



ANNUAL REPORT

PAKISTAN SCIENCE FOUNDATION



PAKISTAN SCIENCE FOUNDATION

**ANNUAL REPORT
1995-96**

**PAKISTAN SCIENCE FOUNDATION
CONSTITUTION AVENUE
ISLAMABAD**

PAKISTAN SCIENCE FOUNDATION

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Dr. Khalid Mahmood Khan (Since 7th January, 1996)

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(Till 13th December 1995)

Dr. Khalid Mahmood Khan
(Since 7th January 1996)

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(Till 17th December 1995)

Mr. Faris Rehman Khan
(Since 18th December 1995)

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(Till 13th December, 1995)

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(Since 7th January, 1996)

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15. Prof. Dr. Atta-ur-Rehman, Director, H.E.J. Research Institute of Chemistry, University of Karachi, Karachi.
16. Dr. G.M. Khattak, Ex-Vice Chancellor, NWFP Agricultural University, Peshawar.
17. Engr. A. Karim Khan, Vice Chancellor, NWFP University of Engineering and Technology, Peshawar.
18. Dr. Ghulam Sarwar Garani, Principal, Bolan Medical College, Quetta.
19. Mr. Aezaz Hussain, Managing Director, Systems (Pvt.) Limited and Member Pakistan Federation of Chamber of Commerce, Lahore.

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LIST OF ABBREVIATIONS

Provinces

AJK	Azad Jammu and Kashmir
B	Balochistan
C	Centre
F	Frontier
P	Punjab
S	Sindh

Sponsoring Institutions

AKU	The Aga Khan University
AU	Agricultural University
AEARC	Atomic Energy Agricultural Research Center
BU	Balochistan University
BZU	Bahauddin Zakaria University
CEME	College of Electrical and Mechanical Engineering, Rawalpindi
CSIR	Council of Scientific and Industrial Research
DRIP	Drainage and Reclamation Institute of Pakistan
EU	Engineering University
GC	Government College, Lahore
GU	Gomal University
KU	Karachi University
KMC	Khyber Medical College
IIBC	International Institute of Biological Control
NCEAC	National Centre of Excellence in Analytical Chemistry
NIBGE	National Institute for Biotechnology and Genetic Engineering
NIAB	Nuclear Institute for Agriculture and Biology
NSFC	National Science Foundation of China
PDC	Poultry Development Centre
PINSTECH	Pakistan Institute of Nuclear Science and Technology
PU	Peshawar University/Punjab University
QU	Quaid-e-Azam University
SU	Sindh University
PCCC	Pakistan Central Cotton Committee
UCR	University College of Rawalakot

Disciplines

Agr	Agricultural Sciences
Bio	Biological Sciences
Eng	Engineering Sciences
Med	Medical Sciences
Phys	Physical Sciences
Chem	Chemical Sciences
Math	Mathematical Sciences
Earth	Earth Sciences
Envr	Environmental Sciences

EXECUTIVE SUMMARY

PAKISTAN SCIENCE FOUNDATION (PSF)

Pakistan Science Foundation is the apex body for promotion and funding of scientific and technological activities in the country. The activities undertaken by the Foundation for the performance of its statutory functions are divided into three broad categories:

- i) To promote basic and fundamental research in universities and research institutes on scientific problems related to socio-economic needs/development of the country.
- ii) To increase public awareness about science through science promotion activities by establishing museum, clubs, herbaria and planetaria etc.
- iii) To establish centers for comprehensive scientific and technological information systems.

The activities of the Foundation revolve around these objectives, some of which are undertaken through Pakistan Museum of Natural History (PMNH) and Pakistan Scientific and Technological Information Centre (PASTIC), the two subsidiary organizations of PSF, while others are performed by the PSF Science Wing, and are reflected in the following.

RESEARCH SUPPORT:

Research support is the principal program of the Foundation for the promotion of basic and fundamental research relevant to the socio-economic needs of the country. During 1995-96, a total 229 projects in the fields of Agriculture, Biology, Chemistry, Earth, Engineering, Environment, Medical and Physics remained under consideration for funding. Among these 119 projects were newly received while 110 had been carried over from the previous year. Among these 24 projects costing Rs. 8.651 million were sanctioned in various fields. In addition, an amount of Rs 0.920 million was released to five academic organizations as institutional support grant for purchase of laboratory equipment and accessories, and books.

Monitoring and evaluation of the on-going research projects sponsored by PSF is an important function of the Research Support Programme. During the year, 71 technical reports of ongoing studies including semi-annual and annual reports were received and assessed by the staff and experts. During the period under report, 12 studies/projects in various fields were completed. The final reports of these projects were reviewed the PSF and experts. The studies completed during the year were:

1. Development of Short Statured Varieties of Basmati Rice.
2. Effect of Various Doses of Potash with and without Boron on the Yield and Quality of Sugarbeet in Peshawar.
3. Studies of Adaptability Patterns for Short Duration Wheat under Environmental Dynamics
4. Production of Medicinally Important Metabolites by Rauwolfia Cell Cultures.

5. Studies on Mass Production of Biocontrol Agents for Application and Plant Disease Control.
6. Combined Effect of VAM-Fungi and Rhizobium for Increasing Growth and Yield of Soybean.
7. Improvement of Salt Tolerance in Sunflower (*Helianthus annuus* L.) by Selection and Breeding.
8. Studies of Hereditary Disorders in Pakistani Human Kindred.
9. Weak Interactions in a Medium and their Implications in Astrophysics/Cosmology
10. Synthesis, Spectroscopic Studies and Biological Activity of Novel Heterocyclic Compounds Having Five or Seven Member Ring System.
11. Selected Air Pollutant Monitoring and Correlation Study for Evaluation of Air Quality of Rawalpindi/Islamabad.
12. Determination of Lead Contaminants in Drinking Water of Peshawar

One of the main achievements and usefulness of any research is the publication of results in scientific journals, and through the above 12 projects, 36 research papers were published in different scientific journals. In addition, three Ph D and three M Phil degrees were awarded to the Research Associates employed in the PSF-supported projects.

Scientific research was further supported by giving annual grants-in-aid to various societies for publication of technical journals. During the year a total of Rs. 0.730 million were released for the purpose. Furthermore, four scientists were given travel grants to participate in international conferences abroad.

Under the MoU with Royal Society, UK, three Pakistani scientists visited UK during the year. Under the MoU with National Natural Science Foundation of China, five collaborative research projects are currently being implemented.

SCIENCE POPULARIZATION:

Popularization and promotion of science has been emphasized in the National Science and Technology Policy. In order to achieve this objective, Pakistan Science Foundation has taken up a number of programmes to popularize and promote science in the society and particularly among the students of rural areas. During the report period the activities carried out are summarized below

The Science Caravans (Mobile Exhibitions) of Pakistan Science Foundation are the main mode of science popularization at school level particularly in rural areas of the country. During the year, the Units for NWFP, Sindh and Federal areas continued their activities to organize science exhibitions in schools within their jurisdictions. The Science Caravan Unit for Balochistan was also made operational for arranging science exhibitions, planetarium & Science film shows in the schools of

Balochistan province. The Unit participated in the Sibi Mela during March 9-14, 1996. a large number people witnessed the exhibition.

Financial Assistance amounting to Rs. 0.587 million was provided to various universities and R&D institutions for organizing conferences, seminars, symposia and workshops etc. Similarly, assistance of Rs. 0.197 million was provided to schools and colleges to organize All Pakistan School/College Inter Board Science Exhibition Contest and Science Quiz Competition. Cash prizes were awarded by the Foundation to the winner students. Also, an amount of Rs. 0.030 million was provided to the Board of Intermediate & Secondary Education, Faisalabad for organizing the Summer School 1995 with the aim to acquaint the students with the role of basic and fundamental science in national development.

On the eve of Asia-Pacific Solar Experts meeting on "Renewable Energies for Development, Culture and Environment" (18-21 December 1996), an exhibition of Solar Energy Appliances/Equipment was organized by the Foundation to create awareness about the state of solar technology and availability of solar appliances in Pakistan. Similarly, on the eve of 7th COMSTECH Meeting held at Islamabad (26-28 December, 1996), the Foundation organized the Science & Technology Expo-95 to highlight the achievements of Science & Technology Organizations in their respective areas of specialization.

During the year, 120 Science Films/Planetarium Shows were arranged in various schools of the country. Some 3600 science students alongwith their teachers viewed these shows. Popular magazine "Science Digest" was purchased for distribution, free of cost, to 800 High Schools on the mailing list of the Foundation for their students.

Science Bulletin of the Foundation for the year 1995-96 was published and distributed free of cost to various schools, colleges and R&D organizations throughout the country.

An amount of Rs. 40,500/- was provided to the National Nematological Research Centre (NNRC), University of Karachi for publishing a monograph entitled "Cyst Nematodes of Pakistan". The monograph has been distributed free of cost to more than 350 relevant national/international institutions/scientists.

The 9th Set of Science Posters was distributed to more than 7000 High Schools throughout the country and to various R&D institutions. The 10th set of Science Posters (1996) was prepared and sent for printing.

The 8th Inter Board Science Posters Contest was completed and a total amount of Rs. 0.026 million was distributed to the prize winning students through their respective Boards.

The 7th Intra Board Science Essay Competition was successfully completed and the prize money amounting to Rs. 0.033 million was awarded to the winning students through their respective Boards.

Science Clubs Programme for schools has been designed to provide information about basic scientific concepts and help to develop technical skills among students. The projects for 1996-97 were identified and prepared, and the manuscript sent for publication.

PAKISTAN MUSEUM OF NATURAL HISTORY (PMNH)

Pakistan Museum of Natural History (PMNH) is an important scientific organization carrying out environmental and biodiversity research in the country as well as promoting informal education and public awareness about our natural wealth. It is a subsidiary organization of Pakistan Science Foundation and was established in 1979 to serve the national needs in the vitally important areas of research, conservation and education involving Pakistan's heritage of natural resources. The Museum is a national repository for permanent storage of plants, animals, rocks, minerals and fossils of the country.

PMNH continued with its research and public education programmes effectively during the year under review. A total of 18 field trips were undertaken to various parts of Pakistan in order to collect fauna, flora and other natural history specimens. About 3000 specimens were collected and brought to the Museum for research and curation. At the same time preservation, curation and further research on the thousands of specimens already collected also continued. As many as 7145 specimens were processed in the form of curation, complete identification and cataloguing etc. Based on similar research carried out during the last year, 31 research papers were published or are in press/accepted for publication in scientific journals, both local and foreign.

Another significant event was the holding of two International Symposia on: "The Himalayan Suture Zone of Pakistan" and "Biodiversity of Pakistan" during the year. Many foreign as well as local scientists took part in these symposia. The Proceedings of both the symposia are being published in the form of books.

Extension work and other services were rendered to many other organizations during this year. However the most outstanding feature of extension service was the recording of 26 TV programmes about various aspects of environment, pollution and conservation. Many of PMNH scientists contributed significantly in the production of these programmes.

The Public Display and Education Programme of PMNH also continued quite successfully. Almost 100,000 persons visited the Display Center and Display Corner of the Museum during the year. In addition, services were rendered to many organizations, including NIST, COMSTECH, and Ministry of Science & Technology in terms of preparation and execution of their Conferences/Symposia/Expositions.

PAKISTAN SCIENTIFIC AND TECHNOLOGICAL INFORMATION CENTRE (PASTIC)

PASTIC is one of the Organs of PSF established to undertake the establishment of comprehensive scientific and technological information and dissemination centres. Its main objective is to collect, organize, classify and disseminate information in all disciplines of Science and Technology to the scientific community of Pakistan.

With its National Centre at Islamabad and four sub-centres at Karachi, Lahore, Quetta and Peshawar, PASTIC develops inter-library cooperation for sharing resources, establishes and maintains links with international/regional information networks/agencies. It trains information specialists in modern information handling and management techniques.

During the report period, 1771 requests for supply of articles were received out of which 1401 were honored, and 341 bibliographies and 12669 references were also prepared/compiled and supplied to clients. Pakistan Science Abstracts (8 issues) were published or prepared for publication on the basis of recent research articles appearing in various Pakistani journals of Science & Technology. Similarly, on the basis of information on technologies collected from 27 countries, 14 issues of "Technology Information" were published during the year.

The usual activities under CEHANET, INFOTERRA and ASTINFO Programmes continued including provision of environmental information, IDAMS & CDS/ISIS software packages and distribution of publication of these networks. Training on CDS/ISIS Package was imparted in Muzaffarabad, HURIDOCs, Islamabad and Aga Khan Rural Support Programme, Gilgit. The Director, PASTIC attended the 10th ASTINFO consultative meeting from 22-27 September 1996 in Beijing, China, and 3rd Meeting of the Governing Board of SAARC Documentation Centre from 7-8 March, 1996 in Maldives. The first Meeting of the SDC-NFP-Cell Coordinators was attended by the Cell Coordinator (Miss Nageen Ainuddin) from 21-22 May, 1996 in Kathmandu, Nepal.

PASTIC Library added to its collection some 112 books, 921 periodical issues and 177 documents during the year. Contents of 96 biological journals and photocopies of 49 articles were supplied to 512 scientists in the country. Various databases on CD-ROM were purchased/updated as well. PASTIC Reprographic Unit undertook 102 printing jobs including composing for 18 organizations.

Technological Information Promotion System (TIPS) based at PASTIC has been regularly publishing weekly bulletins on trade opportunities in Pakistan. It covers 14 different sectors and has the largest database in the world on trade/technology information from the developing countries. These sectors are: Agro-Industries, Energy, Electronics, Pharmaceuticals, Business Opportunities, Food Processing, Machinery, Biotechnology, Textiles, Fisheries, Building Materials, Chemicals, Mining and Packaging

During 1995-96, 2050 technology/trade offers and requests came from 25 countries and were sent to 175 users in Pakistan. Pakistani entrepreneurs/business organizations submitted information on 950 products/processes/technologies which were advertised abroad through TIPS network. TIPS third book on trade and technology information in Urdu language is under process.

PSF and TIPS arranged a Computer Exhibition at Al-Hamra Art Council, Lahore from 9-11 May, 1996.

INTRODUCTION

Pakistan Science Foundation was established on June 30, 1973 under the Pakistan Science Foundation Act No. III as an autonomous body to promote and finance scientific and technological activities having a bearing on the socio-economic needs of the country. Under the Act, the Foundation has been entrusted to carry out the following functions.-

- i) establishment of comprehensive scientific and technological information and dissemination centers.
- ii) promotion of basic and fundamental research in universities and other institutions on scientific problems relevant to the socio-economic development of the country.
- iii) utilization of the results of scientific and technological research including pilot plant studies to prove the technical and economic feasibility of processes found to be promising on a laboratory scale.
- iv) establishment of science centers, clubs, museums, herbaria and planetaria;
- v) promotion of scientific societies, associations and academies engaged in spreading the cause of scientific knowledge in general or in the pursuit of a specific scientific discipline or technology in particular;
- vi) organisation of periodical science conferences, symposia and seminars;
- vii) exchange of visits of scientists and technologists with other countries;
- viii) grant of awards, prizes and fellowships to individuals engaged in developing processes, products and inventions of consequence to the economy of the country; and
- ix) special scientific surveys not undertaken by any other organizations and collection of scientific statistics related to the scientific efforts of the country.

The Foundation shall also:-

- i) review the progress of scientific research sponsored by it and evaluate the results of such research;
- ii) maintain a National Register of highly qualified and talented scientists/engineers and doctors both in and outside Pakistan, and to assist them in collaboration with concerned agencies to seek appropriate employment; and
- iii) establish liaison with similar bodies in other countries.

The activities performed under the above mentioned statutory functions are given in the chapters that follow.

CHAPTER - 1

ACTIVITIES & PROGRAMMES

The Activities and Programmes undertaken by the Foundation for the performance of its statutory functions can be broadly divided into the following four categories.

- i. Establishment of Comprehensive Scientific and Technological Information and Dissemination Centers.
- ii. Promotion and Financing of Scientific Research in the Country and the Utilization of the Research Results.
- iii. Promotion and Popularization of Science in Society.
- iv. International Liaison

The first activity is carried out through Pakistan Scientific and Technological Information Centre (PASTIC), a subsidiary organisation of PSF. The other functions i.e., research support, science popularization etc. are performed by the Science Wing of the Foundation. Functions of the Science Wing of PSF are further subdivided as under:-

(I) Research Support Sections performing the following activities.

1. Research Support
 - a) Grants for Research Projects
 - b) Institutional Support
2. Research Evaluation
3. Promotion of Scientific Societies/Learned Bodies
4. Travel Grants
5. International Liaison
6. Awards and Fellowships
7. Survey and Statistics
8. Scientists Pool
9. Planning and Development Programme

(II) Science Popularization Section, which carries out the following activities:

1. Funding for Conferences, Symposia, Seminars, Workshops
2. Science Popularization Activities
3. Promotion of Science in Rural Areas through Mobile Science Exhibition
(Science Caravans)
4. Science Clubs Programme

The other subsidiary organisation of PSF is the Pakistan Museum of Natural History (PMNH), established in 1979 to serve the national needs in the vitally important areas of research, conservation and education involving Pakistan's heritage of natural resources. The Museum is a national repository for permanent storage of plants, animals, rocks, minerals and fossils of the country.

The progress of the work carried out by the Science Wing of the Foundation, PMNH and PASTIC during the year 1995-96 is summarized in the following pages.

PAKISTAN SCIENCE FOUNDATION (PSF)

I. RESEARCH SUPPORT SECTIONS

I. RESEARCH SUPPORT

During the year under report the Foundation carried out a number of programmes for the promotion of basic and fundamental research in universities and other institutions on scientific problems relevant to the socio-economic development of the country. These programmes include:

- (a) Grants to research projects submitted by individuals or groups of scientists in the universities and research institutions throughout the country.
- (b) Institutional support to scientific institutions for provision of equipment, literature, staff training facilities, etc. to build institutional capability for conducting research.
- (c) Support for participation in regional and international research programmes.

a) Grants for Research Projects

Research Support is the principal programme of Foundation for the promotion of basic and fundamental research having relevance to the socio-economic needs of the country. During the period under report, 119 projects requesting for funds totaling Rs. 82.773 million were received by the Foundation, whereas, 110 projects proposal, at various stages of their processing, were brought forward from the previous year. Thus in all 229 projects in the fields of Agriculture, Biology, Chemistry, Earth, Engineering, Environment, Medical and Physics remained under active consideration of the Foundation. The proposals were examined by the experts in the relevant fields in the light of their scientific merit and relevance to the national needs according to the criteria laid down by the Foundation.

The criteria for research are: competence of the scientific personnel to carry out the research, institutional capability i.e., availability of requisite equipment and library facilities, scientific merit of the proposed research, and likelihood of completion of the project within the stipulated time. Each proposal, after getting a favourable review report by an expert in that particular field, is placed before the Technical Committees for technical evaluation and Executive Committee of the Foundation for final approval.

During the year only 24 project proposals succeeded in getting the approval of the Foundation at an estimated cost of Rs. 8.651 million. The details of the newly approved projects are given in Annexure-II.

b) Institutional Support

Pakistan Science Foundation assists the universities and research institutions in the provision of equipment, chemicals, literature etc. to research workers who, for one reason or another, are unable to obtain these from their own institutions and it is established that such support would lead to quick progress of research of national significance. The emphasis is on fostering and equipping multi-disciplinary research units directed towards the solution of

problems in areas of high research priority. During the report period, an amount of Rs. 0.920 million was sanctioned to the following institutions.

