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Scientometric Portrait of Dr. Atta-ur-Rahman

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Introduction

Bibliometrics is a word that means "the more that is published on a topic, the more important the topic is in terms of money and energy being used" (Jaing, 2003).

The terms *bibliometrics* by Pritchard and 'Naukometriya' (the Russian for 'Scientometrics') by Nalimov & Mulchenko were coined simultaneously in 1969 while Narin (1976) used the term 'Evaluative bibliometrics' to denote the use of bibliometric techniques, especially publication and citation analysis in the assessment of a scientific creativity.

The anyhow fuzzy borderlines between the two specialties almost vanished during the last three decades and nowadays both terms are used almost as synonyms. Instead, the field *informetrics* took the place of the originally broader specialty bibliometrics (Glanzel, 2003).

Bibliometrics is not only the term that is used to refer to the quantitative study of document-related processes. Informatics and librmetry may be defined in similar ways; scientometrics, technometrics, sociometrics and econometrics are fields that overlap with bibliometrics to greater or lesser extent (in the sense either that similar methods are used, or that related processes are studied); and webometrics and cybermetrics are new areas that focus specifically on the communication of information in electronic form (UCLA Graduate School).

Kalyane and Kalyane (1993) for the first time used the phrase 'Scientometric Portrait' to carry out bio-bibliometric studies on scientists while Sinha & Bhatnagar (1980) and Sinha & Ullah (1994) used the term 'Information profile' for such studies while Sen (1995) proposed the term 'Microbibliometrics' for the studies on individual scientists in IASLIC conference (1994).

Recently the term 'Bio-bibliometrics' is being used for a method of retrieving and

visualizing biological information (Stapley & Benoit, 2000) while Koganurmath, et al. (2003) have suggested that 'Scientometric portrait' is the appropriate phrase for the studies on scientists and 'Informetric portrait' for the studies on researchers in other disciplines such as arts, humanities and social sciences.

Biographical Sketch

Professor Dr. Atta-ur-Rahman an outstanding academician and one of the leading scientists in Pakistan completed his Masters in Organic Chemistry from the University of Karachi in 1964 and obtained his PhD from Cambridge University in 1968, where he later on had the rare distinction of being appointed as Don at Kings College, Cambridge (1969-1973) and D.A.A.D. Fellow of University of Tuebingen, Germany in 1979. He is also the only scientist from the Pakistan, other than the late Prof. Abdul Salam (Nobel Laureate), who has been awarded the prestigious degree of Doctor of Science (ScD) by Cambridge University. Three Pakistani Universities, Sir Syed Engineering University (2003), Gomal University (2004) and Karachi University (2005) each awarded him D.Sc. degree

He is internationally renowned in the field of Natural Product Chemistry. He has hundreds of publications to his credit including 15 *Patents*, 94 *Books*, 59 *Chapters in Books* published by major US and European presses while more than 70 students have completed Ph.D researches under his supervision.

He is an eminent writer and the level of his writings can be judged from the fact that his first book "*Biosynthesis of Indole Alkaloids*" was published by Oxford University Press, England as Vol. 7 of their prestigious "*International Series of Monographs in Chemistry*" in 1983 while another book "*Nuclear Magnetic Resonance Spectroscopy*" is considered to be the first text book to have a detailed discussion on 2D-NMR spectroscopy. Its success in USA and Europe prompted it to be translated into Japanese language by Prof. H. Hirota from Tokyo University and Prof. Motoo Tori from Tokushima Bunri University. Another title "*Stereoselective Synthesis in Organic Chemistry*", published by Springer-Verlag, Germany was appreciated by the Nobel Laureate Sir D.H.R. Barton, who wrote its foreword and called it "a monumental tome."

The Government of Pakistan has conferred four civil awards on him in recognition of his eminent contributions in the field of Organic Chemistry. He has also won several national and international prizes. He is the first scientist from the Islamic World to have received the prestigious UNESCO Science Prize (1999) in the 35 year old history of the award. He has secured numerous other national and international prizes and awards including the Federation of Asian Chemical Societies Award (Hiroshima, Japan, 1997), the ECO Prize (2000), ISESCO Prize (2001), the Islamic Organization Prize by Government of Kuwait (1988), the First Prize at the 6th Khwrazmi Festival by the President of Iran (1993), the FPCCI Prize for Technological Innovation (1985), the "Best Scientist of the Year" Award of the Government of Pakistan (1986), and the Prime Minister's Gold Medal and Pakistan Academy of Sciences-INFAQ Foundation Prize in Science (1995).

He is Fellow of three major international science academies and Editor-in-Chief/Executive Editor of fifteen leading European Chemistry journals. He is also the Editor of five book-series entitled "Studies in Natural Product Chemistry", 32 volumes of which have been published under his editorship during the last 14 years. He is also editing "Frontiers in Medicinal Chemistry", "C-13-NMR of Natural Products", "Advances in Organic Chemistry", "Advances in Organic Synthesis" and "Frontiers in Drug Design and Discovery". (Taken from Dr. Atta-ur-Rahman's Bio).

