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PAKISTAN COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH (PCSIR) — A PROFILE

M. Aslam

Chairman, PCSIR

Starting from a scratch in 1953 the first ten years of the Pakistan Council of Scientific and Industrial Research (PCSIR) were devoted: (i) setting up a network of multi-functional laboratories in different parts of the country, providing facilities for research in scientific disciplines such as chemistry, physics, biochemistry, and technological areas comprising minerals, foods, pharmaceuticals, oils and fats, building materials, metallurgy, glass and ceramics, plastics, fuel and wool; (ii) raising professional manpower from 10 to over 400, of whom over 200 received advanced training abroad leading to Ph.D. and other post-graduate degrees; and (iii) establishing agencies like the PANSDOC for documentation and publication of research journals etc.

process related to guanadine nitrate for which POF Wah provided Rs. 2.5 lakhs for a Pilot Plant Study (Foreign Exchange Saving of around Rs. 3.00 million/year). Though this project required a lot more effort, effective utilisation of this invention has not materialised.

C: Commissioning of Industrial Units

Technical know-how was developed to enable commissioning of the following industrial units imported at a cost exceeding Rs. 7.0 million and lying idle for 2 to 3 years: (i) Textile cones and bobbins (Williamson & Co., Karachi); (ii) Plastic Moulding Powder (M.M. Industries and Azmat Industries, Gujranwala); (iii) Glass Wool (Salman Industries, Gujranwala); (iv) Grinding Wheels (Standard Grinding

Physical Sciences Section

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OXIDATION STUDIES IN SOME STEROIDAL BASES (SOLASODINE AND 3 β -O-ACETYL SOLASODINE)

Part I. Reaction With Potassium Permanganate

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(Received March 28, 1983)

Oxidation of solasodine with potassium permanganate/acetic acid yielded I and II while the same reaction when carried out with 3 β -O-acetyl solasodine gave V. On the other hand treatment of solasodine with potassium permanganate in pyridine led to the formation of VII which on acetylation and subsequent hydrolysis formed the diosphenol derivative IX.

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OXIDATION STUDIES IN SOME STEROIDAL BASES (SOLASODINE, 3β -O-ACETYL SOLASODINE AND CONESSINE)

Part II. Periodic Acid as the Trans Hydroxylating Agent

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Periodic acid ($\text{KIO}_4/\text{H}_2\text{SO}_4$) oxidation of solasodine, 3β -O-acetyl solasodine and conessine, yielded the corresponding trans diols. It is noteworthy in this context that the reagent ($\text{KIO}_4/\text{H}_2\text{SO}_4$) is generally employed for the cleavage of vicinal cis diols and there is no reference in literature to the formation of diols from olefins through this reagent. Prolonged treatment of spirostanes with acetic anhydride resulted in the formation of 22, 26-acetyl-epimino-cholest-22-en-derivatives through ring E cleavage. [1].

SYNTHESIS OF 4-[(BENZOPYRANYL, BENZOFURANYL) METHYLENE] -3-METHYL-1-(P-NITROPHENYL)-2-PYRAZOLIN-5-ONE.

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(Received April 10, 1982; revised November 13, 1982)

4-(p-Hydroxybenzylidene)-3-methyl-1-(p-nitro-phenyl)-2-pyrazolin-5-one (1) have been used as a key intermeditate for the introduction of benzofuranones (2 and 5) and chromenones (7) and (9) into the 4-position of 2-pyrazolin-5-one.

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**THE CHELATION BETWEEN DIVALENT TRANSITION METAL IONS AND
CARBOXYPHENYLHYDRAZO- β -DIKETONE ORGANIC LIGANDS IN
75 % DIOXAN-WATER SOLVENT**

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(Received March 27, 1982; revised April 17, 1983)

The dissociation constants for different carboxyphenyl-hydrazo- β -diketones ligands as well as the stability constants for divalent metal complexes of Cu(II), Ni(II), Co(II), Zn(II), Mn(II) and Cd(II) ions, have been calculated pH-metrically in 75 % dioxan-water solvents. The relations between $\log K_{MA}$ and both second ionization potential & dissociation constants are discussed.