<u>Institution</u>	<u>Purpose</u>	<u>Amount</u>
Department of Biological Sciences, Quaid-e-Azam University, Islamabad	Purchase of research microscope with camera and computerized imaging system for recording of GEL data and photographic scanning	Rs.500.000/-
Department of Chemical Sciences, Quaid-e-Azam University, Islamabad	Purchase of Detector Assembly and Pre-Amp PCB 270-01303	Rs.150.000/-
Quaid-e-Azam University, Islamabad	Purchase of equipments Viz: Serozyme-1 EIA Photometer for Department of Biological Sciences.	Rs.180.000-
Department of Physics Gomal University D.I. Khan	Purchase of latest reference material for research and books for M.Sc & M. Phil courses	Rs. 50.000/-
Department of Physiology and Pharmacology, University of Agriculture Faisalabad	Upgradation of PC Microprocessor facility	Rs. 40,000/-
Total:		Rs. 920,000/-

2. RESEARCH MONITERING AND EVALUATION

The Foundation evaluates the technical progress as well as fiscal position of on-going projects continuously till the completion of the projects. During the year, a total of 83 reports (semi-annual, 1st & 2nd annual and final) were received and evaluated as per the procedure laid down for reviewing the progress of scientific research and evaluating the results of such research.

a) On-Going Projects

During the year, 41 semi-annual, 19 first-annual and 11 second-annual reports received after the initiation of each project or after the submission of the annual reports were scrutinized by the Research Support Sections to assess the interim progress of these projects, and to release their next due instalments. The details of reports are given in Annexure-III.

b) Completed Projects

The final technical reports of 12 research projects were received during the year 1995-96. The reports were evaluated by the subject experts and were subsequently submitted along with reviewers' comments to the relevant PSF Technical Committees for consideration and adoption. Titles of the completed projects followed by their summaries are given below.

i) List of Completed Projects

S.No	Project No.	Project Title:
1.	P-NIAB Agr (97)	Development of Short Statured Varieties of Basmati Rice.
2	F-AU'Agr (122)	Effect of Various Doses of Potash with and without Boron on the Yield and Quality of Sugarbeet in Peshawar.
3	F-AU'Agr (123)	Studies of Adaptability Patterns for Short Duration Wheat under Environmental Dynamics.
4	F-PU Bio (177)	Production of Medicinally Important Metabolites by Rauwolfia Cell Cultures
5	S-KU Bio (194)	Studies on Mass Production of Biocontrol Agents for Application and Plant Disease Control.
6	S-KU Bio (200)	Combined Effect of VAM-Fungi and Rhizobium for Increasing Growth and Yield of Soybean.
7.	P-BZU'Bio (189)	Improvement of Salt Tolerance in Sunflower (<i>Helianthus Annuus L</i>) by Selection and Breeding.
8.	C-QU/Bio (225)	Studies of Hereditary Disorders in Pakistani Human Kindreds.
9.	C-QU'Phys (73)	Weak Interactions in a Medium and their Implications in Astrophysics/Cosmology.
10	C-QU'Chem (226)	Synthesis, Spectroscopic Studies and Biological Activity of Novel Heterocyclic Compounds Having Five or Seven Member Ring Systems.
11.	C-QU'Chem (234)	Selected Air Pollutant Monitoring and Correlation Study for Evaluation of Air Quality of Rawalpindi and Islamabad.
12.	F-PU'Chem (223)	Determination of Lead Contaminants in Drinking Water of Peshawar.

ii) Brief Summaries of Completed Projects

Project No: P-NIAB/Agr(97)
Project Title: Development of Short Statured Varieties of Basmati Rice

Duration: Three years
Date of Initiation: 01.01.1992
Date of Completion: 31.12.1994
Location of Scheme: Nuclear Institute for Agriculture and Biology,
Faisalabad
Principal Investigator: Dr M. Afsar Awan
Total Expenditure: Rs. 1,49,122/56
Main Objectives: To search alternate gene sources for dwarfness/short stature in basmati background for use in genetic and physiological studies, and then apply the information to design more productive basmati plant type.

Summary of work done:

Basmati rice occupies a vital position in the economy of Pakistan. The country is earning approximately 300 million US \$ annually from the export of Basmati but the yield of Basmati rice is very low. Among the tested varieties, Basmati 385 is the predominantly grown variety. Despite its high yielding ability, there is risk of genetic vulnerability to diseases and insect pests due to exotic sources involved in its breeding which are closely associated with the fungal diseases. It seemed imperative therefore to search for alternate dwarfing gene sources in the basmati background, for which a large number of semi dwarf mutants were isolated from the radiated segregating populations of rice cultivar Basmati 370. Finally 12 dwarf mutants (DM) were selected and grown in the field. At maturity observations on morphological traits and physical characters of grains were studied and a wide variation in the morphological characters was observed. A positive and significant correlation of plant height with yield and yield components was observed except tillers/plant, whereas, no correlation of plant height with the physical characters of grain was found. It was also observed that reduction in plant height upto 24% did not adversely affect the yield and yield components. Pleiotropic effect of dwarfs was found on agronomic traits but not on grain quality traits.

On the basis of variation in plant height, five selected dwarf mutants alongwith the parent variety were crossed in a diallel fashion excluding reciprocals for genetic studies. Graphic analysis of six parent diallel crosses for plant height showed non allelic interaction.

The removal of interacting parent led to a non-interacting 5 x 5 diallel set. The genes with positive effects were more dominant than the recessive, which indicated that the selection for semi dwarfness will be fairly rapid.

The segregating F2 population resulting from crosses of dwarfs with Basmati 370 showed bimodal distribution with tallness being dominant which fitted 3:1 ratio suggesting that dwarfness in these mutants is controlled by a single recessive gene which indicated that dwarfing gene in DM-15-4 is non-allelic to the other dwarfs.

DM-15-4 (mutant carrying non-allelic dwarfing gene) when crossed with the already existing dwarfing gene (DGWG) viz. IR-6 showed tall F1 and the F2 segregating population gave a 7:9 ratio showing duplicate recessive epistasis, non allelic to DGWG.

From these studies, it can be concluded that some of the mutants viz., DM-16-5-1 and DM-28 can be released directly as commercial varieties as a substitute of Basmati-370 while the other mutant like DM-15-4 can be utilized in hybridization program as an alternate source of dwarfism in order to avoid the risk of genetic vulnerability to various diseases and pests attached to DGWG gene.

Project No: F-AU/Agr (122)
Project Title: Effect of Various Doses of Potash with and without Boron on the Yield and Quality of Sugarbeet in Peshawar

Duration: Two years

Date of Initiation: 01.10.1992

Date of Completion: 30.09.1994

Location of Scheme: Department of Soil Science, NWFP Agriculture University, Peshawar.

Principal Investigator: Dr. Sajida Perveen

Total Expenditure: Rs.1,84,955/-

Main Objectives: To Study the effect of Potassium with and without boron on the yield and quality of sugarbeet.

To Study the effect of high doses of potassium on bioavailability of boron in calcareous/micaceous soils.

To assess the optimum dose of potassium and boron for economic yield and quality of sugarbeet.

To assess the optimum level of potassium and boron in plant leave.

Summary of work done:

The study was conducted to determine the effects of potassium with and without boron on the yield and quality of sugarbeet in the representative sites of NWFP. Two experiments were conducted, one at Malakand Dher Farm NWFP Agricultural University Peshawar and the other at SCRI Mardan in order to study the effect of various doses of potassium with and without boron on the yield and quality of sugar beet. Soil of Peshawar was silty clay loam in texture while that of SCRI Mardan was silty clay in texture. Nitrogen and phosphorus (P_2O_5) were applied at the rate of 120 and 90 kghal as urea and single super phosphate. Potassium was applied at the rate of 0,100,200 and 300 kghal K_2SO_4 as potassium sulfate. Boron was applied at the rate of 0 and 2 $kg\ ha^{-1}$ B as borax.

All levels of applied potassium did not increase the yield significantly over check plot at Peshawar, while the yield was significantly increased over check plot at Mardan. Using regression equation maximum yield of sugar beet was obtained at 300 $kg\ ha^{-1}$ at Mardan. Boron had no effect on the beet yield at Peshawar. Boron also had significant effect on yield at SCRI Mardan. However, no interaction was observed between boron and potassium at both locations.

Quality parameters like top root ratio, root length, total soluble solids, percent purity and poll % were non significantly affected by potassium and boron application at both locations, except root diameter which was significantly affected by potassium application at CRI Mardan. The concentration of K_2O in soil increased significantly at mid season stage at both locations as compared to check plot. The concentration of boron in soil increased non significantly at mid season stage at Peshawar, while it increased significantly at SCRI Mardan. The concentration of potassium and boron in leaves, non significantly increased at mid season stage at both locations. It was noted that the leaf content of boron was less than 35 mg/kg at both locations.

Project No:	F-AU/Agr (123)
Project Title:	Studies of Adaptability Patterns for Short Duration Wheat Under Environmental Dynamics.
Duration:	Three years
Date of Initiation:	01.09.1992
Date of Completion:	31.08.1995
Location of Scheme:	Department of Agronomy, NWFP Agricultural University, Peshawar.
Principal Investigator:	Prof. Dr. Khan Zada
Total Expenditure:	Rs. 3,16,351/-

- Main Objectives:
- To determine the productive potentials of wheat varieties under changed environments.
 - To Study the impact of different environmental factors associated with the vegetative and reproductive biomass of wheat varieties.
 - To find out the development criteria for growth and stability of wheat varieties.
 - To study the stability in performance of different wheat varieties across the environments.
 - To propose a growth and stability model as a determinant of yield effectiveness and adaptability patterns.

Summary of work done:

The study was conducted to ascertain the yield coefficients and stability of wheat varieties planted at different seeding depths and environments. The experiments were laid out in RCB design at Peshawar, Pirsabak, and Jamra locations covering the wide range of environments. Wheat varieties included were Kaghan-93, Pirsabak-85, Kyber-87, and Pirsabak-91 and the seeding depths were 5 and 9 cm to assess the agronomic effectiveness and stability performances of varieties for different agronomic characters.

Statistically significant results were obtained in yield and yield components due to locations and varieties, but seed depths did not affect agronomic traits except plant height. Only locations X varieties interaction could affect productive tillers m^{-2} , 1000-grains weight, grain yield, and seed growth rate, while all other possible interactions could not affect agronomic parameters. Locations responded statistically differently. Pirsabak location was more responsive over Peshawar and Jamra in emergence (110.61 seedling/ m^2), tiller m^{-2} , 1000-grain weight, grain yield, and seed growth rate while all other possible interactions could not affect agronomic parameters. Locations responded statistically differently. Pirsabak location was more responsive over Peshawar and Jamra in emergence (110.61 seedling/ m^2), tiller m^{-2} , (207.50) 1000-grain weight (41.22g), biomass (8.825 t/ha), grain yield (3.283 t/ha) grain yield (3.283 t/ha) harvest index (39.75%), and in grains/spike (38.28) while Peshawar location showed maximum plant height of 96.86 cm. Emergence (plants m^{-2}), tillers m^{-2} , 1000-grain weight (gm) biomass (t/ha), grain yield (t/ha), harvest index, and grain/spike were recorded higher in Khyber-87 among all the varieties planted at different environments and seeding depths, while variety Pirsabak-85 could only show superior performance for plant height by attaining the tallest heights of 96.36 cm among the varieties. Tillers m^{-2} , 1000-grain weight (g), grain yield (t/ha) were increased upto the maximum of 208.30, 43.38, and 3.576 respectively in variety Khyber-78 at Pirsabak location under L X V interaction

Among the locations, Pirsabak and Peshawar were more responsive to seed fill duration and seed growth rate by showing 48.38 days to filling and 0.878 mg/day/grain respectively while Khyber-87 was the superior variety for seed fill duration (51.25 days) and seed growth

rate (0.871 mg/day/grain). All the possible interaction could not affect both the parameters except L XV interaction in seed growth rate by showing maximum of 0.915 mg/grain/day in Khyber-87 at Pirsabak location.

In the present study, varieties Pirsabak-85 and Khyber-87 for grain yield, Kaghan-93, Khyber-87 and Pirsabak-91 for tillers/m² were categorized as stable varieties. Varieties Kaghan-93, and Pirsabak-91 for seed yield, Pirsabak-85 for tillers/m² and all varieties except Khyber-87 for the both 1000-grain weight and seed growth rate could be placed below average stable varieties ($b_i > 1$), thereby showing increasing adaptability only in high yielding environment. While Khyber-87 only for grain weight and seed growth rate characterized itself as above average stable variety as its b_i approached zero, reflecting the good performance only in low yielding environment or under unfavorable environmental conditions.

Project No: F-PU/Bio (177)
Project Title: Production of Medicinally Important Metabolites by Rauwolfia Cell Cultures.

Duration: Two years
Date of Initiation: 01.06.1992
Date of Completion: 31.05.1994
Location of Scheme: Department of Botany, University of Peshawar, Peshawar.
Principal Investigator: Prof. Dr. Ihsan Ilahi
Total Expenditure: Rs. 3,74,640/-
Main Objectives: To establish growth conditions and media for an active growth of the cultures.
To screen (callus/suspension) cultures of Rauwolfia for indole alkaloids.
Screening for high yielding strain as influenced by various physico-chemical factors.
Acclimatization of the regenerated high yielding plants to our local conditions.

Summary of work done:

The study investigated the production of medicinally important metabolites by *Rauwolfia* cell cultures. The nodal explants of *Rauwolfia serpentina* were inoculated on MS nutritional medium supplemented with different concentrations of various growth regulators to see their

effect on growth and development. Our past and present studies have revealed that MS is a suitable medium for the culture of this plant species and does not require addition of other complicated organic addenda. A large number of multiple shoots were induced on MS supplemented with 0.5 mg/l each of BNAP and 2, 4-D. These shoots were severed from the parent axis and induced to root under the influence of various treatments. These plantlets after induction of roots were transferred to soil, where they exhibited normal growth.

Under the influence of a different set of hormones the nodal segments have been induced to callus. A massive and healthy callus was induced on MS supplemented with 1.5 mg/l on kinetin and 1.0 mg/l of 2,4-D. This callus could be easily maintained and multiplied further and will be used for the isolation of alkaloids in the future. This callus will also be tested for its regenerating capabilities.

Another kind of callus was induced when MS was supplemented with 2.0 mg/l of BAP and 1.5 mg/l of IAA. This callus was granular and gave rise to embryoid structures which afterwards produced normal plants. These plants are healthy and have established themselves to the natural conditions. Copious root formation has also been induced using different hormonal combinations. These roots will be further multiplied and utilized for the extraction of the medicinally important metabolites.

As a result of present investigation, numerous shoots could be induced on the nodal segments, rooted and transferred to the field after acclimatization. Furthermore, copious callus has been induced which could be maintained in undifferentiated condition or made to form either roots or shoots for propagation alkaloid analysis. The induced roots could also be kept in undifferentiated state for an indefinite culture period without any obvious loss in its vigour. Similarly, the callus and the shoots could be maintained in undifferentiated state for either organogenesis or alkaloid synthesis.

All important Rauwolfia alkaloids have been isolated from the regenerated roots and shoots. Although active metabolites have also been isolated from callus cultures as well, their concentration was not detected in appreciable quantities. A comparison of the present results with our own previous results and those of others indicated that the two important alkaloids viz. reserpine and serpentine were also synthesized in appreciable amounts by these cultures. These results, thus, indicate the economic importance of this biotechnology which could possibly be exploited on a large scale. Presence of other fluorescent bands deserves identification and confirmation which might add to the economic importance of this technology.

Project No. P-BZU/Bio (189)
Project Title Improvement of Salt Tolerance in Sunflower (*Helianthus Annuus L.*)
by Selection and Breeding.

Duration: Three years

Date of Initiation: 01.09.1992

Date of Completion: 31.08.1995

Location of Scheme:	Institute of Pure and Applied Biology, Bahauddin Zakariya University, Multan
Principal Investigator:	Dr. M. Ashraf
Total Expenditure:	Rs. 3,69,742 -
Main Objectives:	<p>To assess the amount of variation for salinity tolerance in sunflower</p> <p>To determine the extent of variation which is genetically determined</p> <p>To improve the degree of salinity tolerance in sunflower using appropriate selection and breeding techniques.</p> <p>To draw parallels between degrees of salt tolerance and various inorganic and organic osmotica.</p>

Summary of work done:

The study was aimed at improving the salt tolerance of sunflower. To achieve the goals, experiments were conducted step-wise. In the first experiment, 45 accessions of sunflower collected from different countries, were screened for salinity tolerance after 2 weeks growth in sand culture salinized with 150 meq/l of $\text{MgCl}_2 - \text{CaCl}_2$ (1:1 ratio equivalent wt. basis) in half strength Hoagland's nutrient solution. The results for plant biomass of 45 accessions show that there was considerable variation in salinity tolerance.

In a further greenhouse experiment, the salinity tolerance of three tolerant (HO-1, Predovik, Euroflor) and two sensitive (SMH-24, 9UO-985) lines (selected on the basis of their performance in the seedling experiment) was assessed at the adult stage to evaluate the consistency of salinity tolerance at different growth stages. All three salt tolerant accessions produced significantly greater plant biomass, seed yield, and seed oil content than the salt sensitive accessions.

From this study it was clear that salinity tolerance of sunflower does not vary with change in stage of plant cycle, so selection for increased salt tolerance can be carried out at the initial growth stage. Secondly, it was found that there is great variation of salt tolerance in sunflower. Low uptake of Cl^- , high uptake of K^+ , and maintenance of high K^+/Na^+ ratios and K^+ versus Na^+ selectivity in the leaves and possibly the accumulation of organic osmotica such as soluble carbohydrates, soluble proteins, proline and free amino acids, seem to be the important components of salt tolerance in sunflower.

It was established that Euroflor was tolerant to low Ca^{2+} concentrations of the saline growth medium as compared with SMH-24. This was mainly attributable to accumulation of relatively low Na^+ and Cl^- in the leaves, and maintenance of high leaf K^+/Na^+ and $\text{Ca}^{2+}/\text{Na}^+$ ratios and K^+ versus Na^+ selectivity in Euroflor.

In conclusion it was found that a significant advance in salinity tolerance of sunflower is possible through appropriate selection and breeding techniques since the genetic components of variation for salt tolerance is very high in this crop. Low accumulation of chloride and high uptake of K are some of the important adaptive components of salt tolerance in sunflower.

Project No: S-KU/Bio (194)
Project Title: Studies on Mass Production of Biocontrol Agents for Application and Plant Disease Control.

Duration: Three years

Date of Initiation: 01/07/1992

Date of Completion: 30/06/1995

Location of Scheme: Department of Botany, University of Karachi, Karachi

Principal Investigator: Dr. A. Ghaffar

Total Expenditure: Rs. 3,61,083 -

Main Objectives:

- To develop a simple and economical method for mass production of potential microbial antagonists for the control of plant diseases resulting in increased crop productivity.
- To establish a correlation between the population of pathogen in soil and the minimum amount of antagonists inoculum required for effective control of plant diseases.
- To develop a simple method of field application of microbial antagonists for plant disease control.

Summary of work done

Biological control is one of the main non-chemical and environment-friendly methods for the management of pathogens causing diseases in plants. To study the mass production and application method of biocontrol agents, 11 different substrates viz., rice grain, sorghum grain, millet grain, cotton cake, mustard cake, wheat straw, rice straw, saw dust, sugarcane bagasse, sugarcane ash and wheat bran were used for mass production of biocontrol agents viz., *Paecilomyces lilacinus*, *Trichoderma harzianum*, *Gliocladium virens* and *Rhizobium mililoti*. Rice grain, sorghum grain, millet grain and wheat bran were found suitable substrates for mass production of *P. lilacinus* and *R. meliloti*. Good growth of *Trichoderma harzianum* and *Gliocladium virens* was observed on sorghum grain followed by millet grain, rice grain, wheat bran, wheat straw, rice straw and sugarcane bagasse. Oil cakes, sugarcane ash and saw dust were found not suitable substrates for multiplication of microbial antagonists. The inoculum multiplied and stored in plastic bags remained viable for upto 360 days at 30°C. Inoculum

pellets of *P. lilacinus* and its conidial powder stored at 5°C retained the viability of fungal propagules for > 120 days.

P. lilacinus inoculum multiplied on rice grain and wheat bran for upto 15, 30, 60, 90, 180, and 360 days was found effective in the control of *Fusarium* infection on mungbean. A 30 and 60 days old inoculum of *P. lilacinus* on rice grain millet grain, sorghum grain and wheat bran showed complete control of *M. Phaseolina*, whereas, 360 days old inoculum on wheat bran and millet grain showed significant reduction in *M. phaseolina* infection. *P. lilacinus* inoculum multiplied on sorghum grain, millet grain and wheat bran was found effective against *R. solani* infection, whereas, 360 days old inoculum on millet grain completely controlled *R. solani* infection on mungbean. *T. harzianum* after multiplication on rice and sorghum grain reduced the infection of *Fusarium* spp., whereas inoculum multiplied on sorghum grain sugarcane bagasse and wheat bran was found effective against *M. Phaseolina*. *G. virens* inoculum multiplied on sorghum grain was effective against *M. Phaseolina*, whereas, rice grain and millet grain were found effective substrates against *R. solani* and sugarcane bagasse against *Fusarium* spp. *R. meliloti* inoculum on millet grain, rice grain and wheat bran showed significant reduction in *M. phaseolina* infection on mungbean roots. Inoculum multiplied on rice grain and sorghum grain provided complete prevention of *R. solani* infection on mungbean roots. Inoculum pellets of *P. lilacinus* were effective in the control of *Fusarium* spp., *R. solani* and *M. phaseolina*. A correlation between reduction in infection and the amount of antagonist inoculum used as soil amendment was observed. Use of *T. harzianum* showed significant reduction in infection of sunflower roots by *M. phaseolina*. *F. oxysporum* and *R. solani* at low population level of the pathogens with no reduction infection at high population levels.

