



Coden: PSIRAA 30(1)1-80 (1987)

PAKISTAN JOURNAL OF SCIENTIFIC AND INDUSTRIAL RESEARCH

Vol.30, No.1, January 1987

Physical Sciences. Pages 1-18

Biological Sciences. Pages 19-49

Technology. Pages 50-70

Published monthly by

PAKISTAN COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH
KARACHI

Physical Sciences Section

Pakistan J. Sci. Ind. Res., Vol. 30, No. 1, January 1987

SYNTHESIS AND SPECTRA OF 3,5-DIMETHYLPYRAZOLE-4-CARBOXYLIC ACIDS

H. M. Mokhtar, A. T. F. Tag El-Din and M. A. T. Deshesh

Chemistry Department, Faculty of Science and Faculty of Agriculture, Alexandria University, Egypt

(Received January 13, 1986; revised September 1, 1986)

Condensation of ethyl 2-acetylaceto-acetate with hydrazine, arylhydrazines yielded ethyl 3,5-dimethylpyrazole-4-carboxylate (III, R = H) and ethyl 1-aryl 3,5-dimethylpyrazole-4-carboxylates (III, R = aryl), which were hydrolyzed to the corresponding acids.

Key words: Synthesis; Spectra; Pyrazoles.

ESTIMATION OF CERTAIN TOXIC TRACE METALS IN VARIOUS LOCAL FOOD COMMODITIES BY ATOMIC ABSORPTION METHOD

Mohammad Saleem, Syed Anwar Hussain, Maqsood Ahmed and M. Jaffar*

Nutrition Division, National Institute of Health, Islamabad

(Received January 9, 1986; revised August 13, 1986).

Employing standard analytical methods and the atomic absorption technique, toxic trace metal residues are estimated in 103 food samples. The samples, belonging to the broad classes of grains and cereals, spices and condiments and fruits and vegetables, were collected from the Punjab, NWFP, Baluchistan and Azad Kashmir areas. The data pertain to the estimation of lead, cadmium, nickel, mercury and arsenic. Percent recoveries are reported to validate applicability of the analytical methods used to this effect. The overall precision in individual estimation was better than ± 1.6 percent. The reported results appear at 2S confidence level for at least five replicate measurements.

Key words: Toxic trace metal analysis; Food analysis and trace metal estimation.

KINETIC STUDY OF NON-OXIDATIVE DISSOLUTION OF CALCIUM SULPHIDE FROM GYPSUM IN AQUEOUS ACID SOLUTION

M. Saeed, A. Khalique, S. Mansoor and F.A. Farooqi

PCSIR Laboratories, Lahore-16

(Received August 25, 1985; revised June 18, 1986)

This study presents the results obtained from the kinetic study of non-oxidative dissolution of calcium sulphide in aqueous hydrochloric acid for the generation of hydrogen sulphide gas. It was found that dissolution rates were controlled by a chemical reaction on the surface of calcium sulphide. The temperature of 80⁰ or higher and stirring speed above 700 rpm were found to be the optimum conditions for the generation of total H₂S gas from the reduced mass of gypsum containing 93.99 % of calcium sulphide. Reaction kinetics reveal that the type of reaction between calcium sulphide and hydrochloric acid is first order with respect to hydrogen ion activity. Activation energy of the reaction was 7.44 Kcal/mol.

Key words: Kinetics of calcium sulphide; Gypsum.

PHYTATE AND MINERAL CONTENTS OF CEREAL GRAINS

Hamid Hasan Khan, Hala Aziz Dar and G. Mohiuddin Zia*

Biochemistry Section, Department of Chemistry, Government College, Lahore

(Received February 23, 1986; revised August 13, 1986)

High-yield varieties of wheat, barley, maize and sorghum were analysed for calcium, magnesium, sodium, potassium, phytate-phosphorus and inorganic-phosphorus. Wheat and barley contained Ca: 17.5-54.4 and 21.3-32.9mg/100g; Mg: 32.6-71.1 and 28.4-32.9mg/100g; Na: 11.1-30.1 and 12.6-24.2mg/100g; K: 143.7-338.1 and 195.5-300.2mg/100g; phytate-P: 349-660 and 276-480mg/100g and inorganic-P: 235-467 and 96-402mg/100g. The various varieties of maize and sorghum contained Ca: 10.6-13.9 and 7.8-16.0mg/100g; Mg: 27.6-31.6 and 35.8-38.5mg/100g; Na: 12.2-24.6 and 6.4-11.1 mg/ 100g; K: 248-338 and 245-263mg/100g; phytate-P: 302-432 and 284-500mg/100g and inorganic-P: 99-255 and 70-180mg/100g respectively.