Study Objective

The prime purpose of the study is to document quantitatively the publication productivity pattern of Dr. Atta-ur-Rahman and particularly it highlights:

- Year-wise, quinquennium-wise and domain-wise productivity
- Domain-wise authorships and collaborative pattern
- Identify prominent collaborators
- Collaborator dynamics
- Mentor's authorship credibility
- Prominent, new and overlapping collaborators
- Core Channels of Communication and distribution of publications among these channels and
- Bradford multiplier
- Geographical distribution of publications, and
- Documentation of keywords used in the titles.

Literature Review

Both terms *bibliometrics* and *scientometrics* are used for the study of statistical analysis of scientific literature and to trace the origin of statistical studies we have to go back about 46 years before the coinage of these terms in early twenties of the twentieth century when E. W. Hulme (1923) published his book "Statistical Bibliography in Relation to the Growth of Modern Civilization."

Alfred J. Lotka (1926) conducted a study on the frequency distribution of scientific productivity while the very next year Gross and Gross (1927) conducted a citation-based study by examining 3633 citations and is considered to be the first citation analysis. In 1934, Bradford conducted a study on the frequency distribution of papers over journals while Zipf (1949) formulated an interesting law in bibliometrics and quantitative linguistics for studying word frequency in a text.

Until the early 60s these studies were not given much importance. Glanzel (2003) identifies three reasons for this phenomenon.

1. These papers appeared when traditional methods of information retrieval were still sufficient
2. They applied to different phenomena and the interrelation between these laws which was not completely recognised; and
3. Financing systems for scientific research did not yet stand need of quantitative or even sophisticated statistical methods.

Derek deSolla Price(1963) by analysing the system of science communication laid down the foundation of modern research evaluation techniques and paved a path for the modern scientometrics.

Mentionable efforts for the institutionalisation of the field are, the launching of first international journal "*Scientometrics*" by Tibor Braun in 1979 followed by the first international conference in 1983 (being held annually since then). The bibliometricians/scientometricians contributed a number of books and articles and developed complex models of scientific communication to strengthen the foundation of the discipline. The bibliometrics continue its journey passing through different phases and as a result of these efforts "Baby Scientometrics" in the words of (Glanzel, 2003) evolve into a distinct scientific discipline with a specific research profile, several subfields and the corresponding scientific communication structures.

Some biographical and bio-bibliometric studies of individuals have been carried out occasionally at the time of retirement or paying homage to an individual after death. For some noted individuals their contributions are highlighted in the obituary column of professional journals (Koganurmath, 2003).

Hirsch (2005) for the quantification of scientific output of individual scientific authors suggested the *h*-index, also known as the Hirsch Number which is based on the citations each article (paper) of an author gets. This number has several advantages over other criteria. H-index has been suggested for use in academic promotions, tenure, grant funding, and prediction of winning of the Nobel Prize.

Recently individual scientists including the Nobel Laureates are becoming the focus of scientometric studies rather than gross statistical "macro" data (Schubert and Glanzel, 1992). Among a number of scientometric studies on Nobel Laureates few are:

Scientometric portrait of Nobel Lauriat Leland Dr. C.V. Raman (Kademani, Kalyane & Kademani, 1994), Barbara McClintock: (Kalyane and Kademani, 1997), S. Chandrasekhar (Gupta, 1983), Dorothy Crowfoot Hodgkin (Kademani, Kalyane & Jange, 1999), Ahmed Hassan Zewail (Kademani, Kalyane & Kumar, 2001), Harold W. Kroto (Kademani, Kalyane & Kumar, 2002), Pierre – Gilles de Gennes (Kalyane & Sen, 1996), Wolfgang Ketterle (Koganuramath, et al., 2003) and H. Hartwell (Angadi, et al., 2004).

Besides Nobel Laureates there are numerous scientometric studies on other scientists in various disciplines, the reference is made to some of such studies as:

The research by Kalyane & Kalyane (1993), (Kademani, Kalyane & Balakrishnan (1994), Kalyane (1995), Prpic (1996), Kalyane & Sen (1996), Hawkins (2001), Kalyane, Prakasan and Kumar (2001), Swarna, Kalyane and Kumar (2002), Kademani, et al., (2005), Kademani, et al. (2006), Sangum, Savanur and Sarathi (2006), Sangam and Savanur (2006), Tiew (2006), van Raan (2006), (Koley & Sen 2006), Anuradha & Urs (2007), Fred Y. Ye (2007), Sagar, Kademani and Kumar (2007), Leydesdorff & Meyer (2007), Ocholla & Ocholla (2007), Pouris (2007) and Yazit & Zainab (2007).

Few examples of bibliometric/citation studies from Pakistan are: Kousar & Mahmood (2010), Naseer & Mahmood (2009), Mahmood & Rehman (2009), Javed & Shah (2008), Ullah, Butt & Haroon (2008), Ullah (2006), Sharif & Mahmood (2004), Majid (1995, 2000), Anwar and Saeed (1999), Khan and Samdani (1997) and Mahmood (1996).

The bibliometricians, scientometricians and information specialists also contributed a number of books on theory and applications of the discipline. A few examples of such publications are:

Introduction to informetrics: quantitative methods in library, documentation and information science (Egghe and Rousseau, 1990), *Handbook of quantitative studies of science & technology* (van Raan, 1988), *Bibliometric mapping as a science policy and research management tool* (Noyons, 1999), *The challenge of scientometrics: The development, measurement and self-organization of scientific communications* (Leydesdorff, 1995) and *Scholarly communication and bibliometrics* (Borgman, ed. 1990).