Soil amendment with microbial antagonists after multiplication on different substrates was found significant in reducing infection of roots by *R. solani* and *Fusarium* spp., followed by soil drenching and seed treatment. Alginate pellets containing conidia of *P. lilacinus* (@ 1 pellet/pot and *T. harzianum* (@ 1 & 10 pellets/pot showed significant reduction in *M. phaseolina* infection on mungbean and chickpea. *P. lilacinus* (@ 10 pellets/pot and *T. harzianum* (@ 1 & 5 pellets/pot controlled *R. solani* infection on mungbean. Colonization of *Fusarium* on mungbean and chickpea was also significantly reduced. Alginate pelleting of mungbean seed with *P. lilacinus* completely controlled *R. solani* infection on mungbean and also reduced *Fusarium* infection and colonization on mungbean and chickpea roots. Pelleting of seeds with a combination of *Stachybotrys atra* and *R. meliloti* was effective against *Fusarium* spp., *R. solani* and *M. phaseolina* on mungbean, whereas *R. solani* infection was completely controlled on cowpea. Use of inoculum pellets of *P. lilacinus* was found most effective against *M. phaseolina*, *R. solani* and *Fusarium* infection on mashbean followed by soil drenching and seep pelleting.

Mungbean, mashbean, sunflower and chickpea seeds pelleted with *P. lilacinus* stored at room temperature showed a complete loss in viability of *P. lilacinus* conidia after 160 days storage, whereas pelleted seeds stored at 4°C showed a gradual decline in the viability of conidia with the increase in storage time. Pelleting of mungbean, mashbean and sunflower seeds with *R. meliloti* showed no significant variation in population of *R. meliloti* during 160 days storage.

Project No: S-KU/Bio (200)
Project Title: Combined Effect of VAM-Fungi and Rhizobium for Increasing Growth and Yield Soybean.

Duration: Three years
Date of Initiation: 01.06.1992
Date of Completion: 31.05.1995
Location of Scheme: Department of Botany , University of Karachi, Karachi
Principal Investigator: Prof. Dr. M. Jalaluddin
Total Expenditure: Rs. 2,94,239/-
Main Objectives: To isolate VAM-fungi and Rhizobium from the field soil and roots of soybean plants.
To use mycorrhizal biotechnology for maximizing unit area production of soybean in Pakistan by single and mixed inclusion of indigenous VAM-fungi and Rhizobia

Summary of work done:

Significant increase of VAM-spores population in the rhizospheric region was observed on cultivation of soybean plants as compared to the population before sowing. Higher population of VAM-spore was observed in the rhizospheric region of soybean var. NARC-I than the other two soybean vars., NARC-II and William-82 at harvesting stage. A significant increase in the percentage of viability of VAM-spores from rhizospheric soil was found from sowing upto the harvesting stage of soybean whereas there was a non-significant increase in the viability of VAM-spores in non-rhizospheric regions.

VAM-infection percentage in soybean roots varied in the 3 soybean vars. and the initial VAM-infection was established within 15 days in roots of all 3 soybean vars. followed by an exponential increase upto the stage of maturity. A higher frequency of VAM-infection was observed in NARC-I followed by NARC-II and William-82 respectively.

Inoculation with axenic rhizobase VAM-inoculate of six different VAM-fungi (*Glomus macrocarpum*, *G. mossae*, *G. deserticola*, *G. warcupii*, *Acaulospora mellea* and *Acaulospora gerdemanii*) separately in soil pots sown with soybean seeds of 2 vars., resulted in significant increase in VAM-infection percentage, fresh & dry weights and seed weights and seed weight per plant as against the control. Of the six VAM-species inoculated in soil pots and plots, *G. macrocarpum* showed a higher increase in fresh weight (28.2%) dry weight (25.3%) and seed weight (33.3%) per plant, whereas *A. gerdemanii* showed least increase in fresh weight (18.0%), dry weight(17.0%) and seed weight (16.6%) as compared to the control.

The effect of seed inoculation of soybean seeds with two strains of nitrogen fixing bacteria viz. *Rhizobium japonicum* strain KUBFH-145 and *R. japonicum* strain KUBFH-146 produced more nodulation, VAM-infection, growth and yield of soybean plants as compared to the control. Of the two nitrogen fixing bacteria, *Rhizobium japonicum* strain-145 produced increasing number of nodules, nodule weight, fresh weight (25.0%), dry weight (23.2%) and seed weight (22.9%) per plant with inoculated seeds in experimental plots than without inoculation.

On combined inoculation of the nitrogen fixing bacterium *R. japonicum* strain KUBFH-145 either with the VAM-fungus *G. macrocarpum* or *G. warcupi* produced better growth response than on inoculated either with the bacterium or VAM-fungus cultures separately. Of the two VAM fungi, *G. macrocarpum* in combination with *R. japonicum* strain KUBFH-145 produced increased fresh (30.2%) & dry (31.5%) weights and seed weight plant (34.0%), which was highly significant than when inoculated with *G. warcupi* in combination with *R. japonicum* strain KUBFH-145.

In general on combined inoculation, both in pots and plots, there was a significant increase in the number and weight of nodules, VAM-infection, fresh and dry weights, and seed weight plant of soybean. It was thus found that on combined inoculation of an efficient strain of a VAM-fungus and Rhizobium improved growth and yield of soybean plants took place than as compared to separate inoculation of a VAM-fungus or a strain of Rhizobium.

Project No: C-QU/Bio (225)
Project Title: Studies of Hereditary Disorders in Pakistani Human Kindreds.

Duration:	One year
Date of Initiation:	01.07.1994
Date of Completion:	30.06.1995
Location of Scheme:	Department of Biological Sciences, Quaid-e-Azam University, Islamabad
Principal Investigator:	Prof. Dr. Mahmood Ahmed
Total Expenditure:	Rs. 60,271.80
Main Objectives:	To diagnose and record the syndrome, work out its mode of inheritance and develop measures for prenatal diagnosis with an aim to eradicate the disease.

Summary of work done:

Hereditary disorders in humans are prevalent in Pakistan due to various reasons. To diagnose the reasons of these disorders, two families: one from Rawat, Punjab, and one from Panjgur, Balochistan, showing hereditary disorders were studied by constructing extensive pedigrees and X-raying the patients for describing the skeletal defects.

The family from Rawat, Punjab, showed multiple cartilaginous exostosis (diaphyseal aelasis). The trait seems to follow autosomal dominant mode of inheritance with probably complete penetrance i.e. defective gene invariably expresses itself, and variable expression i.e. in different patients, different bones are involved. In conditions with this type of inheritance, in the case of sibships (i.e. off spring consisting of brothers and sisters) containing affected persons, at least one of their parents is affected as well. In cases where one parent is affected with single defective gene and the other is normal, on average, half of the children from such marriages are likely to show the defect. In this disorder, numerous bony lumps become evident between 3-5 years of age. The bony excrescence generally appears on the long bones of the limbs usually towards their ends resulting in various deformities such as shortness of stature, asymmetry of the shoulder girdles, bowing of forearms and dislocation of wrist and elbow joints and deformed knee joints. Some patients showed osteoporosis (i.e. reduction in the amount of bone mass) and flexion deformity of the interphalangeal joints unit they could not make a tight fist.

The family from Panjgur, Balochistan, showed dwarfism with skeletal defect of the spine and limbs. The condition was diagnosed as "spondyloepimetaphyseal dysplasia". In all, 19 persons: 12 males and 7 females, were found to be affected. Analysis of the pedigree is strongly suggestive of autosomal excessive inheritance which means that the trait manifests itself when both the parents, though themselves apparently normal, carry and transmit the defective gene to their off spring, resulting in both the copies of the gene being defective. In case, one parent is affected and the other a carrier, on average half of the children from such a marriage are expected to be affected. In order to avert the recurrence of the disorder, it is advisable that marriages between relatives be strictly avoided. Such studies provide sound basis for genetic counseling with a view to controlling the hereditary disorders.

Project No: F-FU/Chem(223)
Project Title: Determination of Lead Contents in Drinking Water of Peshawar

Duration: One year
Date of Initiation: 01.2.1994
Date of Completion: 28.2 1995
Location of Scheme: Department of Chemistry, University of Peshawar,
Peshawar
Principal Investigator: Dr. M. Rasul Jan
Total Expenditure: Rs.86,000/-

Main Objectives: In the first phase, systematic study of the lead contents in water samples used for irrigation purpose like rivers and canals and in water samples used for drinking purpose like wells, tube wells and pipes.

To compare the amount of lead found with permissible levels set for drinking and irrigation water and to ascertain whether the water is safe or not for the specific purpose.

Summary of work done:

Lead is one of the pollutants to which environmental scientists are seriously concerned. It occurs naturally in small quantities in soil, water and air. In the atmosphere it is relatively more abundant than other heavy metals. Toxic action of lead is mainly due to its enzyme inhibition. A series of samples from different location of Peshawar valley were analyzed to obtain a picture of the lead contents in water used for drinking, irrigation and domestic purposes. In addition to this, pH conductance and total dissolved solid studies were also carried out. Results of the study have shown that although most of the water samples of selected localities of Peshawar Valley were free from lead pollution yet the situation was alarming in some of the localities. The areas exposed to fuel emission due to heavy traffic were found to have higher than admissible lead levels. Hydrogen ion concentration of all the samples except those from Bara River were within the acceptable range. However, the samples from Bara River at Chamkani and Chamkani Sheikh Canal were found to be alkaline. TDS and conductivity values for some of the samples were also greater than the accepted values.

Since sampling was carried out in comparatively less polluted areas, low values of Pb were expected. But some of the results were contrary to our predictions. There is need for collecting data on the lead contents of those areas which are relatively polluted and are exposed to vehicular emission. The presence of lead in some samples necessitates detailed work on road side soil, plant, and underground water. The project resulted in two publications and a student was registered for her M.Phil. degree.

Project No: C-QU/Chem (226)
Project Title: **Synthesis, Spectroscopic Studies and Biological Activity of Novel Heterocyclic Compounds Having Five or Seven Member Ring Systems.**

Duration: Two years

Date of Initiation: 01.3.1993

Date of Completion: 28.2.1995

Location of Scheme: Department of Chemistry, Quaid-e-Azam University, Islamabad.

Principal Investigator: Prof. Dr. Mrs. Roshan Ahmed

Total Expenditure: Rs. 2,97,320/-

Main Objectives: To synthesize (a) heterocyclic α -amino acids especially the choral amino acids (b) phenolic pyrazoles, oxazoles, thiazoles, diazepines, 1,5-benzo-diazepines and 5-benzothiazepines and to modify the synthetic procedures to get maximum yield.

To use the spectroscopic methods namely UV, IR, NMR and mass spectroscopy for elucidation of the structure of the synthesized compounds.

To test the compounds for biological activity.

Summary of work done:

In view of the potential biological activity of heterocyclic compounds some novel five and seven member ring compounds have been prepared. They include pyrazoles, 1,5-Benzodiazepines, 1,4-diazepines, benzothiazepine derivatives and a few nucleosides. With unsymmetric pyrazoles, regioselectivity has been the focus of attention of many chemists. The cyclo-condensation of hydrazine derivatives with phenolic β -diketones lead to different regioisomers of pyrazoles under aird experimental conditions. The new phenolic pyrazoles acetic acids showed anti microbial activity and low cytotoxicity. Pyrazoles connected to triazole and thiazoles via-CH₂ - bridge were prepared via a multistep synthesis. Their anti viral activity is being studied now-a-days. A multistep synthesis was planned to prepare choral heterocyclic α - amino acids. The racemic pyrazolyl amino-acids were prepared in reasonably good yield. Unfortunately the last step to deacetylate the protected amino acid was unsuccessful. Cyclocondensation of phenolic β -diketones with o-aminothiophenol in DMSO lead to oxidative cyclocondensation to give compounds having condensed ring system. DMSO itself was reduced to dimethylsulfide. A number of phenolic 1,4-diazepines and 1,5-Benzodiazepine derivatives were prepared which were coupled with acetomglucose and galactose to give novel nucleosides. These nucleosides showed anti viral activity. The testing of these nucleosides as anti AIDS agents is in progress.

The project resulted in ten publications, whereas three students (two Ph.D. and one M.Phil.) were registered in the program during project period.

Project No: C-QU/Chem (234)
Project Title: Selected Air Pollutant Monitoring and Correlation Study for Evaluation of Air Quality of Rawalpindi/Islamabad.

Duration: One year

Date of Initiation: 01.7.1994

Date of Completion: 30.6.1995

Location of Scheme: Department of Chemistry, Quaid-e-Azam University, Islamabad

Principal Investigator: Dr. M. Jaflar

Total Expenditure: Rs. 2,07,845 -

Main Objectives

To assess the presently prevailing situation of air pollution in terms of levels of SO₂, NO₂, CO and Pb arising from vehicular emissions in and around areas of low and high traffic density.

To evaluate the background levels of the pollutants in areas for removal from urban industrial activities.

To correlate the air pollutant levels with such variables as traffic density, wind, humidity and temperature so that a correlation model could be evolved for future assessment.

To provide data to the relevant authorities for future monitoring programs aimed at controlling air pollution and its related effects on local population.

To help establish emission standards in the country.

Summary of work done:

Levels of CO, SO₂ and NO₂ along with those of suspended particulate matter (SPM), Pb and Fe in the atmosphere of Rawalpindi and Islamabad were measured in situ and on temporal basis to evaluate the local air quality. To this effect, four stations in Islamabad and five in Rawalpindi were selected for the monitoring programs undertaken during July 1994 - June 1995, using standard equipment. The pollutant gases were monitored as a function of parametric variables such as time, location, vehicular frequency, distance from plying roads, working non-working day conditions and as meteorological parameters such as temperature, relative humidity, wind speed and precipitation. The study revealed divergent levels of gaseous and particulate pollutants prevailing in the local atmosphere at levels higher by a factor of 2-3 compared with the background levels measured at remotely located stations. The CO levels were found to range, on the average, from 3.5 - 6.5 ppm, SO₂ from 0.03 - 0.07 ppm and

NO₂ from 0.03 - 0.13 ppm at 95% incidence of occurrence. The SPM levels ranged between 120-560 µg m⁻³ for Rawalpindi and between 319-737 µg m⁻³ for Islamabad with background estimated at 60-190 µg m⁻³. Lead particulate ranged between 0.20 - 0.90 µg m⁻³ (Islamabad) and 0.28 - 0.98 µg m⁻³ (Rawalpindi) while the iron particulate between 0.28 - 1.40 µg m⁻³ and 0.35 - 1.18 µg m⁻³ for the two cities, respectively. Of all the monitoring stations investigated, the industrial station (Islamabad) and the Marcer Station (Rawalpindi), were found to be under pollution stress from CO, NO₂, SO₂, SPM, Pb and Fe. Relatively higher gas concentrations were found in winter and on working days, at peak hours close to 2-4 P.M. Seasonal variations were found to have a positive correlation with SPM, Pb and Fe, the latter being mutually positively correlated at $r > 0.800$. Wind speed, temperature and relative humidity were not found to have a positive strong correlation with the point-source pollutant levels. However, precipitation and SPM were found to have an inverse relationship. The overall air pollution situation was compared both with the national and international data. The results indicate a deteriorating local atmosphere mainly due to vehicular and industrial activities in the twin cities.

Project No: C-QU/Phys (73)
Project Title: Weak Interactions in a Medium and their Implications in Astrophysics/Cosmology.

Duration: Three years.

Date of Initiation: 01.09.1991

Date of Completion: 31.08.1994

Location of Scheme: Quaid-e-Azam University, Islamabad.

Principal Investigator: Dr. Kamal-ud-Din Ahmed

Total Expenditure: Rs. 2,73,729 -

Main Objectives: The project aimed at studying the induced neutrino mass and its implications based on neutrino oscillations, using the finite temperature and density QET method in the following problems:

- Solar neutrino problem which has become of considerable importance and significance because of the expected laboratory data in a couple of years on this issue.
- Nucleo-synthesis and baryogenesis.
- Neutrino data from supernova 87A.
- Dark Matter.
- The fundamental issue of the nature and origin of the neutrino mass itself.

Summary of work done:

Massive neutrino and its associated properties, such as the dispersion through medium, matter induced mixing with other neutrino states and its electromagnetic interactions, have important consequences in astrophysics and cosmology. Under this project, following three aspects relating to the neutrino dispersion in the medium were studied: (i) Matter-induced spin-flavor neutrino oscillations at finite temperature and density - The index of refraction of a weakly interacting massive Dirac neutrino was investigated to study a field theoretic model to generalize the spin-flavor neutrino oscillations within the framework of finite temperature and density theory. The calculations were made in particular extension of the standard model by Fukugita and Yanagida. This model was designed to give maximal neutrino magnetic moment required for the above mentioned oscillations scenario. The range of the oscillations parameters for the solar neutrino problem was then predicted. Further, the applications of the result to birefringence phenomenon in the early universe were discussed (ii) Neutrino oscillations and Faraday effect - An investigation of an effect analogous to the Faraday effect for a massive neutrino de Broglie wave was carried out. This study led to a general understanding of the nature of neutrino and provided a natural and consistent choice of the oscillations parameters corresponding to different oscillations scenarios, like matter induced flavor oscillations (MSW effect), spin-flavor oscillations. A detailed numerical study for the MSW-flavor oscillation case has been reported in the framework of the Faraday effect. (iii) Neutrino dispersion in a minimal SUSY model with explicitly broken R parity at finite temperature and density. This aspect pertains to a super symmetric generalization of work carried out under item (i). By extending a (vacuum) field theory super symmetric standard model with explicitly broken R-parity to finite temperature and density, where fermions coupled to fermions give rise to chirality conserving as well as chirality violating neutrino transitions. The refractive index of the neutrino undergoing such transitions in a heat bath of finite density is then calculated in this framework. Some of the implications of these results to the MSW resonance and in the early universe were discussed and compared with earlier works.

iii) Scientific Publications Produced through PSF-Supported Projects

An important parameter of scientific achievement and a way of utilization of research results is their publication in research journals of repute. During the year, total of 36 research papers were published out of the results of above projects completed during the report period. The list is given in Annexure-IV.

iv) Higher Degrees Earned through PSF-Supported Projects

One of the major goals of the Foundation is strengthening and development of scientific manpower in the country. Thus in recent years, PSF has been encouraging scientific manpower development through its projects. Under the Programme, Research Associates (RAs) are appointed in the projects instead of Research Officers. The Research Associates are required to register for Ph.D or M. Phil and may complete their degrees during the project period.

During the past year, three Ph.D and three M. Phil degrees were reported to have been awarded through the completed projects as detailed below.

S.No.	Name:	Degree	Project No.
1.	Azhar Ali Aram	Ph.D	S-Ku/Bio(200)
2.	Mahnaz Qader	Ph.D	C-QU' Phys(73)
3.	M. Anwar Mughal	Ph.D	C-QU' Phys(73)
4.	Farida Parveen	M.Phil	C-QU' Phys(73)
5.	Athar Husain	M Phil	C-QU'/Phys(73)
6.	Muhammad Sadiq	M.Phil	C-QU' Phys(73)

3. SUPPORT TO SCIENTIFIC SOCIETIES/LEARNED BODIES

The promotion of Learned Bodies, Scientific Societies' Associations and Academies engaged in spreading the cause of scientific knowledge in general or in the pursuit of a specific scientific discipline or technology in particular, is an important activity of the Foundation. The Foundation makes annual grants to the established learned bodies and scientific societies, as partial financial assistance for the achievement of their approved objectives and publication of their respective scientific journals. Annual grants amounting to Rs. 0.730 were released to the following scientific societies and Journal during the year 1995-96.