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SPECTROPHOTOMETRIC STUDIES ON CHARGE TRANSFER COMPLEX OF IODINE WITH MORPHOLINE

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(Received January 20, 1982; revised December 9, 1982)

Spectrophotometric studies on the charge transfer complexes of I_2 -morpholine in different organic solvents are reported. The thermodynamic and the spectral properties of the 1:1 complex formed in solution are determined. The equilibrium constant decreases as the polarizability function of the solvent increases. The data obtained suggests strong donor-acceptor interaction indicating that morpholine forms strong molecular complex with iodine via its nitrogen site.

EFFECT OF PROCESSING CONDITIONS ON THE NUTRITIVE VALUE OF MUSTARD SEED MEAL

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(Received December 28, 1981)

The effect of processing conditions on the proximate composition of mustard seed cake and meal and the digestibility of enzymic detoxified mustard meal was investigated. Maximum amount of oil was extracted when the seeds were crushed twice in a screw press (sc. cone distance 0.38 mm). Maximum digestibility of the mustard meal was 29.8, 26.6 and 24.3 % with single extraction technique (sc. cone distance 1.14 mm) after 9 hr incubation with trypsin, pepsin and papain respectively. It was also observed that the digestibility was always more after single extraction than after double extraction.

CHEMICAL EVALUATION OF PETROLEUM WAXES AVAILABLE IN PAKISTAN

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(Received May 9, 1983)

Locally available waxes Chinese wax, Attock wax, 100NHVI, 650NMVI and BSHVI were analysed/evaluated using physico-chemical methods, statistical methods and instrumental techniques. Nitrogen and sulphur compounds were present in 100 NHVI, 650 NMVI, and BSHVI which can be removed by acidic treatment. The combined olefinic and aromatic content of the waxes was found to be as follows: Chinese wax, 2.43%, Attock wax, 3.12%, 100NHVI, 12.50%, 650 NMVI, 37.23%, and BSHVI, 56.71% Chinese wax was found to be paraffinic, Attock wax contained naphthenic compounds, 100 NHVI contained both naphthenic and aromatic compounds, 650 NMVI was found to be high in naphthenic compounds, and BSHVI was found to be high in aromatic compounds. The content of n-alkanes and their carbon number distribution were Chinese wax, 93.63 and C_{18} to C_{36} ; Attock wax, 69.23 and C_{20} to C_{39} ; 100 NHVI, 48.14 and C_{16} to C_{35} ; 650 NMVI, 17.07 and C_{16} to C_{43} ; BSHVI, 5.39 and C_{16} to C_{44} . The use of these waxes in candle making, emulsions and as a chemical raw material for fatty acids, alcohols, chlorinated hydrocarbons is discussed.

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A QUICK, PRECISE AND ACCURATE METHOD FOR THE DETERMINATION OF NITRAZIPAM BY THE RING – OVEN TECHNIQUE

Muhammad Hanif, Sumra Naeem, Bushra Chaudhry[☆] and Shaukat Ali[★]

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(Received March 3, 1983)

A convenient, simple, sensitive, accurate, reproducible and less time consuming method for the determination of nitrazepam using sodium hydroxide as colour producing reagent has been devised by ring-oven technique and is recommended for routine analysis.

CHEMISTRY AND MINERALOGY OF SOME EOCENE AND ASSOCIATED LIMESTONES OF KOHAT DISTRICT, N.W.F.P.

Ehsan Fatima, Nisar Ahmad, Fazal A. Siddiqi and A.H. Khan*

PCSIR Laboratories, Peshawar, Pakistan

(Received May 10, 1981; revised September 20, 1982)

Very large deposits of limestone ranging in age from Jurassic to Eocene are found in Kohat area. X-ray, differential thermal analysis and chemical data are presented for the rock samples from different sections of Eocene, Paleocene and Jurassic. These limestones are mainly composed of calcite, dolomite and subordinate amounts of quartz, illite and sometimes kaolinite.

The complete absence of titania and small amount of quartz indicate that the sedimentation of limestone occurred away from the shoreline. The Eh and pH conditions during the formation of these limestones have also been discussed.

