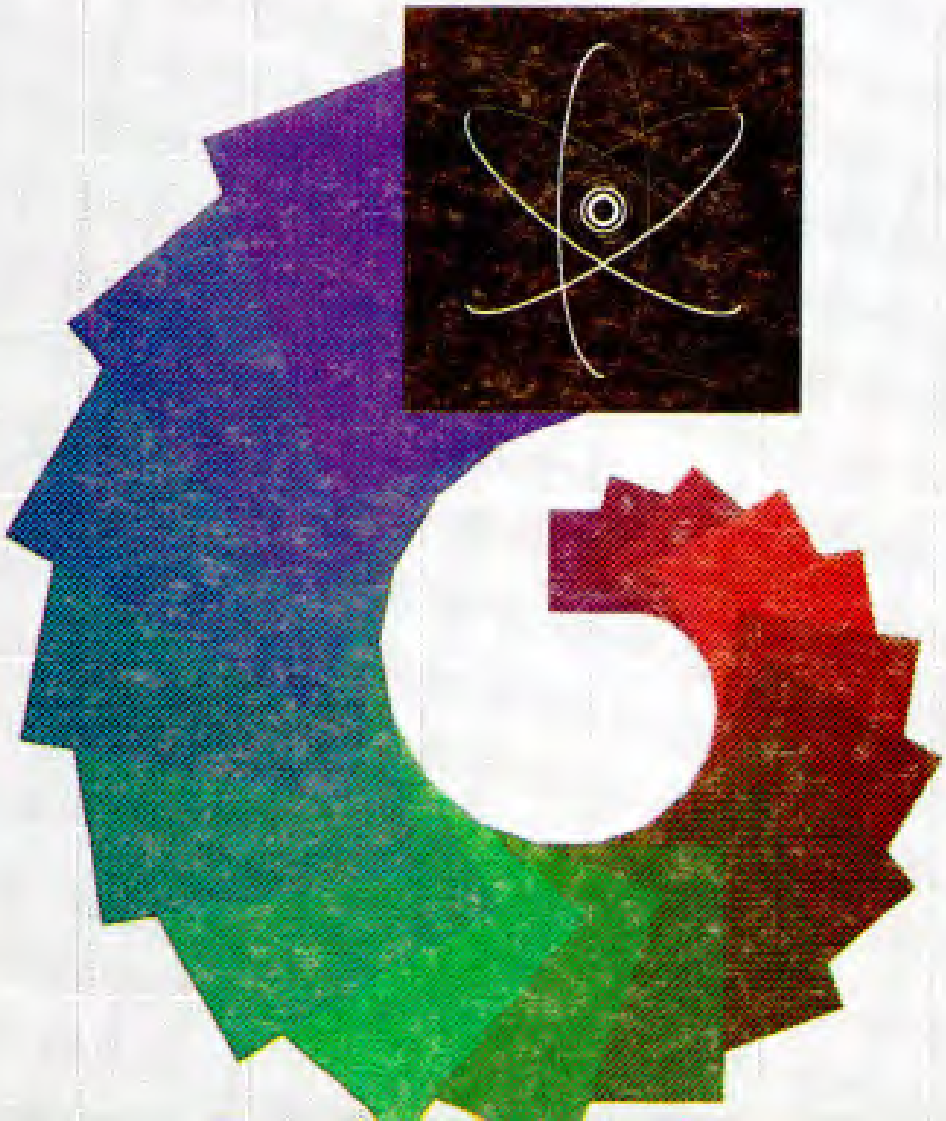
RESEARCH PROJECTS

Vol–II (1986–90)



RESEARCH PROJECTS

Vol-II (1986-90)

PAKISTAN SCIENCE FOUNDATION. ISLAMABAD

FOREWORD

One of the major functions assigned to the Pakistan Science Foundation, under its charter, is to promote and finance scientific research in the Universities and other Research Institutions. The Foundation during the period 1974-90, has funded 403 research projects in various fields of Science & Technology to investigate problems relating to Agriculture, Biochemical Processes, Physical Phenomenon, etc. at various Universities and Research Institutions in the country.

The PSF funded projects, besides expanding the frontiers of knowledge and promoting the cause of scientific research in the country, have greatly helped in the development of Institutional research capabilities by providing sophisticated Laboratory equipments and training of R&D Manpower in important areas of research. Besides, 29 Ph.D Degrees have been awarded to the research scholars under PSF financed projects. Furthormore, the important findings under these projects have been published in local and international journals of repute.

The publication of brief summaries of the final reports of PSF funded projects was undertaken with a view to make the Scientists and Researchers aware of the nature of investigations carried out and works accomplished under these projects. The information provided through these publications help the Researchers to benefit from the research results, avoid duplication of work and collaborate with fellow Scientists in relevant fields. Out of 325 projects completed during 1974-90 period, the summaries of 132 reports were compiled by Foundation in January 1986, under the publication entitled; "Scientific and Technological Research Projects, volume-I (1974-85). The summaries of 125 completed projects are now being included in the present volume.

The efforts put in by Dr. Azra Sultana Ahmad, Chief Scientific Officer, Mr. Subhan-ud-Din, Senior Scientific Officer and other Staff Members of Research Support Section in the compilation of this document are highly appreciated.

(DR. BASHIR AHMAD SHEIKH)
Chairman,
Pakistan Science Foundation,
Islamabad

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P-AU/Agr (31/1) 1980-82

GENETICAL INVESTIGATIONS SUPPORTED BY CYTOLOGICAL STUDIES OF BRANCHED EAR DERIVATIVES IN WHEAT

M. Aslam*

The project is an extension of the previous study on the production of branched ear derivatives of wheat with high yield potential obtained from interspecific crosses between *T. turgidum L.* and *T. aestivum L.* During the extension period of one year, investigations were carried out to find whether stable branched ear derivatives in interspecific crosses involving *T. aestivum* and *T. turgidum* could be established. The branched ear plants were divided in two groups depending upon the height of the plants. A major part of the studies were restricted to semi tall and tall plants, though some studies were carried out on dwarf plants as well. In the tall and medium tall plants almost all classes of branched ears segregated. However, regrouping of the classes gave an indication that although the branching trait was controlled by fewer genes, the instability was due to modifiers linked with the major genes. It was also observed that branching behaviour was influenced by availability of nutrients in soil or photosynthetic activity of plants. Phenotypic instability was confirmed by chromosomal abnormalities and pollen sterility. The dwarf selections of the previous year were surprisingly very uniform in plant height and mode of branching of spike. Pollen sterility was, however, a common phenomenon observed in many progenies. Dwarf selections were made on the basis of Kernal weight and number of kernal per plant which were planted under both high and low fertilization. Some of the dwarf plants were found to be very superior to the plants of new improved variety in potential grain yield of 10 tillers per plant.

S-KU/BIO (109) 1982-85

A QUALITATIVE SURVEY OF NODULATING ABILITY OF LEGUMES OF PAKISTAN

Mahmood Ahmed**

An extensive survey was carried out to study the nodulating ability of different legume species under natural conditions. A total of 115 leguminous species were studied. It was observed that the percentage of nodulation in three sub-families i.e. *Caesalpiniaceae*,

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Mimosaceae and *Papilionaceae* was 0%, 94% and 100% respectively. Furthermore, the nitrogen content in the legumes and rhizobial isolates of 113 plants were found to vary from 6.25 gm/100 gm to 25.6 gm/100 gm.

Nitrogen fixing bacteria from nodules of wild and cultivated legumes were isolated and cultured. From these bacteria, high nitrogen fixing local strains were screened out for further studies.

Rhizobial isolates from the nodules of 47 legumes were obtained in pure culture and were characterized on the basis of their morphology and biochemical reactions. Cross inoculation experiments between some important legumes and isolates from wild legumes were also made and relationship of soil pH and soil type with the frequency of nitrogen fixation by nodules was evaluated by studying the texture and soil pH of the area surveyed.

S-PCCC/AGR (77) 1983-86

DEVELOPMENT OF COMMERCIAL HYBRID COTTON

Mohiuddin Ahmad*

The exploitation of interspecific hybrid vigour for development of commercial hybrid cotton was restored to achieve a break through in the quality and quantity of cotton in Pakistan.

Fifty hybrids of *G. hirsutum* and *G. barbadense* parents were evaluated against local type-Qalandri. Of these, thirtyone gave significantly better performance as compared to Qalandri. For selecting the best cross combination to develop commercial F_1 hybrid, the genetic male sterile line (ms_5-ms_6) was crossed with various *G.barbadense* cultivars and during the season 1985-86, six F_1 hybrids were raised. None of them gave better performance than Qalandri.

Towards the development of commercial F_1 hybrids through cytoplasmic male sterile system, four *G. hirsutum* cultivars viz., Deltapine-70, NIAB-78, ST-3 and CRIS-1/80 were crossed on the cytoplasmic male sterile lines to convert them into cytoplasmic male steriles.

Two new fertility restorers (R lines) of *G. hirsutum* group were developed from the cross (JBW 633 * 2-72) * 2-72 and CMS-BW 76-31Q type restorer, the former with restorer and fertility enhance genes and the latter with an additional gene for high gossypol content.

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To study their efficacy for inducing fertility, these were crossed on to various cytoplasmic male steriles for planting cross seed next year and to evaluate their fertility.

For production of commercial hybrid cotton, available cytoplasmic male sterile lines were propagated by crossing with sister sibs fertility restorer line by selfing besides the maintenance of other promising cultivars of *G. hirsutum* and *G. barbadense.*

On the basis of three years experimentation, following conclusions were drawn:-

i. In F1 hybrids between *G. barbadense* and *G. hirsutum* cultivars, those hybrids which have neat resistant *G. hirsutum* as one of the parents, manifest high degree of heterosis in yield in comparsion to others.

ii. The main contributer towards yield in interspecific F1 hybrids (*G. hirsutim* x *G. barbadense*) is cotton boll number per plant whereas weight shows negative heterosis which is over compensated towards yield by high degree of positive heterosis in number of bolls per plant.

iii. The ginning out-turn, in general, is low in F1 hybrids mainly due to high degree of positive heterosis in seed index and comparatively lesser in lint index.

S-PCCC/Agr (77/1) 1986-87

DEVELOPMENT OF COMMERCIAL HYBRID COTTON

Mohiuddin Ahmad*

The project is an extension of previous study on the production of F_1 hybrid cotton which led to the important conclusion that: a) F1 hybrids of *G. barbadense* and *G. hirsutum* cultivars manifest high degree of heterosis in yield in comparison to others; b) the main contributor towards yield is interspecific F1 hybrids (*G. hirsutum* x *G. barbadense*) is boll number per plant whereas boll weight shown negative heterosis; and c) the ginning outurn, in general , is low in F1 hybrids.

During the extension period, investigations were aimed at applying the phenomenon of heterosis into general practice. The results achieved are as under:

i. The parents belonging to both *G. hirsutum* and *G. barbadense* species have

* Cotton Research Institute, Sakrand, Sindh.

S-AU/Agr (58) 1979-81

ROLE OF PREDACIOUS ARTHROPODS IN MITE PEST CONTROL

Abdul Hayee Soomro*

Detailed investigations on the incidence of mites, their population dynamics, mode of attack on their respective hosts, as well as on the pests of mites were carried out. It was observed that the phytophagous mites belonged to families Tetranychidae, Tenuipalpidae, Tarsonomidae while the predaceous mites belonged to three families mamely: Phyteseiidae, Stigmaeidae & Cunexidae. The host specificity of pest mites on various crops, vegetables, fruit trees was also studied and the results achieved are tabulated below:

Mite Specie:	**Host:**
Schizotetraanychus (immature)	Sugarcane
Tetranychus sp.	Soyabean & Groundnuts.
Eutetranychus sp.	Green grams.
E.Orientalis (Mc Greger).	Castor Crop, Cotton, Cassia fistula.
Eutetranichus sp.	Brinjal and Chillies.
Brevipalus sp.	
Oligonychus sp.	Okra, Jaman.
Eutetranychus sp.	
Tetranychus Cucurbitae	Ridged Gourd.
Tenuipalpus sp.	
E. Orientale.	Lemon.
Porcupinychus abutloni.	Abitutlon indicum.

Studies on the predators of mites showed that *Tethorus pamperalus* beatle is an effective predator of some species of mites and helps in their biological control. The predacious insects identified included: *Menochilus sexmaculatus, Coccinella septumpunctata, Brumus sp.* and *Chrysopa sp.* which may also prove helpful in biological control of Mite Pests.

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C-QU/Envr (22) 1981-82

BIOLOGICAL CONTROL OF TERMITES WITH PHEROMONES

Qazi Javed Iqbal*

Social insects like termites have sophisticated system of communication through chemical compounds called pheromones which control the food collection, defence mating and other activities of the insect colonies. This system of communication has proved to be a promising biological control against the pests. A study was undertaken to isolate the active fractions of termite pheromone with a view to synthesize it at large scale for the biological control of termites. The pheromone was extracted from the *Odontotermes obesus* termite collected from various localities such as Quaid-i-Azam University Campus, Islamabad City, Rawal Lake & Chattar Bagh.

The crude extract was further purified and fractionated by column chromatography, thin layer chromatography and gas liquid chromatography. The fractions obtained were spectroscopically analysed and then subjected to the bioassay test for the confirmation of their biological activity. It was concluded that these active fractions, if synthesised on mass scale, may help in the effective control of termites.

B-BU/BIO (107) 1983-84

STUDY OF BIOLOGY OF VERTEBRATE PESTS OF ORCHARDS OF BALUCHISTAN

Maqsood Ali**

A survey was conducted for various vertebrate pests in seven major orchard bearing districts of Baluchistan, i.e. Quetta. Sibi, Pishin, Kalat, Khuzdar, Loralai and Zhob. The Survey indicated that nine different species of small mammals are associated with orchards, though only four mammalian species, viz; short tailed Mole rat (*Cesokia indica*), great gerbil (*Rhombomys opimus*), mouse hare (*Ochotona rufescens*), and percupine (*Hystrix indica*) act as significant pests in different areas. Other mammals such as indian gerbil (*Tetera indica*), house mouse (*Mus musculus*), persian jird (*Meriones perscus*), and hedge-hog (*Hemiechinus sp.*) are also capable of acting as pest at few stages on the availability of suitable environmental conditions. The degree of damage caused by these pests varies in different areas and in different orchard plantations. It has also been observed that pest infestation is correlated with the extent of the movement of man and material in the area.

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** Department of Zoology, University of Baluchistan, Quetta.

S-AU/Bio (152) 1988-89

QUANTITATIVE SURVEY OF POPULATION TRENDS OF HELIOTHIS ARMIGERA HB. AND ITS NATURAL ENEMIES ON VARIOUS PLANTS IN HYDERABAD DISTRICT

Mohammad Khan Lohar*

Survey of a major insect pest: *Heliothis armigera* of crops in four Talukas of Hyderabad District namely: Hyderabad, Tando Allahyar, Tando Mohammad Khan and Hala was carried out. It was observed that *H. armigera* occurs all round the year on Gram, Tomato, Bersean, Soyabean, Sunflower, Maize, Cotton, Peas, Spinach and Brinjal crops. The maximum number of *H. armigera* moths were trapped during March, April, October and November indicating 4-generations of moths in one year.

Two species of parasitoids *Compoletis chlorideae* and *Apanteles sp.* were recorded as larval parasitoids of *H. armigera*. The highest percentage of parasitism was recorded for *C. chlorideae* as 13% for the larvae of *H. armigera* on the gram crop.

P-PU/Bio (136) 1986-89

PEST STATUS, FEEDING PREFERENCES AND CONTROL OF TERMITES OF PAKISTAN

Muzaffar Ahmed**

A survey of the cotton, wheat and sugar cane fields of Punjab was carried out to study the feeding behaviour of termite pests attacking these crops. The results achieved are as under:-

- Wheat crop is attacked mainly by the fungus growing termites which attack the plant from seedling to the harvesting stage. Mature plants are attacked more severely than the seedlings and younger shoots. In canal irrigated wheat fields, the population density of termites is directly proportional to the atmospheric temperature and relative humidity. Whereas in the rain fed areas, they are inversly proportional to each other.

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** Department of Zoology, University of the Punjab, Lahore.

- Seedlings of the cotton crops are attacked by *Odontotermes obesus, Microtermes mycophagus, M. obesi, M. unicolor, Eremotermes paradexalis & A. dehreansis.*

- Although termites damage the cotton crop at all stages of growth but younger plants are more susceptible to the attack.

- *M. obesi* and *M. mycophagus* are the major pests of the sugar cane crop and a significant positive correlation exists between the age and height of the plant to the severity of attack.

- Heptachlor is found to be more effective insecticide for the termites control as compared to the Dieldrin, Lorsban and Tenekel.

P-PU/BIO (79) 1978-80

STUDIES ON WOOD PREFERENCES OF TERMITES

Muhammad Saeed Akhtar*

Termites, a serious pest of cellulose materials, cause considerable damage to cultivated crops, forest trees, and wood work in buildings. Wood preferences of three termite species *Bifiditermes beesoni, Coptotermes heimi* and *Odontotermes obesus* were studied for 17 species of timber and the factors determining the resistance and susceptibility of these timbers were investigated. Based on the termite feeding preferences, some commercially important timbers as Shisham (*Dalbergia sissoo*), pine, chiapinerdodan (*Pinus roxburghii, Pinus gerardiana, Cedrus deodara* and *Pinus wallichiana*). Essential oil and extract of *Cedrus deodara* was found highly toxic to all the three termite species. However, at high temperatures, the timber lost its resistance and termites showed maximum feeding on wooden logs dried at 60°C - 100°C. Feeding respones to wood extracts and essential oils were also studied and it was found that wood extract and essential oil of *P. wallichiana* were highly unpalatable and termicidal to *O. obesus* and *C. heimi* whereas *B. beesoni* was resistant to these compounds. Resistance of Shisham *(D. sisso)* is attributed to its hardness and partly to its chemical composition.