Name of Society/Journal	Amount of Grant
1. Pakistan Academy of Sciences	Rs.1,00,000 -
2. Scientific Society of Pakistan	Rs.1,00,000/-
3. Pakistan Association of Scientists and Scientific Professionals	Rs. 30,000/-
4. Pakistan Association for the Advancement of Science	Rs. 50,000/-
5. Zoological Society of Pakistan	Rs. 40,000/-
6. Pakistan Botanical Society	Rs 35,000/-
7. Pakistan Society of Biochemistry & Molecular Biology	Rs 25,000/-
8. Institute of Electrical & Electronics Engineers	Rs. 45,000 -
9. Institute of Engineers, Pakistan	Rs. 20,000 -
10. Pakistan Society of Nematologists	Rs. 15,000/-
11. Pakistan Thalasaemia Welfare Society	Rs. 20,000/-
12. Pakistan Phytopathological Society	Rs. 15,000/-
13. Pakistan Nuclear Society	Rs. 20,000/-
14. Society of Economic Geologists and Mineral Technologists (SEGMITE)	Rs. 20,000/-
15. Pakistan Society for Semiconductors	Rs. 15,000 -
16. Pakistan Medical Association	Rs. 15,000.-

Publications/Journals:

1. Journal of Pharmaceutical Sciences	Rs. 20,000/-
2. Mehran University Research Journal of Engineering & Technology	Rs. 10,000 -
3. Pakistan Journal of Forestry	Rs. 10,000 -
4. Pakistan Oral & Dental Journal	Rs. 10,000/-
5. Urdu Journal "Tahqeeq"	Rs. 15,000/-
6. Pakistan Veterinary Journal	Rs. 40,000/-
7. Journal of Pharmacology	Rs. 40,000/-
8. Pakistan Journal of Mineral Sciences	Rs. 10,000/-
9. International Journal of Physics	<u>Rs. 10,000 -</u>
<u>Total:</u>	<u>Rs. 730,000/-</u>

4. TRAVEL GRANTS

A major weakness of Pakistani scientists is their isolation. Due to lack of contact with the scientists in advanced countries and the absence of intellectual interaction, many of our scientific workers become obsolescent and lose enthusiasm, freshness and spontaneity. There is an urgent need to end the isolation from the world of science of Pakistani science and scientists. Our scientific workers should be able to meet their counterparts in the advanced societies and visit international and regional research centers and universities of repute. The Foundation therefore gives grants for the purpose every year.

During the year, travel grants were sanctioned to seven scientists. Out of those only four were able to get NOC from the Government. Grants totaling Rs. 1,61,825 - were given them to attend International Conferences/Symposia and to meet their counterparts in institutions of higher learning in other countries. Details of their participation are as under:

<u>Name and Address of the Scientist</u>	<u>Conference Attended</u>	<u>Amount Released</u>
Dr. Zia-ur-Rehman, Department of Veterinary Physiology and Pharmacology, University of Agriculture, Faisalabad	International Conference on Immunology held from 23-29 July, 1995 at San- Francisco, USA	Rs.43,000
Prof. Dr. Waheed Akhtar, Institute of Chemistry, Punjab University, Lahore.	7th FAOMBS Congress on Advances in Biochemistry and Molecular Biology held from 24-29 Sept. 1995 at Sydney, Australia.	Rs.41,110

Prof. Dr. Jehangir Khan Sial, Deptt. of Basic Engineering, University of Agriculture, Faisalabad.	6th International Energy Conference held from 3-7 June, 1996 at Beijing, China.	Rs.27,275
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Lt. Col. Dr. Abdul Ghafoor, College of EME, Rawalpindi	IASTED ISMM International Conference held from 5-7 June, 1996 at Washington DC, USA.	Rs.50,440
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5. INTERNATIONAL LIAISON

Liaison with international agencies and scientific establishments in different countries serve as a means to solve numerous scientific problems by sharing knowledge, exchange of expertise, collaborative research etc., such agencies were accordingly contacted. Besides, representatives of several foreign organizations paid visits to the Pakistan Science Foundation in order to explore possibilities of collaboration in scientific programs of mutual interest.

a) Exchange of Visits of Scientists and Technologists with other Countries

Under International Liaison exchange of scientists and technologists with other countries is the most important activity of the Foundation. In 1995-96, the Foundation facilitated visits of three Pakistani scientists to UK, under the Memorandum of Understanding (MoU) signed by the Foundation with the Royal Society of London, for exchange of views with counterparts and to work in the advanced laboratories.

Name of Scientist

Purpose of Visit

Ms. Rakhshanda Baqai,
Research Officer, PMRC
Research Center, JPMC
Karachi.

Research work on project entitled,
"Incidence Pathogenesis and Serodiagnosis
of *Giardia lamblia* Infection" at the
Institute of Hygiene and Preventive
Medicines, London

Col. Dr. Sohaib
AFIP, Rawalpindi

Visit to Deptt of Obstetrics and
Gynaecology University College London,
and Leeds General Hospital, U.K.

Dr. S. I. Ali
Professor of Botany
University of Karachi,
Karachi

Visited U.K. regarding the editing of two
books on "Plant diversity and its
conservation in Pakistan" and "Accounts
of Salicaceae, Ploygonaceae and
Scrophulariaceae".

b) Support for Participation in Regional and International Research Programs

The Foundation, under the MoU signed with the National Natural Science Foundation of China, has initiated collaborative research program between the scientists of two countries. Currently, the following five research projects are under implementation

<u>Project Title and Number</u>	<u>Name & Address of P.I.</u>	<u>Name of Counterpart</u>
Phytochemical Studies on the Bioactive Principles of Withania Species, and Other Related Plants PSF-NSFC Res(3)Chem 93	Dr. Atta-ur-Rehman H.E.J. Research Institute of Chemistry, University of Karachi Karachi.	Prof. Bing Nan Zhou Shanghai Institute of Materia Medica, Shanghai, China
Use of Zeolites for the Removal of Heavy Metals of Environmental Importance from Aqueous Solutions PSF-NSFC Res(4)Chem 93	Dr. M. Afzal Department of Chemistry, Quaid-e-Azam University, Islamabad.	Prof. Yu Huisheng Guangzhou Institute of Chemistry, Chinese Academy of Sciences, Guangzhou - 510650, Guangdong Province, China.
Use of Azolla and Plant Growth Promoting Rhizobacteria in Rice based Cropping System PSF-NSFC Res(5)Bio 93	Dr. Kausar A Malik NIBGE, Faisalabad.	Dr. You Chongbiao Atomic Energy Application Institute, Beijing, China and Mr. Liu C.C., Azolla Research Centre, FAAS, Fujian, China.
Particles Production and Nuclear Fragmentation in O_{16} & S_{32} Collisions at 14.6 to 200 A GeV Energies. PSF-NSFC Res(6)Phys 93	Dr. A. Waheed Khan Physics Department, Gomal University, D.I. Khan.	Dr. Puying Zheng Institute of High Energy Physics, Box. 980, Beijing 100039, China.
Development of Thermostable Cellulase System for the Bioconversions of Ligno-cellulosic Biomass. PSF-NSFC Res(10)	Dr. Waheed Akhtar Institute of Chemistry, University of the Punjab, Lahore.	Prof. YU Huisheng Guangzhou Institute of Chemistry, Chinese Academy of Sciences, Guangzhou - 510650, Guangdong Province, China.

6. PLANNING AND DEVELOPMENT WORK

a) Construction of PSF Building

The PSF Office was shifted to its partially completed permanent building in August, 1995. The part work of 2nd floor and the external development work was completed during 1995-96. It is noteworthy that since its inception, the Foundation was housed in rented buildings initially in sector F-6 3 for five years and subsequently in sector F-7 for 18-years. Thus 21-years after the purchase of plot in 1974, the Foundation has finally been housed in its own building at the Constitution Avenue and is providing visibility to the component of science and technology in the Federal Capital

b) Concept Proposals for Inclusion in 9th Five Year Plan

The following 12 new concept proposals were submitted to the Ministry of Science and Technology for inclusion in the 9th five year plan.

<u>Title of Concept Proposal</u>	<u>Amount (Million Rupees)</u>
◆ Establishment of High Tech. Park at Islamabad.	50.00
◆ Establishment of Science City at Faisalabad.	50.00
◆ Construction of Auditorium and other Common Facilities at Science Complex, Islamabad.	30.00
◆ Center for Research Utilization and Special Project: CRUSP.	20.00
◆ Scientific Equipment Maintenance and Technical Advisory Center (SEMTAC)	50.00
◆ Establishment of Fifteen Science Centres in Provinces including AJK and Northern Areas.	50.00
◆ Strengthening of Science Laboratories in High Schools at District Level in Every Province.	10.00
◆ Construction of Fifteen Additional Science Caravans.	19.00
◆ Computer Literacy Program on Wheels.	15.00
◆ Computer Networking of S&T Organizations.	10.00
◆ Expansion of Reprographic Facilities of PASTIC	3.00
◆ Study of Economically Important Biological and Geological Resources of Pakistan.	1.00
TOTAL	308.00

c) Performance Audit

Performance Audit of the Foundation for the years 1993-94 and 1994-95 was conducted by the Government Auditor. Material/data reporting statutory functions was compiled and provided to the auditors as per their requirement.

II. SCIENCE POPULARIZATION SECTION

Popularization and promotion of science is one of the statutory functions and a principal programme of Pakistan Science Foundation. Activities of the Foundation for popularization and promotion of science through various programmes continued during 1995-96 as summarised below.

1. FUNDING OF CONFERENCES/SEMINAR/SYMPOSIA/WORKSHOPS

Conferences, seminars and workshops etc. always provide forums to the scientists to exchange ideas and share their knowledge and research experience with one another. This is therefore considered as an important science promotion activity at the level of scientists, intellectuals and policy makers. Thus the Foundation provides financial assistance to various organizations for holding such conferences, seminars, symposia and workshops etc.

During the report period, a total assistance of Rs. 0.587 million was provided to various Universities, R&D Institutions and/or scientific Societies Associations for organizing 25 National and International Conferences/Symposia etc. as enlisted in Annexure-V.

2. SCIENCE POPULARIZATION ACTIVITIES

The Foundation is engaged in various activities on national level with the purpose of increasing awareness in students and the public at large, about the role played by science in improving and cultivating scientific minds. These scientific minds will hopefully work towards improving the living conditions as well as standards of the community. During the report period following activities were undertaken for the purpose.

i) Science Caravan (Mobile Science Exhibition)

Science Caravan is a Mobile Science Exhibition that has been designed to increase public awareness about science and to motivate the younger generation of Pakistan towards the study of science.

Through the Mobile Science Exhibition, the people living in rural and backward areas of the country are exposed to some of the most fascinating scientific and technological developments of modern world. All narrations are in national language and are accompanied by simple illustrations. At present, four caravan units are operating in the province of Balochistan, Sindh and NWFP, and the Federal Areas/Northern Punjab. The units continued their activities within their respective areas during the year as detailed below.

a) Federal Unit

S.No.	Place of Exhibition	No. of Schools Attending	Period
1	Exhibition arranged by Kashmir Society of Scientific and Social Research, Muzaffarabad	General Public	18-23 July, 1995
2	Beacon House Public School, Rawalpindi	10	29 Oct to 1st Nov, 1995

3	Tehsil Mandra	13	9-19 Dec. 1995
4	Tehsil Daultala	20	1-15 Jan 1996
5	Tehsil Gujar Khan	22	9-24 April, 96
6	Exhibition on Pakistan Culture by International Islamic University, Islamabad	200	20, March, 1996
7	Computer Exhibition at Al-Hamra Hall, Lahore, organized by Pakistan Science Foundation, Islamabad	General Public	9-11 May 1996

b) NWFP Unit

1.	GHS, Parachinar (Kurram Agency)	26	16 -26 Aug, 1995
2	GHS, Sada (Kurram Agency)	13	26 Aug to 4 Sep, 1995
3	GHS, Daggar (Buner)	12	04 -14 Dec, 1995
4	GHS, Domel, (Bannu)	21	14 -25 April, 1996
5.	GGHS, Prang (Charsadda)	13	19-26 May, 1996
6	GHS, Hajjabad (Dir)	22	19-30 June, 1996

c) Sindh Unit

1.	Ubauro, Distt: Ghotki	14	3-19 Sep, 1995
2	Mirpur Mathelo, District Ghotki	22	7-25 April, 1996
3	Mirpur Mathelo, Distt: Ghotki	8	5-14 May 1996

d) Balochistan Unit

The Science Caravan Unit for Balochistan was also made operational during the report period for arranging scientific exhibitions, planetarium & science film shows in the schools of Balochistan province.

For the purpose, the Science Caravan office was set up within the building of PASTIC Sub-Centre, 3-Silachi Street, Saryab Road, Quetta. The newly appointed staff for the Balochistan Unit were fully trained at Islamabad by the Federal Unit for handling/installation of Science Caravan equipment/instruments. The Unit moved to Quetta alongwith all equipment and vehicles etc. in the 2nd week of October, 1995 and is now operative. The unit participated in Sibi Mela, 1996, from 9.3.1996 to 14.3.1996. General Public in large numbers witnessed the Science Exhibition.

ii) Science Clubs Programme in Schools

The Science Clubs Programme has been designed to develop reading habits in school students and provide them information on basic scientific concepts and to develop technical skills at their early stages. It is hoped that the Science Clubs Programme will generate great interest among students for carrying out scientific and technological projects. New science projects are introduced each year, wherein, pupils are made to do simple and easy but interesting experiments in their schools. The projects for 1996-97 have been identified and prepared, and the manuscript has been sent for publication. An amount of Rs. 78,264 - will be involved in the publication of the two volumes of the book entitled, "High School Science Clubs", Part I & II

iii) Science Exhibitions/Fairs

The Foundation provides financial assistance to different schools and colleges for organizing science exhibitions. These institutions display models, posters, technical displays and other scientific exhibits prepared by their students. Such exhibitions help to increase general awareness of science among the masses. During the year, following activities were organized.

a) Science Day 1995

Science Day 1995 was celebrated by National Museum of Science & Technology, Lahore, w.e.f 24-26 October 1995, which arranged science quiz and science models competition for the school students. A large number of students participated. An amount of Rs.20,000/- was provided by the Foundation for award of prizes to the winner students.

b) All Pakistan School/College Inter Board Science Exhibition Contest

For development of scientific culture, PSF supports various science exhibitions contests regularly. During the year under report, the Foundation with the collaboration of the Boards of Intermediate & Secondary Education announced, "All Pakistan School/College Science Exhibition Contest".

The Boards of Intermediate & Secondary Education all over the country have been requested to hold an "Intra Board Science Exhibition Contest" at school and college level. The Foundation is providing a sum of Rs. 15,000/- to each Board to organize the event. Besides cash prizes amounting to Rs. 1000/- , Rs. 800/- & Rs. 500/- shall be awarded by the Foundation to students securing 1st, 2nd & 3rd positions, and shields will also be awarded to the best presented stalls.

These position holders shall then participate in the Inter Board Science Exhibition Contest to be organized by the Foundation in Islamabad during the Golden Jubilee Celebration of Pakistan in the year 1997.

So far, five Boards have shown their willingness to hold the Intra Board Science Exhibition Contest. An amount of Rs. 75,000/- has been released to these Boards for organizing the competition.

c) Solar Energy Exposition

An exhibition of solar energy appliances/equipment on the eve of Asia-Pacific solar experts meeting on "Renewable Energies for Development, Culture and Environment" was organized by Pakistan Science Foundation at the National Library of Pakistan, Islamabad from 18-21 December 1995. The exposition was aimed to create awareness about and project the state of solar technology and availability of solar appliances/equipment in Pakistan. The following organizations participated and displayed their exhibits.

- College of Electrical & Mechanical Engineering, National University of Science and Technology (NUST), Rawalpindi.
- M/s Firex Solar Industries, I-9, Islamabad.
- National Institute of Silicon Technology (NIST), Islamabad.
- Pakistan Museum of Natural History (PMNH), Islamabad.
- M/s Trilium Pakistan (Pvt) Ltd., Rawalpindi.
- M/s POMCO, Lahore.
- M/s Siemens Pakistan, Islamabad.
- G.I.K. Institute of Science and Technology, Topi.
- NED University of Engineering and Technology, Karachi.
- M/s Techno Commercial Enterprises, Rawalpindi.
- Pakistan Council for Appropriate Technology, Islamabad.
- Pakistan Council for Scientific and Industrial Research (PCSIR), Islamabad.
- Mehran University of Engineering and Technology, Jamshoro.

d) Science & Technology Expo-95

On the eve of the 7th COMSTECH meeting (26-28 Dec., 1995), the Foundation organized a Science and Technology Exposition-95. The exposition was aimed at highlighting the achievements of Science & Technology as a whole sector and individual R&D organizations in their respective areas of specialization.

The exhibition was visited by the Ministers and Delegates from OIC countries attending the COMSTECH meeting. It provided an excellent forum to display local technologies for interaction with delegates from Islamic countries. The exhibition was also visited by general public and students.

iv) Science Quiz Competition

This is a regular activity of the Foundation, and with the collaboration of the Boards of Intermediate & Secondary Education in the country, holding of "All Pakistan Inter Board Science Quiz Competition" was announced. The competition will be held in two stages; i.e., 'Intra Board Science Quiz Competition' and 'Inter Board Science Quiz Competition'.

The Boards have been requested to organize the Intra Board Competition among the schools within their jurisdiction. An amount of Rs.10,000/- will be given to each Board to host the above competition. Cash prizes amounting to Rs.1000/- (1st Prize), Rs.600/- (2nd Prize) and Rs.400/- (3rd Prize) will be awarded to the position holders, whereas, shields will be awarded to

the winners and runners up. The winning team and the runners up of each Board shall then participate in the Inter Board Competition scheduled to be held during the Golden Jubilee Celebrations of Pakistan during 1997. So far, nine Boards have already organized the Intra Board Science Quiz Competition and an amount of Rs. 90,000/- i.e. Rs.10,000/- each has been released to each Board for organizing the Competition.

v) Purchase of Science Educational Films

PSF shows scientific educational films during the science exhibitions and science caravan displays as a science popularization activity. To strengthen the library of films/videos maintained by the Foundation, an order for the purchase of science educational films (16mm) and video cassettes (VHS) has been placed with the Encyclopedia Britannica Educational Corporation, USA costing US \$ 29,821/- paid through UNESCO Coupons.

vi) Planetarium & Film Shows

The Foundation arranges planetarium and films shows in schools as well in colleges with the help of portable planetarium and film projectors. During the year 120 planetarium/film shows were arranged for the students of 9 schools in Rawalpindi and Islamabad. Some 3600 science students along with their teachers viewed these shows.

vii) Summer/Winter School in Science for Talented Higher Secondary Students

These residential schools are set up by different organizations during vacations for the benefit of highly talented science students. The purpose is to acquaint the students about the role of basic and fundamental science in national development. Scientists, educationists and research workers are invited to deliver lectures with special relevance to latest development in their areas of interest.

An amount of Rs.30,000/- was provided to the Board of Intermediate & Secondary Education, Faisalabad for organizing the Summer School-95 held at Khanaspur from July 21-28, 1995.

viii) Science Magazines/Books for Schools

The Foundation supports a large number of High Schools in far flung areas of the country by sending them various science publications on regular basis. During the year, popular monthly Urdu science magazines "Science Digest" and "Science Bachoon Key Liye" provided free of cost to 800 schools. The Foundation hopes to increase the number of schools in the programme during the next year. During the report period, magazines worth Rs. 43,000/- were purchased for distribution.

"Science Bulletin" of the Pakistan Science Foundation for the year 1995-96 was published and distributed free of cost to various schools, colleges and R&D organizations through out the country.

An amount of Rs 40,500/- was provided to the University of Karachi, Karachi, for publishing a monograph entitled "Cyst Nematodes of Pakistan" written by F. Shahina and M.A. Maqbool, National Nematological Research Centre, University of Karachi, Karachi, under publication programme of PSF. The monograph has been distributed free of cost, to more than 350 relevant national international institutions scientists.

ix) Science Posters Project

Publication of posters on various S&T themes is an on-going activity of the Foundation. For preparation of these posters, a committee of scientists meets a number of times to discuss various themes proposed by the members and finalize 10 posters each year. The 9th set of science posters for 1995 comprising the following posters were printed for distribution to more than seven thousand High Schools in the country. An expenditure of Rs 0.610 million was incurred on their printing.

1. دل کا دورہ
2. ریگستان
3. ایٹم بومے امن
4. قتل
5. موسمیاتی مرکز
6. فاسل نیول
7. انٹارکٹیکا
8. مراصلاتی سیارے
9. ابر العباس احمد الفرغانی (مسلم سائنسدان)
10. ابوسروان ابن زہر (مسلم سائنسدان)

The 10th set of science posters for 1996 comprising on the following themes has been prepared and order for printing these posters is under process.

1. شہابیے اور شہاب تاقب
2. کمپیوٹر کی ساخت
3. و مدار ستارے
4. بچن کارڈن
5. کرسٹل
6. کثیف و ترقیق مائع جات
7. شور
8. تخلیق و ایجادات
9. فورمٹرک انجن
10. پودوں کا ڈائریس
11. وٹامن

x) Inter Board Science Posters Contest

In addition to PSF posters, the Foundation encourages scientific thinking in school children through poster contests. The 8th such Inter Board Science Posters Contest on the theme, "Atom for Peace" was finally completed. Boards of Intermediate & Secondary Education submitted the best three posters for award of prizes at Rs. 1000.-, Rs 600.- and Rs 400 - for 1st, 2nd and 3rd positions respectively. Thus a total amount of Rs. 26,000/- was distributed to the prize winning students.