EVALUATION OF KONKAR NALA GRAVEL AS NATURAL AGGREGATE

M. Arshad Ali Beg, S. Naeem Mahmood and Sitwat Naeem

PCSIR Laboratories, Karachi-39, Pakistan

(Received February 8, 1983)

Various physical and chemical tests on the gravel and sand from the bed of Konkarn Nala and the chemical analysis of water from the same site were carried out to determine their suitability as natural aggregate for concrete. The study suggests that because of its unpredictable silt, bicarbonates and organic matter content, the aggregates should be subjected to washing and that it should be used in well mixed proportions.

RESPONSE OF TWO POPULATIONS OF *TRIFOLIUM REPENS* L. COLLECTED
FROM POLLUTED AND UNPOLLUTED SITES TO LOW LEVELS OF
SO₂ AND NO₂ SINGLY AND IN COMBINATIONS

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(Received July 5, 1982; revised July 11, 1983)

The polluted and the unpolluted population of *Trifolium repens* L. were exposed to 6.8 pphm SO₂, 6.8 pphm NO₂ and 6.8 pphm SO₂ + 6.8 pphm NO₂ for prolonged period in the winter and summer. The most severe reduction in growth was recorded when both the populations were exposed to SO₂ and the least after the NO₂ exposure during winter. The interaction between SO₂ and NO₂ was significant. NO₂ treatment apparently cancelled or reduced the toxic effects of SO₂. The summer experiment showed different results. NO₂ treatment showed enhanced in growth of both the populations while the combined treatment reduced it. SO₂ treatment on the other hand reduced the growth in the unpolluted population and promoted in the polluted population.

In conclusion there was no firm evidence of the genetic adaptation. However, the polluted population appeared to be slightly more tolerant to SO₂ and NO₂ pollution.

CARBONIZATION OF AROMATIC COMPOUNDS AND A STUDY OF THE SURFACE GROUPS ON THE RESULTING COKES

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(Received March 27, 1982; revised November 25, 1982)

Attempt has been made to carbonize aromatic compounds containing carboxylic, carboxylic anhydride and phenolic functional groups in the presence of aluminium chloride as catalyst to establish whether the functional groups of the original compounds exist as such on the surfaces of the resulting cokes or if they change during carbonization. The acidities of the cokes were determined with aqueous sodium hydroxide and alcoholic potassium hydroxide. The acidities found in alcoholic medium were higher than that in the aqueous medium, which supported the view that the functional groups of the original compounds might have changed (atleast partly) during carbonization and some new groups probably keto-enol had been formed on the surfaces of cokes. Carboxylic or carboxylic anhydride groups if they were present, would have been neutralized to a substantially equal extent in the aqueous and nonaqueous media.

Short Communication

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**DIELECTRIC CONDUCTIVITY OF SHELLAC AND ITS MIXTURE WITH
ROCHELLE SALT, POWDERED MICA AND WOOD DUST AT 9.44 GHZ**

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(Received August 16, 1982; revised January 7, 1983)

Biological Sciences Section

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A COMPARATIVE STUDY OF BARLEY AND TRITICALE FOR SALT TOLERANCE

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(Received June 3, 1982; revised Sept. 20, 1982)

Barley and triticale cultivars were tested against soil salinity in a pot study. The harmful effects of salinity were measured by computing correlation coefficients between salinity levels and different plant attributes of both the crops. The relative salt tolerance of the two crops was compared by calculating the salinity levels corresponding to 50% decline (over control) in the respective plant attributes. Triticale was more affected by harmful effect of salinity than barley. The two attributes of spike length and number of grains per spike in case of barley remained unaffected even at the highest salinity levels.

**PATTERNS OF MICROFILARAEMIA IN *MESOCRICETUS AURATUS* CAUSED BY
*DIPETALONEMA VITEAE***

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(Received June 3, 1982; revised October 30, 1982)

Mesocricetus auratus infected by *Dipetalonema viteae* and the patterns of microfilaraemia were observed for 193 days post infection. The hosts were necropsied and adult worms were recovered. Density of peripheral microfilariae was very low. Adult worms of both sexes were recovered from the amicrofilaraemic hosts. It was concluded that the reaction of the host against the adult stages probably has some sterilizing effects on the female worms.