P-PU/BIO (74) 1980-82

BIOLOGICAL CONTROL OF PLANT DISEASES CAUSED BY ROOT INFECTING PATHOGENIC FUNGI

S. H. Iqbal**

Vasicular Arbuscular Mycorrhiza (VAM), the universal symbionts of plants, are deterrent to pathogenic root infections. The study was undertaken to find a method for obtaining VAM free plants by either inhibiting the mycorrhiza fungi in situ system or by inhibiting the activity of VAM for certain period of time, without affecting the plant growth and nutrient uptake through the roots.

Effects of DDT on the host and mycorrhizal infection, in relation to the age of the host, were studied in detail. Gamma radiation were used to remove the native vasicular

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P-UET/Agr (89) 1987-89

STUDIES ON ADOPTED RECLAMATION PRACTICES IN PINDI BHATTIAN

M. I. Lone*

The project was undertaken to: (i) evaluate the water quality of the newly installed tubewells by Punjab Land Utilization Authority (PLUA) in Pindi Bhattian, (ii) study the extent of development of the culturable waste land in the project areas and role of gypsum application in the soil reclamation; and (iii) determine the micronutrient status of the soils and crops, particularly rice and wheat.

The data collected during these investigations showed significant improvement in the development of culturable waste land and increase in crop field which is indicated by the decrease in waste land from 65 to 28% and increase in cultivated area from 40 to 63%. Water quality data showed that after 5-years of their installation, some tubewells are pumping high bicorbonate water which will damage the soil in few years, so proper management measures are to be adopted to save these lands. The field surveys and soil reclamation trials carried out at different sites have indicated that gypsum can be utilized as effective ammendment for reclaiming the saline-sodic and sodic soils of the project area.

Analysis of the soil and plant samples (rice and wheat crops) for micronutrients including: Zinc, Copper, Iron, and Managnese indicated that soils are deficient in the available Zinc. This deficiency of zinc affects the rice yield negatively.

The project studies have led to the conclusion, that installation of tubewells in the Pindi Bhattian areas has substantially benefitted the farming community. Besides the development of culturable wasteland and increase in crop acreage and yields, there has been an increase in the live-stock and milk production. However, for the long lasting beneficial effects of this change, it has been recommended that: (a) the high bicarbonate tubewell water should only be used after it is ammended with gypsum; (b) Zinc should be used alongwith the macronutrient fertilizers to make up its deficiency in the soils of the area; (c) Flood irrigation system should be replaced by trickle irrigation system on coarse textured soils which will save the irrigation water; and (d) gypsum fertilizers and other technology should be provided to the farmers on easy deferred payment system.

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ZOONOSIS

S-AH/AGR (28) May, 1976 TO Oct. 1976

RINDERPEST LIKE DISEASE AT BUFFALO/CATTLE COLONY, LANDHI, KARACHI

K. M. Mangi*

A study was undertaken to isolate and identify the causative viruses for Rinderpest like disease of Buffalo/Cattle Colony, Landhi, Karachi and to develop an economical and quicker diagnostic technique for this disease. Upto date literature and references were collected from all possible sources for detailed study of the disease.

Blood, urine and faeces of 50 infected animals suffering from fever and diarrhoea (with or without blood) were collected and analysed in the tissue culture laboratory at Karachi University. Their suspensions were made in salt solution containing broad spectrum antibiotics and drained culture techniques were employed for the inoculation of these cultures.

The results of virus isolation revealed that more than one virus were involved in causing this disease. Furthermore, the investigations provided basic information regarding the symptoms and causative agents of the disease which would help in conducting further studies on this disease and synthesizing a vaccine for its control.

P-PU/Bio (91) 1980-81

INCIDENCE OF HYDATID IN LAHORE DIVISION AND ITS EFFECTS ON THE HOST TISSUES

Daler Khan**

A survey was undertaken to collect data about the incidence and prevalence of hydatid cysts of tapeworms belonging to the genus Echinococcus in cattle, goats and sheep of Lahore Division. Liver and lung specimens of the animals were collected from the slaughter houses and carefully examined for the presence of hydatid cysts.

The incidence of Hydatidosis was observed to be the highest in buffaloes than in cow, sheep and goats. Prevalence of the cyst was generally higher in females than males in all

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types of the animals under study. Histo-chemical analyses of hydatid cysts and liver cells indicated that a liver harbouring the cyst of 3-cm diameter or more shows progressive decrease in cell size and the cell-nucleus ratio. This effect was highly pronounced in the immediate vicinity of the cyst wall where the cells and the nucleus get completely destroyed. The cellular changes in the areas as far as 2-cm from the cyst might be due to seepage of hydatid fluid from the cyst.

The study has provided reliable information regarding the occurance and prevalence of Hydatidosis in herbivore animals of Lahore Division.

P-VC/Agr (85) 1985-88

STUDY ON THE EPIDEMIOLOGY OF SALMONELLA OF HUMAN AND ANIMAL ORIGIN IN PUNJAB

M. Ajmal*

Salmonella, an extremely large group of gram negative bacilli bacteria are ubiquitous in nature and majority of them are potentially pathogenic to both man and animals. The epidemiology of Salmonellosis in the Punjab area i.e. the Prevalence of Salmonellae in relation to different species of animals; the carrier status within and between different animals species; and the tissue-organ predilection of Salmonellosis within the animal body was studied. A total of twelve thousand, seven hundred and forty (12,740) samples from different sources including buffaloes, horses, dogs, cats, sheep, goats, poultry, man and food materials were screened for the Presence of Salmonella Serotypes. The *Salmonella typhimurium* was found to be the most prevalent serotype present in the faeces of all the animal species as well as man. The other serotypes having high incidence were *S. butanton*, *S. anatum* and *S. heidelberg*, whereas *S. gallinurum* and *S. pullorum* were mostly isolated from poultry. The mesenteric lymph nodes of buffalo, cattle, sheep, goat and poultry were also found positive for various serotypes of Salmonallae.

Of the 1450 samples of edible food material including vegetables, fruit and pulses, 0.34% were found to be contaminated with *S. typhimurium* and *S.paratyphi*-A (1). This contaminated edible food is the major source of infection and food poisoning in the man. Analysis of the 3077 samples from litter, commercial feed, fish meal and meat showed that 100 samples were positive for different types of Salmonellae. The major sources of contamination were found to be the unhygeinic conditions in abattoirs and butchers shops and poor preservation of food stuff.

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P-PU/AGR (86) 1985-87

STUDIES ON PHENOLOGY, GERMINATION ECOLOGY AND CONTROL OF SOME IMPORTANT WEEDS OF WHEAT

S. Razi Abbas Shamsi*

Weeds incur enormous losses and reduce the productivity of wheat which is the most important food crop of Pakistan. A survey of nine weeds viz. *P. minor, G. arvensis, M. parviflora, M. denticulata, L. aphaca, S. didyma A. arvensis, C. albuns,* and *F. indica* in irrigated and six weeds viz *A. tenuifolius, C. arvensis, F. indica, V. sativa, A. arvensis,* and *I. Polycerata* was carried out in barani wheat fields. Various phenological events of weeds such as germination, response to various temperatures, span of vegetative growth, flowering, fruit formation, seed dispersal and seed dormancy etc. were studied in relation to prevailing climatic conditions. As germination and growth periods of these weeds coincide with that of wheat, they offer competition with wheat crop for the full season. In general, moderate soil moisture is most suitable for germination and seedling growth in all the weeds as they are moderately salt tolerant. Seedling growth of *P. minor, L. aphace* and *C. arvensis* was found to be highly salt sensitive.

Germination response of weeds to thermoperiodicity was studied at two sets of alternating temperatures i.e. 20/5°C and 25/10°C alongwith the effects of storage periods, variable sowing depths and pre-chilling treatment. All the weeds showed variable results while optimum germination occured at 2.5 cm sowing depth in all the weeds.

Application of herbicides like Decoran MA and Arelon significantly improved wheat growth and grain yield as compared to the conventional weedy check.

P-VC/AGR (81) 1985-88

EFFECTS OF AFLATOXINS IN POULTR

Syed Atta-ur-Rehman Rizvi**

Atotal number of 300 samples of finished commercial poultry feeds, obtained from poultry feed mills, poultry feed dealers and poultry farms were analysed for the presence of

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aflatoxins. 126 (42%) samples, including 18 (24%) from mills, 19 (27%) from dealers and 89 (57.42%) from farms, were found to be contaminated with aflatoxins. The survey showd that there is an enormous incidence of contamination of commercial poultry feed with aflatoxins, which are hepatoxic and could be one major cause of high mortality in young broiler stocks and production problems in breeder flocks. High humidity and storage for long periods appear to facilitate the growth of fungus on the feed source.

The poultry feed could be produced free from aflatoxins, if handled with care particularly during storage. These measures will contribute a great deal in the growth and development of poultry industry and minimise the economic losses.

BIOLOGY

S-KU/Bio (54) 1977-79

A SURVEY OF PHYTOPLANKTON OF SIND AREA AND THE UTILIZATION OF FRESH - WATER AND MARINE ALGAE AS FOOD FOR ANIMAL/MAN

Phool. B. Zahid*

Samples were collected from a large area of Sind Province to investigate healthy and resistant varieties of Phytoplanktons which are a rich source of proteins. Twenty strains of Chlorella, Chlamydomonas Cloroccum, Anabaena, Scenedesmus, Spirogyra, Nostoc, Lyngbya, Spirulina, Monoraphidium and Gloeocapsa were isolated and compared with Ulva lectuca (as a standard) for the protein contents of the micro-algae.

These algae were artificially cultivated to produce useful organic material for food and animal feed as the protein content of algae is almost ten times greater than the cultivated crops. Climatic conditions of Southern Sind were found to be suitable for the out-door culture systems of algae.

Three algal species namely; *Chlorella vulgaris, Spirogyra ellipsospora,* and *Ulva lectuca* were used for chicks feeding programme carried out on one-day old chicks to eight weeks old birds. Fowls which were fed on higher percentages of *Chlorella vulgaris* and *Ulva lectuca* showed good results in terms of quantity and quality of meat.

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S-KU/BIO (94) 1980-81

BIOECOLOGICAL SURVEY OF THE INDUS DELTA ESTUARY

Muzammil Ahmed*

Indus Delta constitutes the principal estuarian system of the Pakistan coast and is the nursery ground for both migrating oceanic species of shrimps, blue crabs and fishes as well as resident commercially important oysters. The bio-ecological and hydrographical analysis (including the study of temperature, salinity, oxygen level, nutrients sestons, phytoplanktons, zooplanktons, fish and shellfish) of the estuary was done in the months of February and May.

Values of surface dissolved oxygen, salinity and seston were found to be lower in February as compared to those in the month of May. Productivity in terms of phytoplanktons and zooplanktons was higher in February. Juveniles of Panaeid and Caridean shrimps constituted the most valuable resource in this delta. Qualitative analysis of phytoplanktons from the mouth of the Indus River at Turshian and Keti Bundar showed it to be of purely marine nature. Small Caridean shrimp *Leander stylifera* was the dominant specie of shrimp in February whereas Juveniles of the penaeid shrimp *Metapenaeus monoceros* dominated in May. From the standpoint of shellfish farming, the discovery of *Scylla serrata* juveniles, the finest food crab in the estuary, is also significant. In addition to this juveniles gastropod, *Telescopium telescopium* and 25 species of small fin fish were discovered during the exploratory survey of the estuary.

S-KU/BIO (92) 1981-82

STUDY OF MAJID CRABS OF THE ARABIAN SEA

Nasima M. Tirmizi**

A study was conducted on the Majid crabs of the Arabian Sea which form the second largest family of crabs with over 600 species. The specimens collected during survey were kept under laboratory conditions and their behaviour was carefully noted. All the samples collected from various localities were later housed in the Marine Invertebrte Reference Collection Centre of the Karachi University and a working key to the sub-families of the

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Majids of Pakistan was prepared. This includes review of the diagnostic features, introduction to the Family Majidae,illustrations and description of the local species. A full account of 2 species was prepared including synonymies, distribution, remarks and individual variation. Out of 22 species, studied and collected 13 were previously known more or less incompletely whereas, seven species in the collection were never recorded before from the Northern Arabian Sea.

C-QU/CHEM (175) 1987-88

ESTIMATION OF HEAVEY TRACE METALS IN VARIOUS LOCAL FISH SPECIES AND RELEVANT MARINE/FRESH WATERS

Mohammad Jaffar*

Sixteen marine, fifteen creek and thirty four fresh water commercial fish species, together with relevant waters, were analyzed for ten essential/non-essential heavy trace metals i.e. Cu, Mn, Hg, Fe, Cr, Cd, Pb, As, and Zn by atomic absorption techniques. Muscles, liver and kindneys of various fish species were subjected to trace metal analysis to study the multi-organ distribution pattern of some of the metals. Study on the nutritional status of local fish was conducted on certain marine and fresh-water species in terms of their Ca, Na, and Mg content.

In general, the metal levels in all the species were found to be within the permissible levels laid down for human consumption. The only exception was that of Lead (1.895mg/g) in *Scomberomorus commerson* that crossed the upper allowed level. The tissue sequence in case of distribution of Cu, Mn, Hg, Fe and Zn, was liver kindney muscle. The metal levels in *Pampus argenteus, Formio niger, Thunnus tonggel* and *Sardinella longiceps* were higher as compared with other fish.

Analyses of trace metals levels in fish harvested from the coastal waters of Karachi shore were undertaken to study the local pollution. The trace metal distribution in fish was found to be highly species-specific, with mean concentrations of the metals fulfilling the recommended daily allowance (RDA) laid down for safe consumption. Only mercury was found to exceed the safe limit (1 mg/g) in three species.

The fresh water fish were analyzed alongwith relevant waters to establish possible correlations between the heavy metal concentrations in fish muscle and in relevant waters. The study showed a positive correlation between the concentrations of Zinc and Arsenic in fish muscle and in relevant waters. The distribution of metals was found to suffer largely

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from individual variability, irrespective of area of catch. These investigations have concluded that except for a few identified cases, both marine and fresh water fish do not pose any physiological problem to the consumers.

FORESTRY

F-CSIR/UTZ (28) 1977-78

UTILIZATION OF PINE NEEDLES FOR PAPER AND JUTE MANUFACTURE

Mumtaz A. Khan*

With a view to find new raw materials for paper industry, the pine needles were analysed chemically. It was observed that they contain 31.5% of cellulose, 25.6% lignin, and 10.2% pentoses as compared to sugar cane bagass and Kahi grass which contain about 35% cellulose, The ash percentage of pine needles was found to be 3.3% which is lower than wheat and rice straw and almost equal to Kahi grass. The low percentage of ash facilitates bleaching and cooling of the pulp. The ratio of fibres length to diameter was found to be 63 which is greater than most of the raw material in use for paper production. The yield of pulp varied from 18-20%. Multistage bleaching of pine needle pulp with 10% chlorine produced brightness of 70%.

The physical properties of the hand made sheets indicated that at 45°SR freshness, the tear factor, bursting strength, folding endurance and breaking length of pine needle were superior to those of bagasse, which when mixed with imported pulp is widely used for the production of paper. The pine needle pulp being superior to bagass would thus require mixing of comparatively lesser percentage of imported pulp to get a strong fibre.

P-AU/AGR (55) & 55/1) 1978-81

PATHOLOGY OF TREES

Abdul Hamid Khan**

Pathology (i.e study of diseases) of trees is a vast area of research for the students of forestry and horticulture. The Principal Investigatore compiled a reference book incorporating the results of 30 years of research on pathology of the trees that are native to Indo-Pak region. The book consists of two volumes. The first volume containing three parts namely: (i) The pathogens (fungi, bacteria, and viruses in relation to tree diseases). (ii) Pathogenesis (mode of development of the disease) and (iii) Pathostasis (principles of protection and control of pathogens) was earlier compiled by the author under a PL-480 scheme.

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** Department of Botany, University of Agriculture, Faisalabad.

The second volume comprising of three parts namely: Coniferous Diseases. (ii) Diseases of Fruit Trees (belonging to both tropical and temperature zones of Pakistan) and (iii) Diseases of Hardwood, was compiled and printed under PSF project. The book covers, in detail, the pathological aspects of plants needed for the curricula of the students of forestry, horticulture, and research workers in the field of plant pathology.

S-KU/BIO (132) 1985-87

EXTRA CHROMOSOMAL ELEMENTS FOR IN VIVO GENETIC ENGINEERING

Hajra Khatoon*

The study was undertaken to screen a large variety of plant associated bacteria for the presence and transferability of drug resistant plasmids and transposons for their ultimate use in the *in Vivo* genetic engineering of some important gram negative bacteria. As many as 194 bacteria were studied for their resistance to a variety of broad spectrum antibiotics. The resistant bacteria were tested for the presence and transferability of *R-Plasmids* by conjugating them with standard *E-coil* recipients. Experiments showed that the tested bacteria either lack antibiotic resistant plasmids or contain conjugally non-transferable plasmids. Some results were obtained in case of bacteriocinogenic plasmids. As a parallel, attempts on other gram negative bacteria were made to determine as to whether they could be used for *in vivo* genetic engineering of plant pathogenic/symbiotic bacteria. In this regard, 12 *R-plasmids*, isolated from gram negative enteric bacteria were screened for resistance to broad spectrum antibiotics and then studied for their conjugal transmission to plant pathogenic/associated bacteria. Results showed that *R. Plasmids* were not only trnsmited to these bacteria, but also expressed the drug resistance in their new hosts. Most of them were found to be either completely or partly stable, indicating that they could be ued for in vivo genetic engineering of plant associated bacteria.

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P-PU/BIO (93) 1980-83

MORPHOLOGICAL AND METABOLIC HAZARDS OF CHLORINATED INSECTICIDES ON SMALL MAMMALS IN PAKISTAN

Abdul Rauf Shakoori*

Visible and invisible damage done to the non-target organisms by chlorinated insecticides was assayed. In this regard, effects of these insecticides were studied on haematology, liver blood biochemistry and liver histopathology of albino male rats which were fed on sublethal doses of Aldrin, Dieldrin, Gamma-BHC and DDT for variable time period.