Among a large number of useful web-sites providing information on different aspects of bibliometrics few are:

· *Applications in Teaching Bibliometrics* by Sara von Ungern-Sternberg.

<http://www.ifla.org/IV/ifla61/61-ungs.htm>

· *Bibliometric Mapping* by the Centre for Science and Technology Studies (CWTS) at Leiden University in the Netherlands.

<http://sahara.fsw.leidenuniv.nl/ed/projects.html>

· *BIRD: Bibliometric Retrieval of Documents*, from the National Research Council Canada- Institute for Information Technology.

http://ai.iit.nrc.ca/II_public/WebBird/index.html

· *BIRD Resources: Bibliometric Systems*. A list of bibliometric systems, projects and links. http://ai.iit.nrc.ca/II_public/WebBird/bibliometric.html

· *Bibliometrics, Scientometrics & Informetrics* by Luc Quoniam

<http://crrm.univ-mrs.fr/vl/metrics.html>

Methodology

On critical study of the list down loaded from the web, it was observed that there are certain duplicate titles in the list. After dropping duplicate titles the list counts 766 publications which are considered for study purpose.

The study identifies year, quinquennium and domain-wise productivity and Collaborations, collaborative pattern, mentor's authorship credibility, individual collaborator dynamics, channels of communication used and distribution of publications among channels and geographical distribution of publications. Further, the study find out prominent collaborators, the most productive period, top ranking journals, publication density and concentration, Bradford multiplier and high frequency words used in the titles.

Data Analysis & Discussion

The contribution of 766 publications during 1966-2007 by the mentor were analyzed year, quinquennium and domain-wise, author-wise authorships credits, mentor's authorship credibility, channels of communication used, countries of productivity and keywords used in the titles.

Productivity

The productivity can be divided into; year-wise, quinquennium-wise and domain-wise and are discussed as under:

Year-wise Productivity

Table 1 describes year-wise contribution of 766 publications by the mentor from 1966-June 2007. He contributed 1 (0.13 %) publication in each year 1966, 1968 and 1969 while maximum 67 (8.75 %) publications in the year 2005. Still 4 (0.52 %) publications are in the press while 8 (1.04 %) have been submitted for acceptance. In his 42 years of research career 1970 is the only year when he made no contribution.

S. No.	Year	Number of Pubs.	CF	%	Single-authored	%	Multi-authored	%	Productive Age
1	1966	1	1	.13	0	0	1	0.13	1
2	1967	2	3	.26	0	0	2	0.26	2
3	1968	1	4	.13	0	0	1	0.13	3

4	1969	1	5	.13	1	0.13	0	0	4
5	1971	3	8	.39	1	0.13	2	0.26	6
6	1972	5	13	.65	3	0.39	2	0.26	7
7	1973	3	16	.39	0	0	3	0.39	8
8	1974	3	19	.39	0	0	3	0.39	9
9	1975	4	23	.52	0	0	4	0.52	10
10	1976	10	33	1.31	2	0.26	8	1.05	11
11	1977	6	39	.78	3	0.39	3	0.39	12
12	1978	2	41	.26	1	0.13	1	0.13	13
13	1979	6	47	.78	3	0.39	3	0.39	14
14	1980	7	54	.91	1	0.13	6	0.78	15
15	1981	5	59	.65	2	0.26	3	0.39	16
16	1982	11	70	1.44	0	0	11	1.44	17
17	1983	17	87	2.22	1	0.13	16	2.09	18
18	1984	31	118	4.05	3	0.39	28	3.66	19
19	1985	18	136	2.35	2	0.26	16	2.09	20
20	1986	27	163	3.53	3	0.39	24	3.13	21
21	1987	27	190	3.53	3	0.39	24	3.13	22
22	1988	39	229	5.09	5	0.65	34	4.44	23
23	1989	28	257	3.66	7	0.91	21	2.74	24
24	1990	23	280	3.00	4	0.52	19	2.48	25
25	1991	32	312	4.18	2	0.26	30	3.92	26
26	1992	25	337	3.26	4	0.52	21	2.74	27
27	1993	11	348	1.44	2	0.26	9	1.16	28

28	1994	22	370	2.87	3	0.39	19	2.48	29
29	1995	34	404	4.44	4	0.52	30	3.92	30
30	1996	14	418	1.83	1	0.13	13	1.7	31
31	1997	25	443	3.26	0	0	25	3.26	32
32	1998	33	476	4.31	0	0	33	4.31	33
33	1999	21	497	2.74	2	0.26	19	2.48	34
34	2000	20	517	2.61	3	0.39	17	2.22	35
35	2001	20	537	2.61	2	0.26	18	2.35	36
36	2002	37	574	4.83	4	0.52	33	4.31	37
37	2003	38	612	4.96	1	0.13	37	4.83	38
38	2004	41	653	5.35	1	0.13	40	5.22	39
39	2005	67	720	8.75	4	0.52	63	8.22	40
40	2006	34	754	4.44	3	0.39	31	4.05	41
41	2007*	12	766	1.56	1	0.13	11	1.44	42
	Total	766		100	83	10.84	683	89.15	

Table 1 Year-wise Productivity

* In the press or submitted for publication

The contribution of 222 (28.98 %) publications during five high productive years (1988, 2002, 2003, 2004 and 2005) indicates that more than one-fourth productivity is the result of less than one-eighth period of productive years (42 years) while 50 % productivity in ten high productive years indicates that half of the total productivity is the result of less than one-fourth of the entire period (1966-2007) of productivity. The productivity of 624 (81 %) publications in 20 high productive years indicates that more than four-fifth of total productivity is the result of less than fifty percent of total period of productivity. It is obvious from the above discussion that in least 22 productive years, the productivity is less than one-fifth of the entire productivity from 1966-2007.

