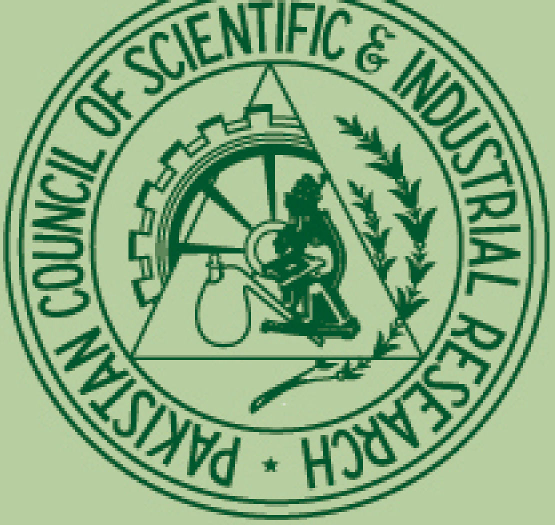
ISSN 2221-6421 (Print), ISSN 2223-2567 (Online)
Coden: PJSIC6 61(3) 121-186 (2018)

Pakistan Journal of Scientific and Industrial Research

Series B: Biological Sciences

Vol. 61, No. 3, September-December, 2018



(for on-line access please visit web-site http://www.pjsir.org)

Published by
Scientific Information Centre
Pakistan Council of Scientific and Industrial Research
Karachi, Pakistan

Pakistan Journal of Scientific and Industrial Research

Series B: Biological Sciences

Pakistan Journal of Scientific and Industrial Research is published triannually into two series:

Series A: Physical Sciences [ISSN 2221-6413 (Print); ISSN 2223-2559 (Online)] (appearing as issues of January-April, May-August and September-December) and
Series B: Biological Sciences [ISSN 2221-6421 (Print); ISSN 2223-2567 (Online)] (appearing as issues of January-April, May-August and September-December).

This Journal is indexed/abstracted in Zoological Record, BIOSIS Preview, NCBI, Pub Med, Scimago, Research Gate, Clarivate Analytics.
Subscription rates (including handling and Air Mail postage): ***Local:*** Rs. 2500 per volume, single issue Rs. 425
Foreign: US$ 450 per volume, single issue US$ 75
Electronic format of this journal is available with: ProQuest Information and Learning, 789 E. Eisenhower Parkway, P.O. Box 1346, Ann Arbor, MI 48106-1346, U.S.A.; Fax.No.+1.734.997.4268; http://www.proquest.com.
Photocopies of back issues can be obtained through submission of complete reference to the Executive Editor against the payment of Rs. 25 per page per copy (by Registered Mail) and Rs. 115 per copy (by Courier Service), within Pakistan; US$ 10 per page per copy (by Registered Mail) and US$25 per page per copy (by Courier Service), for all other countries.

Printed and Published by: PCSIR Scientific Information Centre, PCSIR Laboratories Campus, Shahrah-e-Dr. Salimuzzaman Siddiqui, Karachi-75280, Pakistan.

Editorial Address

Executive Editor

Pakistan Journal of Scientific and Industrial Research, PCSIR Scientific Information Centre,
PCSIR Laboratories Campus, Shahrah-e-Dr. Salimuzzaman Siddiqui, Karachi-75280, Pakistan
Tel: 92-21-99261914-99261916, 99261949-99261917; Fax: 92-21-99261913; Web: http://www.pjsir.org, E-mail: info@pjsir.org

AIMS & SCOPE

Pakistan Journal of Scientific and Industrial Research (PJSIR) was started in 1958 to disseminate research results based on utilization of locally available raw materials leading to production of goods to cater to the national requirements and to promote S&T in the country. Over the past 60 years, the journal conveys high quality original research results in both basic and applied research in Pakistan. A great number of major achievements in Pakistan were first disseminated to the outside world through PJSIR.

It is a peer reviewed journal and published in both print and electronic form. Original research articles, review articles and short communications from varied key scientific disciplines are accepted however, papers of Pure Mathematics, Computer Sciences, Engineering and Medical Sciences are not entertained.

From 54th Volume in 2011, it has been bifurcated into Series A: Physical Sciences & Series B: Biological Sciences. Each series appeared three times in a year from 2011 to 2017.

From 61st Volume in 2018 both Series will be published Triannually with the following sequence:

> Physical Sciences in April, August & December each year. It includes research related to Natural Sciences, Organic Chemistry, Inorganic Chemistry, Physical Chemistry, Environmental Sciences, Geology, Geography, Glass Technology, Material Sciences, Physics, Polymer Sciences and Technology.
>
> Biological Sciences in April, August & December each year. Papers included in this series are from Agriculture, Agronomy, Botany, Biochemistry, Biotechnology, Food Sciences, Genetic Engineering, Pharmaceutical Sciences, Microbiology, Marine Sciences, Soil Sciences, Food Sciences, Tissue Culture, Natural Products, Toxicology, Ecology, Veterinary Sciences, Zoology and Technology.