Orally administered chemicals caused drastic haematological and biochemical changes in blood serum. Activities of several vital enzymes raised due to the cellular damage and physiological abnormalities. Liver was found to be the target organ of these compounds resulting in the hypertrophy of hepatic cells, metabolic disturbance and hapatic dysfuction. Long term effects include carcinogenic changes and serious metabolic as well as mophological disorders. The results pertain specifically to albino rats, but they can be extrapolated to other mammals including man.

S-KU/MED (45/1) 1983-84

HAEMOGLOBIN STRUCTURE CHANGES AND THEIR IMPACT ON FUNCTION

Z. H. Zaidi**

Biochemical tests were performed on the blood sample analysed during the previous project (No.S-KU/Med-45) for the detection of abnormal haemoglobin in anemic pregnant women and its correlation with the anemic conditions. Whole blood haemoglobin concentration was determined and about 70% of the antenatal blood samples showed anemia. To screen abnormal haemoglobin types, ante natal blood samples were analysed electrophoretically and the results showed that twenty samples had abnormal type of haemoglobin, seven of which seemed to be new variants.

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** H.E.J. Research Institute of Chemistry, University of Karachi, Karachi.

Studies were also undertaken for the determination of amino-acid sequence in the heme group of abnormal haemoglobin by using BABITC method which provided an insight into the structure- function relationship of the molecule.

S-AKMC/MED (105) 1985-87

GENERAL ANESTHETIC RESPIRATORY FUNCTION AND GAMMA AMINO BUTYRIC ACID (GABA) LEVELS IN RAT-BRAIN

Amin Suria*

A study was undertaken to determine precise manner in which anesthetics exert their effect on gamma amino Butyric acid (GABA) levels in different brain regions and the role GABA plays in the neural control of respiration. It was found that anesthesia accompanies the increase in GABA levels especially in cortex region. Naloxone, a GABA antagonist, can protect animal from respiratory depressant effects of anesthetics. A hypothesis was put forward that naloxone may reverse the respiratory paralysis caused by high dose of anesthetics. Results obtained, after using different doses/Kg b.w., of the subjects, favoured the hypothesis. GABA was found to be the inhibiory neurotransmitter in respiratory centres of brain. In most cases, thiopental was used as an anesthetic and naloxone was found to reverse the respiratory paralysis caused by either thiopental or 5% halothane. None of these compounds was found to affect the levels of asparate or glycine in major parts of the brain. Same was the case with glutamate or GABA levels in cerebellum or caudate.

Concentrations of glutamate, aspertate, and glycine were also analysed in various regions of brain in experimental animals. Significant changes in glutamate levels occured in cortex region during the administeration of anesthetics and GABA antogonists. Highly sophisticated techniques like HPLC & Auto Tag were employed to get precise results.

The data demonstrated that anesthetic dose of thiopental/ halothane increased GABA and decreased glutamate levels in rat brain stem and cortex. *In Vivo* experiments showed that higher doses of the anesthetics produce respiratory paralysis with further increase in GABA and decrease in glutamate levels.

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S-JPMC/Med (85) 1986-88

BIOCHEMICAL STUDIES ON TRAUMA

Atta-ur-Rehman*

Biochemical studies on blood, urine and cerebro spinal fluid of traumatic patients were conducted. A number of biochemical parameters including sodium, potassium, cyclic guonosine mon-phosphate, cyclic adenosine mono phosphate, lactate, protein, and urea with special emphasis on energetics were selected so as to find out some specific relationship of these to the type and severity of trauma in patients who have undergone surgery or neuro surgical cases who remain unconsious due to trauma.

A total of 214 head trauma, 33 abdominal trauma and 28 normal healthy subjects were studied. Most of the trauma paients were male and highest number of these patients suffered from motorcylce accidents. Impact was severe in most of the grade IV patients and large number of them were deeply camatose. Alternation in CSF, sugar, urea, magnesium, and inorgnaic phosphorus were observed. There was distinct hyperglycemia in acute phase of 1-3 days followed by recovery to normal or near normal values. Discrepancies in blood lactate, pyruvate, and serum cortisol were also observed for all the three days. Blood ATP was increased in all the truma patients with a decrease in ADP and AMP. Serum total protein, albumin, globulin, A/G ratio and urea concentration also varied from the controls. Serum sodium, postassium and magnesium levels were found to be elevated with a decrease in calcium and inorgnaic phosphorus. No change was observed in serum alkaline phosphatase in all the trauma patients. In few instances, mostly in grade IV head injury patients, serum amylase was elevated for just two days of trauma. Urinary retention of sodium, potassium, inorganic phosphorus, magnesium, calcium, and urea were observed for all the three days with a decrease in urinary volumes. Most of grade III and IV patients suffered from moderate scalp injury and fracture if present, was mostly in the frontal bone.

P-PU/BIO (149) 1986-88

HORMONAL INFLUENCES ON SKELETAL MUSCLE GRAFTS

Shahzad A. Mufti**

The effects of three hormones namely Testosterone, Insulin and Thyroxin on the regeneration of muscle fibres within rat EDL (Extensor Digitorum Longus) muscle grafts

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have been studied under various experimental conditions. It was observed that EDL muscle graft reacted negatively to the lack of androgens showing considerable degree of atrophy and degeneration. On the other hand, after exogenous administration of Testosterone, it developed normally or even better than the control ones.

In another series of experiments, the Insulin production in rats was inhibited by Allaxon treatment and its effect was studied on the EDL muscle grafts. In such rats, EDL grafts showed very poor regenerative activity, as compared to the control grafts. On the contrary, in Hyperinsulinaemic rats, (prepared through exogenous administration of Insulin), EDL muscle grafts regenerated much better. In such grafts the hypertrophy of the individual muscle fibres was evident as exhibited by the significantly higher cross-sectional area of the muscle.

When thyroid activity was inhibited through the administration of Thiourea, it was once again noticed that EDL muscle grafts underwent almost complete atrophy. However, the EDL transplants in the rats made hyperthyroid through Thyroxine administration showed a considerable degree of hypertrophy.

The above studies have concluded that: (a) three anabolic hormones namely, Testosterone, Insulin and Thyroxine play a very important role in the regeneration of EDL muscle grafts, (b) complete absence or physiologically lower concentrations of these hormones result in atrophy and degeneration of the muscle fibres within the grafts, and (c) higher concentrations of these hormones affect the EDL muscle grafts positively, as is apparent by higher average cross-sectional area of muscle fibres in such transplants.

C-QU/Bio (125) 1984-85

STUDY OF EPIDIDYMAL FUNCTION IN THE RHESUS MONKEY (MACACA MULATTA) ANDROGEN DEPENDENT PROTEINS, THEIR CHARACTERIZATION AND REGIONAL DISTRIBUTION.

Azra Khanum*

Little information is available regarding the production of specific epididymal proteins which are likely to play a role in sperm maturation in infra human primates and man. The project was undertaken to characterize and study the regional distribution of androgen dependent specific epididymal proteins in the rhesus moneky: *Macaca mulatta.* The experimental animals, according to their physiological status, were catagorized into three groups i.e. intact; castrated; and castrated and then treated with Testosterone. The

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protein pattern in the soluble fraction of the epididymal cytosol was studied by Polyacrylamide Gel Electrophoresis and Isoelectric/Focusing.

The results of these studies have indicated that the bands on the gels showed at least five distinct protein components that are synthesized in the monkey epididymis under androgen stimulus. Castration for one month resulted in the disappearance of two of these protein bands and a marked reduction in the colour intensity of the other three components. Testosteron treatment (10 mg testosterone propionate daily for 6 days) restored the normal pattern of all the five epididymal proteins. As regards their regional distribution, electrophoretic analysis of various regions of the epididymis showed that four protein components were uniformly distributed in the Caput, Corpus and Cauda regions of the tube, while the fifth one was found specifically associated with the caudal region only. The molecular weight and the Isoelectric points of these protein were found to vary between 15,000 to 61,000 daltons and 5.6 to 6.4 respectively.

C-QU/Agr (40) & (40/1) 1976-78

PRELIMINARY STUDIES ON THE BREEDING BIOLOGY OF TEDDY GOAT

M. Arsalan*

The study was undertaken to collect base-line data on the reproductive behaviour of Teddy goat and test its reproductive potential by selecting and devising precise and reliable methods.

Different stages of the Oesterous cycle (i.e., the female reproductive cycle) were studied by investigating the vaginal cytology and hormonal levels of Progesteron and Estradiol. In an attempt to induce Precocious puberty, Pregnant Mare Serum Gonadotrophin (PMSG) was administered to prepubertal females which caused ovulation as was indicated by their fertile matings. Differential effects of various gonadotrophins on the response of goat testicular function to PMSG, Human Chorionic Gonadotrophin (HCG), and Leutinizing Hormone (LH) were assessed in Vitro and LH was found to be the most potent of these gonadotrophins in causing stimulation and reogensis of the goat testis. Data regarding the body weight of the Teddy goat at birth and its subsequent increase was recoreded at weekly intervals. Plasma protein levels in this breed were found to be comparatively higher and cholesterol levels lower than those reported for other breeds.

During the course of these investigations, a specific Testosterone Binding Globulin (TEBG) was also identified.

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F-FI/BIO (70) 1979-81

STUDY OF FOOD HABITS AND POPULATION DYNAMICS OF MARKHOR IN CHITRAL GOL

Abdul Aleem*

Markhore, an important game animal, is one of the endangered species in Northern Areas of Pakistan. A Survey of the area was undertaken to study the general behaviour including food habits and population dynamics of Markhore. During the study period, a population of 518 individuals was recorded, and their male/female, yearling/female, and young/female ratios were calculated at the end of each year. Food habits were studied by observing the animals through bionocular; and telescopes. The markhor was found to be a grazer which turns a browser in winter when the only staple diet available is oak leaves. Various food plant species were analysed for their nutritional contents.Different biological and ecological parameters were studied to explain the inter and intraspecific relations of this species which led to the conclusion that the Markhor population had acquired stable equilibrium and there is no danger of over crowding or extinction of the species in the near future.

P-PU/BIO (50/1) 1982-83

A SURVEY AND CONTROL OF SILKWORM DISEASES IN PAKISTAN AND AZAD KASHMIR

Raffat Hussain Jafri**

A survey of diseases of silkworm was conducted in NWFP, Punjab and A.J. Kashmir, which revealed the presence of several pathogens in the larvae, pupae, moths and eggs of silkworm. Investigations were made to work out suitable control measures for the silkworm diseases which may, ultimately lead to the improvement of silk quality.

The rearing period of univoltine races *Bombys mori* was investigated in different regions of Punjab, NWFP and Azad Kashmir. Fluctuation were found in rearing period due to variation in temperature and humidity conditions of the area concerned.

* Pakistan Forest Institute Peshawar.

** University of the Punjab, Lahore.

Diseased eggs, larvae, pupae and moths were collected from the rearing area and the time table of the apearance of diseases was worked out. The results showed that diseases were in epidemic form during the rearing period of *B. mori.* Pathogens were then isolated from effected insects and techniques were developed for quick pathological analysis and histopathology and their control.

P-CSIR/AGR (67) 1983-86

UTILIZATION OF INDIGENOUS RESOURCES FOR INTRODUCTION OF GAME BIRDS BREEDING IN PAKISTAN

F. H. Shah*

A study was undertaken to utilize the indigenous food ingredients in quail feed and to evaluate the effect of these feeds in terms of weight gain, number of eggs per quail, their hatchability and the mortality rate of chicks.

Detoxified Mustard Seed Meal (DMSM) was incorporated into poultry rations which showed better weight gain, feed efficiency, bone-meat ratio, and egg production in the quails. DMSM, when utilized as a substitute of vegetable protein source such as sesame meal, cotton seed cake and soyabean oil meal, improved the nutritive value of the ration and reduced the cost of ration upto Rs.25/100 Kg. Similarly, replacement of fish meal by DMSM resulted in a saving of Rs.14/100 Kg in case of grower rations and Rs.23/100 Kg in layer rations. This replacement proved to be economical and safe as it showed minimum adverse effects on quail performance.

S-SU/BIO (115) 1983-85

STUDIES ON THE TAXONOMY OF GRASSHOPPERS OF SIND

Muhammad Saeed Wagan**

An extensive survey was carried out in six districts of Sind Province to study the grass-hoppers that act as an active pest in the area. Agricultural fields, semi-mountatious and semi-desert areas with vegetation of crops, grasses, herbs and shrubs, were surveyed and a total of about 1904 adult specimens were collected in about 2400 sweeps. The collected material was sorted out in forty two species of grasshoppers; out of which six belonged to Acridinae; fifteen to Locustinae; Five to Eyprepocnemidinae, four to Oxyinae; three to

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** Department of Zoology, Unversity of Sind, Jamshoro

Gemphocerinae, two to Cyrtacanthacridinae; two to Truexalinae, one to each Catantopinae; Calopteninae, Euthyminae; Tropidopolinae and Dericorythinae families. As a result of this Survey, six species were recorded for the first time from this area. These included: *Dericorys tibialis, Gelastorhinus filatus, Oedipoda germanica germanica, Mioscirtus wagneri rogenhoferi, Hyalorrhiple clausi* and *Sphingonotus theodori theodori*. Besides, a new species *Oxypterna akbarii* reported by Moeed (1976) has been confirmed and its distribution is extended. The distribution of many of the previously recorded species has been extended as well.

In addition to these, a simplified taxonomic key, based on the external morphological characters, for the separation of sub-families, genera and species of Acrididae was also formulated.

P-PU/BIO (102) 1982-85

STUDIES ON VERTEBRATE FOSSILS OF PAKISTAN

Abu Bakr*

Preliminary studies were undertaken on the vertebrate fossils available in Zoology Department of Punjab Unversity, Lahore and Pakistan Museum of Natural History, Islamabad. Later on a number of field trips were made for the collection of additional fossil specimens from various sites at Jhelum, Rawalpindi, Dina, Attock, Mangla Dam, Isakhel, Daudkhel, Kotli and Chinji.

A systematic study of these specimens was carried out and sixteen species of Caraivores, five species of Equids and fifteen species of Bovids fossils have been described. Among carnivores, four species are new records. The material studied under the project has enriched our information on fossils fauna of this region.

S-AU/BIO (122) 1984-86

STUDIES ON INCIDENCE, TAXONOMY AND SEASONAL VARIATION OF ECTO AND ENDO-PARASITES OF WILD BIRDS OF SINDH

Shah Nawaz Buriro**

The incidence, seasonal variations, magnitude of infection, and host specificity of ecto and endo parasites of wild birds was studied in three divisions of Sindh Province

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** Department of Parasitology, Sind Agriculture University, Tandojam.

namely: Hyderabad, Sukhar and Karachi. About 10 species of wild birds including Parrot, Pigeon, crow, Jungle sparrow, House sparrow, Dove, Lylo, Myna, Black bird and golden grackle were examined for the determination of ecto and endoparasitic infection/infestation. The findings have indicated that:

a) In Hyderabad Division, 642 birds were studied out of which 60.5% birds were found to be infected with endo parasites whereas, 29.4% were infested with ecto-para- sites. Highest incidence of endo parasitism was recorded in the month of January and February with cestodal infection significantly dominating the nematodal ones round the year.

b) Screening of 747 birds in the Sukhar Division revealed the presence of endo-parasites 26.12% & ecto parasites 4.5%. Maximum infection was recorded during the months of May-July. Pigeon and dove were found to carry almost all native types of ecto and endoparasites.

c) A total of 365 birds were screened in the Karachi Division, 63.2% of which were found to harbour the ecto or endoparasites of any kind and the prevalence of parasitism was found to be highest during the period of July - August. The records of parasites were maintained upto generic level.

Relative incidence of parasite invasion in the three divisions of the province has indicated that Hyderabad and Karachi Divisions are suitable regions for the propagation of parasites due to their moderate climate. Pigeon was found to be the most suitable host to all parasites in all the three divisions.

P-PU/Bio (141) 1986-89

STUDIES ON THE SIWALIK ARTIODACTYLA (SOUIDEA, ANTHRACOTHEROIDEA AND CERVOIDEA).

Abu Bakr*

Studies on the fossils of the Artiodactyl animals were undertaken so as to interpret the Past History of these animals alongwith stratigraphy of the Siwalik area.

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Field surveys were carried out in Rawalpindi, Chakwal and Jhelum districts of Punjab Province for the collection of fossil specimens of Artiodactyla which were abundantly found in the Siwaliks. The specimens collected from these areas belonged to twelve species of the family Souidae, five species of the family Anthracotheroidea and five species of family Cervoidae. A detailed systematic account of the 22 specimens collected i.e., parts of skull, mandibles and isolated teeth has been prepared which provides additional information about the known species.

The important finding is the collection of fossils of a new species belonging to the genus Hexaprotodon which alongwith the other specimens will form a part of the collections of Pakistan Museum of Natural History, Islamabad.

B-BU/BIO (143) 1987-88

STUDIES ON GENETIC POTENTIALS OF LOCAL BREEDS OF SHEEP/GOATS OF QUETTA

Afsar Main*

The genetic potential of sheep and goat flocks at three different farms in Baluchistan were investigated. The parameters used for this study included: adult weight; seasonal variations in weight; growth pattern; fertility; frequency of twice a year lambing, frequency of twinning etc. The results achieved are as under:

Sheep: (Urk, Karaculi, Baluchi and Randozai Breeds)

Males of all the breeds of sheep showed significantly higher weight than females. Seasonal variations in the adult weight showed a maximum value in May and minimum in September. This fluctuation in the weight coincides with the general Vegetative cycle exhibited in the area. The growth patterns and growth rates are equivalent to other breeds maintained in Pakistan.

Fertility rate and frequency of twice a year lambing in females is highest in Urk while the frequency of twinning is highest in Baluchi followed by Urk and Randozai. Breeding activity mainly occurs during the December - March period.

Goats: (Khurassani, Urk and Randozai Breeds).

