellent yield. The interesting behaviour of SSA lies in the fact that it can be re-used after simple washing with chloroform thereby rendering this procedure more economical. The chemical structures were confirmed by analytical data as well as spectroscopic means.

Keywords: catalyst, spectroscopic means, chalcones, 4-phenylbut-3-en-2-one

Pak. j. sci. ind. res. Ser. A: phys. sci. 2011 **54** (2) 68-74

Comparative Study of the Characteristics of Seed Oil and Seed Nutrient Content of three Varieties of *Cucumis sativus* L.

Md. Abbas Ali[a]*, Md. Abu Sayeed[b], Sandip Kumar Ghosh[b], Sarmina Yeasmin[c], Astaq Mohal Khan[c] and Fadzilah Adibah Abdul Majid[a]

[a]Department of Bioprocess Engineering, Faculty of Chemical Engineering,
Universiti Teknologi Malaysia, 81310, Johor Bahru, Malaysia
[b]Department of Applied Chemistry and Chemical Engineering,
Rajshahi University, Rajshahi-6205, Bangladesh
[c]BCSIR Laboratories, Rajshahi-6206, Bangladesh

(received August 6, 2010; revised April 12, 2011; accepted April 14, 2011)

Abstract. The physicochemical characteristics of oils and nutrient contents of the seeds of three varieties of *Cucumis sativus* namely, Shahi-50, Naogaon-5 and Naogaon-Green, have been reported. Profile of fatty acid composition was not wholly similar in all varieties and unsaturated fatty acids were more than 77%, of which linoleic acid was 61.9-62.2%. High degree of unsaturation was indicated with lower peroxide value (3.7-4.2) and FFA (1.1-1.6%). Triacylglycerols and neutral lipids were the most abounded components recorded as 82.1-83.7% and 92.1-94.0%, respectively. The seeds contained potentially useful amounts of lipid (28.0-31.1%) and protein (14.8-15.9%) and other nutrients.

Keywords: seed oil, fatty acid, nutrient contents, *Cucumis sativus*

Pak. j. sci. ind. res. Ser. A: phys. sci. 2011 **54** (2) 75-83

Removal of Copper from Aqueous Solutions Using Sawdust, Zeolite and Activated Carbon: Equilibrium Time Convergence

Zaman Shamohammadi Heidari[a,c]* Esmat Jamalia, Milad Ghallehban Tekmedash[a] and Mostafa Khajeh[b]

[a]Department of Water Engineering, University of Zabol, P.O. Box 98615-538, Sistan and Balouchestan, Islamic Republic of Iran

[b]Department of Chemistry, University of Zabol , P.O. Box 98615-538, Sistan and Balouchestan, Islamic Republic of Iran

[c]Hamoun International Wetland Institute, Zabol University, P.O. Box 98615-538, Sistan and Balouchestan, Islamic Republic of Iran

(received March 3, 2010; revised October 1, 2010; accepted October 31, 2010)

Abstract. In this study, adsorption of copper(II) ions from aqueous solutions on sawdust, zeolite and activated carbon was studied using batch experiment techniques. The effect of different parameters such as pH of solution, adsorption time and amount of adsorbents were evaluated. Favourable pH for maximum copper adsorption was 6, 6 and 4 for sawdust, zeolite and activated carbon, respectively. The equilibrium of copper adsorption has been described by the Langmuir, Freundlich and Temkin isotherms and their fitness for adsorption was compared. The Temkin model had a better fitness than the other models. Maximum adsorption capacity of sawdust, zeolite and activated carbon were 96.11%, 96.2% and 97.02% (mg/g), respectively. The study of applicability of kinetic models of Lagergren (1898) and Ho *et al.* (1996) showed the latter model to be better fit than the former. The rates of adsorption obey the rules of A-order model with good correlation.