Key words: Phytate. Minerals; Cereals.

Short Communication

Pakistan J. Sci. Ind. Res., Vol. 30, No. 1, January 1987

TRITERPENES FROM *ECHINOPS SPINOSISSIMUS**

Mohammed Abbas Metwally

Department of Chemistry, Faculty of Science, University of Mansoura, Mansoura, Egypt

(Received, October 31, 1985; revised August 6, 1986)

Biological Sciences Section

Pakistan J. Sci. Ind. Res., Vol. 30, No. 1, January 1987

ANTIMICROBIAL ACTIVITY OF THE ESSENTIAL OILS OF UMBELLIFERAE FAMILY

Part IV. *Ferula narthex*, *Ferula ovina* and *Ferula oopoda*

Meena Syed, M. Hanif, F.M. Chaudhary and M.K. Bhatti

PCSIR Laboratories, Lahore-16

(Received July 8, 1986)

The essential oils of *Ferula narthex*, *F. ovina* and *F. oopoda* were tested in liquid media against the standard cultures of *Staph. aureus*, *Escherichia coli*, *Salmonella typhi*, *Shigella dysentery* and *Vibrio cholera*. The optical density taken as an index of growth was measured spectrophotometrically at 530 nm. All oils showed more or less good inhibitory activity, which was, however, different from each other and cannot be referred to as genera related. The oils of *F. narthex* and *F. ovina* were more active against *Staph. aureus*, while the growth of the pathogens of dysentery and cholera was inhibited more by the *F. oopoda* oil.

Key words: Antimicrobial activity, Umbelliferae, *Ferula*.

SCREENING OF PAKISTAN PLANTS FOR ANTIBACTERIAL ACTIVITY- II

Baqir Shyum Naqvi, Dilnawaz Shaikh and Rafi Shaikh*

Department of Pharmaceutics, University of Karachi, Karachi-32.

(Received October 30, 1985; revised May 8, 1986)

The present study involves the screening of 63 plant materials obtained from 42 indigenous herbs of Pakistan using 50 % ethanol extract. The antibacterial activity was determined against 18 different species of bacteria, commonly associated with human infections. Out of 63 plant materials 18 exhibited broad spectrum antibacterial activity (28.6%) 19 plant extracts showed narrow spectrum activity against either Gram negative or Gram positive bacteria (30 %).

Key words: Antibacterial principles of plants.

A STUDY ON SYNTHESIS OF FUNGAL PROTEIN BY *ASPERGILLUS ORYZAE* ON MOLASSES, A BY-PRODUCT OF SUGAR INDUSTRY

S. Shahid Husain and Najma Murtaza

PCSIR Laboratories, Karachi-39

(Received October 17, 1985; revised August 13, 1986)

Aspergillus oryzae, *Paecilomyces elegans* and *Trichoderma viridae* were tried for the selection of a medium which will support rapid growth and form a thick mycelial mat with high fungal protein values. Protein values were high on molasses containing 9 % sugar as a source of carbon. The effect of the addition of different concentrations of KH_2PO_4 and $(\text{NH}_4)_2\text{SO}_4$ was also studied on the formation of the thick mycelial mat and protein values. The time required for optimum production of mycelium and fungal protein was also determined.

It was observed that *A. oryzae* was the most suitable fungus for these studies. 0.1% KH_2PO_4 and 1.4 % $(\text{NH}_4)_2\text{SO}_4$ when added to the medium did exercise beneficial effect. An incubation period of 5 days was found to be optimum for best mycelial growth and the production of fungal protein.

Key words: Fungal protein; *Aspergillus oryzae* and Molasses.

Pakistan J. Sci. Ind. Res., Vol. 30, No. 1, January 1987

**CRAMBE ABYSSINICA – A RICH SOURCE OF ERUCIC ACID, ITS OIL
PERCENTAGE, FATTY ACID COMPOSITION AND AGRICULTURAL DATA**

Sadaqat Hamid, Salma, Abdul Waheed Sabir and Shafiq Ahmad Khan

PCSIR Laboratories, Lahore-16

(Received October 27, 1985; revised July 23, 1986)

Crambe abyssinica (N.O. Brassicaceae) imported from USA, has been grown in Pakistan. Its agricultural characteristics yield and fatty acid composition have been determined. It has been found that *C. abyssinica* seeds contain 44% oil, about 60% of it as erucic acid.

Key words: *Crambe abyssinica*, Ecometeorological, Brassicaceae, Esterification and Germination.