The adult weight fluctuates in the three varieties with maximum values in Khurassani

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Avifauna. A survey was therefore conducted on the Haemazeen parasites of over 1000 birds belonging to 46 species representing 26 families. The infesction rate was found as under:

- Overall infection of blood parasites 13.52%
- Heamoproteus 8.23%
- Plasmodium 3.43%
- Leuscytozoon 0.83%
- Microfileria 0.39%
- Trypanosoma and un-identifie parasites less commonly observed.

S-KU/Bio (167)1988-90

A GUIDE TO MALACOSTRACA OF THE NORTHERN ARABIAN SEA

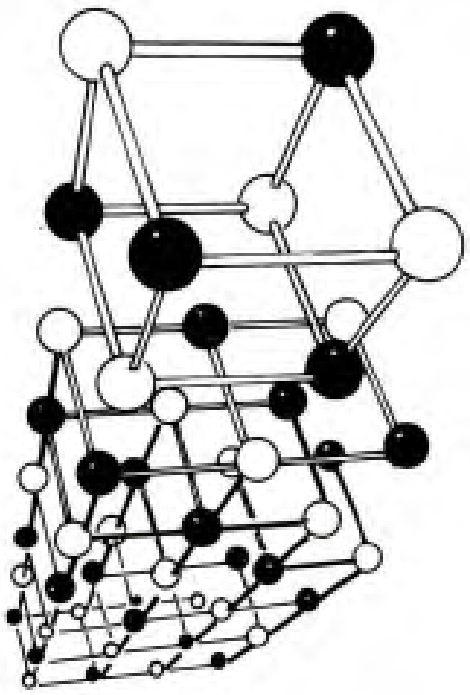
N.M. Tirmizi **

A guide to the identification Malacostracans fauna occuring in the Northern Arabian Sea has been compiled for the first time, which contains identification keys to the orders: Stomatopoda, Decapoda, Mysidacea, Cumacea. About 600 species of Malacostracans found to occur in area under investigation, are referable to 415 genera and 15 families.

Key to the major taxa of the Class Malacostraca is added for the students, whereas the key leadling to species, is for the use of specialists. A dendrogram showing evalutionary trend in class Malacostraca has also been given. The keys have also been updated by incorporating recent changes in the nomenclature. Most of the outline drawings are original and characters used in the keys are illustrated to make the keys more comprehensive.

* Invertebrate Reference Collection Centre, Karachi University, Karachi.

CHEMISTRY



S-KU/Chem (46) 1974-77

CELL AND TISSUE CULTURE RESEARCH

Zain-ul-Abedin*

Culturing of cells and tissues is one of the recent and most effective methods being employed in modern biology with its roots deeply ramifying into the areas of Medicine, Biology, Agriculture, Radiobiology and Biochemical Engineering. Under this project, the Foundation provided financial assistance to the Karachi University for developing a Cell and Tissue Culture Laboratory in the Biological Research Centre of the University. This facility was introduced for the first time in a University of the country. Earlier, these facilities were confined to the specialized medical centres for investigating specific medical problems. The establishment of this laboratory made it possible to undertake sophisticated research on plants, animals, and viral cultures leading to solution of the problems of practical importance.

S-JPMC/Med (38) 1979-82

BIOCHEMICAL STUDIES ON THE CATARACTOUS HUMAN LENSES

M. Atta-ur-Rehman**

The project was undertaken to investigate different aspects of metabolic changes that occur in cataractogenesis. 317 human cataractous lenses of varying stages i.e. Immature, Mature, Hypermature, Margognian and Diabetic Cataracts were selected so as to study the alterations in the concentration of different metabolic enzymes and coenzymes and their ultimate effect on the network of reactions in the human lense.

Regarding the metabolic profile of human lenticular tissues, a higher ratio of lactate/pyruvate and lower levels of malate were obtained in the cataractous lenses of diabetic and non-diabetic patients, whereas the elevated levels of ambeient glucose were found in hypermature and diabetic cataracts. The protein content of the lense was found to decrease and that of glycosylated proteins increase in the course of catactertogenesis.

Activities of enzymes like pyruvate kinase, lactate dehyohogenase, glucose-6.

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** * Department of Iliochemistry, Jinnah Postgraduate Medical Centre, Karachi.

Phosphate dehydrogenose, 6 phosphogluconate dehydrogenase, and ATPase decrease with the progression in the degree of cataractogenesis. Nicotinamide Adenine Dinucletide (Phorphate) redox ratios (NADH/NAD and NADPH/NADP) decrease with the progression of opacification and increase in the blood glucose. Severe deangement in their connection was found to occur in diabetic patients. Effect of aging on the concentration of these enzymes was also studied.

S-KU/Bio (116) & (116/1) 1983-87

CHEMOTAXONOMIC STUDIES IN ANGIOSPERMS (FROM PAKISTAN) WITH REFERENCE TO PHENOLICS

Khadija Aziz*

A preliminary survey was carried out to identify phenolic constituents in the members of family Leguminosae (sub families Mimosoideae and Caesalpinoideae). As many as 45 species belonging to the genera Acacia, Adenanthera, Albizia, Leucaena, Mimosa, Pithecolobium, Prosopis, Bauhinia, caesalpimia, Casiia, Ceratonia, Delonix,

Hardwiodia, Parkinosonia, Peltophorum and Tamarindus were chemically analysed by thin layer chromatography.

As a result of the survey, a large number of phenolics constituents were isolated out of which ninty (90) were tentatively identified by using authentic markers like Rf values, Flourescence in UV, and Colour Reaction with spray reagents. On the basis of their spectral properties, many plants were confirmed to contain Caffeic acid, P-coumaric acid, Kaemferol, Quercetin, Rutin, Myricetin, Luteolin, Peulargonidin and Malvidin. Analysis of inter-plant and interlocality chemical differences revealed the geographical, environmental, and ecological stability of these compounds, indicating that the approach can play a significant role for taxonomic judgement of the Family Leguminoseae.

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S-KU/Chem (18) 1975-77

BIOCHEMICAL STUDIES ON PLANTS INFECTED BY PARASITIC NEMATODES

Zain-ul-Abedin*

Biochemical analyses of the infected and healthy plants of Okra, Banana, Tomato and Citrus and their relevent soil samples, was carried out in Sindh Province to study the metabolic alterations accompanying the nematodal infestation in these plants. It was observed that the nematodes infecting the plants belonged to Heliocotylenchus hoplolaimus, Meloidogyne sps. and Tylenchorhnchus sps. Changes were found to occur in the root, cell wall structure, formation of knots and necrosis. It was further observed that high moisture content of crops favours infection to root knot nematodes resulting in lowering of the dry matter content.

Chemical and biochemical studies of the plant parasitic nematodes indicated the presence of high content of total lipids amylase, perosidase, and acid phosphates enzymes in them. These enzymes play an important role in infecting the plants.

Soil samples from infected plants were analysed for possible alteration of organic and in-organic content. In case of Okra and Citrus, the infected soils showed a relatively higher orgnaic content. Moisture content was higher in Banana, Citrus, and Okra soil samples whereas in tomato the same was low. Nematodes were found to attack the Okra, Banana and citrus at high pH. Similarly, alteration in the Na, K, P content were also observed in the infected soils. All these biochemical alterations were found to be proportional to the degree of infection.

B-BU/Med (93) 1983-87

BIOCHEMISTRY OF NORMAL ASTHMATIC AND BRONCHITIC LUNG MUCUS.

Nasir-ud-Din**

Normal human bronchial secretion has not been effectively investigaed and therefore, bronchial disorders like asthma, cystic fibrosis and chronic bronchitis which are caused by hypersecretion of mucus are difficult to control and regulate. The project was undertaken to study the chemical structure of carbohydrate protein of the normal mucus

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glycoproteins which is known to play a dominant role in intercellular communication and in many pathological processes.

Normal human bronchial secretion was obtained from patients with similar blood type and suffering from chronic bronchitis by washing the lungs with normal saline. The glycoprotein portion was purified, methylated, desulfated and remethylated to obtain the deuteriomethylated sugars. The major oligosacharides were then separated and further purified by gel filteration and ion exchange chromatography. As a result, five neutral oligosaccharides were characterized using enzymic and chemical procedures and classified into following three groups.

a) Gal B(1 - 3) Gal-NAc-01.

b) Glc NAc B (1 - 3) Gal - NAc-01

c) Hlc Nac B (1 - 6) - Gal - Nae -01.

These investigations have detailed the structure of neutral oligosaccharide component of the mucus glycoprotein and provided basis to evolve a meaningful relation between the structure and function of the mucin glycoprotein present in the normal bronchial secretion.

S-KU/Chem (163)1986-89

AMINO ACID SEQUENCE STUDY ON HAEMOGLOBIN AND VENOMS FROM SNAKES FOUND IN PAKISTAN

Z. H. Zaidi *

Trypsin inhibitor from the venom of the cobra, *Naja naja*, has been isolated by a single step of reverse phase high performance liquid chromatography. The protein strongly inhibits trypsin (Ki = 3.5x 10-12M). The primary structure was determined by peptide analysis of the C-14 carboxymethylated inhibitor. The 57-residue polypeptide chain belonges to the family of kunitz-type in-hibitors, and exhibits 42% residue identity with bovine pancreatic typsin inhibitor. The structure shows only 70% identity with the corresponding peptide from the Cape cobra (*Naja nevia*), establishing that the inhibitor molecule exhibits extensive variations. Functionally, a basic residue at position P3' correlates with strong inhibition.

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S-KU/Med(108)1986-89

PROTEIN CHANGES IN SENILE CATARACT FORMATION

Zafar H. Zaidi*

Biochemical investigation were carried out on blood samples, opaque and clear lenses of cataraet and normal subject of same age groups using Electrophoresis, SD-PAGE, Gel-chromatography and HPLC Techniques in order to explore biochemical basis of lens degeneration. The amino acid levels have been found low in local population as compared to other parts of the world where their levels are on higher side. One of the lens proteins, i.e. g-crystallin, was studied in detail. However, further investigations are needed to study the structure and interaction of all lens proteins and to discover the mechanism of transparency, aging and cataract formation.

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C-QU/Chem (14) 1974-77

STUDIES IN THERMODYNAMICS OF INTERACTION OF SOLID WITH GASES, LIQUIDS, AND VAPOURS

M. Afzal*

The project was undertaken to chemically analyse the Nickel catalyst used in Vegetable Ghee Industries and to utilize the used and discarded precious catalyst for the preparation of its derivatives on the laboratory scale. Various used samples of the catalyst from local ghee industres (Rawalpindi/Islamabad region) were collected, analysed, and compared with the imported unused samples of the catalyst. Analysis of the catalyst obtained from Fazal Vegetable Ghee Industries before use yield metallic Nickle 28%, Kiesulghur clay 14%, and hydrogenated fat 57%. The same catalyst after use yielded metallic Nickle 24%, clay 24%, hydrogenated fat 50% and moisture 2%. Same analysis on Kohinoor Ghee Industries samples showed Metallic Nickle 25%, Nickle formate 5%, and hydrogenated fat 7%. After use, the catalyst yielded Nickle 23%, clay 32%, hydrogenated fat 40% and moisture 3%. Discarded Nickle Catalyst was then utilized in the preparation of its nitrate, sulphate, carbonate, and formate in the laboratory.

The investigations have indicated that the discarded Nickel catalyst contains sufficient amount of metallic Nickel which can be utilized in the preparation of its compounds.

P-CSIR/Chem (103/1) 1983-84

MICROBIAL PRODUCTION OF XANTHAN GUM FOR INDUSTRIAL USE

M. A. Qadeer**

Fermentation of molasses by using locally isolated culture of *Xanthomonas cucurbitae* PCSIR-52 was studied to develop industrial production of xanthan gum. The extracellular polysaccaride produced by this bacterium was identical to the xanthan gum produced by *X. cambestris* and was more effective as compared to the industrially produced gum. Evaluation of different food sources was carried out for gum fermentation and sucrose was found to be an ideal substrate for the production of gum at an optimum level of 3%.

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Biopolymer production of xanthan gum was also studied in cane juice and cheese when by using beet molasses and hydrol as carbon source. Addition of organic nitrogen source e.g. urea, thiourea, corsteep liquor, cabbage extract greatly improved the conversion of sugar into extracelluar polysaccaride. Maximum xanthan gum formation was found by adding cabbage extract to the basal medium containing di- ammonium hydrogen phosphate while the production of biopolymer was maximum in the presence of sodium pyruvate/potassium citrate. By improving the oxygen supply, the rate of gum formation was enhanced as compared with simple aeration system. Similarly, it was found that designing of the stirred culture vessel plays significant role in the conversion of substrate to metabolites and cell mass due to better agitation and aeration.

S-CSIR/Chem (143) 1984-87

DEVELOPMENT OF NEW INORGANIC MATERIALS BASED ON PORTLAND CEMENT

M. Aslam*

Superplasticizers namely: (i) Melamine/ formaldehyde sulphonate (ii) Melamine/sugar/ sulphonate and (iii) Napthalene sulphonate were prepared and their effects on the properties of cement and concrete were investigated. Polymers such as acrylics, polyvinylidine, polyvinyl alcohol and acetate, and methyl cellulose were also investigated for their effect on properties of cement and concrete.

Two compositions of superplasticizers; one based on stabilized Sodium Rosinate and the other on the waste sulphite liquor, which give optimum performances and are commercially exploitable were systemetically evaluated. These studies have shown that stable Sodium Rosinate formulations can be prepared which are comparable to the market plasticizers based on other ingredients. Sulphite liquor as a plastisizer can be improved by incorporating urea. These superplastisizers show improved strength by reducing the macro-pores by about 20% which contribute particularly to the improved tensile strength. Intensive mixing with sand and water, and cement incorporated thereafter, increases compressive strength by about 25% and tensile strength by 50% as compared to the conventional mixing results.

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S-SU/Chem (125) 1982-83

INDUSTRIAL ENZYMOLOGY AND THEIR CHARACTERIZATION

Abdul Rehman Memon*

Studies were undertaken to utilize rice husk for the production of endocellular and exocellular industrial enzymes. The exocellular lipase and phospholipase B and endocellular protease were obtained by growing Penicillium expensium on rice husk as carbon base, for 24 hrs at 28°C. Enzyme activites were found to be 33 and 56 units for lipase and phospholipase B respectively. In a medium containing glucose together with rice husk, *P. expensium* yielded 30 & 45 units of Lipase and Phospholipase B respectively which was 20% less than the previous medium containing rice husk only. A decline in the enzyme activity was observed after 24 hrs. incubation period. As regards the endocellular protease, its activity in the rice husk medium under assay system was observed to rise after 48 hrs. incubation system and then declined in 120 hrs. The decline observed in the activity of enzymes with the passage of time can be attributed to the change in pH of the medium with increasing incubation period.

The experiments have thus proved that rice husk is a better and inexpensive substitute of cornsteep and glucose in the production of enzymes.

P-CSIR/Chem (171)1986-89

BIOSYNTHESIS OF ANTIBIOTIC BACITRACIN BY BACILLUS LICHENIFORMIS AS SUPPLEMENT IN POULTRY FEED.

M.A. Qadir**

Bacitracin, a polypeptide antibiotic is active against gram positive and few gram-negative bacteria. This antibiotic has been used successfully for control of infections. Feed supplement containing bacitracin have proved to be quite effective and economical. The production of antibiotic bacitracin by *Bacillus licheniformis* on pilot plant scale was attemped in the stirred fermenter, and also by solid state fermentation process using Agricultural by-products, such as soyabean, meat, sun-flower, meal, and wheat bran etc., as starting material. The conditions for the isolation of antibiotic from the fermented mesh were also optimized. The evaluation of Zinc bacitracin in poultry feed was carried out by feeding to the poultry.

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S-KU/Chem (10/1) 1975-78

STRUCTURAL AND SYNTHETIC STUDIES ON SOME ß-CARBOLINE BASES

Salimuzzaman Siddiqui*

As a part of the overall programme of studies in the correlation of structure and activity, a study was specifically undertaken to cover the alkaloidal bases carrying a ß-carboline nucleus. As a result of investigations in this field, nitro-derivatives of a whole range of alkaloidal bases were prepared and their pharmacological activity tested out at the Jinnah Postgraduate Medical Centre and subsequently in a leading German pharmaceutical firm. Three nitro-derivatives were obtained under highly critical experimental conditions from Reserpine: the base which when used over a long period in the treatment of hypertension produces heavy depressions leading to suicidal tendencies and schizophrenia in about 50% of the cases treated. Of its 3 isomeric mononitro derivatives, it was found that 1-netroroserpine has the same order of hypotensive activity as Reserpine when administered intravenously to cats and rabbits and was completely free from its undesirable side effects like tremor, ptosis (drooping of upper eyelids) and diarrhoea.

The study was extended to other ß-carboline bases like Rescinnamine, Ajmalicine, Serpentine, Marmine and Harmidine from which a number of nitroderivatives were prepared. New procedures were developed for the synthesis of ß-carboline derivatives through the generation of Vilsmeier complexes of indolic amides and their reduction by borohydride.

Condensation of Harmaline/Harmidine with formyl-cyclohexanone and subsequent reduction led to the formation of a compound having 11-methoxy-5, 6-dihydrosempervirine skeleton. working on the same lines, a compound containing the basic skeleton of Reserpine was also synthesized with Harmaline.

The reinvestigation of the alkaloidal constituents of *Rauwolfia vomitoria* has led to the isolation of 4 new alkaloids. The structure of one of them was elucidated as Hydroxyajmaline mainly through spectroscopic studies.

In the course of the study of germination metabolites of *Peganum harmala* seeds, it was found that the alkaloidal constitutents are wholly located in the husk of the seeds to the extent of upto 7%. On the other hand the kernels which form about 50% of the whole seeds

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yield 20% of an oil which is completely free from the toxic alkaloids and compares in its physical data with cotton seed oil.

