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Physical Sciences Section

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SYNTHESIS OF SUBSTITUTED PYRIDINES

Part IX. Formation of 1,2-Dihydro-6-(0-Carboethoxy)-4-Hydroxy-2-Oxo-1-Substituted Pyridines-3-Carboxyanilides

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Ethyl chloroformate reacts with 2,4-dihydroxy-1-substituted pyridinecarboxyanilides (I) to yield derivatives of 6-(0-carboethoxy)-1, 2-dihydro-4-hydroxy pyridine-3-carboxyanilide (II). IR and UV data of the new products have been recorded in support of their assigned structure.

Key words: Hydroxy pyridines.

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PHARMACOGNOSTICAL STUDY ON "CHANGERI"

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The Unani drug "Changeri" is confused with two botanical names, *Rumex dentatus* L. and *Oxalis corniculata* L. In order to determine the correct botanical name of the drug, pharmacognostic studies on "changeri" as well as on *Oxalis corniculata* L., and *Rumex dentatus* L. were taken up. These pharmacognostic studies show that the correct botanical name of "changeri" is *Oxalis corniculata* L.

Key words: Medicinal plants; Changeri; Unani drug.

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PHYSICO-CHEMICAL PROPERTIES OF SOME INDIGENOUS CLAYS

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(Received January 6, 1987; revised September 29, 1987)

Chemical composition, X-ray powder diffraction, simultaneous DTA and TGA and activation studies of clay samples collected from D.G. Khan, Dherikot (Attock) and Khairpur are being presented. The clays from D.G. Khan and Dherikot after activation may be utilized for bleaching purposes, whereas the Khairpur clays are not suitable for commercial activation and utilization for the bleaching of oils.

Key words: Clay, activation, bleaching.

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EVALUATION OF FIRE CLAYS FOR IRON AND STEEL REFRACTORIES

Part I. Chemical Characteristics

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An investigation was conducted to search out the possible sources of Mianwali fire-clays that could be used for refractory products in the iron and steel industry. Forty-six samples were collected and studied for their chemical characteristics. The results indicate that the fireclays of Bakwala and Dakpost areas contain high alumina and low iron contents and possess high values of refractoriness. These clays are quite suitable for the production of high quality refractories.

Key words: Fire-clays; Refractory bricks; Steel plant refractories.

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EVALUATION OF FIRE CLAYS FOR IRON AND STEEL REFRACTORIES

Part II. Physical Properties

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Physical properties of six representative Mianwali fire clay samples have been studied. It can be ascertained from these investigations that four fire clays, representing the Dak Post and Dakwala (Moza Bazar) areas, can be used as safe materials under the severe conditions and other two clays representing the Turta area can also be considered in moderate conditions for iron and steel plant refractories.

Key words: Fire clays; Refractories; Metallurgical industries.

A STUDY OF GLASS SAND DEPOSITS FROM KURD, KARAK DISTRICT, NWFP

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and

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(Received August 2, 1987)

In continuation of these authors' earlier work on the evaluation and utilization of raw materials of NWFP and FATA areas [1,2], the silica sand deposits of Kurd village, Karak District, NWFP were surveyed. The deposits are large, occur in Datta formation of Jurassic age and are exposed over a wide area in the Surghar range. The samples of this area were collected for evaluation and beneficiation. The chemical composition, grain-size distribution and physical characteristics were determined. Beneficiation by physical and chemical methods were undertaken to reduce iron contents. The objective of the work was to investigate whether the silica sand deposits of Kurd are suitable for the rapidly expanding glass industries of Pakistan.

Key words: Glass sand, Kurd silica sand, (Karak district), Evaluation.

Biological Sciences Section

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ESSENTIAL OILS OF THE SPECIES OF LABIATAE

Part III. Studies on the Essential Oil of *Zataria multiflora*

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Chemical composition and physico-chemical values of the essential oil of *Zataria multiflora* (N.O. Labiatae), grown in Pakistan, have been investigated. The essential oil (0.69%) consists of α -phalldrene (2.40%), *p*-cymene (7.10%), γ -terpinene (0.35%), caryophyllene (8.30%), borneol (1.72%), unknown alcohol (1.80%), thymol (15.60%), carvacrol (57.40%) eugenol (1.69%), methyl eugenol (1.54%) and an unidentified phenol (2.10%).