By dividing total period of productivity (42 years) into three clusters of 14 years each, we find that in the first cluster of 14 years (1966-1979) the productivity is only 47 (6.14 %) publications. In the next cluster (1980- 1993) the productivity is 301 (39.3 %) while in the last cluster of 14 years from 1994-2007, he contributed 418 (54.57 %) publications. It is obvious from the above discussion that the productivity (39.3 %) in the second cluster and (54.57 %) in the third is more than six-times and about nine-times respectively as compared with the first cluster of 14 years of productivity.

In case of decade-wise productivity it is 23 (3.00 %) in the first decade (1966-75), 113 (14.75 %) in the 2nd decade (1976-85), 268 (34.99 %) in the third (1986-95) while in the fourth decade (1996-05) it is 316 (41.25 %). The decade-wise analysis of productivity indicates that only 3 % of entire productivity is during the 1st decade, about one-seventh in the 2nd decade, about one-third in the third while more than two-fifth of entire productivity is in the last decade. Moreover, the collective productivity during the third & the fourth decades is more than three-fourth (76.24 %) of the entire productivity.

The publication productivity coefficient .69 indicates his higher productivity period just after 50 percentile age of his research career under consideration.

Quinquennium-wise Productivity

Table 2 describes quinquennium-wise productivity which consists over nine quinquenniums from 1966-2007. As the productivity in the 9th quinquennium is only of two years, thus it is not reflecting the exact productivity for the complete 9th quinquennium (2006-10).

The productivity in the 8th quinquennium at its peak point is even more than the collective productivity of first four quinquenniums (I-IV). The productivity from 1st to 5th quinquennium remains increasing while decreases in the sixth and seventh quinquenniums. The collective productivity (49.74 %) in three quinquenniums (5th to 7th) is nearly equal as compared with the collective productivity of remaining six quinquenniums (1st- 4th, 8th & 9th) irrespective the decade with maximum productivity (8th) is also included in these six quinquenniums.

Table 2 Quinquennium-wise Productivity

Q	Period	Number of Pubs. (F)	CF	%	Single-authored	CF%	Multi-authored	CF	%	
I	1966-70	5	5	.65	2	2	0.26	3	3	0.39
II	1971-75	18	23	2.35	4	6	0.52	14	17	1.83
III	1976-80	31	54	4.05	10	16	1.31	21	38	2.74
IV	1981-85	82	136	10.7	8	24	1.04	74	112	9.66
V	1986-90	144	280	18.8	22	46	2.87	122	234	15.93
VI	1991-95	124	404	16.19	15	61	1.96	109	343	14.23
VII	1996-00	113	517	14.75	6	67	0.78	107	450	13.97

VIII	2001-05	203	720	26.5	12	79	1.57	191	641	24.93
IX	2006-07	46	766	6.00	4	83	0.52	42	683	5.48
		766		100	83		10.84			89.16

Q= Quinquennium

Domain-wise Productivity

Table 3 provides detail of domain-wise authorship pattern, number of publications and authorships in each domain of 766 publications as:

NP	Natural Products
NP_{syn}	Natural Products – Synthesis
NP_{iso}	Natural Products –Isolation
NP_{x-ray}	Natural Products --X-Rays
NP_{nmr}	Natural Products – NMR
SY	Synthesis
SP	Spectroscopy
AC	Analytical Chemistry
MC	Medicinal Chemistry
Misc.	Encyclopedias, Handbooks, Directories, General topics, etc.

The entire productivity in various domains is NP 90 (11.75 %), NP-syn & NP-x-ray each 9 (1.18 %), NP-iso 423 (55.22 %), NP-nmr 14 (1.93 %), SY 132 (17.23 %), SP 27 (3.53 %), AC 8 (1.04 %), MC 24 (3.13 %) and Misc. 30 (3.92 %). Domain-wise detail of 83 (10.83 %) single-authored contribution is NP 28 (3.66 %), NP-syn 9 (1.18 %), NP-iso 13 (1.7 %), NP-nmr and AC each 2 (0.26 %), SY 16 (2.09 %), MC 6 (0.78 %), SP 4 (0.52 %) and Misc. 3 (0.39 %) while collaborative productivity in various domains is NP 62 (8.09 %), NP-iso 410 (53.53 %), NP-x-ray 9 (1.18 %), NP-nmr 12 (1.57 %), SY 116 (15.14 %), MC 18 (2.35 %), SP 23 (3.0 %), AC 6 (0.78.%) and Misc. 27 (3.53 %).