S-SU/Chem (13) 1975-77

CHEMICAL INVESTIGATIONS ON THE PLANT MATERIALS OF SINDH

Munir A. Qureshi*

Isolation and identification of the biologically active compounds from the medicinal plants *Inula grantioides* and *Salvia plebeia* was undertaken with a view to make these compounds available for their pharmacological screening. The results achieved are as under:-

i) *Salvia plebeia:* Eleven (11) Compounds were isolated from the petroleum-ether, and benzene extracts of the seeds and stem of the plant and were further purified by thin layer chromatography. Their physical properties were studied in detail. Out of the seven compounds isolated from the seeds of *Salvia plebeia*, two were identified as Benzealdehyde and Tetratriacetone.

ii) *Inula grantioides:* In all, seventeen (17) compounds were isolated from the floral extracts of the plant in petroleum ether and benzene solvents and were further purified by thin layer chromatography. The physical properties of these compounds were investigated and one of the compound was identified as dioctylphthalate.

S-KU/Chem (84) 1978-79

ISOLATION AND STRUCTURAL STUDIES ON THE CHEMICAL CONSTITUTENTS OF SOME INDIGENOUS FLOWERING PLANTS

Viqar-ud-Din Ahmad**

The chemical constituents of medicinal plants namely: (i) *Prosopis juliflora* (ii) *Morinda citrifolia* (iii) *Bougenvilles glabra* and (iv) *Nepeta hindostana* were isolated, characterised and their structures determined. The findings are reported as under:-

a) *Prosopia juliflora*: Three new alkaloids and a number of neutral constituents

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were isolated from the plant. The structure of one of the alkoloids was elucidated completely and of an other alkaloid partly. The main alkaloid Juliflorine was found to possess strong antibacterial activity against *Bacillus subtilis, Bacillus magathelium, Sarcinia lutea.*

b) *Morinda citrifolia*: Two neutral compounds were isolated from the leaves of this plant which have been identified as β-sitrosterol and Ursolic acid. The presence of stigmasterol was also detected.

c) *Bougainvillia glabra*: Chromatographic separation of the ethyl acetate soluble fraction of the extract of leaves of plant yielded triacontanol & oleanolic acid.

d) *Nepeta hindostana*: Chemical reinvestigation of the aerial parts of this plant led to the isolation of several neutral and acidic substances in pure state. These include Oleanolic acid, Triacontance, β-sitosterol, which have already been reported by earlier researchers. The Nepetol, reported by earlier authors appeared to be identical with Amyrine. An aliphatic alcohol isolated from this plant was identified as triacontanol.

Form the mass spectrum, the isolated hydrocarbon fraction appeared to be a mixture of ortriacontance and hentriacontance. Three triterpenoids were isolated in pure state which appear to belong to the Iupance series.

C-QU/Chem (94) 1980-81

ISOLATION, IDENTIFICATION AND STRUCTURAL MODIFICATION OF SOME BISBENZYLISOQUINOLINE ALKALOIDS FROM PLANTS

Roshan Ahmed*

A number of plants in and around Islamabad, belonging to the family Ranunculaceae were screened, for the isolation and identification of anticancer alkaloids. The results of these investigations are summarised below:-

A. ISOLATION AND IDENTIFICATION OF ALKALOIDS:

i) *Cissampelos pareira*: Five new alkaloids namely Laudanosine, Nuciferine, Bulbo- carpine, Corytuberine and Magnoflorine were isolated, which had not been reported previously from this plant. These isolated alkaloids were com-

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pared with known samples and their structures elucidated by spectroscopy.

ii) *Machilus odoratissima*: Chemical constituents of leaves and bark of the plant found in Murree and Azad Kashmir were investigated. The isolated compounds included Ocopodine, Chondrocurine, Apomorphine-dimethyl ether, and two unidentified alkaloids. M.P., specific rotation I.R., N.M.R and Mass Spectrum techniques were applied for the identification of these alkaloids.

iii) *Thalictrum rochebrunianum:* Three alkaloids namely thaliglucinone, 2-northalibrunine and O-methyl thalibrunine were isolated which had not been previously reported from this plant. The 2-Nor thalibrunine was N. methylated with formaline/$NaNH_4$, which yeiled thalibrunine. Attempts were made to O-methylate thalibrunamine with diazomethane which remained unsuccessful. Structure of O-methyl thalibrunamine was determined spectroscopically.

B. STRUCTURAL MODIFICATION OF SOME KNOWN ALKALOIDS:

Aporphines having methyl group on 6a position have neither been isolated from natural sources nor synthesized. Nuciferine was selected as a model compound and different bases including (CH_3) Cd, CH_3 Mg,s CH_3 Li, and $(CH_3)_2$ CuLi were tried to introduce a methyl group at 6α angular position but the end product was always dehydronuciferine. Similarly, attempts were also made to prepare 7-dimethyl Nuciferine by reacting with different phase transfer catalysts like acetyl trimethyl ammonium bromide, benzyl trimethyl amoniumn hydroxide (Triton B) and tetrabutyl ammoniumn hydroxide. The reduction of aldehyde group of Nuciferine to methyl group yielding methyl dehydronuciferine was easily done but its further reaction with CH_3I to yield 7-dimethyl Nuciferine remained unsuccessful. Instead, the starting material could be recovered by column chromatography.

S-JPMC/Med (44) 1981-83

INVESTIGATION ON THE THERAPEUTIC VALUE OF THE INDIGENOUS PLANTS IN TRADITIONAL MEDICINE FOR THE CONTROL OF DIABETES IN PAKISTAN

M. Atta-ur-Rehman *

Extracts of two plants, namely *Poterium spinosum* and *Gymnema sylvestre* which are known for their hypoglycemic activity, were analysed chemically and their role in the control and treatment of Diabetes mellitus was investigated in male albino rats. The results of these investigation are as follows:

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a) *Poterium spinosum*: Water extract of plant roots showed significant hypoglycemic activity in alloxane diabetes (insulin deficiency) as well as in glucosamine diabetes (insulin sufficiency). Mechanism of their action was investigated by measuring the metabolites in liver and blood. Results showed that *Poterium spinosum* produces significant hypoglycemic effect in alloxan diabetic rats through extra pancreatic means and its action is independent of insulin production or pro- tection.

b) *Gymnema sylvestre:* Ethanolic extracts of leaves showed hypogglycemic effect in alloxan diabetic rats upto 24 hours period after the administration of the extract. An antidiabetic powder of unknown chemistry was also tested. Oral administration of whole powder or its extracts in water and organic solvents showed hypoglycemic activity in diabetic rats. Benzene extract of powder showed maximum efficiency, indicating the presence of benzene soluble hypoglycemic content in the powder.

S-KU/Chem (84/2) 1983-84

ISOLATION AND STRUCTURAL STUDIES ON THE CHEMICAL CONSTITUENTS OF SOME INDIGENOUS FLOWERING PLANTS

Viqar-ud-Din Ahmad*

The project being an extension of previous project of the same title under which chemical constituents of three plants namely, *Prosopis juliflora, Nepeta hindostana*, and Euphorbia *granulata,* earlier reported to have medicinal value, were isolated and characterised. The results achived are as under:

a) *Prospis juliflora*: Several new alkaloids were isolated and characterized from this plant. The microbial study of their effects showed that these alkaloids inhibit the growth of pathogenic fungi and gram positive bacteria.

b) *Nepeta hindostana*: A number of Triterpenes were isolated from this plant.

c) *Euphorbia granulata:* The work on this plant resulted in the isolation of callic acid and Triterpenes. In addition to these Lupeol, Lupeol acetate, Taraxasterol acetate, and B. Sitosterol were identified by employing spectropscopic techniques.

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S-KU/Chem (96/1) 1983-86

SYNTHESIS AND ISOLATION STUDIES TOWARDS VINBLASTINE AND VINCRISTINE AND THEIR NOVEL DERIVATIVES

Atta-ur-Rehman*

Catharanthus roseus (L) locally known as "Sada Bahar" belonging to the family Apocyanaceae has assumed great therapeutic importance, as it has yielded six-neoplastic alkaloids. Amongst these, Vinblastine and Vincristine are the most powerful anti-tumor agents. The project was undertaken to isolate and synthesize Vinblastine and Vincristine and their derivatives from *Catharanthus roseus.* The results achieved are as under:-

i) A new procedure was developed for the isolation of Vinblastine, using tartaric acid/HCl for adjusting the pH, followed by solvent extraction.

ii) Lourosine, a compound extracted from the leaves of *C. roseus,* was in one step converted to anydro Vinblastine which can then be converted to Vinblastine representing a novel approach to the synthesis of Vinblastine.

iii) A number of new and known alkaloids were isolated from the leaves and flowers of *Catharanthus roseus* namely,16-epi-19-*S*-vindolinine, catharanthinevindoline, vinblastine,16-epi-19-*S*-vindolinine- N-oxide.Vindoline-N-oxide, Fluoro-carpamine, Pleio-carpamine, Gomaline, Rhazimol, Rosa- mine, Rosicine,14-15-dehydroepivincadine,19-hydroxytabersonine, Norharmaner, Catharine, Cathobaline, Bunnucine and Leurosinone; whereas Coronaridine, 11-methoxytabersonine, Terahydroalstonine, Ajmalicine, Mitraphlline and Vindorosine were isolated from its flowers.

iv) Attempts were made to synthesise ß-carbolines and the biogenetically important secodine systems: the precursor compounds in the synthesis of vinblastine and vincristine. The studies have led to the first synthesis of N-methylsecondine and N-benzylsecodine. The synthesis of the closely related Hunteria alkaloids and the novel synthesis of Vincamine (which is convertible to the Aspidosperma type alkaloids in a one step process) was also achieved.

v) Oxidation of Vinblastine and Vincristine was successfully carried out by using

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a number of oxidizing agents.

vi) A new derivative of Leurosine (dinitroleurosine) was prepared and submitted to a foreign pharmaceutical company for evaluation of its biological activity.

S-CSIR/Chem (150) 1985-86

STUDIES ON THE HYPOCHOLESTEROLEMIC EFFECT OF ALLIUM SATIVUM LINN AND SCIENTIFIC INVESTIGATION OF ITS PROTECTIVE ACTION AGAINST THE CORONARY HEART DISEASE

Yusuf Ahmad*

Garlic (*Allium sativum*) is reputed for its beneficial effects in various ailments, particularly heart diseases. In view of the emergence of the coronary heart disease as one of the major killer diseases in the country, a project was undertaken to establish the biochemical and anatomical effects of garlic on modern scientific lines in a chicken model of atherosclerosis.

Animals were subdivided into the following three groups:-

i) Group I: fed with cholesterol and simultaneously with garlic to assess the protective effects of garlic

ii) Group II: fed with cholesterol until atherosclerosis was produced. This group was later fed with garlic to assess the amelioration in the levels of triglycerides and decrease in sortic damage by comparing them with the controls.

iii) Group-III: fed with cholesterol and allowed to revert to normal feed without adding garlic to their feed.

Studies on these three groups have shown that in group I levels of triglycerides, total cholesterol and LDL & VLDL-bound cholesterol in the plasma of chickens decrease considerably as compared to the Group III or "Autoreversal group. The aortic damage in the Autoreversal group was higher as compared to the garlic fed group. In addition, the *in vitro* studies showed a marked inhibitory effect of aqueous garlic extract on platelet aggragation., These investigations have led to the conclusion that administration of garlic provides a significant protection against hyperlipidemia and thrombus formation and, therefore, has a potential to protect against cardiovascular anomalies.

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S-KU/Chem (170) 1986-88

STUDIES ON THE CHEMICAL CONSTITUENTS OF CAPPARIDACEOUS PLANTS OF PAKISTAN

Viqar-ud-Din Ahmed*

Four plants of the family Capparidaceae namely: *Cadaba farinosa, Capparis decidum, Cleome brachycarpa,* and *Crataeva adansonii* which are famous for their medicinal properties, were selected for detailed investigation of their chemical constitutents. The reults achieved are as under :-

a) *Cadaba farinosa:* Three new spermidine alkaloids named as Cadabicine, Cadabicine diacetate, and Cadabicine methyl ether were isolated. The structures of these alkaloids were determined by spectroscopic and crystallographic analyses. Alongwith spermidine alkaloids, a sesquiterpene Cadabicilone was also isolated from the same plant and its structure was proved by means of spectroscopic techniques including 2D-NMR.

b) *Capparis decidua:* Six new spermidine alkaloids name as Capteridisine, N-acetyl Caparisine, Capparisine isocodono- carpine, and N-acetylisocodonocarpine were isolated. All these alkaloids are structurally related to Cadabicine. The structures of these alkaloids were determined by means of spectral data.

c) *Cleome bracycarpa:* The plant does not contain akaloids but it was possible to isolate three new triterpenoids of dammarane series and were named as Brachycarpone, Deacetoxybrachycarpone and Cleocarpone. The structures of these compounds have been elucidated on the basis of spectroscopic as well as chemical methods, whereas, structure of brachycarpone was confirmed by X-ray crystallographic techniques.

d) *Crataeva adansonii:* Four alkaloids: Cadabicine, Cadabicine diacetate,

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Cadabicine methyl ether, and Capparisine were identified which have already been isolated from *Cadaba farinosa* and *Capparis decidua.*

S-KU/Chem (165) 1986-89

ISOLATION AND STRUCTURAL STUDIES ON THE CHEMICAL CONSTITUTENTS OF ERVATAMIA CORONARIA

Atta-ur-Rehman*

Ervatamia coronaria a glabrous, evergreen tree is widely distributed in tropical countries as a garden plant. Its juices and various parts have found wide use in the indigenous system of medicine for the treatment of eye diseases, opthalmia, paralysis, diarrhoea, vomiting, ulcers, asthma, leprosy, etc..

The phytochemical studies on the chemical constituents of *E. Coronaria.* have resulted in the isolation and structural characterization of five new indole bases namely Stafinine, Ervaticine, Ervatimine, Lahoricine and Mehranine, In addition, two more alkaloids namely: Dihydrocondylocarpine and Appariciné were isolated for the first time from this plant. The structures of these alkaloids were elucidated using standard spectroscopic analysis, mass fragmentation and H-NMR spectral analyses. Pharmacological screening of the newly isolated indole bases will help in proving the medicinal value of the plant.

C-QU/Chem(177) 1987-89

STUDIES ON THE CHEMICAL CONSTITUENTS OF SOME LABIATAE PLANTS OF PAKISTAN.

Dr. Mashooda Hassan

Two Labiatae plants of Pakistan i.e. *Tencrium royaleanum* and *T. stocksianum* were studied with a view to identify their chemical constituents.

Four pure compounds and eight components were isolated from *T. royaleanum* as siven below:-

- pentatriacontanone

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- hentricontadien-1-01
- Z-12-nonadecen-9-one
- 5,23-stigmastadie n-3-0-galactoside
- mixture of triterpenes
- misture of 5,22,25-stigmastatrien-3-01 and 5,25-stigmastadien-3-01
- mixture of octadecanoic acid and octadecadeienoic acid methylesters
- mixture of hexacosanoic acid its higher homologues

Six pure compounds were isolated from *T. stocksianum* as under:

- acetyl derivative of oleanolic acid
- 1,4-disubstituted benzene derivative with hydrocarbon type of side chains
- saturated straight chain hydrocarbon corresponding to molecular formula $C_{39}H_{80}$
- two diterpenes
- $C_{19}H_{22}O_5$
- $C_{20}H_{24}O_5$
- 5,22-stigmastadien-3-01

Characterization and structure elucidation of all the isolated components has been done with the help of NMR and mass spectral studies.

F-PU/Chem (22) 1975-77

STUDIES ON THE INTERACTION OF ORGANIC PHOSPHATES WITH METAL IONS AND RELATION OF THE MOLECULAR STRUCTURE TO BIOLOGICAL ACTIVITY

Sakhawat Hussain*

For a better understanding of the role played by the metal ions in the phosphate transfer reactions in biological system, isolation of stable metal ion complexes with suitable organic phosphate models was carried out. The results achieved from various experiments have shown that the presence of electron donating group such as dimethylamine on phosphoryl group (in pyrophosphates) increases the coordinating capacity of the **P=O** group thereby resulting stable metal complexes. It was observed that substitution of dimethylamine group by ethoxy group altogether changes the coordination capabilities of the pyrophosphate and the complex formation doesn't take place at all.

New quantitative procedures for the determination of Antimony (III) Mercury (II) and Bismuth (III) based on their precipitation with 1,3-dimorpholinopropane were designed and experimented upon. In addition, monofunctional ylide (tri n-butyl methylene phosphorane) having three n-butyl group on the phosphorus atoms was synthesized and the chemical characteristics of this ylide alongwith its organometallic compounds were studied in detail.

F-PU/Chem (38) 1975-77

INFLUENCE OF LIGAND STRUCTURE ON THE COORDINATION PROPERTIES AND REACTIVITY OF TRANSITION METALS

S. Marghoob Ali**

Synthesis of new chelating agents was undertaken to study the influence of the ligand structure and steriochemistry on the coordination properties and reactivity of various transition metals.

Two ligands namely phenohomozine (**PHZ**) and methylated phenohomozine

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(MePhz) were synthesized using non aquous anyhydrous conditions. The metal complexes of the Phenohomozine were prepared with Copper (II) Nickel (II) and Zinc (II) and the influence of ligand design on the coordination properties of the central metal atom were investigated through analytical and physical measurements. It was found that Cu (II) Porms mono and bis complexes while both Ni (II) and Zn (II) form only bis complexes. A comparison of the chemical characteristics of the metal ion comolexes with those of mesocyclic diamines (deco and dach) showed that the diamagnetic Ni (II) complexes are planer like the corresponding complexes of the mesocyclic diamine while the Cu (II) complexes differ appreciabely from the mesocyclic diamine complexes of copper.

It was concluded that (i) the ligand phenohomozine appeaers to be a suitable chelating agent for importing 4-coordinated square planer geometries on the metal ions and (ii) 10 mesocyclic diamides synthesized under this project can serve as possible models for the studies involving metal amide interaction.

F-PU/Chem (77) 1976-77

ANALYTICAL USES OF CHELATING AGENTS

Sakhawat Hussain*

Metal chelation is involved in a number of chemical and biological processes and provides an effective and efficient method for the extraction and detection of trace amounts of noble metals such as gold, uranium etc., from their respective ores.