Key words: Essential oil; *Zataria multiflora*; Labiatae; Saponification.

LABORATORY INVESTIGATIONS ON THE REPELLENCY OF SOME PLANT OILS TO RED FLOUR BEETLE, *TRIBOLIUM CASTANEUM* HERBST

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(Received June 25, 1987; revised October 14, 1987)

Seventeen locally available plant oils were tested for their repellent activity against red flour beetle, *Tribolium castaneum*. The studies have shown that the seed oil of *Ipomoea pes-caprae* (Crotalaria) Kuntze. can be favourably compared with neem oil. Both these oils showed class V repellency. Vegetable oils from *Ocimum basilicum* L., *Allium sativum* L., *Tagetes erecta* L., *Momordica charantia* L., *Apium graveolens* L., showed repellent activity of class IV while oils from *Cuminum cyminum* L., *Lagenaria vulgaris* Seringe, *Brassica juncea* L. exhibited repellent activity of class III.

Key words: Repellency, *Tribolium castaneum*, *Ipomoea pes-caprae* oil.

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**SEED GERMINATION AND INTRODUCTION OF *DUBOISIA LEICHHARDTII* F. MUELL. AT
KARACHI 24° ϕ 59 'N-68° ϕ 56E**

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(Received March 29, 1987; revised September 24, 1987)

Efforts were made to germinate the seeds of *Duboisia leichhardtii* using different dormancy breaking methods. Excluding gibberellic acid treatments, no other method was found effective. In our experiments different concentrations of gibberellic acid (100, 200, 250 and 300 ppm) responded positively. The best results were found in 200 ppm of gibberellic acid.

Key words: *Duboisia leichhardtii*, Seed germination and Gibberellic acid.

STUDIES ON THE ANTIFUNGAL PROPERTIES OF INDIGENOUS PLANTS FROM KARACHI REGION

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(Received March 24, 1987; revised September 24, 1987)

Screening was carried out to study the antifungal properties of extracts of indigenous plants from the Karachi region. These studies are based on 50 crude extracts of higher plants belonging to 28 families, viz, *Apocynaceae*, *Asclepiadaceae*, *Cucurbitaceae*, *Compositae*, *Caricaceae*, *Crassulaceae*, *Euphorbiaceae*, *Lythraceae*, *Labiatae*, *Gentianaceae*, *Meliaceae*, *Moraceae*, *Menispermaceae*, *Myrtaceae*, *Nyctaginaceae*, *Oleaceae*, *Orchidaceae*, *Palmae*, *Papilionoidae*, *Polygonaceae*, *Solanaceae*, *Rhamnaceae*, *Ramunculaceae*, *Umbelliferae*, *Valerianaceae*, *Verbinaceae*, *Vitaceae*, *Zygophyllaceae*. The results showed that 18 % of the plants possessed some level of antifungal activity.

Key words: Antifungal, Plants, Karachi.

COMPARATIVE EVALUATION OF PRIMITIVE GENETIC STOCKS OF WHEAT COLLECTED FROM TWO HIMALAYAN CENTRES OF DIVERSITY

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Investigations on twelve primitive wheat accessions collected from the mirco-centres of diversity (northern Pakistan and northern India) were conducted for comparative evaluation of genetic variability for an array of characters. A fair amount of genetic variability was displayed by the quantitative characters under observation. The variability exhibited by the qualitative characters was of lesser amount.

The promising and desirable genotypes from the genetically variable material could be utilized for evolving high yielding disease resistant, good quality wheat varieties, through wheat breeding and by hybridization programme.

Key words: Primitive genetic stocks, Himalayan centres of diversity; *Triticum aestivum* L.

EFFECT OF FERTILIZER FRITS ON WHEAT

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(Received June 12, 1986; revised September 29, 1987)

Fertilizer frits, prepared in PCSIR Laboratories, Karachi, were tried on Paven and Sonnah varieties of wheat. In the presence of frits, wheat seeds plated in petridishes, germinated earlier and grew faster than those without it. On application of 200 mg. of frits/pot, the plants matured one week earlier than control and a 30% increase in yield was also observed. Application of large quantities of frits did not show any corresponding increase in yield.