The 9th such contest with the theme "Information Highway" has been announced and the last date for receipt of these posters has been fixed as 30th September, 1996. So far two Boards have sent their prize winning posters.

xi) Intra Board Science Essay Competition

Intra-Board essay contests for healthy competition among students are also organized by the Foundation regularly. The 7th Intra Board Science Essay Competition with the theme, "Science and Modern World" was successfully completed during the year with the collaboration of 18 Boards. In all, 11 Boards submitted the best three essays and prize money amounting to Rs. 33,000/- was awarded to the prize winning students.

The 8th such contest with the theme "Impact of Computer Technology on our Life" was announced and the last date for receipt was fixed as 31.8.96. So far, five Boards have submitted their best three essays and prize money to the extent of Rs.18,400/- has been awarded to the position holders.

PAKISTAN MUSEUM OF NATURAL HISTORY (PMNH)

Pakistan Museum of Natural History (PMNH) is an important scientific organization carrying out environmental and biodiversity research in the country as well as promoting informal education and public awareness about our natural wealth. It is a subsidiary organization of Pakistan Science Foundation and was established in 1979 to serve the national needs in the vitally important areas of research, conservation and education involving Pakistan's heritage of natural resources. Thus, Museum is the national repository for permanent storage of plants, animals, rocks, minerals and fossils of the country.

During the period under review, the scientists remained involved not only in building up a comprehensive reference collection, but also in the curation and cataloguing of the previously collected natural history specimens. In addition, to promote public awareness about different natural history concepts and issues, various activities were organized. These included two international symposia on: "The Himalayan Suture Zone of Pakistan" and "Biodiversity of Pakistan", and a number PTV-2 programmes. A brief account of research and education activities of the Museum during 1995-96 is given below.

1. BOTANICAL SCIENCES DIVISION (BSD)

a) Reference Collection

The main objective of BSD is to collect, identify and preserve for reference the plant treasure of the country. During the year, five field trips were undertaken to Kalabagh-Dungagali, Samundri-Faisalabad, Islamabad and adjoining areas, Muzaffarabad, Siran Valley and as a result, 245 higher and 210 lower plant specimens were collected.

b) Laboratory Work

Preservation of the newly collected material and curation and cataloguing of the previous reference collection is in progress. Processing, mounting and labeling of 1400 higher and 1600 lower plant specimens was carried out, and 800 higher and 180 lower plants were identified upto species level.

c) Research Work

In addition to routine research activities a checklist of plants of Deosai Plains (Skardu, Baltistan) was prepared under the project "Flora and Fauna of Deosai Plains" in collaboration with Dr. C. Woods, Professor, University of Florida, USA. Compilation work on "The degradation of various ecosystems of Pakistan with emphasis on their conservation" is being done.

d) Extension Work and Services Rendered to other Organizations

For the students of various educational institutions of Pakistan and AJK University, 780 plant specimens were identified by the BSD. Ten talks for PTV-2 educational channel, were delivered by its scientists, which pertained to various ecosystems of Pakistan and their degradation with emphasis on their conservation. Correct nomenclature and distribution of medicinal plants were provided to Drugs Control and Traditional Medicine Division, NIH, Islamabad. Collaboration with Prof. Dr. S.I. Ali, of University of Karachi, regarding a joint publication and research on "Rosaceae of Pakistan" continued during the year.

e) Publications

- Shah, M., Z.K. Shinwari & F. Bano (1995) Distribution of genus *Potentilla* (Rosaceae) in Pakistan and Kashmir. Nat. Hist. Bull. Vol. 1 (2) (in press).
- Shah, M., B. Schirone & C. Pelosi (1995) On the affinity between *Quercus baloot* and *Q. ilex*. Nat. Hist. Bull. Vol. 1 (2) (in press).
- Bano, F., S. Malik, M. Shah and T. Nakaike (1995) A note on topography, climate, geology and ecology of Pakistan. In: "Cryptogams of the Himalayas, vol.3, Nepal and Pakistan", eds. Masayuki Watanabe and Hiromitsu Hagiwara. Dept. of Bot. Nat. Sci. Mus. Tsukuba, Japan pp: 193-197.
- Nakaike, T. and S. Malik (1995) A list of Pteridophytes collected from Pakistan in 1992. In: "Cryptogams of the Himalayas, vol.3, Nepal and Pakistan", eds. Masayuki Watanabe and Hiromitsu Hagiwara. Dept. of Bot. Nat. Sci. Mus. Tsukuba, Japan pp: 165- 177.
- Yamanito, Y., H. Hagiwara and K. Sultana (1995) Myxomycetes from Northern Pakistan III. In: "Cryptogams of the Himalayas, vol.3, Nepal and Pakistan", eds. Masayuki Watanabe and Hiromitsu Hagiwara. Dept. of Bot. Nat. Sci. Mus. Tsukuba, Japan pp: 37-44.
- Haga, M. and M. K. Leghari (1995) A freshwater red alga *Banjia atropurpurea* (Roth) Ag. from Kawai, North West Frontier Province, Pakistan. In: "Cryptogams of the Himalayas, vol.3, Nepal and Pakistan", eds. Masayuki Watanabe and Hiromitsu Hagiwara. Dept. of Bot. Nat. Sci. Mus. Tsukuba, Japan pp : 29-36.
- Afzal, S., Amin-ud-Din and R. Awan. (1994) Preliminary studies on the distribution of maize weeds of Abbottabad and Haripur. Pak. J. Weed Sci. 7(1-2) PP: 15-17.
- Shah, M. (1996) Taxonomic evaluation, distribution and diversity of the genus *Potentilla* from Pakistan and Kashmir. In: " Biodiversity of Pakistan", eds. S.A. Mufti, C. Woods and S.A. Hasan, 1995, PSF, Islamabad (in press).
- Awan, R. (1996). Ethnobotanical studies of Swat District of Pakistan. In: " Biodiversity of Pakistan", eds. S.A. Mufti, C. Woods and S.A. Hasan, 1995, PSF, Islamabad (in press).
- Awan, R. (1996). Taxonomic study on the weeds of maize in Abbottabad and Haripur (NWFP). Presented at CAP-Crop Protection Conference held at NWFP Agricultural University (in press).

2. EARTH SCIENCES DIVISION

a) Reference Collection

ESD as one of its objectives, collects and preserves for reference various rocks, minerals and fossils present in the nook and corner of the country. During the year, five field trips were made to Swat, Besham, Chelas, Kaghan, Tarbela, Padhri-Hasnot, Kala Chitta Range

and Sarai Alamgir areas for the purpose and 150 fossils and 100 rock/mineral specimens were collected.

b) Laboratory Work

A total of 250 rock/mineral samples collected earlier were catalogued, the collection during the year is being processed. Also, 600 rock/mineral samples were chipped, powdered and subjected to various chemical analyses, and petrographic studies of 160 minerals were carried out including 20 thin sections prepared. Megascopic studies and descriptions of 250 samples were made and 50 fossils were identified.

c) Research Work

In addition to the routine research activities, 3rd annual report on NSRDB funded project in collaboration with Punjab University, entitled "Geology, Petrology, Economic Geology and Structure of MKTZ Ophiolites, Gawachi Back Arc Basin & Associated Rocks of Kohistan Arc & the Asian Mass" was prepared.

The collaborative research project on "Himalayan Suture Zone of Pakistan" is in progress with Punjab University and ETH, Switzerland. A project on "The Small Mammals of Padhri-Hasnot" was initiated during the year.

d) Extension Work and Services Rendered to Organizations

An International Symposium on "Himalayan Suture Zone of Pakistan", in collaboration with ETH, Switzerland was organised in Islamabad. The symposium was attended by a large number of geoscientists from Pakistan and abroad. For the students of University of Arid Agriculture, Rawalpindi, 50 igneous, sedimentary and metamorphic rocks were identified. The Division also explained the research methodology for the exploration of rocks/minerals, to the teachers and students from D.G. Khan visiting PMNH.

e) Publications

- Baqri, S.R.H., V. Hussain, R. Bilquees, N. Jan and N. Ahmad (1994) Petrographic and chemical characteristics of glauconitic and phosphatic sediments of the Kussak Formation, Khewra Gorge, Salt Range, Pakistan. *Pak. J. Sci. Ind. Res.* Vol.37, No.8 pp: 291-296.
- Baqri, S.R.H., G. Roohi and G. Mustafa (1994) A new record of fossil polychaete (Annelid) from the cambrian of Salt Range; *Biologia*, 37(1): 8-13.
- Baqri, S.R.H. and M.Q. Baloch (1996) The sedimentological and palaeoenvironmental studies of the Khewra sandstone exposed at Nilawahan, Central Salt Range, Pakistan. In: "Biodiversity of Pakistan", eds. S.A. Mufti, C. Woods and S.A. Hasan, 1995, PSF, Islamabad (in press).
- Baqri, S.R.H., S.A. Hasan, S. Khatoon and N. Iqbal (1996) Biodiversity of Gastropods in the Eocene time, during the closure of Tethys Sea in the Central Salt Range. In: "Biodiversity of Pakistan", eds. S.A. Mufti, C. Woods and S.A. Hasan, 1995, PSF, Islamabad (in press).
- Baqri, S.R.H. and H. Dawood. The stratigraphic importance of the Passu slates and Gujhal dolomite and their stratigraphic relations with the Baltit group. in: "Himalayan Suture Zone of Pakistan" (in press).

- Baqri, S.R.H., M. Javed, Z. Ahmad and Anwar-ul-Haq. The X-ray diffraction and geochemical studies of the Hunza ruby and associated rocks. In: "Himalayan Suture Zone of Pakistan" (in press).
- Chaudhary, M.N., M. Ghazanfar, S. Hussain and H. Dawood. Problems of petro-tectonic modelling of suture zones of northern Pakistan. In: "Himalayan Suture Zone of Pakistan". (in press).
- Chaudhary, M.N., M. Ghazanfar, D.A. Spencer, S.S. Hussain and H. Dawood. The division between lower and higher Himalayas of Pakistan. In: "Himalayan Suture Zone of Pakistan" (in press).
- Cheema, I.U. and A.R. Rajpar (1995) Late Astracian small mammal fauna- the Miocene Siwaliks of Kallar Kahar, Dhok Thalian, Distt. Chakwal. Pak. J. Zool. (submitted).
- Hussain, S. S. and H. Dawood (1996). Geology of Thana Barikot area (Sheet no. 43812) Natural History Bulletin 2: (in press).
- Hussain, S., H. Dawood and M.N. Chaudhary. Mineralization associated with the Himalayan Suture Zone of Pakistan. in: "Himalayan Suture Zone of Pakistan" (in press).
- Iqbal, N., S.R.H. Baqri and A. Izert. (1996) The clay mineralogy and the palaeo-environments of the Warcha formation exposed at Burrkhel. In: " Biodiversity of Pakistan", eds. S.A. Mufti. C. Woods and S.A. Hasan, 1995, PSF, Islamabad (in press).
- Mateen, A., S. Hussain, M.N. Chaudhary and H. Dawood. Occurrence of carbonatites in higher Himalayan basement rocks of Pakistan. In: "Himalayan Suture Zone of Pakistan" (in press).

3. ZOOLOGICAL SCIENCES DIVISION (ZSD)

a) Reference Collection

Like other technical divisions of PMNH, ZSD collects zoological specimens for future reference. During 1995-96, eight field trips were undertaken covering mainly Northern Areas of Pakistan, Narowal and Pir Sohawa for reference collection. In all, 390 invertebrate, 125 Lepidoptera, 300 butterfly, 1238 fish, 180 mammal and 25 herpetile specimens were collected.

b) Laboratory Work

Cataloguing of 400 planarians, 160 butterflies, 100 reptiles, 80 aquatic mites, 400 invertebrates and 370 insects was completed, and 25 millipede/centipede, 250 fish, 40 butterfly, 20 spider and 55 invertebrate specimens were identified during the year.

c) Research Work

A collaborative project with Oxford University entitled "Butterflies of Northern Pakistan" continued. While another collaborative project with Florida State University on "Small Mammals of Pakistan" also continued for the second year.

A project entitled "Impact of Water Pollution on Aquatic Life in Rawalpindi Division" was submitted to Ministry of Science and Technology for funding. A collaborative project with Dr. C. Woods, Professor, Florida State University on the compilation of "Fauna of Deosai Plains" is in progress.

d) Extension Work and Services Rendered to other Agencies

An international symposium on "Biodiversity of Pakistan" was organised on 7-8 November 1995 at PSF. It was attended by more than 100 scientists from Pakistan and abroad. Proceedings of symposium are being finalized for publication.

The Division provided training in stuffing and skinning of birds and mammals to the officers of Khunjerab National Park, at their request. Scientific information on biodiversity of Pakistan was provided at the Expo-95, organized during the last COMSTECH meeting.

e) Publications

Baig, K. J. (1996) Distribution of *Laudukia* (Sauria: Agamidae) and its origin. In: "Biodiversity of Pakistan", eds. S.A. Mufti, C. Woods and S.A. Hasan, 1995, PSF, Islamabad (in press).

Hasan, S.A. (1995) Structure and phylogeny of Pretarsus in pentatomid bugs (Heteroptera: Pentatomidae). Proc. Pak. Congr. Zool. 14: 163-190.

Hasan, S. A. and D. S. Smith (1996) Biodiversity and Biogeography of Butterflies of Northern Pakistan, Gilgit to Khunjerab. In: " Biodiversity of Pakistan", eds. S.A. Mufti, C. Woods and S.A. Hasan, 1995, PSF, Islamabad (in press).

Khatoon, S. and S.R. Ali (1993) Microfauna of Leh Sci. Int. 6(4): 334-360.

Khatoon, S. (1996) The opilionids (Opiliones, Palpatures, Phalangioidea) from Islamabad and Rawalpindi. In: " Biodiversity of Pakistan", eds. S.A. Mufti, C. Woods and S.A. Hasan, 1995, PSF, Islamabad (in press).

Rafiq, M. (1996). Studies of fish diversity in Northern Areas of Pakistan. In: "Biodiversity of Pakistan", eds. S.A. Mufti, C. Woods and S.A. Hasan, 1995, PSF, Islamabad (in press).

Rafiq, M. and M. Y. Qureshi. (1996). A contribution to the fishes of Azad Kashmir. In: " Biodiversity of Pakistan", eds. S.A. Mufti, C. Woods and S.A. Hasan, 1995, PSF, Islamabad (in press).

Smith, D.S. and S. A. Hasan (1995). A preliminary survey of diversity and distribution of butterflies of Northern Pakistan, Gilgit to Khunjerab.

4. PUBLIC SERVICES DIVISION (PSD)

One of the main objectives of PMNH is to promote the education and public awareness about our natural wealth involving Pakistan's heritage of natural resources, and PSD is mainly responsible for achieving this objective. In addition the Division takes care of the display part of the Museum, and provides assistance/expertise to various S&T organizations in designing and arranging science exhibitions.

a) Museum Display and Maintenance

All the write-ups of various displays/exhibits were re-written after incorporating different amendments suggested by the technical divisions of PMNH. Three different possibilities in the form of visuals were prepared for the display of marble slab with the name of PMNH, to be fixed near the main gate of PMNH building. The Division designed and prepared visuals and artwork of conference material for the symposia on "Himalayan Suture Zone of Pakistan" and "Biodiversity

of Pakistan", the two international symposia organised by the Museum. The conference material included: folders, programme brochures, name cards, abstracts and press releases regarding the symposia.

The PSD also constructed new wooden plinths for chimpanzee and fossils, and repaired the 'Python' for the Display Centre.

b) Educational Activities

As mentioned above, education of students and the public at large about the natural history and resources of the country, is the main objective of PSD, thus guided tours of the Museum Display Centre are regularly provided to visitors. During the year, tours were provided to 3058 students and 370 teachers of various educational institution. Film shows on "Science and Natural History" were also organized for students.

Help was also extended to PTV-2 personnel in recording of a series of programmes on "Environment and Major Ecosystems of Pakistan, their Degradation and Conservation". In this context at least 20 talks were delivered by the Director General Dr. Shahzad A. Mufti and 10 by Dr. M. Rashid Awan an ecologist of the Museum

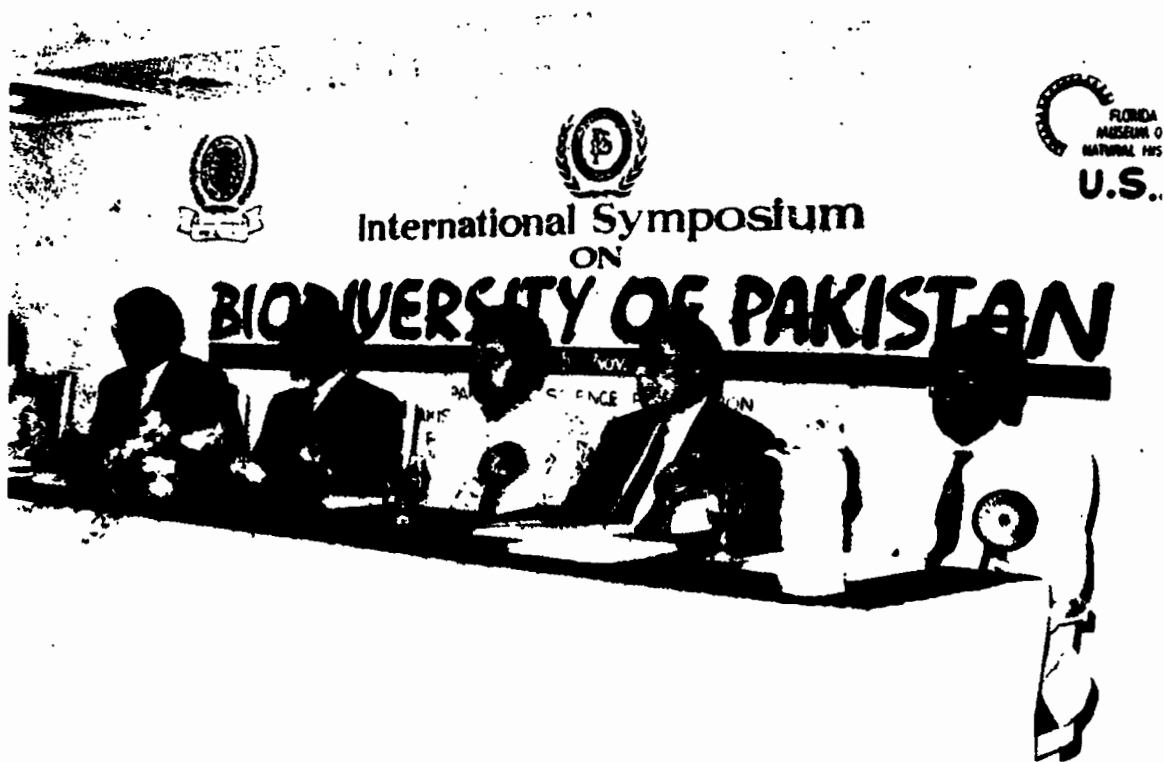
c) Services Rendered to other Organizations/Professionals

Services for designing and art work etc. were provided to: i) Pakistan Science Foundation for designing and preparation of eight science posters and material for the 19th meeting of Board of Trustees of the Foundation, ii) National Institute for Silicon Technology (NIST) for designing and preparation of materials for a conference on solar energy organized by the institute, and iii) Ministry Science and Technology for organizing Solar Energy Show-95 and Expo-95 (during COMSTECH meeting).

d) Visitors to Museum Displays

The Museum has its main Display Centre in Al-Markaz, F-7 Islamabad, while a Display Corner is set up outside the local Zoo, and every year a large number of students and general public with their children visit the displays. During 1995-96, 24,500 visitors were received at the main Display Centre, while, 74,725 persons visited the Display Corner.

INTERNATIONAL SYMPOSIUM ON BIO-DIVERSITY OF PAKISTAN



Sardar Talib Hassan, Parliamentary Secretary, Ministry of Science & Technology inaugurating the International Symposium on Bio-Diversity of Pakistan.



Some Guests & Delegates at the Inaugural Ceremony of the Symposium.



H.E. Hamid-Al-Ghabid, Secretary General, OIC, Inaugurating Expo-95 arranged by the Foundation during the 7th Meeting of COMSTECH at National Library of Pakistan, Islamabad.



Chief Guest, H.E. Hamid-Al-Ghabid at the Stall of Defence Science & Technology Organisation.