Synthesis of some new chelating agents and their complexes was undertaken for their use in analytical chemistry. Spectroscopic estimations of copper (II) in water solvent were carried out using 1,5, Diazacyclooctane (deco) as a chelating agent. The minimum amount of copper (II) which could be estimated, was about 2-5 parts per million. The complex was found to be stable for at least 24-hrs and no change in absorbance was observed at 520 mu for this period.

Gravimetric estimation of Arsenic (II) with 1,3 dimorpholinopropane (DMP). DMP was proved to be an extremely versatile ligand for the estimation of the group VA elements except for nitrogen. Preliminary experiments showed that DMP has great prospect as a precipitating agent for group II B elements.

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C-QU/Chem (54) 1976-79

PREPARATION OF NEW MEDICINAL COMPOUNDS BY STRUCTURE MODIFICATION AND METAL CHELATION OF CERTAIN EXISTING MEDICINAL COMPOUNDS AND THEIR STUDY.

Christy Munir*

The project was undertaken to synthesize some new medicinal compounds by modifying the structures of Ampicillin and Sulphaguanidine and to study pharmacological activity of modified compounds. Structural modifications were carried out by substitution and by chelation method in Ampicillin and Sulphaguanidine respectively.

Metal complexes of Ampicillin with Cobalt (II), Iron (III) and Palladium (II) were synthesized and their structures, physical and pharmacological properties were studied in detail. The pharmacological assay of the newly synthesized Ampicillin-Cobalt (II) Complex, i.e. Co (ampicillin)$_2$ (OH_2)$_2$ Cl_2 $3H_2O$ showed that it is 2-3 times more active than Ampicillin against *Salmonella arizona, Proteus vulgaris, Staphylococcus pyogeneus* and Klebsiella pneumonie and inactive against *Enterobactor agrogenes,* whereas, the Iron Ampicillin complex was found inactive against these micro-organisms.

Attempts were also made to make structure modification in Sulphaguanidine via replacement of its pheyl group with groups like CH_2-or-(CH_2)$_2$ and to study the changes in the pharmacological activity of the compounds but due to some technical difficulties and limited facilities, the desired synthestic results were not achieved.

S-KU/Chem (100) July Dec., 1979

REACTIONS AND INDUSTRIAL APPLICATIONS OF ORTHO-PHENYL BENZALDEHYDE

S. A. Fasech**

A number of medicines contain benzaldehyde as an important part of their composition. A small project of six months duration was implemented to produce compounds of medicinal nature from the substituted benzaldehydes e.g. ortho-phenyl-benzaldehyde. The pure artho-nitrophenyl (b.p. 200-250°/lmm) and crystalline

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para-nitrobiphenyl (mp: 110-113°) were synthesized. The crude orthro-nitrobiphenyl was then reduced to its corresponding amino group.

F-GU/Chem (87) 1979-81

TRANSITIONAL METAL COMPLEXES WITH MEDICINAL COMPOUNDS

Abdul Rauf*

The project was aimed at investigating the effect of metal ions on the activity of a particular medicinal compound. Promethazine and Ethambutol were selected as the model medicinal compounds and their following complexes were prepared:-

- Ethambutol Cu (II) Chloride
- Ethambutol Fe (II) Sulphate
- Ethambutol Pd (II) Chloride
- Ethambutol Pt (II) Chloride
- Promethazine Fe (II) Sulphate
- Promethazine Pt (II) Chloride
- Promethazine Cu (II) Chloride

A relatively better yield was obtained in case of promethazine Pt (II), Ethambutol Pt (II) (i) & (ii) and Ethambutol Cu (II). Their probable structures were then elucidated by elemental analysis and Infra Red Spectra.

P-PU/Chem (106) 1983-84

SYNTHETIC AND CATALYTIC ASPECTS OF NEW TRANSITION METAL ALKYLES AND ARYLES

M. Zafar Iqbal**

The project was undertaken to develop the chemistry of transition metal alkyles and Aryles exhibiting unusual structures and chemical reactivities. In this regard, nature of the

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complex compound that are formed by the reaction of N.N. dimethyl benzylamine with group I (b) & II (b) was studied in detail. Their empirical formulae, molecularweight Synthesis, reactivity, and structures were established by employing spectroscopy, chemical micro-analysis and other physical measurements.

Studies were also carriad out to investigate the catalytic nature of these complex compounds and reactions including that of transition metals with N.N. dimethyl benzylamine and benzylidene analine which provided basic knowledge for the development of new molecular catalysts.

C-QU/Chem (137) 1983-86

POLYMERIZATION AND ELECTRON TRANSFER PROCESS, STUDIES ON SUBSTITUTED ETHYLENES

Mahboob Mohammad*

Studies were carried out on electron transfer process with reference to polymerization, by using parameters such as electro chemical (redox) potentials, solvation (free energies of various species, ion pair formation, disproportionation and dissociation equilibria, homogeneous and heterogeneous electron transfer reaction rates. Tetra phenylethylene was selected as a model ethylene for polymer research.

Salts of tetraphenylethylene with lithium, Sodium, Potassium, Rubidium, and Tetra-butylammonium were prepared, their optical spectra were recorded and computer resolved which indicated three bands of absorption. Computer programmes were written in BASIC language and developed for Huckel, W-technique and perturbation Methods. Organization energy for heterogeneous electron transfer rate constant was calculated from these programmes. Theoretical aspect of calculating the reversible (formal) electrode potential E^{o} for irreversible (electrone transfer) process, through the calculation of heterogenous rate constants, was worked out. Outer and inner reorganization energies, free energies of activation and heterogeneous electron transfer rates constants were also calculated.

Voltammetric studies were carried out on tetraphenylethylene in DME, DMF Benzene mixture and HMPA and disproportionation constant as well as dissociation constants were calculated.

In addition to these investigations, a quite inexpensive simple polarograph was

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fabricated successfully which can be used for routine experiments as well as teaching purposes.

S-SU/Chem (133) 1985-86

PREPARATION AND DEVELOPMENT OF NEW SENSITIVE CHROMOGENIC REAGENTS FOR METAL ANALYSIS

Iftikhar-ud-Din Arain*

Pyridyl substituted pyrizine and quinoxaline compounds containing ferrion and cuperion functionalities have proved to be of great value in analytical chemistry. In view of this importance, twenty seven (27) copper and iron selective reagents were prepared and their structures determined with the help of IR,UV, H-NMR and Mass spectroscopic techniques.

Effects of methyl, ethyl, phenyl, furyl and pyridyl substitutions in dihydropyrazine, pyrazine and quinoxaline ring on the reactions towards metals like Copper (I), Iron (II), Ruthenium (II) Cobalt (II) and Nickel (II) were investigated. The results showed that only few reagents react with these metals, where colour development with Iron (II) and Copper (I) is immediate but Ruthenium takes longer time. Colour reactions of other reagents towards Iron Were found to be sterically hindred because of the substitutents adjacent to imine nitrogen atom.

The calibration range for Copper, Iron (II) & Copper (I) were calculated. Effects of diverse ions on the copper deteminations with the reagent BMPTDP was investigated and then the reagent was applied for quantitative determination of copper in different water samples and human head hairs. Results thus obtained were counter checked by employing spectrophotometric method (With Bathocuprine as the complexing reagent) and were found to agree with each other.

Reactions of furyl substituted dihyropyrazine, pyrazine and quinoxaline towards Copper, Iron, Cobalt, and Nickel were studied qualitatively and spectrophotometrically.

These reagents are helpful in developing a flow injection system for the possible determination of Copper and Iron in large number of the samples.

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C-QU/Chem (154) 1985-86

DEVELOPMENT OF AMINO ACID ESTERS HYDROBROMIDE SALTS AS ANTIMICROBIAL, ANTI-MOTH & ANTI-COCKROACH AGENTS

Zubair Ahmad Malik*

Ester hydrobromide salts of amino acids were synthesized and their anti microbial activity was investigated. Most of the salts were found to be insect-repellants and showed anti- microbial activity against a vide variety of Gram-positive and Gram-negative bacteria. Some esters showed specific activity against particular bacteria with negligible toxicity and harmful effects. The 2-chloroethanol, ethyl, and propyl esters of amino acids were found active against most of the microbes. Methyl-L-leucinate (10%) was studied for its anti-moth activity at various stages of moth- lifecycle. The compound was found to be highly toxic to larvae. Dilute sprays made them lethargic and they died after three days. It was concluded that amino acid esters hydrobromide salts can be used as anti-moth and anti microbial agent.

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F-PU/Chem (60) 1976-79

MOLECULAR WEIGHT AND SIZE MEASUREMENT OF COLLOIDAL POLYMER AND MACROMOLECULAR MATERIALS BY LIGHT SCATTERING TECHNIQUES.

Noor Ahmed*

Polymer and colloidal systems from samples of cellulose acetate which were obtained from Ravi Rayon Chemical Complex, Kala Shah Kakoo (Lahore) and sample of silica polymer under the trade name of Ludox-LS. manufactured by E.I.D. Port Nemoulrs Co-QNC EILMINGTON (Delaware) U.S.A., were characterized making use of light scattering techniques. Three methods namely the Turbidity method, Dissymetry method, and Zimm plot method were employed for the interpretation of data obtained through light scattering techniques. Measurements were taken with several concentrations at two different wavelengths of 436nm and 546nm and then mathematically manipulated. The range of the results obtained for cellulose acetate of Ravi Rayon Chemical complex are as under:-

- Apparant molecular weight: 1,00,000 - 7,75,194 g/mole
- Second Varial Co-efficient: 7.08 * 10-6- 2.06 * 10-2
- Excluded volume: 1.5 * 10-18-2.26 * 10-15 ml/g
- Specific volume: 930 - 1012ml/g
- Radii of gyration: 1095A - 1598A

Studies were also made on the presumably spherical particles of Ludox-LS, the size of which was found to be fairly monodisperse lying in the range of 18.53 nm - 19.1 nm. The dissymetry and turbidity methods were employed for these determinations while Zimm plot Method was used in the final stages to determine the molecular weight of the sample. These measurements can be used as standard for the fabrication of the instrumentation required in the field of light. The data thus obtained would help in establishing quality control and provide better technical know how both of which are vital to the development of the plastic and Polymer industry in the country.

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C-QU/Chem (73 & 73/1) 77-80 & 81-83

KINETICS, ELECTROCHEMICAL AND OPTICAL INVESTIGATIONS OF BIPYRIDILIUM HERBICIDE (PARAQUAT) AND RELATED COMPOUNDS.

Mahboob Mohammad*

In order to better understand the biological reactions of the molecule Nicotinamide Adenine Dinucleotide (NAD) and the herbicidal mechanism of bipyridilium compounds, some electrochemical, kinetics and spectroscopic studies were carried out on the model compound: 1-ethyl-4-carbomethyl pyridilium iodide and the herbicide: N, N^1 dimethyl-4-,4^1- bipyridilium dichloride (paraquat, methylviologen).

Through electrochemical studies, information was obtained regarding the stabilities and concentration of those (reduction) products were obtained which were considered to be responsible for biological reactions and herbicidal activity. During kinetics studies, rates of chemical reaction of the reactive products (intermediates) with some relevant compounds were measured. The conductor and spectroscopic (optical and NMR) studies on these compounds indicated the forms in which they might be occuring *in vivo* and taking part in biological reactions. Besides, the dynamics of some processes occuring in solution were also indentified and their rates studied.

During these investigations two new analytical tools were developed, one of these is now being used in studying the kinetics of reactive intermediates.

S-KU/Chem (142) 1983-84

CHEMICAL, SPECTROSCOPIC, AND MICROBIAL STUDIES OF TRANSITION METAL COMPLEXES CONTAINING MIXED LIGANDS

Najma Sultana**

Synthesis, Chemical, spectroscopic and antibacterial studies of mixed ligand complexes of transition metals were carried out. Copper (Cu) and Silver (Ag) were incorporated in monodentate ligands having donor characteristics such as; quinoline, 2, 5 dimethyl aniline, 2-ethylpyridine, of naphthylamine and dimethylamine. These ligands differ in their chemical properties and in the position of the nitrogen atoms in their molecular structures. New mixed ligand complexes with triphenyl-phosphine were also synthesised.

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The Chemical studies showed that tetrakis halogeno triphenylphosphine copper (I) CoX (PPh_3) 4 and do--halogeno bis triphenylphosphine di copper (I) CuX (PPh_3) 2 give compounds of different stoichiometry when treated with quinoline in different molecular ratios. Ultra violet spectra of complex compounds were examined in the region 400-200 cm^{-1} to ascertain whether the spectra are compatible with those reported for the ligands. Spectroscopic and conductiometric measurements were carried out for the structural studies of the newly synthesised compounds.

In the microbial studies, *Becillus substilis* and *Escherichia coli* were used as the microbial organisms. The complex were found inactive to these organisms. A few metal complexes of Erythromycin were also prepared including the metals which are present as trace metal ions in our body. From the results obtained, it was concluded that few metal ions readily complex with Erythromycin and ultimately affect the efficiency of this antibiotic negatively.

F-PU/Chem (153) 1986-88

A THERMODYNAMIC STUDY OF THE SUPERMOLECULAR ORDER IN AQUEOUS SOLUTION OF POLYVINYL ALCOHOL.

Noor Ahmed*

The project was carried out to study the formation of the supermolecular structure in the aqueous Polyvinyl Alcohol (PVA) solution by viscometric and light scattering methods. The PVA polymer was subjected to these studied at various temperatures and in different solvents to find the super- molecular formation and the determination of thermodynamic parameters, second virial co-efficients, molecular weight and the unperturbed dimensions of the PVA polymer.

Studies on (i.e. normal and shear viscosity were undertaken by using ostwald viscometre, and roto viscometer respectively. From these viscosity studies, it was found that the 20% propyl alcohol behaves as good solvent, while it is a poor solvent for PVA.

Further orientation and coiling of polymer molecule was observed to be more in water and in aqueous dioxane as compared to aqueous propyl alcohol solvent. The values of heat and entropy of activation of viscous flow increased with concentrations but no generalization can be made due to its irregular pattern at various temperatures. The values of heat and entropy of activation show that solutions of the polymer in 20% propyl alcohol behaves as a good solvent while water is a poor solvent for PVA.

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The light scattering studies were also undertaken for the PVA-water system for un-known molecular weight sample. Form these studies, specific refractive index increment, molecular weight, second virial coefficient, etc. were determined.

EARTH SCIENCES

P-GC/Earth (25) Feb. Aug., 1980

RESOURCE POTENTIAL OF POTWAR: A STUDY FOR THE IDENTIFICATION OF RESOURCE MANAGEMENT AREAS AND GROWTH POINTS.

Zafar Ahmed Khan*

An extensive survey of the Urban and Rural settlements of Attock District was conducted to collect data on the physical and human resources. The interpretation of the collected data, has led to the following conclusions:

The District contains several types of valuable physical and human resources which are not being properly utilized.

There is a concentration of resources in certain areas and settlements which has resulted in a lopsided development. There are several areas which are comparatively less developed than others.

Lack of communication was identified to be a major problem in the utilization and unequal distribution of resources.

The neglected areas of the District have valuable potentials for the future development.

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S-KU/Ocean (4/1) 1980-83

SHORE EROSION STUDIES OF PAKISTAN COAST IN THE VICINITY OF KARACHI

S. M. A. Tirmizi*

The process of shore erosion was studied along the Karachi coast ranging from Manora Island to Cape Monze. The visual wave and wind data, samples of sediments and water were collected fortnightly from six different locations. Inorder to track the offshore movement of the suspended load, satellite imageries were visually interpreted. Sediment samples were subjected to laboratory tests for the determination of variations in grain size of surf zone in different seasons. An attempt was also made to work out the longshore energy flux in surf zone due to breaking of waves.

These observations revealed that during post- monsoon and premonsoon period, the beaches and nearshore zones are subjected to only moderate to low wave energy conditions. Rebuilding of beaches takes place in these periods but as the erosion is greater so there is net loss of beach material at Paradise Point and Sandspit areas. Immediate protective measures are required to safeguard these areas from landslides and soil erosion.

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P-UET/ENG (17) 1983-84

GROUNDWATER MANAGEMNET MODEL OF SCRAP-II

N. M. Awan*

Several grave problems affect the productivity of agricultural fields of the Indus plain, the principal of which are: recurring water shortage resulting from inadequate canal system capacities and water supplies, and rapidly spreading water logging and salinity of the soils.

The project was aimed at formulation of computer model to predict changes in the underground water table by utilizing the data available with WAPDA and the Punjab Irrigation Department. The project covered command area of upper and lower Jhelum Canal System including both freshwater and saline zones and was divided into following schemes:

a) Forecasting of future groundwater levels both in time and space coordinates.

b) Evaluation of the effects of operational procedures and selective pumping on the conjunctive use of surface and groundwater.

c) Evaluation of optimal well position in relation to surface water distribution system and.

d) Study of the behaviour of Salt Freshwater interface under imposed operation condition.

Procedures adopted for the survey included computer programme for a grid of 37x15 nodes with each node 5 mile apart.

In the light of all the data collected by surveys, a model is calibrated which will be used to predict future changes in water table levels.

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S-SU/CHEM (30) 1974-77

CHEMICAL ANALYSIS AND UTILIZATION OF CERTAIN SUBSTANDARD OR UNECONOMIC MINERALS AND ORES OF PAKISTAN

N. A. Naqvi*

The project envisaged studies on certain substandard and commercially unexploited mineral resources with a view to convert these minerals into more useful and economically feasible products. The samples of celestite, obtained from different areas near Thana Bola Khan, analysed for their Strontium content were found to contain 97 + 1.5% of Strontium sulphate.

Analysis of Bauxite samples obtained from Larkana (Sind) and Khatta Marshad, Sargodha District (Punjab), was made for its Alumina (Al_2O_3) contents. The average of Alumina in these substandard ores was found to be 20 + 1.0%. whereas, the yield of pure Alumina prepared was calculated to be 19.8%. These investigations have shown that various useful salts such as Alum, Al Cl_3 (Aluminium Chloride) Al $(NO_3)_3$ (Aluminium Nitrate) etc., can be economically prepared from Bauxite ores by using ordinary well known methods.