Keywords: adsorption efficiency, sawdust; zeolite, activated carbon, equilibrium time, copper

Pak. j. sci. ind. res. Ser. A: phys. sci. 2011 **54** (2) 84-89

Investigation of Carbon Monoxide at Heavy Traffic Intersections of Karachi (Pakistan) using GIS to Evaluate Potential Risk Areas for Respiratory and Heart Diseases

Akhtar Shareef[a], Durdana Rais Hashmi[a]*, Muhammad Azam[b] and Imran Ahmad Khan[c]

[a]Centre for Environmental Studies, PCSIR Laboratories Complex, Karachi-75280, Pakistan

[b]Department of Geography, Federal Urdu University, Gulshan Campus-Karachi, Pakistan

[c]Govt Degree Science and Commmerce College Landhi Korangi, Karachi-74900, Pakistan

(received August 13, 2009; revised September 29, 2010; accepted October 8, 2010)

Abstract. Measurement of carbon monoxide in the ambient air at 36 locations on the busy roads of Karachi showed peak values of CO at 18 sites to be within the permissible limit of 10 ppm whereas up to 70 ppm at the other 18 sites. The evaluated carboxy haemoglobin (COHb) level was in the range of 1.1 to 15.8 %.

Keywords: carbon monoxide, air pollution, GIS, vehicular pollution

Pak. j. sci. ind. res. Ser. A: phys. sci. 2011 **54** (2) 90-97

Petroleum Hydrocarbon Pollution after the Tasman Spirit Oil Spill of Coastal/Deep Sea Sediment along the Clifton Beach Karachi, Pakistan

Alia Bano Munshi*, Fayyaz Ahmed Ansari, Hina Asgar Siddiqi and Mohammad Zeeshan
Centre for Environmental Studies, PCSIR Laboratories Complex,
Shahrah-e-Dr. Salimuzzaman Siddiqui, Karachi-75280, Pakistan

(received January 7, 2010; revised October 12, 2010; accepted October 28, 2010)

Abstract. An oil tanker, Tasman Spirit, carrying 67000 tons crude oil, got damaged near the Clifton Beach of Karachi, Pakistan and approx. 31,000 ton oil spilled into the sea. The distribution of aliphatic and aromatic hydrocarbons was determined in deep sea and surface sediment collected at 12 stations along the Clifton beach of Karachi, following the oil spill. Sampling was performed during 2003-2006, starting just after the accident of the oil tanker. Concentrations of PAHs (Σ16 parent components) and aliphatics were in the range of 0.09-560 μg/kg dw and 0.12-685 μg/kg dw, respectively, since the date of accident and after bioremedial measures. The highest concentrations were found within the radius of 50 km around the site, the area most heavily impacted by the spill, whereas at the stations, away from the ship, the concentrations were in the lower range without alkylated compounds. Addition of increasing amounts of ship fuel oil (taken from a Pakistani ship) to a representative sediment sample showed that measurable concentration of the Tasman Spirit oil was > 1 g/kg of sediment. The toxicity of selected samples of surface sediment from the coastal area near oil spill showed higher PAH concentrations; the average number of dead fauna was 90-95% within 3 days of oil spill which gradually decreased with the time.

Keywords: Tasman Spirit oil spill, Clifton beach, sediment, hydrocarbons, toxicity

Pak. j. sci. ind. res. Ser. A: phys. sci. 2011 **54** (2) 98-102

Lead Concentration in Road Side Dust and Selected Vegetables of Lahore City, Pakistan

Naz Imtiaz[a], Tahir Butt[a]*, Muhammad Irfan[a], Tahira Shafiq[a] and Arshad Chaudhry[b]

[a]Centre for Environmental Protection Studies, PCSIR Laboratories Complex, Lahore-54600, Pakistan

[b]Atomic Energy Commission Centre, Ferozepur Road, Lahore-54600, Pakistan

(received November 12, 2010; revised April 2, 2011; accepted April 14, 2011)

Abstract. The contents of lead as a pollutant in road side dust and vegetable samples of urban and rural areas of Lahore city, Pakistan, were monitored with the help of atomic absorption spectrophotometer. Average concentration of lead in dust samples collected from residential areas was 25 to 165 mg/L, from rural areas 9.5 to 13.0 mg/kg, from commercial areas 201 to 1685 mg/kg, and from canal side 105 to 220 mg/kg. In most of the vegetable samples, lead level was in the permissible range, whereas in some samples, the average lead concentration ranged from 0.13 to 5.0 mg/L.