INOCULUM AND NPK FERTILIZATION OF BERSEEM: CHANGE IN RESPONSE TO MOLYBDENUM, ZINC, COPPER, BORON AND MAGNESIUM APPLICATION

Azra Shaheen, Rahmatullah and Ashiq Hussain

National Agricultural Research Centre, Islamabad.

(Received November 5, 1985; revised August 10, 1986)

Berseem (*Trifolium alexandrinum* L.) is an important rabi fodder crop. A greenhouse pot trial was conducted on a medium textured alkaline calcareous soil to investigate the influence of Mo, Zn, Cu, B and Mg application on changes in response to inoculated berseem fertilized with NPK. In addition to the check treatment, NPK @ 25-100-50 kg ha⁻¹ + Inoculum was applied alone and in combination with 2.5, 5, 5, 2 and 10 kg Mo ha⁻¹ as (NH₄)₂ MoO₄, Zn as ZnSO₄, Cu as CuSO₄, B as boric acid and Mg as MgSO₄, respectively, in triplicate following randomized complete block design. Urea, single superphosphate and potassium sulphate were used to supply N, P and K, respectively. Four cuttings of fresh berseem were taken consecutively at five-week interval. Application of NPK fertilizer and inoculum together significantly ($P < 0.05$) increased the fodder yield parameters of berseem. Among other elements Zn and Mo application had significantly ($P < 0.05$) augmented response of berseem to NPK + inoculum. Statistically Mo and Zn application had same effect on the average weight and number of nodules parameters related to N fixation.

Key words: Berseem; Inoculum; Trace elements.

THE EFFECTS OF VARYING SEEDLING DENSITIES ON THE GROWTH AND YIELD OF THREE WHEAT VARIETIES

M. S. Sharar, M. S. Ahmad and M. Ayub

Department of Agronomy, University of Agriculture, Faisalabad.

(Received June 17, 1985; revised September 1, 1986)

Investigations to evaluate the differential performance of three wheat varieties viz., Chenab-70, Yecora and Lyallpur 73 sown at four seeding densities, i.e. 125, 188, 250 and 313 seeds per m^2 were carried out on a sandy clay loam soil under irrigation. Seeding at a rate of higher or lower than 188 healthy grains per m^2 (82 kg per hectare) did not increase or decrease the grain yield substantially. The yield components like grains per spike and grain weight were reduced consistently with successive increases in the seeding rate. Chenab-70 and Yecora proved to be equally higher yielding than Lyallpur 73.

Key words: *Triticum aestivum* L; Wheat varieties; Seeding densities.

Pakistan J. Sci. Ind. Res., Vol. 30, No. 1, January 1987

USE OF VEGETABLE OIL FOR PROTECTION OF STORED GREENGRAM (*VIGNA RADIATA* (L.) WILCZEK) FROM ATTACK OF *CALLOSOBRUCHUS MACULATUS* (FABR.) (COLEOPTERA: BRUCHIDAE)

Feeroza Khalique, Khalique Ahmed, Bashir Ahmed Malik and Muhammad Afzal*

Pakistan Agricultural Research Council, National Agricultural Research Centre, Islamabad

(Received, November 12, 1985; revised October 3, 1986)

The use of vegetable oil for protecting 4 varieties of greengram (*Vigna radiata* L.) Wilczek) seeds for 4 months from attack of bruchid beetle (*Callosobruchus maculatus* (Fabr.) and its effect on the germination of the treated seeds were studied. The lowest damage was recorded in seeds treated with 12.5 ml oil/kg seed. The variety NCM-9 was found to be the most susceptible as the damage percentage was 43.63, 33.80 and 4.12 at treatment levels of 7.5, 10.0 and 12.5 ml oil/kg seed respectively. However, the germination percentage of the seed treated with 12.5 ml oil dose was significantly reduced.

Key words: *Vigna radiata*; *Callosobruchus maculatus*; Mustard oil.

Short Communications

Pakistan J. Sci. Ind. Res., Vol. 30, No. 1, January 1987

LEAF SPOT DISEASE OF PEA (*PISUM SATIVUM* L.) CAUSED BY *ALTERNARIA TENUISSIMA* (KUNZE EX PERS) WILTSHIRE

S.A. Jamil Khan and A.K. Khanzada

*Crop Diseases Research Institute, Pakistan Agricultural Research Council,
University of Karachi, Karachi*

(Received May 25, 1986; revised October 19, 1986)

Key words: Alternaria tenuissima; Pea leaf spot; Disease of pea.