F-PU/Chem (19) 1975-77

CHEMICAL ANALYSIS OF MINERALS FOR THEIR COMMERCIAL EXPLOITATION

M. Sakhawat Hussain**

Geochemical exploration of the metallic and non metallic mineral deposites of the N.W.F.P. Area was carried out for the commercial and economic exploitation of these minerals. Samples of the Chromite, Copper, Limestone and Gypsum deposites were analysed both qualitatively and quantitatively.

The analytical results of the chromite ore samples collected from North Waziristan and Mohmand Agency have shown that the chromite deposites, present in the area, are of low grade and hence suitable as a refrectory material only. Copper ore was found to be located in Mimi Rogha, Sherkai Killi and Ismail Khel in North Waziristan Area.

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** Department of Chemistry, University of Peshawar, Peshawar.

Thermo-gravemeteric and chemical analyses of these ore samples suggested that it contained copper in the Malachite form i.e. $Cuco_3$ $Cu(OH)_2$.

Study of the limestone and Gypsum deposites was also conducted with a view to recommend a suitable location for a Cement Factory in the Tribal Area. A substantial part of the N.W.F.P. Region was geologically explored and samples of the minerals were analysed spectrophotometrically. The results thereof indicated that Ali Masjib, Alizai, Miram Shah and Sarweki Areas, contain inexaustive deposites of these minerals. Moreover, limestone found in these areas was of the cement grade.

C-QU/Chem (122) 1982-83

SILICONS FROM LOCALLY AVAILABLE SILICATE MINERALS

M. Mazhar*

Samples of mineral silicates were collected and analysed to establish their composition. Trimethylsilylation of these mineral silicates was studied in different experimental conditions to achieve the optimum yield of trimethyisilylated silicates. It was found that Muscovite and Phlogopite give 25% yield of silylated product. Sodium silicate undergoes silylation to give 99% Trimethylsilylated product which can be exploited industrially. Silylated products of all the silicates studied did not react with Grignards reagent of methyl-Lithium to yield methylpolysiloxanes.

SiO_2 was found to react with Catachol under certain reaction conditions to yield hexacoordinated complexes which were characterized by UV, IR, Spectroscopy, Thermogravimetric and differential thermal analysis etc.. The investigations have indicated that these complexes have potential to exploit them for the conversion of SiO_2 into solar grade silicon and industrially useful material such as polysiloxanes.

P-PU/Chem (169) 1986-87

DEVELOPMENT OF PROCEDURE FOR THE EXTRACTION AND REFINING OF BERYLLIUM FROM BERYL ORES OF PAKISTAN

Mohammad Ali Khan**

Berylium metal is used extensively in the formation of X-ray windows, missiles,

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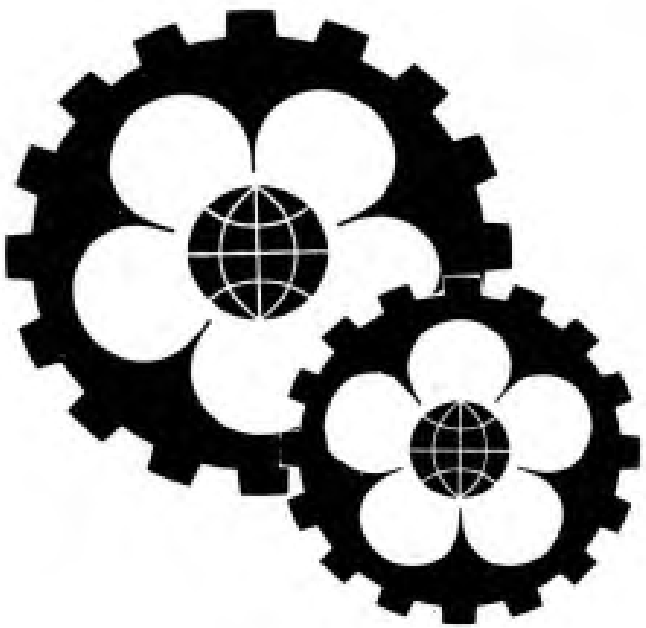
aircrafts, and as a moderator in nuclear technology. In Pakistan, heavy deposits of Beryl ore are present but no serious attempt was ever made to exploit the metal on commercial scale.

Studies were carried out to develop a new procedure (i.e solvent extraction procedure) for the extraction and refining of Beryllium metal from Beryl ore which could replace the conventional metallurgical procedures. The metal is highly poisonous and requires special care for its handling and processing at each step. The operational unit was, therefore, especially designed for the purpose. Complete chemical analysis of the Beryl ores was carried out using various analytical techniques. Leaching of the ore was done to get the metal which was then extracted in different solvents to study the distribution ratios of pure Beryllium alongwith other metals. Radio-active nucleoids were used for the determination of recovery percentage and trace impurities in the final products. The end product was found to be 94.5% pure, showing a good recovery thus proving the new procedure feasible for the exploitation of Beryl ores on industrial scale.

ENGINEERING



P-CTT/Engg (14) 1977-78

DYEING PROBLEMS IN BLENDED FABRICS: STUDY ON PAKISTAN TEXTILE INDUSTRY

F. A. Bhatty*

A study was undertaken to identify the problems encountered by the Textile Industries in dyeing of blended fabrics and to suggest improvement in the existing dyeing processes. During the survey of various Textile Mills of Faisalabad, it was observed that cellulosic/polyester blends processing is being practised on a significant scale and the machinery hitherto utilized for cotton processing was being utillized for blend processing with some modifications in its processing lines. It was found that that these modifications were neither uniform nor adequate in some of the processing establishments.

The second phase of the project was concerned with the atempts to resolve the problems identified during the survey by adoption of single chemical means and exploitation of appropriate processing technology while keeping in view the existing facilities available in our Textile Mills. In this regard a "Laboratory Scale Jet Dyeing Machine" and "Gas Heated Pin Type Stenter" were designed and manufactured which is fully verstile to process synthetics, polyester/ cellulosic blends and other fibres under the controlled, conditions. The machine has the capability of dyeing a wide range of fabrics quality including fabron, teravira, lawn, voils, poplins, sheetings, summer suiting and hoisery products.

P-PSIR/Eng (20) 1984-87

DEVELOPMENT OF FLUIDIZED BED COAL COMBUSTION SYSTEM BASED ON LOW GRADE COAL FOR THE SUPPLY OF CLEAN HEAT FOR INDUSTRIAL USE.

A. B. Choudhary**

Fluidized Bed Combustion a technique particularly applicable to the combustion of low grade fuels with high ash and sulphur contents, avoids slag formation which fouls the ordinary coal combustion hearths. It also reduces, if not eliminates, the quantity of sulphur in flue gases, which causes corrosion to the combustion and related equipment. In order to develop an economic combustion system, a Pilot Scale Fluidized Bed Combustor based on

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indigenous low grade coal for steam generation was designed. The combustor alongwith a heat recovery system was fabricated in the workshop of the PCSIR laboratories, Lahore and successfully operated on the indigenous coals of Gulakhel, Shahring, Khoast, and Degari areas. The combustor was subjected to a 72 hrs continuous test operation in which no manufacturing defect of the components was traceable. The theorectical bases of the design of the Fluidized Bed combustor were experimentally tested for their applicabilities.

For further improvement and scale up design, various parameters such as: the effects of (i) coal feed size and rate, (ii) different bed materials like Silica, Marble, Calcite (iii) air flow rate on the efficiency of the combustor and (iv) absorbents for removal of sulpher dioxide were investigated. It was established that:

a) Among dry absorbents used, calcite is the best one but no absorbent possesses the capability to retain all the sulpher even at the very outset of combustion.

b) Coal size plays a significant role not only in combustion but also in sulpher retention of the absorbent.

c) Quartz, being a good thermal shock resistant, can be used as a bed material.

d) Uniform air distribution through the plate is a corner stone for the success of the bed results in incomplete mixing, uneven bed temperature, and incomplete combustion of the coal.

e) Sight glass always breaks due to the Thermal Shock.

ENVIRONMENT

S-KU/Envr (21) 1982-83

POLLUTION DUE TO WASTE WATER EFFLUENTS FROM TEXTILE AND RAYON MILLS OF KARACHI

M. A. Salam*

Waste water samples from ten Textile and Rayon Mills of Landhi and Site Area, Karachi screened for the estimation of toxic metal ions by employing spectroscopic, atomic absorption and titration techniques, were found to contain a number of toxic metal ions including Copper, Zinc, Cadmium, Manganese, Nickle, Cobalt, Iron, Chromium, Lead, Sulphate and Sulphide. A comparison of their quantity in the water with the international standards has revealed that the quantity of these elements are above the maximum permissible fluent concentration for industrial wastes which definitely causes environmental pollution as well as various health hazards to aquatic and human life. Accordingly, the essential pre-treatment of the industrial chemicals must be ensured before allowing the waste to be mixed with river or sea water.

C-QU/Chem (138) 1983-84

ESTIMATION OF TRACE METAL CONTAMINANTS AND POLLUTION CONTROL PARAMETERS FOR LOCAL PUBLIC UTILITY WATERS

M. Jaffar**

A survey was carried out for the estimation of trace metal contaminants in local public utility water for which water samples form 125 publc utility supply sources within a radius of 50 miles from Islamabad were collected. Physiochemical parameters as well as trace metal contaminants of these samples were estimated with the help of standard analytical methods and atomic absorption spectrophotometric techniques. The measured physiochemical parameters included, temperature, pH, conductance, alkalinity, hardness, chemical oxygen demand, ozone, phosphate, nitrate, nitrite and total dissolved oxygen. The estimated trace elements were Sodium, Potassium, Copper, Iron, Zinc, Strontium, Nickel, Cobalt, Lead, Cadmium, Chromium, Barium, Antimony and Mercury. The data thus obtained was discussed in terms of feasibility of the tested waters for public utility within the frame-work of the internationally known tolerable levels.

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S-KU/Envr (24) 1984-87

HAZARDOUS EFFECTS OF INDUSTRIAL POLLUTION AND ENVIRONMENT DUE TO REFINERIES AND OIL-SPILLS

Akhlaq Ahmed*

A survey was undertaken to assess the hazards of pollution caused by the National Refinery; Pakistan Refinery and oil spills near Kemari Fish harbour, Karachi harbour, and Gadani Shipyard. From the survey and experimental data, it was observed that the refinery waste water contained higher concentration of Na, K,S, Cl, Cu and C.O.D. as the oil reaching coastal waters is subjected to a variety of physico-chemical changes which ultimately affects the chemistry of marine environment. The Zooplankton and Copepode population levels have reduced with the increase in oil concentration at Kemari beach.

For the control of oil pollution, chemical dispersion methods were suggested which involve breaking of oil-slicks into fine droplets that are then degraded. Generative and remedial measures for the treatment of refinery liquid streams were also suggested.

Studies were also conducted on solid wastes and gaseous effluents of the two refineries. Special methods for the removal of pollutants and toxic materials were than suggested including source reduction, resource recovery and treatment before ultimate disposal. Results were compared with those of other developed countries and in the light of this comparison, Minimum National Standards for oil refineries in terms of pollution parameters were suggested.

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MEDICINE

P-PMI/Med (90) 1984

URINARY EXCRETION OF CRYSTALLOIDS DURING FASTING IN THE MONTH OF RAMAZAN IN SUMMER SEASON

Farrukh A. Khan*

A study was carried out to investigate the biochemical profile of normal young males during fasting. Urine and serum samples of 20 volunteers were analysed to study the urinary crystalloid response during the month of Ramazan. Results showed that levels of stone forming elements, including calcium and uric acid, fall significantly in serum during Ramazan. The 24 hours urinary excretion of both calcium and uric acid decreased during Ramzan, although fall in the calcium excretion was not significant.

The unaltered urinary calcium excretion, decreased uric acid excretion, and high urine out-put with raised pH suggest that lithogenic potential decreases during the fasting in Ramzan.

P-PMI/Med (91) 1986-87

AN ETIOLOGICAL STUDY OF UROLITHIASIS IN D.G. KHAN, MUZAFFARGARH AND BAHAWALPUR

Farrukh A. Khan**

A survey was carried out in three cities of Punjab Province i.e, D.G. Khan, Muazffargarh and Bahawalpur, where incidence of Urolithiasis is very common. In addition to the data collected from the operation registers of 14 hospitals, urine and blood samples were also collected from patients at four hospitals one each in D.G. Khan, Muzaffargarh, Bahawalpur and Rahim Yar Khan. These samples were analysed at King Edward Medical College, Lahore.

The investigations have revealed following two important aspects of stone disease in comparison with previous studies conducted at Lahore.

i) The incidence and prevelance of bladder stone disease in children has fallen

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in the Northern Punjab, although it is still common in Southern Punjab.

ii) The serum and urinary variables show that calcium is not a risk factor in Northern or Southern Punjab. Serum and urinary uric acid is perhaps important in stone formation. The other variables (24 hours urinary volume, urinary pH, serum and urinary phosphate, urinary oxalate, serum and urinary creatinine, serum and urinary proteins and serum and urinary electrolytes) also showed a difference between Northern and Southern Punjab.

The significance of these findings need further verification as the dietary, environmental and other factors may be involved in these differences.

S-LMC/Med (71) 1982-85

ULTRA-SOUND IN OBSTETRICS AND GYNAECOLOGY

Qamar Shah*

The objective of the study was to estimate the gestational age of the fetus by Biparietal Diameter (B.P.O.) and to investigate the placental localization. A total number of 722 cases were studied continously till delivery and the base-line graph for B.P.D. was established. Subjects residing in Hyderabad City and adjoining Districts of Thatta, Nawabshah, Badin and Tharparker were examined and scanned after every four weeks. Results of these investigations indicated that no relationship existed between parity and age of mother to influence the Biparietal diameter. A comparison of results with cephalometric graphs of U.K. showed marked differences at the second trimester as the pregnancy advances and reaches term.

P-GRH/Med (87) 1983-84

COMPARATIVE STUDY OF ASPIRATION CYTOLOGY AND TRU-CUT NEEDLE BIOPSY IN THE DIAGNOSTIC EVALUATION OF BREAST MASSES

Khalida Usmani**

The purpose of the study was to evaluate the efficacy of the needle biopsy and to find out the diagnostic field of Tru- Cut cytology in breast lumps. Out of a total of 100 subjects, fine needle aspiration biopsy was performed in 61 cases while Tru-Cut biopsy was done in 70 cases. Efficiency of fine needle-biopsy was found to be 67.2% and that of trucut biopsy was 90%. Sensitivity of aspiration biopsy was 71.4%.

The procedure of fine needle aspiration biopsy was found to be cheap, simple, and easy to perform. Another advantage of these procedures is that no hospitalization of patients is required and biopsy can be performed as an out door procedure. The chances of missing an intracystic carcinoma by needle biopsy are rare and even that can be eliminated by cytological examination of the aspirated fluid.

* Liaquat Medical College & Hospital, Jamshoro, Hyderabad.

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S-DMC/Med (103) 1985-87

EARLY DETECTION OF CANCER CERVIX USING COLPOMICROSCOPE AND COMPARING WITH OTHER METHODS

Noor Jehan Samad*

A study was conducted in the Gynaecology Department, Civil Hospital, Karachi to screen women for the detection of cervix carcinoma in its early stages. A total of 1903 patients were screened by studing their cervical smears for exfoliate cytology. The smears were then classified as (i) Normal cells (ii) Inflammatory cells (iii) Mild Dysplasia (iv) Moderate Dysplasia, and (v) Severe Dysplasia.

On the presence of abnormal vascular pattern and appearance of white areas by applying 3% acetic acid, colposcopy was found to be a significant test for the detection of cancer. Patients with significant colposcopy had biopsies taken and then analysed by a pathologist and on confirmation of diagnosis relevant treatment was carried out.

P-PMI/Med (104) 1985-86

MATERNAL SERUM ALPHA FETOPROTEIN LEVEL IN SECOND TRIMESTER OF PREGNANCY & ITS CORRELATION WITH PRENATAL DIAGNOSIS OF IMPENDING FETAL DEATH AND OPEN NEURAL TUBE DEFECTS.

Shahnaz Javed Khan**

A study was undertaken to estimate maternal Serum Alpha Fetoprotein (AFP) levels in pregnent women for screening of Congenital malformation as it has been established earlier that there is an increase in AFP level in the amniotic fluid of fetus having neural tube defects.

A total number of 161 subjects were screened out of which 20 subjects could not be followed up. 40 subjects (20 pregnant and 20 non-pregnants) were kept as control. Among 104 experimental subjects, 49 had normal deliveries, 49 aborted., 2 had neural tube defects and 4 were with molar pregnancies. Estimation of the maternal serum clearly showed that the AFP levels of control group, and that of 49 subjects of the experimental group with normal deliveries, ranged between 15 to 30 ng/ml. Among 49 subjects whose pregnancy ended in abortion, the range of maternal serum AFP level was very high i.e 15.3 -

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229.5ng/ml. Of the two subjects with fetuses having open neural tube, one had AFP level of 102 ng/ml and the other 207.4/ng/ml, showing spina-bifidia and anencephaly in their fetuses respectively. In molar pregnancy, AFP levels were subnormal ranging from 3.4ng/ml to 6.8 ng/ml.

The findings of the study clearly indicate that maternal serum AFP levels in the 2nd trimester of pregnancy can be used as an effective screening test for neural tube disorders of fetuses and molar pregnancies.

C-PC/Med (36) 1977-79

FREQUENCY AND NATURAL HISTORY OF RHEUMATIC FEVER IN ISLAMABAD

S. M. Malik*

A survey of 31-schools of Islamabad was carried out to find out the incidence of rheumatic/congenital heart diseases in school-going children between the age of 5-15 years. A total number of 15,100 children belonging to various socio- economic groups were examined. Out of these, 172 children suffering from heart disease were referred to the Polyclinic Hospital, Islamabad, where different physiological tests like X-ray Chest, E.C.G., Throat Swab Culture, ASO titre, Hemoglobin Percentage, and E.S.R. estimation were carried out. The results showed that 76 children had definite heart disease giving an over all rate of 4.77 per thousand. Of these, 26 had rheumatic heart disease (1.2 per thousand and 50 had congnital heart disease (3.25 per thousand).