Due to many global issues, we are encouraging contributions from scientists and researchers from all across the globe with the sole purpose of serving scientific community worldwide on the whole and particularly for our region and third world countries.

Pakistan Journal of Scientific and Industrial Research
Series B: Biological Sciences
Vol. 61, No. 3, September-December, 2018

Contents

Special Paper

Reviews

Pak. j. sci. ind. res. Ser. B: biol. sci. 2018 **61B**(3) 121-125

Special Paper

A Bibliometric Portrait of Pakistan Journal of Scientific and Industrial Research (PJSIR) During the Period of 1958-2007

Zameer Hussain Baladi
King Saud Bin Abdulaziz University for Health Sciences, College of Applied Medical Sciences,
Ministry of National Guard Health Affairs Riyadh, Kingdom of Saudi Arabia

(received September 17, 2018; revised October 3, 2018; accepted October 5, 2018)

Abstract. Pakistan Journal of Science and Industrial Research (PJSIR) had celebrated its sixtieth anniversary in 2017. Inspired by this occasion, this observational study presents a bibliometric review on the quantity of all published materials under the caption of Physical, Biological and Technological Sciences with Short Communications during the period of 1958-2007 in Pakistan. The data of 340 issues of PJSIR was downloaded and collected to tabulate from the website of electronic journal: (http: www.pjsir.org/arc.php) during January-July, 2018. This study expressed that n=4929; 14.4% articles were published in 340 issues of PJSIR during the period of 1958-2007. Total 4417 (1790; 36.3%, 1651; 33.5%, and 976; 19.8%) articles published under the caption of Physical, Biological, and Technology out of 4929 articles. Remaining 512; 10.3% articles were short communications. Maximum articles n=1375; 28% were published in the fourth decade and n=694; 14% articles in the first decade as a minimum. The short communications n=208; 4.2% related to biological science take a position with the slight margin to other disciplines. PJSIR published regularly from 1958 to this day. It is counted a teamwork of the management of Journal and supported by Pakistan Council of Scientific and Industrial Research (PCSIR) Government-owned body. There are few examples in the world to publish a scientific journal which covers three major disciplines of science.

Keywords: bibliometrics, PJSIR, PCSIR, Ministry of Science and Technology, Pakistan

Pak. j. sci. ind. res. Ser. B: Biol. sci. 2018 **61B**(3) 126-135

General and Specific Combining Ability Estimates for Morphological, Yield and its Attributes and Seed Traits in Sunflower (*Helianthus annuus* L.)

Muhammad Siddique Depar[a], Muhammad Jurial Baloch[a]* and Qumar-Uddin Chacher[b]
[a]Department of Plant Breeding and Genetics, Sindh Agriculture University, Tandojam, Pakistan
[b]Department of Crop Physiology, Sindh Agriculture University, Tandojam, Pakistan

(received October 28, 2016; revised May 25, 2017; accepted May 29, 2017)

Abstract: The improvement in sunflower breeding requires exploitation of combining ability of divergent male and female inbreds. Six cytoplasmic male sterile (CMS) lines and three testers were crossed in line × tester design, thus 18 F_1 hybrids were developed for evaluation of general combining ability (GCA) and specific combining ability (SCA) of inbred parents for days to 90% maturity, stem girth, head size, achenes/plant, 1000-seed weight, achene yield kg/ha, oil and protein%. The significant variances due to lines and testers both determined GCA variances revealed the predominance of additive genes whilst significance of lines × tester interactions indicated the importance of SCA variances and the involvement of non-additive genes in the expression of traits studied. The foremost role of non-additive genes was apparent when ratio σ^2 SCA/σ^2GCA was above 1.0. These results suggested the prevalence of dominant genes and possibility of hybrid crop development. The GCA effects indicated that CMS parents SF-187, 64-A-93 and ARG-0405 and tester RHP-46 were high general combiners, thus may be chosen for crossing and selection programmes, whereas F_1 hybrids SF-187 × RHP-46, 64-A-93 × RHP-46, PAC-ARG-0405 × PAC-ARG-0106, 64-A-93 × RHP-46 and PSF-025 × RHP-64 which used parents with good × good and good × poor GCA estimates revealed higher positive SCA estimates for achene yield, oil and protein traits yet manifested desirable negative effects for 90% maturity. Such results suggested that these hybrids are desirable for the exploitation of hybrid crop development or selection of desirable plants from earlier filial generations.