COMPUTER EXHIBITION



Chief Guest Dr. Khalid Mahmood Khan, Chairman, Pakistan Science Foundation, at one of the stalls.



Dr. Khalid Mahmood Khan, Chairman, Pakistan Science Foundation at the Mobile Science Exhibition Federal Unit organized during the Computer Exhibition.

SOLAR ENERGY EXHIBITION



Models/Exhibits displayed by National University of Science & Technology at Exhibition Solar/Renewable Energy Appliances/Equipment.



Students of National University of Science & Technology at one of the Stalls.

PAKISTAN SCIENTIFIC AND TECHNOLOGICAL INFORMATION CENTRE, (PASTIC)

Pakistan Scientific and Technological Information Centre (PASTIC) is the premier organisation in the field of information dissemination, serving thousands of researchers. It is a unit of the Pakistan Science Foundation.

PASTIC has evolved from the erstwhile Pakistan National Scientific and Technological Documentation Centre (PANSDOC), which was established in 1957 at Karachi with the assistance of UNESCO, under the Pakistan Council of Scientific and Industrial Research (PCSIR). In 1974 however, PANSDOC was transferred to the Pakistan Science Foundation (PSF), and was renamed as the Pakistan Scientific and Technological Information Centre (PASTIC). After transfer to PSF the scope and facilities of PASTIC were expanded with the following objectives.

1. To procure, process and disseminate scientific and technological information to the researchers.
2. To interact with regional and international information agencies/networks.
3. To develop inter-library cooperation and resource sharing at national level.
4. To train information personnel in contemporary techniques and methods of information handling.
5. To develop and strengthen the National Science Reference Library.
6. To provide bibliographic and translation services.
7. To compile Directory of S&T Periodicals of Pakistan, Union Catalogue of S&T Serials and Bulletin of Technology Information.
8. To publish an abstracting and indexing journal entitled "Pakistan Science Abstracts".

PASTIC has a National Centre in Islamabad housed in its own building located at the Quaid-e-Azam University Campus, and four Sub-Centres at Karachi, Lahore, Quetta and Peshawar. The Centre offers numerous specialized services to the scientific community of Pakistan as described below.

1. DOCUMENT PROCUREMENT AND SUPPLY SERVICE

Under the Document Procurement and Supply Service, queries are received from different R&D organizations for supply of reprints of research articles/conference papers and reports which are procured either from local sources or from abroad. A total of 1401 S&T documents were procured and supplied against 1771 requests received from scientists and technologists during the year.

2. BIBLIOGRAPHY SERVICE

References from International databases on CD ROM are supplied on request to users according to their research topics. During 1995-96, against 341 orders, 12669 references were collected and supplied on S&T topics to the researchers.

3. CURRENT CONTENT SERVICE

Under the Current Contents Service, copies of the tables of contents from 96 S&T journals in the fields of chemistry, biology, physics, computing, earth sciences, mathematics and medicine were provided to 512 scientists. During the period under review, copies of 49 articles were also supplied to users.

4. ABSTRACTING AND INDEXING SERVICE

PASTIC publishes a quarterly journal viz.: Pakistan Science Abstracts (PSA), which contains abstracts of research articles published in recent S&T Journals of Pakistan. During the report period, following volumes were processed.

- i) PSA 1994 Vol. 34 (1-2 & 3-4), were published.
- ii) PSA 1995 Vol. 35 (1-2 & 3-4) were composed and sent for printing.
- iii) PSA 1993 Vol. 33 (1-4) and PSA 1994 Vol. 34 (1-2) were distributed to 30 organizations on subscription basis and to 80 organizations on exchange basis.

5. PASTIC NATIONAL SCIENCE REFERENCE LIBRARY

About 921 issues of various S&T periodicals, 177 documents and 112 books were received in the libraries of PASTIC National Centre and Karachi Sub Centre. The number of references supplied were 1245. The subscription of five databases, viz., Life Sciences, POLTOX, PROQUEST, Physical, Chemical and Earth Science, and Sociofile and Medline on CD-ROM were renewed

6. TECHNOLOGY INFORMATION

PASTIC publishes a monthly bulletin, namely, "Technology Information". The January-December 1995 and January-February 1996 issues of the bulletin were published based on information on technologies collected from 27 countries. The March-June, 1996 issues were finalized and sent for printing and the July-August, 1996 issues were composed. The mailing list for the bulletin comprises of 251 industrial and technical enterprises/entrepreneurs in public and private sectors.

7. REPROGRAPHIC SERVICES

The Reprographic Section of PASTIC (Islamabad) has facilities ranging from photocopying to offset printing. During 1995-96, about 873775 impressions, 3,028 pages and 77,495 copies were produced by the Reprography Unit against 102 jobs received from 18 organizations.

8. COMPUTERIZATION ACTIVITIES

Under this activity, various computer items including a Dot Matrix Printer PANASONIC KX-P1121, Mother Board 80386 Dx (Qty 2) and Tonner Cartridge for HP Laser Jet Printer were purchased. Composition work also continued and 12825 pages were composed including PSA 1994 Vol. 34 No.(1-2 & 3-4). In addition, computer software and desk-top publishing services/facilities were provided to other S&T organizations.

9. INTERNATIONAL LIAISON

PASTIC is the National Focal point of International/Regional Information Networks like, SAARC Documentation Centre, WHO/CEHANET and UNEP/INFOTERRA. PASTIC is also the coordinating/collaborating body for UNDP/TIPS, UNESCO/ASTINFO and AIT/ENSICNET. The following collaborating activities were undertaken during the report period.

a) INFOTERRA

INFOTERRA is the United Nations Environment Programme's Global Information Network based at Nairobi, Kenya comprising of National Focal Points (NFPs) in about 200 member states. INFOTERRA provides information by searching the database on Environmental Information Sources it has developed with the assistance of the NFPs. All information services such as articles service, bibliographic service, reference and referral services are provided free of charge. During the period under review, the following activities were undertaken.

- i) Information was supplied in response to queries pertaining to Forest Fire, Trace Elements in Crops and Plants, Lead in Air, Veterinary Pathology, Tannery Effluents, Pesticides Pollution, Biotechnological Applications for Waste Disposal, Pesticidal Effects on Rabbits and Pigeons, Water Distribution in Rural Areas, Incinerators for Pharmaceutical Wastes, Pollution and Skin Diseases, Pesticides Toxicology, Fresh Water Vertebrates, Solid Wastes, Hazards of Lasers in Medicine, Noise Pollution in Buildings, Management of Lions in National Parks, Biological Control of Aphids, Biosafety, Insect Parasitism, Industrial Pollution Effects on Cereals, Industrial Pollution by: Sugar Industry, Cement Industry, Paper Industry, Steel Industry, Brick Industry, Chemical Industry, etc.
- ii) A national level survey was undertaken for collection of data about organizations and personnel engaged in environmental activities for publishing in the Directory of Environmental Organizations, Professionals and Legislation. A database has already been created using this data.
- iii) Information was provided to INFOTERRA Headquarters in Nairobi on Global Environmental Facility in Pakistan.
- iv) News item was provided on the celebrations of the World Environment Day.

b) CEHANET

The World Health Organization's Centre for Environmental Health Activities Information Network gathers information about published material on environmental health with the help of 22 National Focal Points. Information is then provided through the bibliographic database on environmental health documents which can be obtained from the member states. During 1995-96, CEHANET publications, such as, technical reports, training manuals, and information materials were distributed. Information was provided on water pollution, solid waste disposal, hospital waste and pharmaceutical wastes.

c) ASTINFO

It is a UNESCO supported network for the exchange of experience and information in science and technology in Asia and the Pacific. It aims to build and strengthen the information infrastructure in the member states. Under this network, PASTIC is responsible for distributing the UNESCO developed software package CDS/ISIS and for providing training on this package. During the year, CDS/ISIS package was provided to 11 Organizations, and ASTINFO Newsletter and other promotion material were distributed.

d) SAARC Documentation Centre (SDC)

SDC was established in 1994 for facilitating the exchange of information amongst the SAARC Member States. During the period under report, reprints were procured from INSDOC under the SAARC programme. SDC Newsletters were distributed and SDC questionnaires were distributed to collect data about S&T and R&D Institutions for publishing in the SDC Directory.

e) Miscellaneous

In addition to above, information was searched and supplied mostly on Environmental and S&T topics, reference and referral services were provided to researchers and a brief was prepared for the Prime Minister. A project was also prepared for providing Abstracting & Indexing Services to Chip Computer Services, Saudi Arabia.

10. MEETINGS/VISITS/FUNCTIONS

PASTIC personnel attended/participated in various meetings and functions etc. during the year as given below.

- i) The Director PASTIC attended the 10th ASTINFO consultative meeting in Beijing, China from 22-27 September 1995.
- ii) Director General PASTIC attended the 3rd Meeting of the Governing Board of SAARC Documentation Centre from 7-8 March, 1996 in Maldives.
- iii) The first meeting of the SDC-NFP-Cell Coordinators was held from 21-22 May, 1996 in at Kathmandu, Nepal and was attended by Miss Nageen Ainuddin, the Cell Coordinator, PASTIC.
- iv) PASTIC participated in EXPO 95, organised by MoST in Islamabad.
- v) Secretariat services were provided to 7th Session of COMSTECH, 13th Meeting of SAARC Technical Committee Meeting on Science & Technology, 3rd Meeting of Bureau of UN Commission on Science & Technology for Development (UNCSTD) and National Commission for Science and Technology.
- vi) Groups of several students and teachers visited PASTIC from Islamia University Bahawalpur, University of Agriculture, Faisalabad and University of Karachi.
- vii) An S&T delegation from China visited PASTIC.

11. TRAININGS

a) Trainings Received

Study visit was undertaken by Miss Nageen Ainudin, Senior Documentation Officer to Institute of Scientific and Technological Information of China (ISTIC) 2-31 July 1995, to learn modern information handling techniques and compare the services and facilities available at ISTIC and PASTIC.

An officer (Miss Nageen Ainuddin) from PASTIC attended an "Introductory Seminar on Intellectual Property", Geneva from 30th August to 1st September, 1995. Miss Nageen Ainuddin also attended a specialized training course on "Patent Information and Documentation" at Austrian Patent Office, Vienna, Austria, from 5-22 September, 1995.

b) Trainings Imparted

The PASTIC provided the following trainings during the year.

PASTIC/PSF and Kashmir Society for Scientific and Social Research/Computer Line organised a workshop on Library/Office Automation & Management from 18-24 July 1995, in Muzaffarabad, AJK. PASTIC provided all the technical training required.

Training services were provided to HURIDOCs for their National Training Course on Handling of Human Rights Information on Published Material from 13-17 August 1995 in Islamabad.

Training on CDS/ISIS package was provided to 4 persons from AKRSP, Gilgit from 14-18 April 1996, and an officer from Cabinet Division, Islamabad.

12. TECHNOLOGICAL INFORMATION PROMOTION SYSTEM (TIPS)

Technological Information Promotion System (TIPS) based at PASTIC has been regularly publishing daily and weekly bulletins in Pakistan which provide up-to-the-minute and detailed information on technology and trade opportunities. It covers 14 different sectors and has the largest data base in the world on trade & technology information from the developing countries. The sectors are; i) Agro-Industries, ii) Energy, iii) Electronics, iv) Pharmaceuticals, v) Business Opportunities, vi) Food Processing, vii) Machinery, viii) Biotechnology, ix) Textiles, x) Fisheries, xi) Building Materials, xii) Chemicals, xiii) Mining, and xiv) Packaging. During the year under report, TIPS undertook the following activities.

- i) In the year, 2050 technology/trade offers and requests were received from 25 countries and were sent to 175 users in Pakistan. Pakistani entrepreneurs/business organizations provided information on 950 products/processes/technologies which were advertised abroad through TIPS network.
- ii) Articles on products and technologies were received.
- iii) Free advertisements were provided to 225 organizations by the TIPS National Bureau.
- iv) PSF and TIPS arranged a Computer Exhibition at Al-Hamra Art Council, Lahore. More than 10,000 people visited the exhibition.
- v) TIPS has sold its 2nd information book/directory in Urdu through book shops.
- vi) TIPS third book on trade and technology information in Urdu language is under process.

CHAPTER 2

ORGANIZATION AND ADMINISTRATION

The organizational structures of the Pakistan Science Foundation, Pakistan Museum of Natural History and Pakistan Scientific and Technological Information Centre are given on the forth coming pages. The staff position in the Foundation, PMNH & PASTIC during the period was as under:

PAKISTAN SCIENCE FOUNDATION (PSF)

Sr. No.	Designation	Number
1.	Chairman	1
2.	Member (Science)	1
3.	Member (Finance)	1
4.	Chief Scientific Officer	1
5.	Secretary	1
6.	Principal Scientific Officer	2
7.	Senior Scientific Officer	3
8.	Senior Research Officer	1
9.	Deputy Director (F&A)	1
10.	Deputy Secretary	1
11.	Deputy Director (Admn)	1
12.	Public Relations Officer	1
13.	Accounts Officer	1
14.	Assistant Director (Budget, CP Fund & Pension)	1
15.	Research Officer	1
16.	PS to Chairman	1
17.	Librarian	1
18.	Scientific Officer	6
19.	Internal Audit Officer	1
20.	Caravan Incharge	5
21.	Graphic Artist	2
22.	Superintendent	1
23.	Assistant Research Officer	1
24.	PA to Chairman	1
25.	Mechanic for Instrument	1
26.	Assistant Scientific Officer	1
27.	Accountant	1
28.	Supporting Staff	125
	Total :	165

PAKISTAN MUSEUM OF NATURAL HISTORY (PMNH)

S. No.	Designation	Number
1	Director General	1
2	Director	3
3	Curator	3
4	Associate Curator	11
5	Product Designer	1
6	Research Associate	21
7	Artist	1
8	Senior Administrative Officer	1
9	Accounts Officer	1
10	Librarian	1
11	Taxidermist	2
12	Associate Artist	2
13	Teacher Guide	1
14	Superintendent	1
15	Accountant	1
16	Stenographer	1
17	Casting Staff	1
18	Modeller	1
19	Children Education Programmer	1
20	Stenotypist	3
21	Calligrapher	1
22	Assistant Artist	2
23	Fossil Preparator	1
24	Photographer	1
25	Office Assistant	1
26	Purchase Assistant	1
27	Accounts Assistant	1
28	Cashier	1
29	Senior Collection Incharge	2
30	Key Punch Operator	1
31	Incharge Embalming	1
32	Skeleton Preparator	1
33	Collection Incharge	2
34	Drying & Fumigating Assistant	2
35	Tracer	1
36	Electrician	1
37	Lathe Machine Operator	1
38	Painter	1
39	U.D.C	2
40	Store Keeper	1
41	Field Assistant	12
42	L.D.C	2
43	D.M.O.	1
44	Dispatch Rider	1
45	Driver	5
46	Naib Qasid	8
47	Guard	4
48	Helper	4
49	Gardener	1
50	Chowkidar	10
51	Sanitary Worker	5
	Total Posts	136

PAKISTAN SCIENTIFIC AND TECHNOLOGICAL INFORMATION CENTRE (PASTIC)

S.No.	Designation	Number
1	Director General	1
2.	Deputy Director (Doc)	1
3.	Manager Reprographic Unit	1
4.	Senior Administrative Officer	1
5	Senior System Analyst	1
6.	Senior Documentation Officer	1
7.	Senior Information Officer	1
8	Senior Librarian	1
.	Chief Editor	1
10.	Chief Liaison Officer	2
11	Scientific Information Officer	3
12.	Admin. Officer (Karachi)	1
13.	Printing Officer	1
14.	Graphic Artist	1
15.	Translating Officer	1
16.	System Analyst	2
17.	Liaison Officer	2
18	Manager Technology Information	1
19.	Accounts Officer	1
20.	Patent Officer	1
21.	Assistant Documentation Officer	2
22.	Assistant Manager Reprographic Unit	1
23.	Assistant Scientific Information Officer	4
24.	Assistant Programmer	3
25.	Superintendent (Admin.)	1
26.	Superintendent (Reprographic Unit)	1
27.	Accountant	1
28.	P.A. To Director General	1
29.	Supporting Staff	91
	Total:	130

CHAPTER-3

**PAKISTAN SCIENCE FOUNDATION
FINANCIAL STATEMENTS
JUNE 30, 1996**

AUDITORS' REPORT TO THE BOARD OF TRUSTEES

We have audited the annexed Balance Sheet of PAKISTAN SCIENCE FOUNDATION as on June 30, 1996 and the related Receipts and Expenditure Account together with the notes forming part thereof for the year then ended and state that in our opinion the Balance Sheet, Receipts and Expenditure Account together with the notes forming part thereof respectively give a true and fair view of the state of the Foundation's affairs as on June 30, 1996 and of the surplus for the year then ended.

We further certify that these accounts include receipts of Rs.30,910,000/- which comprise the grants received from Federal Government and we are satisfied with the propriety of disbursement thereof.

ISLAMABAD _____ 1996

CHARTERED ACCCOUNTANTS.

**PAKISTAN SCIENCE FOUNDATION
BALANCE SHEET AS ON JUNE 30, 1996**

GRANT AND LIABILITIES	NOTE	1996 Rupees	1995 Rupees
GENERAL FUND	2	29,397,239	27,098,967
RESEARCH SUPPORT GRANT	3	<u>32,519,642</u>	<u>32,253,024</u>
		44,128,834	39,948,394
CURRENT LIABILITIES	4	<u>1,734,494</u>	<u>1,556,451</u>
		63,651,375	60,908,442

The report of the auditors is set out on page 1.

The notes set out on pages 5 to 9 from an integral part of these accounts.

ACCOUNT OFFICER

DY. DIRECTOR (F&A)

**PAKISTAN SCIENCE FOUNDATION
BALANCE SHEET AS ON JUNE 30, 1996**

FIXED CAPITAL EXPENDITURE	NOTE	1996 Rupees	1995 Rupees
Operating fixed assets	5	27,368,842	7,075,611
Capital work in progress		--	16,949,540
		27,368,842	24,025,151
RESEARCH PROJECT IN PROGRESS		32,519,642	32,253,024
LONG TERM SECURITIES	7	1,617,195	
CURRENT ASSETS			
Advances, deposits & Prepayments	8	487,318	930,869
Cash and bank balances	9	1,658,378	3,699,398
		2,145,696	4,630,267
		63,651,375	60,908,442

The report of the auditors is set out on page 1

The notes set out on pages 5 to 9 from the integral part of these accounts

ACCOUNT OFFICER

DY DIRECTOR (F&A)

**PAKISTAN SCIENCE FOUNDATION
RECEIPT AND EXPENDITURE ACCOUNT
FOR THE YEAR ENDED JUNE 30, 1996**

RECEIPTS	Note	1996 Rupees	1995 Rupees
Development Grants		2,500,000	8,999,000
Non-Development		27,910,000	25,975,000
Research Grants		500,000	
		30,910,000	34,974,000
EXPENDITURE			
Non-Development Grants			
Scientific Functions	10	10,545,050	11,628,068
Administrative Expenses	11	16,213,143	12,612,471
		26,758,193	24,240,539
Research Grants		<u>500,000</u>	
SURPLUS CARRIED OVER		<u>27,258,193</u>	<u>24,240,539</u>
		3,651,807	10,733,461

The report of the auditors is set out on page 1

The notes set out on pages 5 to 9 form an integral part of these accounts

ACCOUNT OFFICER

DY DIRECTOR (F&A)

PAKISTAN SCIENCE FOUNDATION, ISLAMABAD
NOTES TO THE ACCOUNTS FOR THE YEAR ENDED JUNE 30, 1996

STATUS AND OBJECTS

PAKISTAN SCIENCE FOUNDATION (the Foundation) is a statutory organization established under Pakistan Science Foundation Act, 1973. The main object of its establishment is to promote and finance scientific activities having a bearing on the socio-economic needs of the country.

1. ACCOUNTING POLICIES

The principal accounting policies which have been adopted in the preparation of the Foundation's accounts are as follows:

(i) GRANTS RECEIVED

Grants from the Government of Pakistan have been accounted for on actual receipt basis.

ii) RESEARCH SUPPORT GRANT

Research support grant has been accounted for on actual payment basis.

iii) FIXED ASSETS

Fixed assets have been valued at cost less accumulated depreciation except lease hold land which is valued at cost. Depreciation on fixed assets is charged on reducing balances method, at the rates specified in note 5.

iv) GENERAL

a) Figures have been rounded off to the nearest rupee.

b) Figures of the previous year have been regrouped and rearranged wherever necessary for the purpose of comparison.