The single-authored productivity (3.66 %) in the domain of NP is more than all other categories (2-11, 13, and 21–authored) while five-authored productivity (85) in the domain NP-iso is the highest followed by six-authored (77), four-authored (71) and seven-authored (52).

Under the domain of NP-x-ray the maximum productivity is by 6-authored while in case of NP-nmr 2-authored contribution is the highest followed by each 3, 6,

single and each five and seven-authored respectively. Under the domain SY two-authored productivity is the highest (39) followed by three-authored (18) and in case of domain AC single and 6-authored productivity is the same and the highest 2 (0.26 %).

Table 3 Domain-wise Productivity

Papers	Domains											
	NP	NP _{syn}	NP _{iso}	NP _{x-ray}	NP _{nmr}	SY	MC	SP	AC	Misc.	Total	%
1-authored	28	9	13		2	16	6	4	2	3	83	10.83
2- authored	18		39	1	4	39	5	8	1	22	137	17.89
3-authored	11		47		3	18	3	10		3	95	12.4
4-authored	7		71	1		14	6	1			100	13.05
5-authored	6		85	2	1	10	2	3	1		110	14.36
6-authored	13		77	4	3	11			2	2	112	14.62
7-authored	4		52	1	1	7	1	1	1		68	8.88
8-authored	3		19			4					26	3.39
9-authored			12			6					18	2.35
10-authored			5			6	1				12	1.57
11-authored			1			1			1		3	.39
13-authored			1								1	.13
21-authored			1								1	.13
Total	90	9	423	9	14	132	24	27	8	30	766	
Percentage	11.8	1.2	55.2	1.2	1.8	17.2	3.1	3.5	1.1	3.9		100
NP= Natural Product NP _{syn} , NP _{iso} , NP _{x-ray} , NP _{nmr}			MC=Medicinal Chemistry AC= Analytical Chemistry				Misc.=Reference & General Books			SP=Spectroscopy & SY= Synthesis		

Collaborations

Table 4a provides the detail of 3214 (97.48 %) collaborative authorships out of

total 3297 authorships. Among these 3214 Collaborations 274 (8.53 %) are two-authored, 285 (8.87 %) three-authored, 400 (12.45 %) four-authored, 550 (17.11 %) five-authored, 672 (20.91 %) six-authored, 476 (14.81 %) seven-authored, 208 (6.47%) eight-authored, 162 (5.04 %) nine-authored, 120 (3.73 %) ten-authored, 33 (1.03 %) eleven-authored, 13 (0.4 %) thirteen-authored and 21 (0.65 %) collaborative authorships are twenty-one-authored.

Table 4a Collaborations

Type of Productivity (X)	Number of Contributions (Y)	%	Author-ships $F = X*Y$	CF	%	Collabora-tiveships	CF	%
1-authored	83	10.83	83	83	2.52	0		
2- authored	137	17.89	274	357	8.31	274	274	8.53
3-authored	95	12.4	285	642	8.65	285	559	8.87
4-authored	100	13.06	400	1042	12.13	400	959	12.45
5-authored	110	14.36	550	1592	16.68	550	1509	17.11
6-authored	112	14.62	672	2264	20.38	672	2181	20.91
7-authored	68	8.88	476	2740	14.44	476	2657	14.81
8-authored	26	3.39	208	2948	6.31	208	2865	6.47
9-authored	18	2.35	162	3110	4.91	162	3027	5.04
10-authored	12	1.57	120	3230	3.64	120	3147	3.73
11-authored	3	0.39	33	3263	1.00	33	3180	1.03
13-authored	1	0.13	13	3276	0.39	13	3193	0.4
21-authored	1	0.13	21	3297	0.64	21	3214	0.65
Total	766	100	3297		100	3214		100

The number of collaborations is the highest 672 (20.91 %) in case of six-authored productivity followed by five-authored contribution 550 (17.11 %). The contribution of more than 80% co-authorships is by six high productive categories (2 to 7-authored) while the remaining six categories (8 to 11, 13 and 21-authored) contributed less than 20 % Collaborations.

The number of Collaborations from one to six-authored productivity remains increasing and afterwards decreasing till 13-authored productivity which indicates that in case of 1-6-authored productivity, the relationship between number of Collaborations and category of productivity is directly proportional while from 7 to 13-authored productivity this relationship is inversely proportional. The authorship

per paper is 4.3.

Table 4b provides the detail of 2531 collaborations made by co-authors. The most prolific collaborator contributed 398 (15.73 %) authorships while 250 collaborators contributed 250 (9.88 %) co-authorships one each.

The contribution of 398 (15.73 %) Collaborations by one collaborator indicates that the credit of one-seventh of total co-authorships goes to only one collaborator. The contribution of 846 (33.43 %) co-authorships out of total 2531 by only 18 out of total 547 collaborators indicates that 3.3 % of total collaborators contributed one-third of the total Collaborations while only 57 co-authors contributed 50 % of the total Collaborations.

It is evident from the data that the contribution of 50 % Collaborations only by 57 reseachers is equal to the remaining 490 collaborators while the contribution of 94.47 % Collaborations by only 92 collaborators indicates that Collaborations contribution exceeds the general rule of 80/20.