Keywords: combining ability estimates, line × tester analysis, sunflower

---

Pak. j. sci. ind. res. Ser. B: biol. sci. 2018 **61B**(3) 136-144

Genetic Variability, Heritability and Correlation Studies in F_2 Populations of Upland Cotton

Muhammad Jurial Baloch*, Rehana Lochi, Wajid Ali Jatoi, Abdul Wahid Baloch and Muhammad Ahmed Arain
Department of Plant Breeding and Genetics, Sindh Agriculture University, Tandojam, Pakistan

(received April 7, 2016; revised June 29, 2017; accepted August 7, 2017)

Abstract. A field experiment was conducted at the experimental area of the Department of Plant Breeding & Genetics, Sindh Agriculture University Tandojam, during the year 2014-2015 in order to carry-out genetic analysis in F_2 populations of upland cotton. The trial was laid-out in a Randomized Complete Block Design with four replications. The material was consisted of eight parents and ten F_2 populations. The analysis of variance revealed significant differences among the parents and F_2 populations for all the traits studied except that fibre length was non-significant in parents. The results further suggested that maximum heritability, higher genetic variances coupled with more genetic gains were expressed by the F_2 populations CRIS-134 × CRIS-508 and CRIS-134 × CIM-598 for 1st sympodial node number; CRIS-134 × Neelum-121 and CRIS-134 × CRIS-508 for sympodial branches/plant; CRIS-342 × FH-113 for boll weight; CRIS-342 × Neelum-121 for bolls/plant, seed cotton yield/plant, lint % and micronaire value and progenies CRIS-342 × MNH-886 followed by CRIS-342 × Neelum-121 for staple length. These results also suggested that a number of F_2 populations indicated their potential for various seed cotton yield and fibre traits. The phenotypic correlations revealed that most of the traits were significantly and positively associated with seed cotton yield/plant. However, higher correlations of sympodial branches/plant (r = 0.69**) and bolls/plant (r = 0.82**) with seed cotton yield indicated that both the traits are more reliable as compared to other traits for selection of higher seed cotton yields. Very interestingly, fibre traits like lint%, fibre length and micronaire were also significantly correlated with seed cotton yield, suggesting that fibre quality traits can be improved without compromising on seed cotton yield. Thus, the material under study is very promising and worthy of selection to improve many traits simultaneously.

Keywords: genetic variability, heritability, F_2 populations, correlations, cotton genotypes

---

Pak. j. sci. ind. res. Ser. B: biol. sci. 2018 **61B**(3) 145-150

Fortification and Stability of Iodine in Bread to Mitigate Iodine Deficiency Disorder

Muhammad Sajid Manzoor[a], Imran Pasha[a*], Shabbir Ahmad[b], Mian Kamran Sharif[a] and Muhammad Farhan Jahangir Chughtai[a]
[a]National Institute of Food Science and Technology, University of Agriculture, Faisalabad, Pakistan
[b]Department of Food Science and Technology, Muhammad Nawaz Shareef University of Agriculture, Multan, Pakistan

(received January 2, 2017; revised October 3, 2017; accepted October 23, 2017)

Abstract. The core objective of this study was to prepare iodized bread by using iodized salt and potassium iodide (KI) to fulfill Recommended Daily Intake (RDI) of iodine. Triplicate level of each fortificant was added in separate treatments in different concentrations with an aim that 2 slices of bread provide RDI of iodine. The prepared samples were analyzed for stability of iodine by spectrophotometric method and for sensory attributes by panel of judges. Results showed good retention of iodine in bread with 15-20% loss of iodine in final product after processing. A slight level of potassium was increased in treatments in which KI was used while other minerals profile was not affected by fortificants and showed no significant behaviour after examining the results statistically.

Keywords: fortification, stability iodized bread, iodine deficiency

---

Pak. j. sci. ind. res. Ser. B: biol. sci. 2018 **61B**(3) 151-157

Spatial Patterns and Trends of *Escherichia coli* in Public Water Supply System of Lahore, Pakistan

Isma Younes[a], Abdul Ghaffar[a], Rakhshanda Sadaf[b]*, Naheeda Naseem[a] and Muhammad Shafiq[c]
[a]Department of Geography, University of the Punjab, Lahore, Pakistan
[b]Department of Geology, Federal Urdu University of Arts, Science and Technology, Karachi, Pakistan
[c]Directorate of Earth Sciences, SUPARCO, Karachi, Pakistan

(received May 30, 2017; revised November 11, 2017; accepted December 29, 2017)

Abstract. Most of the Northern and Central part of Lahore district is supplied with ground water by Water and Sanitation Government Authority. The quality of public water supply is getting deteriorating due to increasing population of Lahore city. Moreover, the effects of microbial water pollutants on health of population of study area have been addressed. In this research, presence of *Escherichia coli* in pre & post monsoon seasons has been focused. The water samples were taken from tube wells as well as adjacent houses. A questionnaire survey was also conducted to find out the responses of people in study area. It was clear from the results of the study that *E. coli* were detected in all the water samples of public water supply system. An increase in growth of pathogens was also noticed in post monsoon season. It was also proved from study that many people were suffering from diarrhoea at sample places where *E. coli* were identified. The mixing of sewage with drinking water was the major cause of presence of pathogens in water samples of houses although they were less or absent in water samples of tube wells.