	1996 Rupees	1995 Rupees
2. GENERAL FUND		
Balance as on July 01	27,098,967	15,011,971
Development grant	(1,353,535)	1,353,535
 Add: Balance transferred from Receipt and Expenditure Account	 3,651,807	 10,733,461
	29,397,239	27,098,967
3. RESEARCH AND SUPPORT GRANT		
Balance as on July 01	32,253,024	29,116,863
Add: Disbursement during the year (3a)	7,421,323	7,827,790
	33,588,163	36,944,653
Less: Project completed during the year.	7,154,705	4,691,629
	32,519,642	32,253,024
3a. DISTRIBUSEMENT DURING THE YEAR		
Mathematics and Computer Sciences	42,630	200
Physical Sciences	1,145,007	1,584,124
Chemical Sciences	1,617,595	1,748,077
Biological Sciences	1,882,857	1,310,098
Earth Sciences	1,000	64,164
Environmental Sciences	78,187	46,633
Engineering Sciences	65,675	400
Agricultural Sciences	2,049,835	2,227,398
Medical Sciences	400	264,625
Institutional Support	420,000	455,000
Board and Committee Meetings	<u>118,137</u>	<u>127,071</u>
	<u>7,421,323</u>	<u>7,827,790</u>
4. CURRENT LIABILITIES		
Security Deposits	6 1,575,424	1,395,358
Accrued Expenses	159,070	161,093
	1,734,494	1,556,451

5. OPERATING FIXED ASSETS

Particulars	C O S T				D E P R E C I A T I O N			
	As at July 01, 1995	Additions	As at June 30, 1996	RATE %	As at July 01, 1995	For the year	As at June 30, 1996	Writing Down Value As at June 30, 1996
Lease hold land	3,713,418	-	3,713,418	-	-	-	-	3,713,418
Building	-	19,484,540	19,484,540	5	-	974,227	974,227	18,510,313
Motor vehicles	3,023,209	472,850	3,496,059	20	2,046,884	289,835	2,336,719	1,159,340
Office equipment	1,963,401	216,296	2,179,697	15	1,007,858	175,776	1,183,634	996,063
Science equipment	969,833	534,715	1,504,548	15	757,406	112,071	869,477	635,071
Furniture & fixture	1,330,635	325,711	1,656,346	6	434,576	73,306	507,882	1,148,464
Air conditioners	194,974	-	194,974	15	169,120	3,878	172,998	21,976
Library books & films	412,242	950,541	1,362,783	5	116,276	62,325	178,601	1,184,182
Bicycle	680	-	680	20	661	4	665	15
1996 Rupees	11,608,392	21,984,653	33,593,045		4,532,781	1,691,422	6,224,203	27,368,842
1995 Rupees	9,651,387	170,683	9,822,070		3,666,952	338,295	4,005,247	5,816,823

	1996 Rupees	1995 Rupees
6. SECURITIES DEPOSITS		
M S Moderate Builders	746,754	1,343,028
M S Faisal Associate	178,670	48,580
PCSIR Share for boundary wall	650,000	-
	1,575,424	1,391,608
7. DETAIL OF LONG TERM SECURITIES		
M S WAPDA Islamabad	1,472,195	
M S SNGPL	145,000	
	1,617,195	
8. ADVANCES, DEPOSITS AND PREPAYMENTS		
Advances to Staff	188,329	185,979
Deposits		5,500
Prepaid rent	298,989	7,39,390
	487,318	930,869
9. CASH AND BANK BALANCES		
Cash In hand	27,904	44,850
UNESCO Coupons	40,206	910,461
Cash at Bank	1,590,268	2,744,087
	1,658,378	3,699,398

10. SCIENTIFIC FUNCTIONS

Research and Support Grant	7,421,323	7,827,790
Scientific Societies and Professional Bodies	690,000	519,020
Scientific Conferences, Meetings and Seminars	584,000	705,000
Operation of Science Caravan	728,598	1,061,501
Science Survey	--	204,045
Science centres & herbaria	376,680	74,000
Information and documentation	49,737	8,706
Awards, prizes and fellowship	--	102,200
International Liaison	882	192,216
Science Promotion Activities	395,745	9,33,590
Science Fair	100,000	--
Exchange of Visits of Scientists and Technologists		--
	<u>198,085</u>	
	<u>10,545,050</u>	<u>11,628,068</u>

11. ADMINISTRATIVE EXPENSES

Salaries and other benefits	9,540,764	8,155,952
Travelling	557,558	269,876
Rent	1,822,144	1,682,063
Electricity, gas and water	230,137	209,724
Postage, telephone and telegram	1,075,784	754,691
Printing & stationery	159,581	175,955
Vehicle running and maintenance	626,898	483,078
Newspapers and periodicals	51,375	33,509
Liveries and uniforms	2,700	37,802
Entertainment	46,126	50,456
Repair and Maintenance	104,665	66,471
Audit fee	12,500	12,500
Advertisement and publicity	171,565	113,263
Law charges	3,000	3,000
Depreciation	1,691,422	527,534
Miscellaneous	116,924	36,597
	16,213,143	12,612,471

PAKISTAN SCIENCE FOUNDATION ACT 1973

**National Assembly of Pakistan
Islamabad, the 2nd February, 1974**

The following Acts of the National Assembly received the assent of the President on the 31st January, 1973 and hereby published for general information.

Act No. III of 1973

An Act to provide for the establishment of the Pakistan Science Foundation

Whereas it is expedient to provide for the establishment of the Pakistan Science Foundation and for matters ancillary there to.

It is hereby enacted as follows -

- 1 **Short title, extent and commencement.** (1) This Act may be called the Pakistan Science Foundation Act, 1973.
 - 2) It extends to the whole of Pakistan
 - 3) It shall come into force at once
- 2 **Definitions** In this Act, unless there is anything repugnant in the subject or context
 - a) "Board" means the Board of Trustees of the Foundation.
 - b) "Chairman": means the Chairman of the Foundation, and
 - c) "Foundation" means the Pakistan Science Foundation established under this Act
3. **Establishment of the Foundation** (1) As soon as may be after the commencement of this Act, the Federal Government may, by notification in the official Gazette, establish a Pakistan Science Foundation to promote and finance scientific activities having a bearing on the socio-economic needs of the country. (2) The Foundation shall be a body corporate by the name of the Pakistan Science Foundation, having perpetual succession and a common seal, with power, subject to the provision of this Act, to acquire, hold and dispose of property, both movable and immovable, and shall be the said name sue and be sued. (3) The Head Office of the Foundation shall be at Islamabad
4. **Functions of the Foundation:** (1) The Foundation shall function as a financing agency for
 - i) the establishment of comprehensive scientific and technological information and dissemination centers;
 - ii) the promotion of basic and fundamental research in the universities and other institutions on scientific problems relevant to the socio-economic development of the country;
 - iii) the utilization of the results of scientific and technological research including pilot plant studies to prove the technical and economic feasibility of processes found to be promising on a laboratory scale;
 - iv) the establishment of science centers, clubs, museums, herbaria and planetaria;
 - v) the promotion of scientific societies, associations and academies engaged in spreading the cause of scientific knowledge in general or in the pursuit of a specific scientific discipline or technology in particular.
 - vi) the organisation of periodical science conferences, symposia and seminars;
 - vii) the exchange of visits of scientists and technologists with other countries;
 - viii) the grant of awards, prizes and fellowships to individuals engaged in developing processes, products and inventions of consequence to the economy of the country; and

ix) special scientific surveys not undertaken by any other organization and collection of scientific statistics related to the scientific effort of the country.

(2) The Foundation shall also:

i) review the progress of scientific research sponsored by it and evaluate the results of such research;

ii) maintain a National Register of highly qualified and talented scientists of Pakistan including engineers and doctors, in or outside the country and to assist them, in collaboration with the concerned agencies in finding appropriate employment; and

iii) establish liaison with similar bodies in other countries

(3) In the performance of its functions, the Foundation shall be guided on questions of policy by the instructions, if any, given to it by the Federal Government which shall be the sole judge as to whether a question is a question of policy.

5 Board of Trustees (1) The general direction, conduct and management of the affairs of the Foundation, including administration of its funds, shall vest in a Board of Trustees consisting of the following members namely:-

Whole-time members

i) the Chairman;

ii) one eminent scientist;

iii) the Director of Finance: to be appointed by the President;

Part-time members

iv) the Chairman of the National Science Council;

v) four scientists to be nominated by the National Science Council; and

vi) eleven eminent scientists to be nominated by the President

(2) The remuneration and other terms and conditions of service of the Chairman and the two other whole-time members of the Board shall be such as may be determined by the President.

6. Chairman of the Board. The Chairman of the Board shall be the Chairman of the Foundation and shall be appointed for a term of three years from amongst the eminent scientists of the country having experience of research and scientific administration.

7 Term of Members of the Board. The members of the Board, other than the ex-officio member, shall hold office for a term of three years and shall be eligible for re-appointment or re-nomination, as the case may be.

8. Meetings of the Board. (1) The meeting of the Board shall be held at least twice a year and shall be presided over by the Chairman or, in his absence, by its whole-time scientist member. (2) All decisions at a meeting of the Board shall be taken by a majority of the votes of the members present and voting.

9. Quorum at the Meeting of the Board. To constitute a quorum at a meeting of the Board not less than nine members shall be present.

10. Executive Committee. There shall be an Executive Committee consisting of the Chairman and the two whole-time members of the Board.

11. Delegation of Powers. The Board may, from time to time, delegate the Chairman or the Executive Committee such of its power and functions as it may consider necessary.

12. Adhoc Committees. The Foundation may set up adhoc committees consisting of university professors and other leading scientists and experts to scrutinize applications for financial assistance for carrying out scientific research submitted to the Foundation by the universities or other institutions or by individual scientific workers or groups of scientific workers and to review and evaluate the results of research sponsored by the Foundation.

13. **Funds.** The funds of the Foundation shall consist of.
- a) grants made by the Federal Government and the Provincial Governments.
 - b) donation and endowments; and
 - c) income from other sources:
14. **Budget.** The Foundation shall cause to be prepared and approve a statement of its receipt and expenditure for each financial year.
15. **Accounts and Audit.** (1) The funds of the Foundation shall be kept in a personal ledger account of the Foundation with the State Bank of Pakistan or with any Branch of the National Bank of Pakistan acting as an agent of the State Bank. (2) The accounts of the Foundation shall be maintained in such form and manner as the Auditor-General of Pakistan may determine in consultation with the Federal Government (3) The accounts of the Foundation shall be audited by one or more auditors who are chartered accountants within the meaning of the Chartered Accountants Ordinance, 1961 (X of 1961) and are appointed by the Foundation in consultation with the Auditor-General of Pakistan
16. **Appointment of Officers and Servants.** (1) The Foundation may appoint such officers and servants and engage such consultants or experts, as it may consider necessary for the efficient performance of its functions, on such terms and conditions as it may deem fit (2) In fixing the terms and conditions of service of its officers and servants, the Foundation shall, as nearly as may be, conform to the scales of pay, allowances and conditions of service applicable to the corresponding class of employees of the Federal Government
17. **Annual Reports.** (1) The annual report of the Foundation, which shall among other things, clearly bring out the benefits accruing to the nation as a result of the activities sponsored by the Foundation, shall be prepared by the Chairman and submitted through the Board to the Federal Government along with the audited accounts of the Foundation (2) The annual report along with the audited accounts of the Foundation shall be laid before the National Assembly
18. **Regulations.** The Foundation may make regulations for the efficient conduct of its affairs.
19. **Repeal.** The Pakistan Science Foundation Ordinance, 1972 (LII of 1972), is hereby repealed

LIST OF NEW PROJECTS APPROVED BY THE FOUNDATION DURING 1995-96

<u>No.</u>	<u>Title and Number of Project</u>	<u>Name of P.I and the Organization Supported:</u>	<u>Project Cost</u>
a) Agricultural Sciences			
1.	Factors Affecting Successful In Vitro Maturation, Fertilization and Culture of Buffalo Follicular Oocytes P-AU Agr(175)	Dr Ala-ud-Din Professor Deptt of Animal Production Faculty of Veterinary Sciences University of Agriculture Faisalabad	Rs. 3.62.681 -
2.	Breeding for Glandless Cotton S-PCCC Agr(183)	Abdul Razaque Soomro Senior Research Officer Cotton Research Institute Sakrand, Distt Nawabshah	Rs. 2.46.799 -
3.	Investigation on the Diseases of Betel Vine and their Control S-KU Agr(184)	Dr Saleem Shahzad Lecturer Deptt. of Botany University of Karachi, Karachi	Rs 3.67.159/-
4.	Management of <i>Pentaloma nigronervosa</i> , a Vector of Banana Bunchy Top Disease in Sindh Province, Pakistan C-IIBC Agr(201)	Riaz Mahmood Senior Scientist PARC-IIBC Station International Institute of Biological Control (IIBC), Data Ganj Bakhsh Road, Rawalpindi	Rs 5.05.920 -
b) Biological Sciences			
5.	Use of Rhizobia in the Integrated Control of Root Rot Disease of Crop Plants S-KU/Bio(193)	Dr Syed Ehteshamul Haque Research Officer M.A.H. Qadri Biological Research Centre, University of Karachi, Karachi	Rs. 4.02.676/-
6.	Cage Culture of <i>Lutjanus Jhom</i> (Snapper) and <i>Pomadasys Kaakan</i> (Grunt) Marine Commercial Fishes. S-KU/Bio(233)	Dr S Makhdoom Hussain Associate Professor Centre of Excellence in Marine Biology University of Karachi, Karachi	Rs. 3.27.860/-
7.	Potentials of Owls as Controlling Agents of Rats and Mice P-AU/Bio(238)	Dr. Mirza Azhar Baig Professor, Deptt. of Zoology & Fisheries, University of Agriculture, Faisalabad	Rs 4.19.015/-
8.	Elucidation of the Structure and Function of a New Form Dihydrofolate Seductase. S-AKU Bio(239)	Mohammad Perwaiz Iqbal Professor, Deptt. of Biochemistry The Aga Khan University Medical College, Stadium Road, Karachi	Rs. 4.24.493/-

- | | | | |
|-----|--|--|----------------|
| 9 | Molecular Epidemiology and Characterization of Sulmonellus Isolates of Avian Origin
C-QU/Bio(245) | Dr. Khalida Sultana
Deptt. of Biological Sciences
Quaid-e-Azam University
Islamabad | Rs. 5.16.668 - |
| 10. | Development of Salt Tolerant Sugar-cane Cultivars through Genetic Engineering.
F-GU/Bio(247) | Prof. Dr. Hamidullah Khan
Chairman
Deptt. of Plant Breeding & Genetics,
Faculty of Agriculture
Gomal University, D.I. Khan | Rs. 3.84.917 - |
| 11. | Systematics and Ecology of Polychaete Worms of Pakistan Coastal Waters
S-KU/Bio(260) | Dr. Javed Mustaqim
Associate Professor.
Centre of Excellence in Marine Biology, University of Karachi,
Karachi | Rs. 87.250 - |

c) Environmental Sciences

- | | | | |
|----|---|--|----------------|
| 12 | Assessment of Physiological and Genetic Defects in Human Population Exposed to Industrial Pollutants in the Industrial Area of District Kasur , Punjab
P-PU/Envr(36) | Dr. Abdul Rauf Shakoori
Professor Dept. of Zoology
University of the Punjab,
Lahore | Rs. 2.37.232 - |
|----|---|--|----------------|

d) Chemical Sciences

- | | | | |
|-----|---|---|----------------|
| 13. | Physio-Chemical Studies on the Biologically Active Constituents of Ferns In Pakistan.
B-BU/Chem (279). | Dr. Hamid Latif Siddiqui
Assistant Professor, Department of Chemistry, University of Balochistan,
Quetta | Rs. 4.09.204 - |
| 14. | A Study on the Lubricity of Lubricating Oils Produced in Pakistan
F-PU/Chem(284) | Dr. Ikram-ul-Haq
Assistant Professor, National Center of Excellence in Physical Chemistry,
University of Peshawar. | Rs. 3.81.072 - |
| 15. | Flash Pyrolysis of Indigenous Coal Utilizing Effective Radical Transfer
F-PU/Chem (285) | Dr. Iftikhar Ahmed Awan
Assistant Professor, National Center of Excellence in Physical Chemistry,
University of Peshawar. | Rs. 3.64.752 - |
| 16. | Electro Deposition of Alloys
F-PU/Chem (288) | Prof. Dr. Lutfullah
National Center of Excellence in Physical Chemistry,
University of Peshawar | Rs. 5.16.792 - |
| 17. | Spectrophotometric and High Performance Liquid Chromatographic Determination of Copper, Nickel, Iron, Cobalt, Vanadium, Cadmium, Lead and Mercury. Using New Semi-carbozones as Complexing Reagents.
S-SU/Chem (294) | Dr. M.Y. Khuhawar,
Professor, Institute of Chemistry,
University of Sindh,
Jamshoro. | Rs. 5.27.116 - |

e) Physical Sciences

18.	Atomic Coherence Effect in Laser and Quantum Optics C-QU Phys (93)	Dr. M. Sohail Zubairy Professor and Chairman, Deptt. of Electronics, Quaid-e-Azam University, Islamabad	Rs. 2,38,037 -
19	Theoretical Computational Studies of Fractals in Materials P-PU Phys (94)	Dr. Nazma Ikram Professor, Center for Solid State Physics, University of the Punjab, Lahore	Rs 3,39,588 -
20	Optical and Electrical Properties of Germinate Glasses P-BZU Phys (95)	Dr. Younus Nadeem Associate Professor, Deptt. of Physics, Bahauddin Zakariya University, Multan	Rs 5,29,563 -
21	Study of Heavy Ion Reactions using Dielectric Track Detectors C-PINSTECH Phys (97)	Dr. Imtihan Fiahi Qureshi Head, Nuclear Interaction Studies Group, Radiation Physics Division, PINSTECH, Islamabad	Rs.2,89,732 -
22	Design and Development of Gas Puff Z-Pinch C-QU Phys (101)	Dr. G. Murtaza, Professor, Deptt. of Physics, Quaid-e-Azam University, Islamabad	Rs 5,17,793 -
23	Solar Tent for Snow bound Areas P-CEME Engg (61)	Lt Col. Dr. Nasim A. Khan Associate Professor College of Electrical and Mechanical Engineering, Rawalpindi	Rs 27920 -
24	Ricci Collineations Space times C-QU Maths (21)	Dr. M. Ziad, Assistant Professor, Department of Mathematics, Quaid-e-Azam University, Islamabad	Rs 2,26,532 -

Total: Rs. 8,650,771/-

DETAILS OF MONITORING AND EVALUATION OF ON-GOING PSF PROJECTS DURING 1995-96

a) *Semi-Annual Reports*

No.	Project No.	Project Title	Reports
1	AJK-UCR Agr (126)	Application of Molecular Approach towards Biological Nitrogen Fixation (BNF) in Azad Kashmir	3rd semi annual
2.	P-AU Agr (128)	Fish as a Bioindicator of Fresh Water Contamination by Metals.	3rd semi annual
3	P-C'SIR Agr (129)	In-Vitro Selection for Salt Tolerant Strain of Poorbi-Raya as Oil Crop	2nd semi annual
4.	AJK-UCR Agr (132)	Soil Management and Alfalfa Production in Azad Kashmir	2nd semi annual
5	F-AU Agr (133)	Modeling Integrated Control for Maize Smuts in the N W F P	3rd semi annual
6	P-NIBGE Agr (136)	Use of Rhizobium Bio-Fertilizer for Increasing Production of Food Legumes	3rd semi annual
7.	S-AEARC Agr (141)	Host Plant Resistance of Bioregulator Treated Cotton to Bollworm and Sucking Complex and its Impact on Yield and Yield Components.	1st semi annual
8.	AJK-UCR Agr (142)	Studies on the Nature and Application of Fungi and Bacteria Controlling Insect Pests of AJK.	1st semi annual
9.	S-AEARC Agr (148)	Improving Productivity of Salt Affected Lands through Continuous Cropping	1st semi annual
10.	F-AU Agr (149)	Biological and Chemical Transformation of Phosphorus and its Availability to Plants in NWFP Soils	2nd semi annual
11.	P-PDC Agr (151)	Diagnosis and Control of Avian Mycoplasmosis	1st semi annual
12.	P-PDC Agr (152)	Isolation of Locally Prevailing Strains and Preparation of Vaccine of IBD Virus	1st semi annual
13.	S-AU Agr (156)	Integrated Pest Management of the Pests of Chick Pea in Hyderabad District	1st semi annual
14.	P-AU Agr (157)	Free Living Nematode Rhabditis as Helminth Vaccine Against <i>Torocara vitulorum</i>	1st semi annual
15.	F-GU Agr (158)	Evaluation of the Economics of Various Rice Based Cropping Systems Under Dera Ismail Khan Conditions.	1st semi annual
16.	AJK-UCR Agr (159)	Some Physio-Chemical Studies on Alternate Bearing in Apple in Azad Kashmir.	1st semi annual

17	S-KU/Bio (186)	Studies on Plasmid Associated Bacteriocin Production by Lactobacilli.	2nd semi annual
18.	S-KU/Bio (209)	Lipasis: The Multifunctional Enzyme of Microbial Origin.	1st semi annual
19	S-AU/Bio (210)	Virus Free Clonal Propagation of Banana In Vitro.	1st semi annual
20	S-AKU/Bio (217)	Effect of Benzodiazepines Administered to Pregnant and Lactating Rats on the Reproductive Functions of their Off Spring	2nd semi annual
21	AJK-UCR/Bio (218)	Survey of Rice Pests in Azad Jammu and Kashmir and Potential of Dragon Flies as Biocontrol Agents	1st semi annual
22	P-NIBGE/Bio (219)	Construction of Genetically Engineered Neval Cellulolytic Yeast Strain for Step Conversion of Mass Produced on Saline Land for Ethanol Production	2nd semi annual
23.	P-GC/Bio (221)	Development of Aspergillus Niger Strains for Citric Acid Formation of Molasses	1st semi annual
24.	S-KU/Bio (222)	Plasmids of Indigenous Pseudomonads: Molecular Characterization and Gene Manipulation	1st semi annual
25	S-CSIR/Bio (223)	Amaranthine Production through Cell Suspension Culture Of <i>Celastia Cristata</i>	1st semi annual
26	C-QU/Phys (71)	Optical Characterization of Defects in Semi-conductors	3rd semi-annual
27.	S-KU/Phys (74)	Optical Studies of Liquid Crystals.	2nd semi-annual
28.	C-QU/Phys (85)	Hard Processes in Nuclear/Particle Physics.	2nd semi-annual
29.	C-QU/Phys (87)	Characterization of Radiation Induced Defects in Semi-conductors.	2nd semi-annual
30	C-QU/Phys (92)	An Experimental Study of Plasma Focus Discharge.	2nd semi-annual
31	P-PU/Phys (91)	Elastic and Diffractive Scattering and QCD Based Phenomenology.	1st semi-annual
32.	C-QU/Phys (89)	Numerical/Theoretical Study of Laser Light Propagation and Energy Deposition and Thermal Transport in Laser Produced Plasmas and Computational Study of Z-Q Pinch Plasma.	1st semi-annual
33.	P-EME/Phys (103)	Fabrication of Cadmium Telluride Photovoltaic Solar Cells by Close-Spaced Sublimation.	1st semi-annual
34	C-QU/Phys (82)	A Study of the Electrical Behavior of Orgaometalic Polymers.	1st semi-annual
35.	P-PU/Phys (99)	Analytical Investigation of Non-Linear Waves in Semi-conductor Superlattice Plasmas.	1st semi-annual.
36.	C-QU/Chem (256)	Synthesis of Biologically active Organotin Derivatives. their Characterization and Applications.	1st semi-annual.