Table 4b Collaborations

S. No.	Number of Collaborators (X)	Number of Collaborations (Y)	Total Collaborations $X*Y= F$	CF	%
1	250	1	250	250	9.88
2	87	2	174	424	6.87
3	48	3	144	568	5.69
4	28	4	112	680	4.43
5	14	5	70	750	2.77
6	26	6	156	906	6.16
7	15	7	105	1011	4.15
8	12	8	96	1107	3.79
9	10	9	90	1197	3.56
10	10	10	100	1297	3.95
11	6	11	66	1363	2.61
12	7	12	84	1447	3.32
13	2	13	26	1473	1.03
14	4	14	56	1529	2.21

4	1969	0	5	0	25	1991	119	703	4.7
5	1971	2	7	0.08	26	1992	64	767	2.53
6	1972	3	10	0.12	27	1993	32	799	1.26
7	1973	6	16	0.24	28	1994	76	875	3.00
8	1974	5	21	0.2	29	1995	110	985	4.35
9	1975	7	28	0.28	30	1996	32	1017	1.26
10	1976	16	44	0.63	31	1997	85	1102	3.36
11	1977	9	53	0.36	32	1998	119	1221	4.7
12	1978	2	55	0.08	33	1999	71	1292	2.81
13	1979	5	60	0.2	34	2000	82	1374	3.24
14	1980	11	71	0.44	35	2001	97	1471	3.83
15	1981	3	74	0.12	36	2002	143	1614	5.65
16	1982	27	101	1.07	37	2003	185	1799	7.31
17	1983	30	131	1.19	38	2004	207	2006	8.18
18	1984	66	197	2.61	39	2005	318	2324	12.56
19	1985	38	235	1.5	40	2006	160	2484	6.32
20	1986	47	282	1.86	41	Sub	47	2531	1.86
21	1987	66	348	2.61		Total		2531	

Quinquennium-wise Collaborations

Table 4d about quinquennium-wise collaborations indicates that the highest number of collaborations 950 (37.53 %) are in the 8th quinquennium (2001-05) followed by 401 (15.84 %) in the 6th quinquennium (1991-95).

Table 4d Quinquennium-wise Collaborations

Quinquennium	Period	Collaborations (F)	CF	%
I	1966-70	5	5	0.2
II	1971-75	23	28	0.91

III	1976-80	43	71	1.7
IV	1981-85	164	235	6.48
V	1986-90	349	584	13.79
VI	1991-95	401	985	15.84
VII	1996-00	389	1374	15.37
VIII	2001-05	950	2324	37.53
IX	2006-07	207	2531	8.18

Mentor's Authorship Credibility

The credit of contributing 766 out of 3297 authorships goes to the mentor. Table 5 describes his authorship credibility. The credibility of 444 (57.96 %) publications as first author and 74 (9.66 %) as second author indicates that being the first or the second author he is mainly responsible for the contents and productivity of 67.62 % publications. In case of 86.55 % publications his authorship credibility varies from 1 to 5 while in case of only 13.45 % publications the authorship credibility is either seventh or beyond.

Table 5 Mentor's Authorship Credibility

Authorship Position	Frequency (F)	CF	%
1 st author	444	444	57.96
2 nd author	74	518	9.66
3 rd author	41	559	5.35
4 th author	49	608	6.4
5 th author	55	663	7.18
6 th author	49	712	6.4
7 th author	26	738	3.39
8 th author	11	749	1.44
9 th author	12	761	1.57
10 th author	2	763	0.26
th			

34	2000	82	1374	3.24	34	336	1.34	48	1038	1.9
35	2001	97	1471	3.83	21	357	0.83	76	1114	3.0
36	2002	143	1614	5.65	30	387	1.19	113	1227	4.47
37	2003	185	1799	7.31	37	424	1.46	148	1375	5.85
38	2004	207	2006	8.18	40	464	1.58	167	1542	6.6
39	2005	318	2324	12.56	55	519	2.17	263	1805	10.39
40	2006	160	2484	6.32	25	544	0.99	135	1940	5.33
41	2007	47	2531	1.86	3	547	0.12	44	1984	1.74
		2531		100	547		21.66	1984		78.44

F= Total Collaboratorships, F-1= New collaborators, F-2= Overlapping collaborators

4.2 Quinquennium-wise Collaborator Dynamics

During the 9 quinquenniums from (1966-2007) 2531 reseachers collaborate with the mentor. During the three quinquenniums (6th to 8th) 371(67.82 %) new collaborators join the mentor while during the same period (6th & 8th quinquenniums) the overlapping collaborators are 69 %. It is evident from the data that with the passage of time the number of collaborators in each quinquennium increased.