Keywords: spatial patterns, *Escherichia coli*, water supply system, sewage contamination

---

Pak. j. sci. ind. res. Ser. B: biol. sci. 2018 **61B**(3) 158-164

Population Status and Distribution of Himalayan Brown Bear (*Ursus arctos isabellinus*) in Musk Deer National Park Neelum, Azad Jammu and Kashmir (Pakistan)

Liaqat Ali Khan[a], Riaz Aziz Minhas[a], Muhammad Siddique Awan[a],
Khawaja Basharat Ahmad[a], Nuzhat Shafi[a], Usman Ali[b]* and Naeem Iftikhar[c]
[a]Department of Zoology, University of Azad Jammu and Kashmir, Muzaffarabad, Pakistan
[b]Department of Zoology Mirpur University of Science and Technology (MUST),
Mirpur, 10250 Azad Jammu and Kashmir, Pakistan
[c]Department of Wildlife and Fisheries, Government of Azad Jammu and Kashmir, Muzaffarabad, Pakistan

(received October 3, 2016; revised May 19, 2017; accepted June 22, 2017)

Abstract. The Himalayan brown bear (*Ursus arctos isabellinus*) is considered as ‘Endangered’ in Pakistan. However, a small population of this species still exists in northern Pakistan including Azad Jammu and Kashmir (AJK). A study was conducted to determine population status and distribution of Himalayan brown bear in Musk Deer National Park (MDNP), from April 2011 to September 2012. MDNP, covering an area of 528.16 km^2, is situated in the extreme north of AJ&K (upper Neelum Valley) about 155 km away from Muzaffarabad. Study area was divided into three zones (Phulawai, Sardari and Loser) and searched for brown bear signs and evidences. A total of 17 transect surveys were carried out to collect the data on current population status and distribution of Himalayan brown bear in the study area. In addition, questionnaires based surveys were carried out in the area to gather maximum information about this species. Based on direct and indirect signs collected, a total population of about 12 individuals with a population density of 0.42 bear/km^2 was estimated in the MDNP with maximum (0.45 bear/km^2) in Loser and minimum (0.37 bear/km^2) in Phulawai zone. Altitudinal preference was recorded highest (0.46 bear/km^2) at the elevation level of >3000 m asl. For the proper management and conservation of Himalayan brown bear, more comprehensive study should be carried out throughout its potential habitat.

Keywords: population, distribution, Himalayan brown bear, Musk Deer National Park, Azad Jammu and Kashmir

---

Pak. j. sci. ind. res. Ser. B: biol. sci. 2018 **61B**(3) 165-171

Repellent Responses of Maize Weevil, *Sitophilus zeamais* Motsch (Coleoptera:Curculionidae) towards Entomocidal Plant Products

Riaz-ud-din[a], Muhammad Mamoon-ur-Rashid[a] and Muhammad Mansoor[b]*
[a]Department of Entomology, Gomal University, Dera Ismail Khan, Pakistan
[b]Arid Zone Research Centre (PARC), Dera Ismail Khan, Pakistan

(received August 31, 2016; revised. March 30, 2017; accepted August 24, 2017)

Abstract. Laboratory studies were conducted to investigate the repellency effect of six plant species (*Azadirachta indica, Caralluma fimbriata, Allium sativum, Curcuma longa, Citrullus colocynthis* and *Calotropis procera*) against *Sitophilus zeamais* reared on maize grains (Cv. Azam White) in the Laboratory of Entomology Department, Gomal University, Dera Ismail Khan, Pakistan. Six concentrations viz. 5000, 10000, 15000, 20000, 25000 and 30000 ppm of each plant powder were applied to 20 g of sterilized maize grains under constant conditions of 27 ± 1°C and 65 ± 5% relative humidity. Twenty newly emerged adult maize weevil were introduced into glass petri dishes and percent repellency of plant powders was determined. *A. indica* seed powder at 30,000 concentration showed 100% repellency against maize weevil followed by *C. longa* (76%) after 72 h exposure period whereas *C. procera* was found least effective showing only 39% repellency of the test insects compared to control. The powders of *A. sativum*, *C. fimbriata* were found moderately repellent against the test insects. During the observations, it was also noted that repellency of the tested plant powders was dose dependent, the higher the concentration of the tested powders, the higher was the repellency and vice versa. The findings of this study indicated that the selected plant products could be used for a safer control of maize weevil.