Keywords: lead, vegetables, soil

Pak. j. sci. ind. res. Ser. A: phy. sci. 2011 **54** (2) 103-107

HPLC Determination of Betamethasone and Prednisolone in Urine Samples Using Monolithic Column

Kamran Abro[ab]*, Najma Memon[a], Muhammad Iqbal Bhanger[a], Shahnaz Perveen[b] and Rehana Jafri[b]

[a]National Centre of Excellence in Analytical Chemistry, University of Sindh, Jamshoro - 76080, Pakistan
[b]PCSIR Laboratories Complex, Shahrah-e-Dr. Salimuzzaman Siddiqui, Karachi - 75280, Pakistan

(received February 24, 2010; revised August 13, 2010; accepted August 18, 2010)

Abstract. A fast and reliable HPLC method is reported for the separation and quantification of betamethasone and prednisolone in urine samples using Chromolith® Performance RP-18e (100 mm × 4.6 mm) column. The separation and detection was achieved using an isocratic mobile phase composed of methanol:water (44:56 v/v) at 2.0 mL/min and wavelength of 254 nm. After successful optimisation of method parameters, it was applied to the urine samples. Solid phase extraction technique was used to clean the sample before analysis. The developed method was validated for the system suitability, precision and accuracy. The limits of detection for the prednisolone and betamethasone are 0.11 ng and 0.075 ng/10 µL injection, respectively allowing their determination in human urine samples. Recovery for spiked urine samples was in the range of 97-103%. The method offers a valuable alternative to the methodologies currently employed for separation and quantification of prednisolone and betamethasone in urine samples.

Keywords: monolithic column, HPLC, betamethasone, prednisolone, urine, solid phase extraction

Pak. j. sci. ind. res. Ser. A: phys. sci. 2011 **54** (2) 108-113

Technology for Treatment and Recycling of Wastewater of Automobile Service Stations

Abdur Rahman Khan[ab], Mumtaz Khan[a]*, Tehseen Aslam[a], Naveed Jan[a], Jehangir Shah[a] and Inayat-ur-Rehman[a]

[a]PCSIR Laboratories Complex, Peshawar, 25120, Pakistan

[b]COMSAT Institute of IT, Abbottabad, Pakistan

(received January 1, 2010; revised October 22, 2010; accepted November 2, 2010)

Abstract. A prototype treatment plant was fabricated and tested at varied hydraulic retention times for settling the suspended/settleable matter and skimming out oil and grease at laboratory plants of 40 L and 56 L. The results showed that 99.7% of oil and grease and almost all total suspended solids were removed and sparkling clear water was obtained, reusable for washing vehicles.

Keywords: water treatment technology, water recycling, wastewater treatment, automobile service stations

Pak. j. sci. ind. res. Ser. A: phys. sci. 2011 **54** (2) 114-116

Short Communication

Influence of Expeller Design Parameters on Free Fatty Acid Content and Colour of Palm Kernel (*Elaeis guineensis*) Oil

Rahman Akinoso*[a], Abdulganiy Olayinka Rajib[b] and Joseph Chulwugoziem Igbeka[b]
[a]Department of Food Technology, Faculty of Technology, University of Ibadan, Ibadan, Nigeria
[b]Department of Agricultural and Environmental Engineering, Faculty of Technology, University of Ibadan, Ibadan, Nigeria

(received January 16, 2010; revised April 15, 2010; accepted April 29, 2010)

Abstract. In the study of the influence of compressive stress (10, 20, 30 Mpa), feeding rate (50, 100, 150 kg/h) and rotational speed (50, 80, 110 rpm), of the expeller on the quality of expressed palm kernel oil, compressive stress and feeding rate were found to significantly affect palm kernel oil colour at $P < 0.05$. The lowest value of FFA content (1.09%) was produced at 10 Mpa compressive stress; 50 kg/h feeding rate and 110 rpm revolving worm speed. The highest colour intensity recorded was 87%. Optimum processing condition was achieved at compressive stress of 18.3 Mpa, 61.1 kg/h feeding rate and 76.7 rpm revolving worm speed.

Keywords: palm kernel oil, oil expeller design, free fatty acid, colour