Table 8 Quinquennium-wise detail of New & Overlapping Collaborators

Q	Period	(F)	CF	%	(F-1)	CF	%	(F-2)	CF	%
I	1966-70	5	5	0.2	2	2	0.08	3	3	0.12
II	1971-75	23	28	0.9	6	8	0.24	17	20	0.67
III	1976-80	43	71	1.7	16	24	0.63	27	47	1.07
IV	1981-85	164	235	6.5	38	62	1.5	126	173	4.98
V	1986-90	349	584	13.8	86	148	3.4	263	436	10.39
VI	1991-95	401	985	15.8	85	233	3.36	316	752	12.49
VII	1996-00	389	1374	15.4	103	336	4.1	286	1038	11.3
VIII	2001-05	950	2324	37.5	183	519	7.23	767	1805	30.3
IX	2006-07	207	2531	8.2	28	547	1.11	179	1984	7.07

		2531	100			21.65	1984		78.39
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Q=Quinquennium, F=Collaboratorships, F-1= New collaborators, F-2= Overlapping collaborators

Channels of Communication

The mentor used 113 channels of communication to publish 756 out of total 766 publications in which 106 (13.84 %) are published locally while 660 (86.16 %) from abroad. For the remaining ten titles the names of publishers are not mentioned in the list provided by the mentor. Channel-wise scattering of publications is depicted in the Table 8 as below.

The Photochemistry by publishing 93 (12.14 %) titles is at the top followed by Elsevier Science Publishers and J. Nat. Prod 56 (7.31 %) each. Fourteen channels each publish 2 (.26 %) titles while 55 channels of communication (12 local and 43 foreign) publish only 1 (.13 %) title each. It is interesting to note that among the most prolific publishers, the top seven belongs to foreign countries.

The publication of 346 (45.17 %) titles by 7 top publishers indicates that one-sixteenth numbers of publishers publish more than forty percent of titles and all are foreign. The publication of 413 (53.9 %) titles in ten channels of communication indicates that less than one-eleventh numbers of channels publish more than fifty percent titles and among these ten publishers, local is only one. It is evident from the above discussion that 90% channels of communication used among top ten are foreign.

The publication density in this case is 6.69, (the ratio of total number of papers published to the total number of channels in which the papers were published while publication concentration is 7.96 (as the ratio in percentage of the journals containing half of the papers published to the total number of journals in which those papers were published during the period under study) (Vinkler (1990).

Table 9 Channels of communication

S. No.	Channel of Communication	F	%	CF	Local%	Foreign%
1	Photochemistry	93	12.14	93		93 12.14
2	Elsevier Science Publishers	56	7.31	149		56 7.31
3	J. Nat. Prod	56	7.31	205		56 7.31
4	Planta Medica	48	6.27	253		48 6.27
5	Heterocycles	35	4.57	288		35 4.57
6	Nat. Prod. Letters	30	3.92	318		30 3.92
7	Z. Naturforsch	28	3.66	346		28 3.66
8	J. Chem. Soc. Pak	27	3.53	373	27	3.52

9	Acta Cryst.	21	2.74	394			21	2.74
10	Chem. Pharm. Bull.	19	2.48	413			19	2.48
11	Natural product research	17	2.22	430			17	2.22
12	Tetrahedron Lett	17	2.22	447			17	2.22
13	Fitoterapia	15	1.96	462			15	1.96
14	Patent Offices	15	1.96	477	10	1.31	5	0.65
15	COMSTECH	14	1.84	491	14	1.83		
16	Bioorganic & Med. Chemistry	12	1.57	503			12	1.57
17	Helv. Chim. Acta	12	1.57	515			12	1.57
18	J. of Ethnopharmacology	12	1.57	527			12	1.57
19	Tetrahedron	11	1.44	538			11	1.44
20	Bentham Science	9	1.18	547			9	1.18
21	Chem & biodver	9	1.18	556			9	1.18
22	Elite Publishers	9	1.18	565	9	1.18		
23	J. Chem. Soc	9	1.17	574			9	1.17
24	Pure & Applied Chemistry	9	1.18	583			9	1.18
25	B.C.C. & T. Press	7	0.91	590	7	0.91		
26	Pak. J. Sci. Indus. Res.	7	0.91	597	7	0.91		
27	Springer Verlag	7	0.91	604			7	0.91
28	Academic Press	6	0.78	610			6	0.78
29	J. of Enzyme Inhibition and Med. Chemistry	6	0.78	616			6	0.78
30	Phytotherapy Research	6	0.78	622			6	0.78
31	Hamdard Foundation Press	5	0.65	627	5	0.65		
32	Biochemical and Biophysical Res. Comm.	4	0.52	631			4	0.52

105	Proc. ISBBP Symp. Biochem. Biophys	1	0.13	748			1	0.13
106	Recent Trends in Biomed. Res. in Pakistan	1	0.13	749	1	0.13		
107	Royal Society of Chemistry	1	0.13	750			1	0.13
108	Social and Natural Sciences	1	0.13	751			1	0.13
109	Synthesis	1	0.13	752			1	0.13
110	Turk. J. Chem.	1	0.13	753			1	0.13
111	UGC Press	1	0.13	754	1	0.13		
112	Vanguard Books	1	0.13	755	1	0.13		
113	Yaulor & Farcis	1	0.13	756			1	0.13
114	Name not mentioned	10	1.31	766	2	0.26	8	1.04
		766	100		106	13.84	660	86.16

Bradford Distribution

Dr. Atta-ur-Rahman contributed 766 publications during the entire period of productivity (1966- June 2007). For the ten publications the names of channels of communication are not mentioned. To test for the remaining 756 publications whether his contribution follows Bradford distribution or not, the productivity is divided into three zones each having approximately 252 papers.

The first 4 channels published 253 titles, the next 16 published 250 while in case of 3rd zone 64 channels published 253 publications. The below table provides zone-wise distribution of publications and journals.