Keywords: plant powders, insect repellency, *Sitophilus zeamais,* maize grain

---

Pak. j. sci. ind. res. Ser. B: biol. sci. 2018 **61B**(3) 172-181

Review

Epigenetic Alterations and their Dietary Backgrounds

Rani Saira Saleem[a]* and Rani Wafa Shear[b]
[a]Institute of Biochemistry and Biotechnology, University of Punjab, Lahore, Pakistan
[b]Biotechnology Department, University of Gujrat, Pakistan

(received June 27, 2016; revised April 25, 2017; accepted May 10, 2017)

Abstract. The key intention of this review is to summarize the different studies which relate the genome-diet interactions with future perspectives of exploring an insight into the well defined functions of diverse micronutrients and other dietary components that play a vital task in defining the early developmental patterns of an organism. Human fetus development is a complex process that is totally dependent on the dietary components which interact with the genes to regulate the different proliferation and differentiation stages. We want to explore those complex interactions that lay hidden between micro-nutrients and gene expressions but are means of the apparent changes of a phenotype of an individual. Along with this the review will also perceive some basics of development of certain diseases as well, due to these complex genome-diet interactions thus leading to refine the dietary outlines for maternal and prenatal developmental stages in future. Research has also shown that genome-diet interactions are very complex as without proper nutrients the end result is the genome instability which may lead to chronic diseases, developmental defects and certain types of cancer.

Keywords: epigenetics, genome diet, methylation, DNA sequence, eukaryotes

---

Pak. j. sci. ind. res. Ser. B: biol. sci. 2018 **61B**(3) 182-186

Review

Probable Ingredients for *Trans* Free Margarine with Omega-3 Fatty Acids

Muhammad Ajmal, Muhammad Nadeem*, Maryam Batool and Imran Taj Khan
Department of Dairy Technology, University of Veterinary and Animal Sciences, Lahore, Pakistan

(received October 20, 2015; revised July 25, 2017; accepted July 31, 2017)

Abstract. Margarine is widely used as table spread, in cooking and bakery products. Awareness of consumers regarding the intake of omega fatty acids has led the food industry to develop foods which are rich sources of omega fatty acids. Harmful effects of *trans* on the development of cardiovascular diseases have steered the researchers to find out wide range of *trans* free options, without compromising on functional and physical properties of fats. Nutritionists recommend margarine for the growing and school going babies, it is usually manufactured from the combination of hard and soft fats, followed by the addition of vitamins A, D and E. However, little is known regarding the supplementation of margarines with omega fatty acids of chia oil. This paper summarizes the physical and chemical characteristics of few ingredients that may be used in the formulation of *trans* free margarine with higher magnitude of omega fatty acids.

Keywords: margarine, omega fatty acids, *trans* free, chia oil

---

Pakistan Journal of Scientific and Industrial Research
Series B: Biological Sciences
Volume 61

Contents

Series B: Biological Sciences
Vol. 61, No.1, January - April, 2018

Short Communication

Vol. 61, No.2, May - August, 2018

Short Communication

Review

Vol. 61, No.3, September - December, 2018

Special Paper

Reviews

Pakistan Journal of Scientific and Industrial Research
Series B: Biological Sciences
Volume 61

Author Index

Pakistan Journal of Scientific and Industrial Research
Series B: Biological Sciences
Volume 61

Subject Index

INSTRUCTIONS TO AUTHOR

Pakistan Journal of Scientific and Industrial Research, Series A: Physical Sciences and ***Series B: Biological Sciences publish original researches as full research papers, short communications and reviews papers. The manuscript written in clear, concise English will be accepted for review. Authors who are not native English speakers should note that the manuscript must be edited for linguistic errors by some professional experts.***

The manuscripts will be entertained covering the following subjects of Physical and Biological Sciences: Agriculture, Agronomy, Biochemistry, Biotechnology, Botany, Chemistry, Ecology, Environmental Sciences, Epidemiology, Food Sciences, Genetics, Geography, Geology, Microbiology, Nanotechnology, Natural Products, Pharmaceutical Sciences, Physics, Proteomics, Radiation, Soil Sciences, Spectroscopy and Applied Sciences, Toxicology, Veterinary Sciences and Zoology. However, we do not entertain articles of pure Mathematics, Computer Sciences, pure Engineering and Medical Sciences.

All manuscripts are evaluated by subject experts of advanced countries. However, authenticity of the contents remains the sole responsibility of the author/s. The Journal reserves the rights to edit, wherever considered necessary to make contribution harmonized with the format of the journal.

Manuscripts should be submitted online *via* PJSIR website:

- Simply log on to our website and follow the onscreen instructions for all submissions (you will need to register before your first submission to PJSIR).
- If you have any technical problems or questions related to the electronic submission process or uploading your files, please contact to our Editorial Office.