Pakistan J. Sci. Ind. Res., Vol. 30, No. 1, January 1987

IN VITRO CALLUS FORMATION OF *PISTACHIA VERA* L.

Nasreen Zaidi and Shaista Jabeen

PCSIR Laboratories, Lahore-16

(Received August 4, 1986)

Key words: Pistachia vera L.; Hypocotyl; Callogenesis.

HUMAN HEALTH AND MINOR MINERALS

Part III. Diabetes Control with Chromium Complexes: Trace Metal Analysis of the Emerald and its Complexes (Zamarrud Stone & Zamarrud Kushtajats)

K. M. Janjua and Shaukat Ali*

PCSIR Laboratories, Lahore-16

(Received February 12, 1985; revised May 26, 1986)

The salts of *Zamarrud* (emerald) have been used for diabetic control in the Islamic system of medicine for centuries. An analysis of trace metals was carried out to determine its effectiveness in diabetes. Atomic absorption spectroscopy studies indicated the presence of large amounts of chromium (100 ppm). The presence of chromium in such amounts clearly provides the scientific background for its usefulness in controlling diabetes.

Key words: Emerald; Chromium; Diabetes.

Technology Section

Pakistan J. Sci. Ind. Res., Vol. 30, No. 1, January 1987

BIOGAS FROM BUFFALO DUNG

M. Nazir, M. Ashraf and F.H. Shah

PCSIR Laboratories, Lahore-16

Received, October 10, 1985; revised, September 9, 1986)

Changes in weather effected the dry matter content of buffalo dung and the production of biogas. The plant produced maximum biogas 1.78 M_3 /Day at the loading rate of 2.4 Kg. total solids (TS)/ M_3 digester/day at 34.8 C atmospheric temperature. Anaerobically fermented dung, i.e. effluent from biogas plant showed decrease in the fibre content from 26.24 % to 22.34 %. Application of effluent as fertilizer at the rate of 1800 litre/hactare/day resulted in 10.9 % increase in the yield of barseem/cut.

Key words: Animal dung; Anaerobic fermentation; Biogas.

EVALUATION, BENEFICIATION AND UTILIZATION OF KOGA NEPHELINE SYENITE AS GLASS AND CERAMICS RAW MATERIAL

Part I-Geochemical Evaluation and Concentration Studies

Izhar H. Khan, M.A. Qazi, F. Mahmood and Bahrawar Khan*

PCSIR Laboratories, Lahore-16

(Received October 7, 1985; revised September 25, 1986)

Economically important and sizeable reserves of nepheline syenite occur in the Koga area near Mardan. The rock after beneficiation and market evaluation was found to be in demand for local glass, ceramic and other industries. It has been found to be an excellent substitute for conventional feldspar in view of its low cost, large and consistent reserves, operative advantages; low melting; decrease in devitrification of glass; and chemical durability.

Detailed mineralogical, textural and chemical studies show that the factors important in beneficiation are the texture of iron minerals and not the Fe percentage of the head-ore as considered previously. The rock mass was not found homogeneous and contains certain deleterious minerals in sample. However, proper sampling technique which can result in desirable product recovery has been suggested.

Key words: Ne. Syenite; Beneficiation; Geochemistry

AIR POLLUTION IN KARACHI

Part I. Survey of Smoke Concentration

M. Arshad Ali Beg, A.H.K. Yousufzai and S. Naeem Mahmood

PCSIR Laboratories, Karachi-39

(Received, October 30, 1985)

The level of smoke concentration, lead and tarry deposit on tree leaves has been determined during the surveys carried out in 1975, 1982 and 1983 along the main roads of Karachi. The highest smoke concentration is found at the Tibet Centre, where it was $270 \mu\text{g}/\text{m}^3$ in 1975, $598 \mu\text{g}/\text{m}^3$ in 1982 and $623 \mu\text{g}/\text{m}^3$ in 1983. The maximum amount of tarry deposits on leaves is $4.987 \text{ g}/\text{sq. ft.}$ containing 0.019% lead, found in the Burns Road Area near the KMC School. The results have been compared with the previous surveys in this context and it has been noted that at all the sampling points, the smoke level during the last 14 years has alarmingly increased by about 5 times.

Key words: Pollution Air; Smoke Concentrations; Environmental Survey.

Review Article

Pakistan J. Sci. Ind. Res., Vol. 30, No. 1, January 1987

THE ALKALOIDS OF RAUWOLFIA

Salimuzzaman Siddiqui, S. Imtiaz Haider, S. Salman Ahmad and Naheed Sultana

HEJ Research Institute of Chemistry, University of Karachi, Karachi-32

(Received October, 23, 1986)