EXPERIMENTAL CULTIVATION OF *SILYBUM MARIANUM* AND CHEMICAL COMPOSITION OF ITS OIL

Sadaqat Hamid, Abdul Waheed Sabir, Shafiq Ahmad Khan and Perveen Aziz

PCSIR Laboratories, Lahore, Pakistan

(Received December 12, 1982)

Silybum marianum, known as Lady's thistle (N.O. Compositae), is a wild growing herb used as medicine for liver diseases. This plant has been successfully cultivated in the experimental fields of the PCSIR Laboratories, Lahore with a view to studying its feasibility as an oil seed crop. It has been observed that the per acre seed yield and percentage of oil are 600 kg and 25.7 % respectively. The fatty acid composition (percentage by wt) of the oil obtained from the seeds is linoleic 42.11, oleic 36.45, palmitic 9.728, stearic 7.067, arachidic 3.3 and behenic 3.04 %.

STUDIES ON NUTRITION OF FUNGI
Part VII. Effect of Different Amino Acids and Their Combinations
on the Growth of Different Fungi

Mrs. Naheed Anwar and S. Shahid Hussain

PCSIR Laboratories, Karachi, Pakistan

(Received June 25, 1981)

Effect of four basic amino acids, lysine, arginine, histidine asparagine and two acidic amino acids, glutamic and aspartic acid and their combinations has been studied on the growth of *Botryodiplodia theobromae*, *Fusarium sulphureum*, *Curvularia lunata*, *Glomerella cingulata* and *Pleospora infectoria*. It was observed that mixtures of some amino acids support better growth than others while some fungi grow more profusely in the presence of a single amino acid.

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INTRODUCTION AND DEVELOPMENT OF *APIUM GRAVEOLENS* AT LAHORE

A.W. Sabir, P. Aziz, S.A. Khan and M.K. Bhatti

PCSIR Laboratories, Lahore, Pakistan

(Received September 19, 1982)

The seeds of *Apium graveolene* L. (Celery, Karfas ajowan) are commonly used as Medicine and its essential oil and Oleo-resin are used in the flavour industries and in food preparation. The plant has been successfully cultivated at experimental fields of P.C.S.I.R. laboratories, Lahore and its yield and percentage of oil is up to the international standards. It has an established export foreign exchange earnings. The return per hectare is very high as compared to many other cash crops in Pakistan.

**STEBBING ON EARLY SEX DIFFERENTIATION BETWEEN LARVAE
OF LAC INSECTS AND ON THE INDIAN WAX-INSECT**

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Technology Section

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OPTIMUM SIZE OF INDUSTRIAL AND MINI PLANTS: A RE-ASSESSMENT AND POSSIBLE GENERALIZED FORMULA

M. M. Qurashi

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The Choice of technology for transfer to a developing country, or to a particular area or region in a developing country, involves a number of critical decisions, which include the type and size or capacity of plant. In a great many cases, the sophisticated technology can operate under the local conditions, but with a different capacity, while in certain other cases, an essentially different technology is found to operate more effectively under the local or village conditions. Mini-plants in general cover both these types of situation.

This paper first discusses a general formulation for the variations of cost of unit production, so as to estimate the capacity for optimum operation under a given set of conditions for some typical products, and gives a working formula for this. Then a discussion is also given of the merits of what may be called "micro-plants," based on an essentially different concept of village-level operations, using locally fabricated machinery and relatively unsophisticated designs. The products so obtained are eminently suited for local consumption and provide an incentive for rural industrialization so necessary for a balanced economic growth.

Several types of mini-plants, notably those for mini-cement, mini-sugar, mini-paper, mini-spinning and mini-fertilizer, have been extensively studied and appear to possess sufficient economic viability to justify field trials. The village-level operations for both cement and sugar seem to be feasible. Several others deserve R&D studies.