Types of Manuscript:

The journal publishes **(1) Regular manuscripts, (2) Short communication and (3) Reviews.**

(1) Regular Manuscripts: The manuscript being submitted must consist of original research performed by the authors and the research must include new information that is significant.
(2) Short Communications: Short communication should contain description of findings in a concised form that would be of interest to readers of the journal. The material should be formatted as per PJSIR style and should not exceed 1500 words/3 printed pages.
(3) Reviews: ***Regular Reviews*** **:** Reviewing scientific discoveries including the recent results of author(s) and articles must having total length of the paper along with references approximately 10 printed pages.
Invited Reviews**:** Submitted by invitation from the Editorial Board and encompass recent important scientific discoveries of approximately 10 printed pages (including tables, figures and references).

Prerequisites for Publication:

- **Certificate:** A certificate must be submitted that the paper has neither been submitted nor will be sent to any other journal after submitting to PJSIR.
- **Co-authors verification:** Author should certify that the co-author(s) has / have been informed about the submission of the paper to the journal.

- **Reviewers' names:** The author should submit at least four experts and their e-mail for review of the paper out of their country.
- **Illustrations/photographs:** It should be prepared for reproduction as halftones or line drawings. All illustrations are to be submitted in complete and finished form, with adequate labeling. Photographs in JPEG/TIFF format preferably direct from original with minimum reduction and clear resolution. Symbols and lines should be chosen to remain legible after the degree of reduction that will be used (single column 7.5:double column 16 cm) for better results.
- **Copyright:** PJSIR owns all copyright to any work published in the Journal. Any material submitted, whether appearing in the journal or not, may not be used, reproduced, or transmitted without the written consent of PJSIR.
- **Plagiarism Report:** PJSIR observes/follows HEC guidelines/Criteria for plagiarism. It is the author's responsibility to apprise themselves of plagiarism in any form. All the papers submitted to PJSIR should be accompanied by Turnitin Plagiarism Report up to 19% similarity index. If plagiarism report has been taken earlier, submit a certificate for the same.
- **Conflict of interest/Financial disclosure statement:** At the time of submission declaration must be submitted that the authors have no conflict of interest. Authors should disclose in the online submission system any commercial affiliation or consultancy that could be construed as a conflict of interest with respect to the submitted data.
- **Authors' contribution:** All papers submitted to PJSIR should be accompanied with statement describing contributions of each author of the paper.

Manuscript preparation:

- Manuscripts should be submitted with double spaced with proper margin on left and right side preferably in MS-Word (version 2003 and upwards) in 12-point size font on A4 size sheet with pages numbers from 1st to last in the bottom of the paper .Author/s may submit electronic copies in Ms Word via e-mail or through our website.
- **Cover letter:** Manuscript should be submitted with a covering letter at every time of submission.
- **Title of the paper:** The manuscript should contain title of the paper and unabbreviated names of all authors with their complete postal addresses e-mail and phone numbers. An asterisk (*) should be added to the right of the corresponding author's name.
- **Abstract:** The manuscript should contain abstract (not more than 300 words for research paper and 150 words for short communication).
- **Key words:** Up to six keywords identifying the nature of the subject matter may be used to alert readers. Key words should be listed below the summary of the paper.
- **Introduction:** The section should contain a clear statement of the purpose of work, the reasons for undertaking the research and pertinent background of the study that allows readers outside the field to understand the purpose and significance of the work.
- **Materials and Methods:** Description of methods should be brief, but with sufficient details to enable the experiments to be repeated by the readers. The design of the study or experiments, any specific procedures used, and statistical analyses must be described clearly and carefully. References to other papers describing the techniques may be given. The name and location (city and state/country) of commercial suppliers of uncommon chemicals, reagents, or instruments should be mentioned.
- **Results and Discussion:** The results and discussion should be presented concisely. Tables and figures should be used only if they are essential for the comprehension of the data. The purpose of the discussion is to interpret the results and to relate them to existing knowledge in the field.