Key words: Wheat, Frits, Micronutrient.

STUDIES ON BIOCONVERSION**Part II. Conversion of Domestic Garbage into Compost Using Three Different Techniques
— A Comparative Study**

Naseem F. Usmani, Radia Khatib and S. Shahid Hussain

PCSIR Laboratories, Karachi-39

(Received December 22, 1986)

Domestic refuse from Orangi township communal bins contains 55-56 % organic vegetable matter. Three aerobic composting methods, Chinese, Windrow and Forced Aerated Pile techniques were applied for the conversion of this organic matter. Employing these techniques almost 2/3 garbage was converted into compost. On analysis the composts obtained by the above methods did not show any significant difference in carbon, nitrogen and phosphate content. The Chinese method requires less time, is more cost effective and comparatively simple.

Key words: Garbage, Bioconversion, Compost.

STUDIES ON BIOCONVERSION

Part III. Laboratory Studies on Utilisation of Bagasse, Rice and Wheat Straws for Biogas Generation

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PCSIR Laboratories, Karachi-39

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Untreated rice straw yielded 0.038 m³ gas/kg. solids; bagasse and wheat straw produced negligible biogas. However, pretreatment of bagasse, rice and wheat straw on soaking in water for suitable lengths of time yielded 0.054, 0.057, 0.061 m³ gas/kg. solid respectively with 34-36% carbon dioxide. During fermentation with untreated rice straw, the acidic phase lasted for 35-40 days and burnable gas evolved after 45-48 days. After treatment of rice straw, the acidic phase shortened to 15-17 days and early evolution of burnable gas (21 days) was also observed.

Key words: Biogas, Bagasse, Rice straw.

Technology Section

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SUGARCANE PROCESSING AT VILLAGE LEVEL

Part VII. A New Face Configuration for Rolls of the Vertical Sugarcane Crusher (Belna, Trapiche)*

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and

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(Received June 23, 1987)

EFFECT OF SUBSTITUTION OF SUCROSE WITH LIQUID GLUCOSE ON THE QUALITY OF MANGO SQUASH

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(Received July 12, 1987; revised October 6, 1987)

Replacement of sucrose with liquid glucose at 25 to 100 % levels in mango squash caused a significant increase in total acidity, significant decrease in total soluble solids (TSS) and TSS/ acid ratio, but had no significant effect on ascorbic acid content. Ascorbic acid and total acid content of mango squash decreased significantly whereas TSS and TSS/acid ratio increased markedly during a storage period of five months at room temperature (13-35°). Substitution of sucrose with liquid glucose upto 25 % did not lower the organoleptic scores of the mango squash.

Key words: Mango squash, liquid glucose and storage stability.

FABRICATION OF A LOW COST DIGITAL mV/pH METER

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(Received June 10, 1987; revised September 22, 1987)

A digital mV/pH meter based on the use of a commercially available CMOS 3½ digit A-D converter is introduced. The meter features automatic zero and off-balance search. The range coverage is 0-2000 mV, with an accuracy of ± 1 mV, full-scale. The unit is energised with a ± 5 V power supply operatable on 220 VAC, 50 Hz mains line. Output noise is typically less than 10 μ V at a power consumption of 15 mW. The unit is directly adoptable for direct pH measurements.

Key words: Millivolt/pH meter, low cost potentiometry, digital pH meter.

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RELATIONSHIP BETWEEN PHYSICOCHEMICAL CHARACTERS AND COOKING TIME IN CHICKPEAS (*CICER ARIETINUM* L.)

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(Received July 1, 1987; revised October 8, 1987)

Physical characters, chemical and mineral composition of some chickpea mutants/varieties were determined and their relationship with cooking time was established. In physical characters more variability was observed in seed size, hydration and swelling capacities and cooking time (18.44 to 23.99%) than in density and hydration and swelling indices (7.43 to 13.61%). Weight ($r = 0.752$) and volume ($r = 0.755$) of seeds, and hydration ($r = 0.751$) and swelling ($r = 0.742$) capacities were significantly correlated with the cooking time. None of the chemical constituents determined had significant correlation with cooking time of chickpea grains.

Key words: Physical characters, Proximate and mineral composition, Phytic acid.