In conclusion, it was found that contrary to some earlier studies carried out in India and other Western Countries, rheumatic fever is fairly common and the incidence and severity of carditis alongwith its complications is quite high in this region.

F-KMC/Med (50) 1981-82

PREVALENCE AND PREVENTION OF TUBERCULOSIS IN CHILDREN

Faiz Mohammad Khan**

A survey of pre-school and school going children as well as those attending the in and out-patient ward of paediatrics Department, Khyber Hospital, Peshawar, was carried out to study the prevalence of tuberculosis in children and infants and to evaluate the value of B.C.G. Vaccination. A total number of 4562 cases were studied. The results achieved were concluded as under:-

i) The disease is not that much uncommon in the infants and children as is commonly understood.

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** Khyber Medical College, Peshawar.

ii) The B.C.G. Vaccination as a screening test is far more reliable than the old tuberculin test. So the tuberculin test should only be used to determine the efficiency of previous B.C.G. vaccination.

iii) In cases with previous scars, the B.C.G. test can give false positive test.

iv) The B.C.G. vaccination becomes ineffective after a minimum duration of one year as is shown by the negative tuberculin test and a strongly positive montoux test.

v) A combination of Streptomycin, Ethombutal and INH is as much effective as that of Rifamicine, INH and Ethambu- tal. The later is, however, much more expensive than the former combination.

P-KEMC/Med (57) 1981-83

EPIDEMIOLOGICAL STUDY OF THE ORBITAL TUMOURS

Mohammad Munir-ul-Haq*

A study of orbital tumours cases referred to the Mayo Hospital, Lahore, during past 21 years, was undertaken in order to link early diagnosis with early treatment for saving the sight, miseries and even life of the patient. A total of 1200 cases of orbital tumours were registered and 368 cured during the years 1962-1983. Out of these, tumours of orbital origin were 250 while those of extra-orbital origin reached upto 118. The extra orbital tumours were of three main types, viz; (a) From adjacent structures (e.g. lids and paranasal sinuses) and then involving the orbit, (b) From distant organs to Metastasise of the orbit, (c) Systemic diseases with impact as tumour in the orbit. The study has led to the following conclusions:-

i) Malignant tumours are more common in North-Western areas of Pakistan.

ii) Among pigment tissue tumours, Malignant Melanoma is less common than benign Melanoma and its occurance is independent of age groups.

iii) There is no link in the family history and occurance of orbital tumours. The treatment of retino biastona results in an increase of only 3-4 years in life. As the young patients die at a maximum age of 12 years so the question of inheritance does not arise.

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iv) Tumours in children are mostly fatal.

v) When tumours matastasise in the orbit, no treatment, even the chemotherapy or radiotherapy, is helpful.

vi) The tumour of the Reticulo Endothelial System (RES) may appear in the orbit without any evidence in the body. They occur at the age of 2-10 years only.

C-NIH/Med (69) 1981-83

STUDY OF VIRAL RESPIRATORY DISEASES IN CHILDREN IN RAWALPINDI/ ISLAMABAD AREA.

Abdul Ghafoor*

A study was carried out in Islamabad/Rawalpindi area to isolate and identify various viral organisms that are associated with respiratory diseases in children. About 3000 childrens were screened. In children under one year of age, respiratory syncytical virus was found to be the most prevelent viral respiratory agent (63.64%) while only 12 isolations (36.35%) were positive for this virus in age group of 1 to 5 years. Of bacterial agent, 250 specimens were found positive for B-haemolytic streptococci.

Different bacterial agents were tested for their sensitivity to various antibiotics and Erythromycin, Cloxallin, Cephalotin, Septran and Vibromycin were found to be highly effective antibiotics as none of the specimens was found resistant against these drug. On the other hand, higher incidence of drug resistance was observed against Streptomycin (41.672) and Tetracyclines (29.41%) in viral organisms. Influenza virus strain A/Bangkog/2/79 H_3N_2 was isolated for the first time in Pakistan which was later published in the report of WHO.

C-QU/Med (88) 1984-85

USE OF CARCINO EMERYONIC ANTIGEN FOR CANCER DIAGNOSIS

M. Arslan**

Studies were carried out to isolate Carcino Embryonic Antigen (CEA) in a relatively pure form, from a number of malignant tissues. Serum samples from 88 cancer patients and

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23 normal subjects were analysed for CEA activity. Highest level of CEA was obtained in the sera of patients with colorectal cancer (44.65 - 21.13 ng/ml Vs 3.8 + 2.34 ng/ml). The analysis of serum samples of patients suffering from 13 different types of cancers, provided the information that colorectal cancer, lung cancer, and oesophageal cancer, all of which have endothelial origin, do secrete large quantitites of CEA. Furthermore, the data clearly showed that measurement of serum levels of CEA can be used as an effective index for the diagnosis of these types of cancer.

Analysis of the CEA content of malignant tissues indicated that CEA is synthesized in substantial quantities by the colorectal tissues (upto 21 mg/g tissues), followed by tongue, mandible, hip and chest sarcomas. However, no comparison of these data could be made with those of the corresponding normal tissues.

C-NIH/Med (110) 1986-88

MOTHER INFANT TRANSMISSION OF HEPATITIS-B VIRUS IN PAKISTAN

Abdul Ghafoor*

The study was undertaken to determine the prevalance of hepatitis B Virus in women of child bearing age and the rate of transmission of HBV from carrier mothers to their infants.

A total of 6,225 expectant mothers were sceeened for HGsAg out of which 4% were found positive for HBsAg. 150 such mother/infant pairs were studied and the delivered infants had complete follow up right from birth uptill 18 months of age. The results were compared with the 150 mother/infant control pairs and following conclusions were drawn:-

i) Transplacental transmission of HBV is one of the causes of Hepatitis B in infants. About 4% children born to HGsAg and HBs Ag mothers carry the virus and develop the disease.

ii) Infants born to HGeAg positive mothers are at a great risk of acquiring hepatitis B. Such children must get vaccination as early as possible.

iii) Passively transmitted anti-HBe in infants confers protection until the immune system of the infants start producing antibodies against (6-12 months) hepatitis B.

* National Institute of Health, Islamabad.

iv) Hepatitis B in children under 5 years of age appears to be associated in cases found positive HBsAg with liver disease, either of the parents were found positive for HBeAg and HBsAg. As children are more close to mothers, the risk of infection increases if the mother is HBeAg positive. Such children may be protected by immunization against hepatitis B.

P-PMI/Med (109) 1987

SODIUM TRANSPORT IN ERYTHROCYTES OF PATIENTS WITH TREATED AND UNTREATED ESSENTIAL HYPERTENSION.

Shahnaz Javed Khan*

Hypertension is known to result from a combination of genetic and environmental factors. The project was undertaken to find out if the sodium and potassium co- transport activity is defective in the erythrocytes cell membrane and if it can be a useful genetic marker for susceptibility to essential hypertension.

The study was conducted in two parts, i.e. (a) measuring of net sodium and potassium fluxes after sodium leading of the erythrocytes and (b) sodium-potassium cotransport and the effect of medication on the sodium efflux. Subjects included in the study were catagerised into three groups namely; i) Hypertensive group without any medical treatment ii) Hypertensive group including patients who have received some medication and iii) Normotensive group including individuals with positive family history of Hypertension. All the parameters studied for the experiemental groups were compared with control group which included normotensive individuals without a family history of hypertension. From the experiments carried out, the following conclusions were drawn:-

i) There is a decreased sodium - potassium co-transport activity in untreated essential hypertensive patients which becomes normal when the hypertension is controlled by medication. However, it could not be confirmed whether this abnormality in hypertension is involved in its pathogeneisis or not.

ii) The defective sodium-potasium co transport was not found in normatensive offsprings of hypertensive parents showing that genetic factors may be important but are not exclusive determinents of the sodium-potassium cotransport.

iii) The sodium-potassium flux ratio is decreased in untreated essential hypertension and remain so, although to a lesser degree, even after the

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hypertension has been controlled by medication for at least one month. This shows that the cellular defect in sodium/potassium flux ratio requires longer duration for correction.

S-JPMC/Med (114) 1987-88

ACQUIRED IMMUNE DEFICIENCY SYNDROME; SEROEPIDEMIOLOGY AND SURVEILLANCE

Amtul Hafeez*

AIDS, the global epidemic disease characterized by severe Immune deficiency state has been reported from 140 countries since 1981 and the number of people infected with Human Immune Deficiency Virus (HIV) is more than ten million. A seroepidemiological study was conducrted to find out indications of HIV infection, if any, in Pakistan. 413 representative individuals from various high risk group viz: professional blood donors, ricipients of multiple blood transfusion, clinical cases, drug addicts, Haemophiliccs, foreigners/pakistanis settled abroad, individuals showing suspected promiscuous behaviour, and the family members/ contacts of these individuals were screened for HIV anti-bodies from Feb., 1987 to Aug., 1988.

Out of these, four cases were found positive for the HIV antibodies by employing ELISA technique., and three were confirmed by Western Blot Method as well. Two individuals were foreign nationals visiting Pakistan, one of whom died of full blown AIDS. The third case was a Pakistani who prsented full blown AIDS with toxoplasmosis and is the first case reported in a Pakistani national. Fourth case was an asymptomatic promiscuous lady who could not be traced further. It was found that blood transfusions abroad and sexual contacts were responsible for HIV infection in these cases.

In conclusion, the study clearly showed that although most of the cases of AIDS recognised in Pakistan are imported by people coming from abroad, some individuals might have acquired the infection by contact with these individuals. Cases of frank AIDS emphasize the need to promulgate a national policy for the clinical management of patients with AIDS and AIDs related diseases. Otherwise these cases will be responsible for spreading the disease all over the country.

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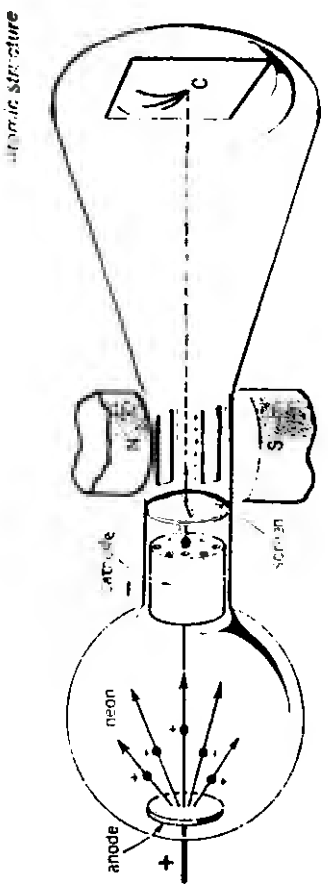
PHYSICS



S-KU/Phys (41) 1985-86

STUDIES ON TRANSPORT PROPERTIES OF SOLIDS, PARTICULARLY II-IV COMPOUNDS

S. M. A. Tirmizi*

Semiconductors have a wide range of application including electroluminiscent and LED devices, and solar energy devices. Some transport properties of semiconductors were investigated in the research project. For which, Compounds of II-IV groups were selected for systematics' studies.

Electrical resistivity of MoS_2 were measured at room temperature and upto 200C. I-V characteristics curves were plotted to check ohmic/non-ohmic contacts. The results thus obtained are reasonably reproducible and show that electrical conductivity increases with the increasing temperature which is in agreement with the general behaviour of semiconductors.

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P-PU/Maths (8) 1976-79

INCLUSIVE REACTIONS

M. Saleem*

Theoretical models and the experimental techniques for inclusive reactions and their underlying dynamics were studied with speical emphasis on the reaction p + p - p + x and P + d - d + x. The variation of single particle distribution with S and variation of distribution with q and r for fixed s were studied. In order to consider fundamental questions which might be relevent to the overall picture of the new high energy results, the following points were noted:-

a) The-dependence of the diffractive component in exclusive reactions, in particular, the energy dependence of the production cross section for isobar states.

b) The mass dependence of the inclusive diffractive cross- section for large or reduced masses.

c) The resonance composition of final states. In particular do invariate mass distributions reach a limiting behaviour with increasing as inclusive spectra in the fragmentation region do.

d) The slop-mass correlation and shrinking phenomena as possible universal properties of diffraction.

e) The relevance of impact-parameter models in describing structures in the differential cross-sections and the mass dependance of the helicityflip amplitudes.

f) The dynamical connections between single and double diffraction. In particular, is factorization adequate to describe the behaviour of differential cross- section.

On the basis of work done on the above aspects, theoritical modles for inclusive reactions were proposed.

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P-PU/Phy (11/1) 1979-82

HIGH ENERGY PHENOMENOLOGY

Mohammad Saleem*

The project was undertaken to investigate the nature of elementary particles at high energy as it was considered that study of hadronic reactions at high energies can give an insight into the nature of these particles. Different models with appropriate modifications were used to explain the freshly available data concerning particle-particle and particle-nucleus interaction. Efforts were also made to solve the problems involving angular distribution, polarizations and density matrix elements for two body exclusive reactions. For this purpose extensive studies were carried out on the following:-

- Simple Ragge Pole Model for hypercharge exchange reaction i.e. up -- K + its reversed raction K-P -- + and -- nn.
- Dual abroptive model and np elastic scattering at high and ultra high energies.
- Dipole pomeron and Neutron-proton elastic scattering between 70 and 400 GeV/C.
- Study of the Fermilab data for reaction p -- nn at high energies.
- Study of the reaction Kn -- n and K P -- n^o.
- Proton-proton elastic scattering at ultra high energies.
- Study of the reaction PP -- nn.

The results of these investigations might be a useful addition to the existing knowledge regarding the nature of elementary particles.

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C-QU/Phy(20)1978-80

TO STUDY VARIOUS INTERACTIONS IN ELEMENTARY PARTICLE PHYSICS IN PARTICULAR WEAK AND ELECTROMAGNETIC INTERACTION

Fayyazuddin*

The elementary particles with the exception of proton and electron are unstable and decay via weak interaction which is a low energy phenomenon. Studies were undertaken on different aspects of weak and electromagnatic interactions as well as the high energy interaction. The work done is summarized below:-

i) Guage model was studied to elucidate the possibility of unification of the fundamental interactions in nature. The colour guage groups SU (3) was extended to chiral colour guage group SU (3) X SU (3) presenting a better understanding of quark confinement in a hardon. The experimental consequences of these results have shown that at presently available energies, it yields results that are similar to the famous Salam-Glashov-Weinberg model for the weak and electromagnetic interactions. Similarly work was also carried out on a model for electro weak interactions based on left right symmetry guage group U (2) X U (2), so as to find out an electro weak guage group to fix the parameter $Sin^2 O_w$ which was set free in the Salam - Weinberg model.

ii) For the detailed study of mass spectrum of Charmonium, two newly discovered particles J* and Schrodinger equation was solved by taking an oscillator type of potential as the confining potential and adding to it the pretubative effects of Fermi-Briet potential. The mass spectrum thus obtained was found qualitatively in agreement with the experimental ohservations.

iii) Work was also carried out on dipole saum rule to distinguish between various potential models for Charmonium states by testing the three potential as the confining potential i.e., Linear, Oscillator, and Logrithmic ones. Results indicated that only the oscillator potential is the confining potential.

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P-PU/Phy(31) 1982-84

DIELECTRIC PROPERTIES OF BUILDING MATERIALS AND ROCKS

M. A. Shah*

Dielectric properties of the insulative materials and the change in the conductivity at variable frequency range were studied. Specimen holders and dielectric measuring cells for liquid, solid and powder samples were designed and fabricated locally. They were then used to measure the dielectric constant of building materials, bricks and cement in high frequency region. Measurements have also been made on water loaded samples to assess the degree of C & C and the state of water molecules when absorbed in these materials. Water loaded materials (under- treated as a composite material of bricks, water, and air) showed that absorbed water molecules are almost free to take part in dielectric polarization, which means that they are not chemically bound with the materials. In case of cement, water is chemically bound and can be driven out by heat or pumping from the hardened cement paste. This water does not contribute to the total polarization of the materials.

The experiments have shown that the dielectric constant of almost all the building materials in the range of 3-7 Moisture, has a marked influence on the electric properties of these materials. These results are quite significant as all the communication is done at high frequencies and the attention of the signal is dependent on the complex dielectric constant of the material through which they pass.

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P-PU/Phys (29)

MATERIAL STUDIES BY AUGAR AND PHOTO-EMISSION SPECTROSCOPY

M. Suleman*

The secondary electron emission yield, was measured for polycrystalline Mo and W samples, at normal incidence by using primary energies of 100 eV to 1500 eV in a contamination free ultra high vacuum system with working pressure maintained below 2x10-9 torr. The sample cleaning was carried out by heating and flashing in order to achieve reproducable results. The accuracy in yield is achieved by measuring it in an obsorbtive mode instead of the more frequently used emissive mode. From these yield measurements, escape depth of secondary electrons was found to be 9.8 and 10.2 A for Molybdenum and Tungsten respectively. These results were found to be good and in agreement with the available experimental data.

C-QU/Phys (44)

DEEP LEVEL TRANSIENT SPECTROSCOPY ON SEMI-CONDUCTOR MATERIALS

M. Zafar Iqbal**

The standard technique of Deep Level Transient Spectroscopy (DLTS) was established and successfully installed for studying the deep levels in crystelline semi-conductors, caused by impurities and defects created inadvertently or resulting from delebrate doping of silicon with known impurities. Study of various types of Light Emitting diesds (LEDs) have shown the presence of several electron-emitting and hole-emitting levels. Data regarding thermal emitting rates for these levels and their field dependency was obtained and compared with previously published data. By applying the results to theoretical models, important conclusions regarding the origin and microscopic structure of these levels were drawn and detail characterization accomplished. Sufficient expertise for the (DLTS) has been developed so that, deep level spectroscopy can be performed on any semi-conductor junction for complete characterization.

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