- **Conclusion:** Conclusion should be provided under separate heading and highlight new aspects arising from the study. It should be in accordance with the objectives.
- **Tables:** Tables should be numbered (Arabic numerals) in the order in which they are referred to in the text. Each Table should have brief title, be on a separate page, and be double-spaced throughout. Non-standard abbreviations should be used sparingly and must be defined in a legend at the bottom of the Table. For Table title, use lower case letters with only the first letter capitalized.
- **Figures:** All illustrations (line drawings and photographs) are classified as figures. Digital photograph files should have a resolution of at least 300 dpi. Figures should be cited in consecutive order in the text. The abbreviation "Fig." should be used (e.g., (Fig. 1), If a figure consists of multiple parts, letters (a, b, c, etc.) should be used to label them (e.g**,** Fig. 1a). Legends for the figures should be double-spaced, in numerical order, and on a separate page. Non-standard abbreviations should be defined in legends. For figure title, use lower case letters with only the first letter capitalized.
- **Units:** IUPAC rules for units and their abbreviations should be used, i-e length (m, cm, mm, μm, nm, Å), mass (kg, g, mg, μg, ng pg, mol, mmol, μmol), volume (L, mL, μL), time (s, min, h, d), temperature (°C, °K), radiation (Bq, dpm, Gy, Sv), and concentration (M, mM) mol/L, mmol/L, mg/mL, (v/v), (w/v), ppm, ppb).
- **Spectral and elemental analysis data:** Please report spectral and elemental analysis data in the following format. ^{1}H-NMR ($CDC1_3$) δ : 1.25 (3H, D, J=7.0Hz) 3.55 (1H, q, J=7.0Hz), 6.70 (1H, m) ^{13}C-NMR ($CDC1_3$) δ :20.9 (q) 71.5 (d), 169.9 (s). IR (KBr) cm^{-1}: 1720, 1050, 910 UV λmax (EtOH) nm (ε) : 241 (1086), 288 (9380). UV λ_{max} (H_2O)nm(log ε): 280 (3.25). FAB-MS *m/z*: 332.1258 (Calcd for $C_{18}H_{20}O_6$: 332.1259). MS *m/z*:332 (M^+) 180, 168, $[\alpha]^{23}_D$ – 74.5 (c=1.0 MeOH). Anal. Calcd for $C_{19}H_{21}NO_3$:C, 73.29; H, 6.80; N, 4.50 Found: C, 73.30; H, 6.88: N, 4.65.
- **References formation:** All references should be as per PJSIR format, and cited in the text by the last name of the author and year into a chronological descending order. All references in the bibliography should be listed in alphabetical order of the authors' last names followed by date of publication and other complete details with full names of Journals as given below:

In "Text" References :

Park (2005), Aksu and Kabasakal (2004) and Evans *et al.* (2000)

(Park, 2005; Aksu and Kabasakal, 2004; Evans *et al.,* 2000)

In "List" References :

Evans, W.J., Johnson, M.A., Fujimoto, Cy. H., Greaves, J. 2000. Utility of electrospray mass spectrometry for the characterization of air-sensitive organolan-thanides and related species. *Organometallics,* **19:** 4258-4265.

For Standards:

ASTM, 2007. Standard Test Method for the Determination of Iron Ion Ores and Related Materials (E247-OD) P.O. Box C700, West Conshohocken, USA, *Annual Book of ASTM Standards*, vol, 30.5 pp.163-165.

PCRWR, 2007. *Water Quality Monitoring, Fifth Monitoring Report* 2005-6 . ISBM 978-969-8469-184, Pakistan Council of Research in Water Resources. Pakistan

Books:

Cinar, A., Parulekar, S.J., Undey, C., Birol, G. 2003. *Batch Fermentation: Modeling, Monitoring, and Control,* 250 pp.Marcel Dekker Inc., New York, USA.

Chapters in Edited Books:

Newby, P.J., Johnson, B. 2003. Overview of alternative rapid microbiological techniques. In: *Rapid Microbiological Methods in the Pharmaceutical Industry,* M.C. Easter (ed.), vol. **1**, pp. 41-59, 1st edition, Interpharm / CRC, Boca Raton, Florida, USA.

Papers in Proceedings:

Marceau, J. 2000. Innovation systems in building and construction and the housing industry in Australia. In: *Proceedings of Asia-Pacific Science and Technology Management Seminar on National Innovation Systems,* pp. 129-156,Japan Int. Sci. Technol. Exchange Centre, Saitama, Japan.

Reports:

*SIC, 2016. Annual Report, 2014-15,*Scientific Information Centre, Pakistan Council of Scientific and Industrial Research, PCSIR Laboratories Campus, Shahrah-e-Dr. Salimuzzaman Siddiqui, Karachi, Pakistan.

Thesis:

Saeed, A. 2005. Comparative Studies on the Biosorption of Heavy Metals by Immobilized Microalgal Cultures, Suspended Biomass and Agrowastes. *Ph.D. Thesis*, 248 pp., University of the Punjab, Lahore, Pakistan.

Patents:

Young, D.M. 2000. Thermostable Proteolysis Enzymes and Uses Thereof in Peptide and Protein Synthesis, US Patent No. 6,143,517, 7th November, 2000.

Data Set from a Database: (information should be retrievable through the input)

Deming, D; Dynarski, S. 2008. The lengthening of childhood (NBER Paper 14124) Cambridge, MA: National Bureau of Economic Research, Retrieved July 21, 2008 from http://www.nber.org/papers/w14124) DOI No..........