37	P-CSIR Chem (267)	Production of Citrus Flavors through Tissue culture Technology	1st semi-annual
38	C-QU Chem (235)	Isolation and Characterization of Flavonoids Having Potential Agricultural Applications	3rd semi-annual
39	F-PU Chem (286)	Preparation and Characterization of Reforming Catalysts	1st semi-annual
40	C-QU Chem (265)	Synthesis, Structure and Pharmacological Studies on some New 4,1-Benzozazepine, 2,5-Diones	1st semi-annual
41	S-NCEAC Chem (269)	High Resolution NMR Studies of Chemical Shifts and Relaxation Times in Quinoline, its various Derivatives and some Metal Complexes Formed by its Hydroxy-quinoline Derivatives	1st semi-annual

b) First Annual Reports

1	P-PU Agr (137)	Effect of Echinococcosis in Rabbits and Sheep Alongwith its Control by Indigenous Plants of Pakistan
2	P-AU Agr (138)	Studies on the Physiological Adaptations during Pregnancy and Lactation in Dwarf Goat to Improve its Production
3	AJK-UICR Agr (142)	Studies on the Nature and Application of Fungi and Bacteria Controlling Insect Pests of AJK
4	P-PDC Agr (151)	Diagnosis and Control of Avian Mycoplasmosis.
5	P-NIBGE Agr (153)	Characterization and Improvement of Plant Growth Promoting Rhizobacteria (PGRP) and their Effects on Cereal Production
6	P-AU Agr (155)	Breeding for Seedless Kinnow- a Biotechnology Approach
7	P-AU Agr (157)	Free Living Nematode Rhabdities as Helminth Vaccine against <i>Torocara Vitulorum</i>
8	S-AU Bio (210)	Virus Free Clonal Propagation of Banana in Vitro
9	S-AKU Bio (217)	Effect of Benzodiazepines Administered to Pregnant and Lactating Rats on the Reproductive Functions of their Off Spring
10	P-NIBGE Bio (219)	Construction of Genetically Engineered Noval Cellulolytic Yeast Strain For Step Conversion of Biomass Produced on Saline Land for Ethanol Production
11	S-KU Bio (222)	Plasmids of Indigenous Pseudomonads Molecular Characterization and Gene Manipulation
12	P-BZU Phys (84)	Electrical Properties of Alkali Phosphate Glasses
13	C-QU Phys (90)	Studies on the Anisotropy and Vortex Motion in Melt Texture Grown Superconductors
14	C-QU Phys (92)	An Experimental Study of Plasma Focus Discharge
15	PSF NSFC Res(6) Phys	Particle Production and Nuclear Fragmentation in $O^{16}-S^{32}$ Collision at 14-6.60 and 200 GeV Energies

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| 16 | S-DRIP Engg (33) | On Farm Drainage and Water Management Strategies to Minimize Environmental Impacts of Drainage Effluent |
| 17 | S-PCSIR Chem (248) | Evaluation of Aqueous Extracts of Seaweeds as an Elicitor of Plant Defense Mechanisms |
| 18 | C-QU Chem (235) | Isolation and Characterization of Flavonoids Having Potential Agricultural Applications. |
| 19 | P-CSIR Chem (267) | Production of Citrus Flavors through Tissue Culture Technology. |

c) Second Annual Reports

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| 1 | F-AU Agr (121) | Fate of Nitrogen-15 Urea in Soil Plant System as Influenced by Nitrification Inhibitor |
| 2 | AJK-UCR Agr (126) | Application of Molecular Approach Towards Biological Nitrogen Fixation (BNF) in Azad Kashmir. |
| 3 | P-AU Agr (128) | Fish as a Bioindicator of Fresh Water Contamination by Metals. |
| 4 | P-CSIR Agr (129) | In Vitro Selection for Salt Tolerant Strain of Poorbi Raya as Oil Crop. |
| 5 | S-AEARC Agr (131) | Utilization of Intraspecific and Alien Genetic Variation for Inducing and Enhancing Salt Tolerance in Bread Wheat. |
| 6 | F-AU Agr (133) | Modeling Integrated Control for Maize Smuts in the N.W.F.P. |
| 7 | F-AU Agr (149) | Biological and Chemical Transformation of Phosphorus and its Availability to Plants in NWFP Soils. |
| 8 | S-KU Bio (186) | Studies on Plasmid Associated Bacteriocin Production by Lactobacilli. |
| 9 | S-KU/Phys (74) | Optical Studies of Liquid Crystals. |
| 10 | C-QU Phys (87) | Characterization of Radiation Induced Defects in Semi-conductors. |
| 11 | S-KU Chem (218) | Microbial Transformation (Bio-transformation) of Natural Anti-tumor Agents. |

**LIST OF PUBLICATIONS PRODUCED THROUGH PSF SUPPORTED PROJECTS COMPLETED DURING
1995-96**

- 1 Dawar, S., S. Shahzad, R. Iqbal and A. Ghaffar. 1993. Effect of seed pelleting with biological antagonists in the control of root infecting fungi of cowpea and mungbean. *Pak J Bot.* 25: 219-224.
- 2 Dawar, S. and A. Ghaffar. 1993. Mass production of *P. lilacinus* for the control of soilborne root infecting fungi. Proc. Int. Symp. Biotechnol. for sustainable Development (Dec. 15-20, 1993). NIBGE, Faisalabad.
- 3 Shahzad, S. and A. Ghaffar. 1993. Seed bacterization for the control of *M. Phasecolina* on sunflower. Proc. Int. Symp. Biotechnol. for sustainable Development (Dec. 15-20, 1993). NIBGE, Faisalabad.
- 4 Dawar S., S. Shahzad and A. Ghaffar. 1994. Mass production of *T. harzianum* for the control of soilborne root infecting fungi. Proc. First IIDRL Symposium on Microbiology, (Feb. 8-10, 1994), Department of Microbiology University of Karachi, Karachi.
5. Shahzad, S., S. Dawar and Abdul Ghaffar. 1994. Production of pellets of *P. lilacinus* inoculum and its use for the control of root-knot nematode. Proc. First IIDRL Symposium on Microbiology, (Feb. 8-10, 1994), Department of Microbiology University of Karachi, Karachi.
- 6 Ehteshamul-Haque, S., S. Dawar and A. Ghaffar. 1994. Field application of *T. harzianum* and *G. virens* in the control of root rot disease of melon and tomato. Proc. Second National Biochemistry Symposium (July 26-28, 1994). Department of Biochemistry, University of Karachi, Karachi.
- 7 Shahzad, S., S. Dawar and Abdul Ghaffar. 1994. Mashbean (*Vigna mungo* L.) Hepper, a new host of *Meloidogyne incognita* in Pakistan. *Pak J Nematol.* 13: 99.
- 8 Jalal, A. O. Dawar & A. Ghaffar. 1995. Effect of *P. lilacinus* and *Ocimum sanctum* in the control of root rot of mashbean. Proc. Fifth National Conference of Plant Scientists 28-30 March, 1995, NARC Islamabad.
- 9 Dawar, S., S. Shahzad and A. Ghaffar. 1995. Effect of different organic substrates on growth and biocontrol activity of *P. lilacinus*. *Pak J Bot.*, 27.
- 10 Shahzad, S., S. Dawar and A. Ghaffar. 1995. Effect of inorganic fertilizers on the efficacy of *P. lilacinus*. *Pak J. Bot.* 27.
11. Dawar, S., S. Shahzad and A. Ghaffar. 1994. Effect of *P. lilacinus* on root-knot infection on mashbean. Fourteenth Pakistan Congress of Zoology (April 1-3 1994), Karachi P 51 (Abstract).
12. Jalaluddin, M. and Azhar, A. Occurrence of VAM-fungi in soybean fields of Sindh (prepared)
13. Jalaluddin, M. and Azhar, A. Effect of the combined inoculation on VAM-fungi and Rhizobium on the growth and yield of soybean (prepared)
14. Ahsan Illahi and Fazal Rahim. Enhanced propagation, root production and alkaloid biosynthesis by cultures of *Rauwolfia serpentina*. In "adapted techniques for commercial crops of tropics". International Foundation for Science 1993. P 198-207.
15. Ahsan Illahi and Fazal Rahim. In vitro differentiation and culture of *Rauwolfia* roots. *Hamdard Medicus* XXXVI (2) 1993 P 57-67.
16. Ahsan Illahi and Fazal Rahim, K. A. Malik, A. Nasim & A. M. Khalid. 1995. *Rauwolfia serpentina* from test tube to field. International Symposium on Biotechnology for sustainable Development NIBGE, Faisalabad (in press).
17. Ahsan Illahi and Fazal Rahim. 1995. Induction of somatic embryos and plant regeneration in *Rauwolfia serpentina*. *Pak J Plant Sci* (Submitted).
18. K. Ahmed. 1990. Neutrino Oscillations, Solar Neutrino Problem and Induced Neutrino Mass. 3rd Symposium on Frontiers of Physics, p-126.
19. K. Ahmed. 1991. Resonant Spin-Flavour Precession and Solar Neutrino Problem. Proc. Mini Wksp on Rel. Astro. Cosmo., p-69.
20. K. Ahmed. Matter Induced Spin-Flavour Neutrino Oscillations at Finite-Temperature and Density. *Nucl. Phys. B* 388 (1992) 509.
21. K. Ahmed. Neutrino Oscillations and New Faraday Effect. AICTP Preprint NO. IC 92 185, 1992.
22. K. Ahmed. Neutrino And its Role in Frontiers of Fundamental Physics. Proc. 4th National Symposium on Frontiers of Physics, 1992, p-324.
23. K. Ahmed. Neutrino Oscillations and Faraday Effect. *Mod. Phys. Lett. A* 9 (1994) 2097.
24. K. Ahmed. Matter Induced Spin-Flavour Neutrino Oscillations at Finite-Temperature and Density. Proc. of 6th Regional Conf., 1994.
25. K. Ahmed. Neutrino Dispersion in a Minimal Supersymmetric Model with Explicitly Broken R-Parity at Finite Temperature and Density.
26. Roshan Ahmed, M. Arif Malik and M. Zia ul Haq. Synthesis and spectroscopic studies of some phenolic B-Diketones. *J. Chem. Soc. Pak.* 12.4, 352(1990).

27. Roshan Ahmed, M Zia ul Haq Naeema Khan and Naheed Kauser Regioselective Cyclocondensation reactions leading to phenolic Pyrazoles. *Arabian Journal of Science and Engineering*, KFUPM, Dharan, Saudi Arabi (accepted).
28. Roshan Ahmed and M Zia ul Haq: Synthesis, spectroscopy and antimicrobial Activity of 3-(2-Hydroxy Phenyl)-5-(4-substituted phenyl) 1-pyrazole Acetic Acids. *Jurkish Journal of Chemistry*, 19(2), 101(1995).
29. Roshan Ahmed, M. Zia ul Haq, Rukhasana Jabeen and H. Duddeck : Synthesis of 2-[1 (3, 5-Disubstituted Pyrazolyl) methyl]5-Phenyl Amino-1, 3,4-Thiadiazoles and 1,2,5-Triazoles as Potential Therapeutic Agents. *Turkish Journal of Chemistry*.
30. Roshan Ahmed and M. Zia ul Haq: Synthesis and Spectroscopy of Novel Pyrazolyl Glycine Derivatives *J Chem. Soc. (Pak)*, 15.1, 48 (1993).
31. Roshan Ahmed and M. Zia ul Haq. Synthesis of Novel Benzothiazepine Derivatives. 5th National Chemistry Conference 221, 1993
32. Roshan Ahmed, M Zia ul Haq and Iqbal Chaudhary. Synthesis of novel oxygen Bridged 1,4-Benzothiazepine Derivatives. *Benzo[b] Benzofuro[3,2-e]-7[Phenyl Para substituted Phenyl] 1,4-Thiazepines*. *Iranian Journal of Chemistry*.
33. Roshan Ahmed, M. Zia ul Haq and H. Duddeck. Study of Conformational Equilibrium of 2-(0-Hydroxy Phenyl) 5-Phenyl-1,3H-1, 5-Benzodiazepine using Dynamic ¹H-NMR Spectroscopy. *Monatshefte fur chemie*.
34. Roshan Ahmed, M. Zia ul Haq, Naheed Kausar, H. Budzikiewicz, P. Bold and I. Bahr. : Ring contraction of 2,4-Diphenyl-1, 5-Benzodiazepines Following Electron Ionization *J. chem. Soc. Pakistan*.
35. Roshan Ahmed, M.Zia Ul. Haq, Khalid Khan and W Voelter. Spectroscopic Identification of 1,4-Diazepine Nucleosides Synthesized as Antiviral and Anti AIDS Agents. 2nd Symposium on Modern Trends in Contemporary Chemistry Proceedings (1995).
36. Roshan Ahmed and M. Zia ul Haq: Synthesis and spectroscopy of Novel 1,5-Benzodiazepine Nucleosides as Antiviral and Anti AIDS Agents. Submitted in *Monatshefte fur Chemie*.

**FINANCIAL ASSISTANCE FOR CONFERENCES, SEMINARS, WORKSHOPS
AND SYMPOSIA ETC. DURING 1995-96**

S.No	Name of Event	Name of Organization	Amount Sanctioned
1.	4th National Symposium on "Analytical and Environmental Chemistry".	Department of Chemistry, University of Peshawar, Peshawar.	Rs. 20,000/-
2.	Summer School, 1995. at Khanaspur	Punjab Boards Committee of Chairmen Office, Board of Intermediate & Secondary Education, Faisalabad.	Rs. 30,000/-
3.	National Seminar on "Recent Development in Statistics" at Bara Gali.	Department of Statistics, University of Peshawar, Peshawar.	Rs. 20,000/-
4.	Bilingual Declamation Contest.	Islamabad College for Boys, G-6/3, Islamabad.	Rs. 12,500/-
5.	2nd Pakistan Nuclear Society Seminar on "50 years of Nuclear Energy Vision and 100 years of X-rays".	Pakistan Nuclear Society, Islamabad.	Rs. 10,000/-
6.	National Symposium of Animal Nutritionists.	College of Veterinary Science, Lahore.	Rs. 20,000/-
7.	31st All Pakistan Science Conference.	Pakistan Association for Advancement of Science, Lahore.	Rs. 30,000/-
8.	1st Meeting of the National Committee on Veterinary Research and Curricula.	University of Agriculture, Faisalabad.	Rs. 25,000/-
9.	International Symposium on "Bio-diversity of Pakistan".	Pakistan Museum of Natural History, Islamabad.	Rs. 50,000/-
10.	Short Course/Workshop on "Rainfall Runoff Analysis & Catchment Modeling" and Workshop on Current Status & Future Needs for Hydrologic System".	Centre of Excellence in Water Resources Engineering, University of Engineering & Technology, Lahore.	Rs. 20,000/-

11	2nd International Workshop and Conference on QMAATHIC	Gomal University, Dera Ismail Khan.	Rs 25,000 -
12	International Preparatory Seminar-cum-Workshop to Develop Projects on Research & Management and Sustainable Livelihood for Traditional Societies in South Asia	University of Agriculture, Faisalabad	Rs 20,000 -
13	Science Day, 1995 Science Quiz and Science Models Competition	National Museum of Science & Technology, Lahore.	Rs 20,000 -
14	5th National Symposium on "Frontiers in Physics"	Pakistan Physical Society, C/o Department of Physics, Quaid-e-Azam University, Islamabad	Rs 25,000 -
15	6th International Symposium and Pakistan - US Binational Workshop on Natural Products Chemistry	H E.J. Research Institute of Chemistry, University of Karachi, Karachi.	Rs. 50,000 -
16	16th Pakistan Congress of Zoology	Zoological Society of Pakistan, C/O Department of Zoology, University of the Punjab, Lahore	Rs. 35,000/-
17	1st International Phytopathological Conference and Symposium in Pakistan	Pakistan Phytopathological Society, C/o Department of Plant Pathology, University of Agriculture, Faisalabad.	Rs 20,000 -
18	70th Birthday Celebrations of Prof. Dr. Abdus Salam	Pakistan Academy of Sciences, Islamabad.	Rs 10,000 -
19	Laboratory Training Workshop on Plant Transformation	National Centre of Excellence in Molecular Biology, University of the Punjab, Lahore.	Rs 20,000/-
20	Short Course and Workshop on Ground Water and Irrigation Management Issues	Centre of Excellence in Water Resources Engineering, University of Engineering & Technology, Lahore.	Rs. 20,000/-

21	International Seminar on Megaicities Crises & Challenges	The Aga Khan University Karachi	Rs. 40,000 -
22	CAP-Crop Protection Conference	Crop Protection Association of Pakistan, NARC, Islamabad	Rs. 10,000 -
23	8th All Pakistan Geographical Conference	Department of Geogriaphy, University of Peshawar, Peshawar	Rs. 15,000 -
24	Regional Workshop on Artificial Ground Water & Recharge	Pakistan Council for Research in Water Resources, Quetta	Rs. 20,000 -
25	7th National Chemistry Conference	Department of Chemistry, University of Balochistan, Quetta.	Rs. 20,000 -
Total:			Rs. 587,000/-

LETTER OF TRANSMITTAL

Dear Mr. Secretary,

I have the honour to enclose herewith the Annual Report of the Pakistan Science Foundation for the Fiscal Year 1995-96, alongwith its audited accounts as adopted by PSF Board of Trustees for submission to the National Assembly as required by the Pakistan Science Foundation's Act No.III of 1973.

With regards.

Yours sincerely,

Dr. Khalid Mehmood Khan
Chairman
Pakistan Science Foundation
Islamabad

Secretary,
Ministry of Science and Technology
Government of Pakistan
Islamabad.