IMPROVEMENT IN THE NUTRITIVE VALUE OF WHEAT STRAW BY BIOLOGICAL TREATMENT*

F.H. Shah, Zia-ur-Rehman, A. Majid, T. Firdous and A.D. Khan

PCSIR Laboratories, Lahore, Pakistan

(Received November 15, 1981)

In vivo digestibility of straw hydrolysed by cellulolytic microorganism showed an increase from 42.27 to 50.03 %. Maximum dry matter digestibility was 68.83 % when a combination of *Chaetomium globosum* and *Bacillus polymyxa* was propagated on alkali treated straw. An improvement in the digestibility of nitrogen, cellulose, minerals and fibre contents was also observed.

A METHOD FOR THE CONVERSION OF GYPSUM INTO SODIUM SULPHATE

Mohammad Saeed, Salih Mansoor, A. Khaliq and M.K. Bhatti

PCSIR Laboratories, Lahore, Pakistan

(Received February 17, 1983)

Production of sodium sulphate by the action of sodium chloride on indigenous gypsum has been studied. The work describes two methods utilising cation exchange resin whereby 90 % of gypsum has been transformed into sodium sulphate of 90 % purity. In the first method gypsum powder was used and particle size (400 mesh) caused completion of reaction in 7 min whereas 13 and 28 min were required respectively for 300 and 200 mesh size. In the second method same results were achieved without grinding gypsum thus eliminating an energy consuming step. One cubic foot of resin could convert 1 kg of gypsum and 700 g sodium chloride into 900 g of sodium sulphate with 570 g calcium chloride as by product. The final product of 98 % purity was obtained by primary evaporation in a solar tank followed by final evaporation by natural gas.

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STUDIES ON THE REDUCTION OF GYPSUM TO CALCIUM SULPHIDE WITH MINERAL COAL AS THE REDUCTANT

Mohammed Saeed, A. Khalique, Salih Mansoor and M.K. Bhatti

PCSIR Laboratories, Lahore, Pakistan

(Received February 16, 1983)

The optimum conditions for maximum reduction of gypsum ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$) by using mineral coal as reductant carbon source have been described. The particle size of 325 mesh of both gypsum and coal, the temperature of 850° and one hour heating time have been found to be the best conditions to achieve the maximum yield of calcium sulphide of 96.1 % purity. The process has been made economical by establishing conditions which allow the use of lowest carbon to gypsum ratio of 1:5.

COPOLYMERS OF CASTOR OIL PREPOLYMER
Part III. Copolymerization of Acrylic Acid with COP

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(Received January 6, 1983)

A study of copolymerization of castor oil prepolymer (COP) with acrylic acid has been carried out at 75° using benzoyl peroxide as inhibitor. It is found that good yields of copolymers are obtained at high feed of COP. The copolymers of low molecular weight decreasing with increasing concentration of acrylic acid are obtained. The intrinsic viscosities of copolymers are 0.039 to 0.074 dl/g. The copolymer obtained is soft rubbery type.

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HOMOPOLYMERIZATION OF ALLYL ALCOHOL AND PREPARATION OF COMPLEXES OF ALLYL ALCOHOL WITH SOME INORGANIC SALTS **

S.A.K. Lodhi and A. Rasheed Khan

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(Received August 18, 1981)

The homopolymerization of allyl alcohol was carried out at 100° in the presence of inorganic salt without using any radical initiator. The monomer homopolymerizes but degree of polymerization is low enough. The complexes of allyl alcohol are also prepared with some inorganic salts like CuCl_2 , CoCl_2 , HgCl_2 , ZnCl_2 , NiCl_2 , SrCl_2 , MnCl_2 , PtCl_6 and CrCl_3 . Allyl alcohol forms complexes with PtCl_6 and CuCl_2 in 1:1 (AA/salt) molar ratio whereas rest of the above salts combines in the 1:2 molar ratio. These complexes are hygroscopic and viscous material soluble in alcohol and acetone.

MAJOR PROBLEMS OF TRANSFER OF TECHNOLOGY IN RELATION TO THE ISLAMIC WORLD

M.M. Qurashi and S.M.A. Shah

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A brief review of the major problems involved in the transfer of technology from the developed to developing countries has been undertaken, especially with a view to examining prospects for speedy technological development in the latter countries. The economic and socio-economic issues involved in such transfer have been indicated. The situation obtaining in Islamic countries has been considered as a special case and the discussion has been concluded by suggesting a number of measures to effectively achieve the desirable objectives.