Other Important Points:

1. In general, after submission of a paper, no authors may be added deleted or replaced with other names from the paper, and the order of the names of the authors cannot be changed at any stage i.e. modification, revision and galley proof.
2. The authors are given an opportunity to proofread the galley of an accepted manuscript. No additions and revisions are allowed other than the correction of typographical errors.
3. No reprints will be sent. Single hard copy will be sent to the corresponding author and co-authors may subscribe it. Full-text will be available on our website.
4. Any change in postal address or e-mail of the corresponding author should be communicated immediately to the Editorial Office.

- **Publication fees:** At the time of submission of an article, the author has to submit Publication fees of the paper PKR. 2000/= (through Cross Cheque in favour of **PCSIR NIDA 16-3, NBP** and send at the address given below).

The manuscripts should be addressed to :

The Executive Editor
Pakistan Journal of Scientific and Industrial Research
Scientific Information Centre, PCSIR Laboratories Campus,
Sharah-e-Dr. Salimuzzaman Siddiqui, Karachi-75280, Pakistan
Phone: (92-21)-99261914,16,17,99261949 **Fax:** (92-21) 99261913
Web: http://www.pjsir.org; **E-mail:** info@pjsir.org

Pakistan Journal of Scientific & Industrial Research (PJSIR)

Call For Papers

Pakistan Journal of Scientific and Industrial Research (PJSIR) is the premier research journal of Pakistan and has been publishing for the last 60 years, comprising of original research papers in the fields of Physical and Biological Sciences. Since January 2011, the Journal has been bifurcated and now published bimonthly i.e. 6 issues in a year in two series as follows:

Series A: Physical Sciences (appearing as issues of January-February, May-June and September-October) including articles of Physics, Physical and Analytical Chemistry, Geology, Geography, Environmental Sciences, Technology) and

Series B: Biological Sciences (appearing as issues of March-April, July-August and November-December) including articles of Agriculture, Botany, Zoology, Microbiology, Biochemistry, Biological Chemistry, Genetics, Food Sciences, Pharmaceutical Sciences, Environmental Sciences).

PJSIR is an interdisciplinary open access peer-reviewed refereed journal and complies with the international standards and ethics of scientific community.

We publish original primary research articles/Review papers related to Biological Sciences, Physical Sciences and Technology. However, we do not entertain articles of Pure Mathematics, Computer Sciences, Social/Management Sciences and Medical Sciences. You may send it via e-mail info@pjsir.org as well as through our website www.pjsir.org.

CALL FOR PAPERS

Please submit your research papers for upcoming volume 62 of PJSIR for the year 2019.

Pakistan Journal of Scientific and Industrial Research

PCSIR - Scientific Information Centre

PCSIR Laboratories Campus, Shahrah-e-Dr. Salimuzzman Siddiqui, Karachi - 75280, Pakistan
Ph: 92-21-99261949-99261917, Fax: 92-21-99261913, E-mail: info@pjsir.org Website: www.pjsir.org

EXCHANGE FORM

We wish to receive Pakistan Journal of Scientific and Industrial Research Ser. A: Phys. Sci: and/or Ser. B: Biol. Sci. in exchange of :

Name of Journal: ______________________________
Frequency: ______________________________
Subjects Covered: ______________________________
Institution: ______________________________
Address: ______________________________
____
____

Signature: ______________________________
Name: ______________________________
Designation: ______________________________
Date: ______________________________
E-mail: ______________________________
Fax: ______________________________
Phone: ______________________________

Pakistan Journal of Scientific and Industrial Research

PCSIR - Scientific Information Centre

PCSIR Laboratories Campus, Shahrah-e-Dr. Salimuzzman Siddiqui, Karachi - 75280, Pakistan
Ph: 92-21-99261949-99261917, Fax: 92-21-99261913, E-mail: info@pjsir.org Website: www.pjsir.org

SUBSCRIPTION FORM

I / we wish to subscribe to 'Pakistan Journal of Scientific and Industrial Research' Ser. A: Phys. Sci: and/or Ser. B: Biol. Sci. The filled in proforma is being returned for compliance.

Subscriber's data:
Name: ______________________________
Address: ______________________________
____
____
E-mail: ______________________________
Fax: ______________________________
Phone: ______________________________

Signature: ______________________________
Order Membership No. (if any): ______________________________

Tick the relevant box: ☐ Send invoice ☐ Bill later on ☐ Cheque for ....enclosed

RevisedSubscription Rates:	Local: Rs. 2500/ = per volume; Rs. 425/ = per copy Foreign: US$ 450/ = per volume; US$ 75/ = per copy

Payment should be made through cross cheque in favour of PCSIR NIDA 16-3 NBP and mailed to the Director PCSIR - Scientific Information Centre, PCSIR Laboratories Campus, Shahrah-e-Dr. Salimuzzaman Siddiqui, Karachi-75280, Pakistan.