Bradford multiplier is 4 in this case. According to this multiplier the number of publications in the third zone should be $4 \times 4 \times 4 = 64$ which is exactly the same as actual number 64. Thus the data follows the Bradford Law of distribution, Garfield, E. (1979).

Zones	Papers	Journals
1 st	253	4
2 nd	250	16
3 rd	253	64

Geographical Distribution of Publications

The table below explains countrywise distribution of the publications. The publishers from 23 countries published 766 titles. UK is at the top by publishing 220 (28.72 %) titles followed by USA 131 (17.1 %) and Pakistan 106 (13.84 %). , Germany 91 (11.88 %), The Netherlands 89 (11.62 %), Japan 57 (7.41 %) while 11 countries publish 1 (0.13 %) title each. The numbers of locally published titles are 106 (13.84 %) while the numbers of titles published abroad are 660 (86.16 %). The top seven countries published 95.14 % titles and the titles published in developing countries is about 16 % as compared with the developed world.

Table 10 Geographical Detail of Productivity

S. No.	Country	F	CF	%	Foreign%	Local%
1	UK	220	220	28.72	220	28.72
2	USA	131	351	17.1	131	17.1
3	Pakistan	106	457	13.84		106 13.84
4	Germany	91	548	11.88	91	11.88
5	The Netherlands	89	637	11.62	89	11.62
6	Japan	57	694	7.41	57	7.41
7	Switzerland	35	729	4.57	35	4.57
8	Italy	13	742	1.7	13	1.7
9	Canada	7	749	0.91	7	0.91
10	Brazil	2	751	0.26	2	0.26
11	Ireland	2	753	0.26	2	0.26
12	Sri Lanka	2	755	0.26	2	0.26
13	Bulgaria	1	756	0.13	1	0.13
14	Denmark	1	757	0.13	1	0.13
15	Hungary	1	758	0.13	1	0.13
16	India	1	759	0.13	1	0.13
17	Indonesia	1	760	0.13	1	0.13
18	Kazakhstan	1	761	0.13	1	0.13
19	Korea	1	762	0.13	1	0.13

20	Nepal	1	763	0.13	1	0.13		
21	New Zealand	1	764	0.13	1	0.13		
22	Thailand	1	765	0.13	1	0.13		
23	Turkey	1	766	0.13	1	0.13		
		766		100	660	86.16	106	13.84

Keyword Tomography

Titles of publications convey precisely the thought contents of publications. Therefore, if a word occurs more frequently than expected to be occurred, then it reflects the emphasis given by the author about the domain of his research (Angadi, et. al., 2006). The list of keywords with frequencies in parenthesis appeared in the titles of publications is provided in descending order as under. The words without frequencies are those which appear once in the titles.

Natural (84), Synthesis (77), Products (74), Chemistry (69), Isolation (68), Natural Products (54), Alkaloids (53), Studies (45), New (42), Structure (41), Natural Products Chemistry (36), Bioactive Natural Products (32), Alkaloid (29), Constituents (26), Novel (25), Steroidal Alkaloids (26), Recent (22), *Rhazya stricta* (22), Stereoselective (22), Microbial Transformation (21), *Buxus papillosa* (20), Chemical Constituents (19), Vinblastine (19), Derivatives (18), Synthetic (18), Medicinal Plants (17), New Steroidal Alkaloids (16), Structural Studies (16), Bioactive (15), Chemists (15), Publications (15), Their (15), *Atharanthus roseus* (14), Activity (14), Directory (14), OIC Members (14), *Sarcococca saligna* (14), Scientific (14), States (14), Some (13), Structure Elucidation (13), Leaves of *Buxus papillosa* (12), Structural (12), Frontiers (11), Inhibitors (11), Syntheses (11), Synthetic Studies (11), Total (11), Antifungal (10), Inhibiting (10), Vincristine (10), α -Carbolines (9), Crystal (9), Leaves of *Rhazya stricta* (9), Medicinal (9), Reactions (9), *Alstonia macrophylla* (8), *Buxus sempervirens* (8), Harmaline (8), Indigenous (8), Isolated (8), Leaves (8), Pakistan (8), *Tinospora malabarica* (8), *Withania coagulans* (8), ¹³C-NMR (7), Antibacterial (7), *Ervatamia coronaria* (7), Inhibition (7), Plants (7), Prolyl Endopeptidase (7), Structure and Chemistry (7), Tyrosinase (7), Using (7), *Withania somnifera* (7), Acetylcholinesterase (6), Compounds (6), Procedure (6), Rhizomes (6), Urease (6), *Veratrum album* (6), Advances (5), *Alstonia scholaris* (5), Analogues (5), Biotransformation (5), Butyrylcholinesterase (5), Characterization (5), *Delphinium denudatum* (5), Elucidation (5), Fungal Transformation (5), Indole Alkaloids (5), Inhibitory Activity (5), Microbial Transformations (5), Nepalese Origin (5), New Cholinesterase (5), New Indole Alkaloid (5), New Triterpenoidal Alkaloids (5), *Nigella sativa* (5), Nigellidine (5), Phytochemical Studies (5), Seeds (5), *Skimmia laureola* (5), Spectroscopy (5), Strictamine (5), *Suregada multiflora* (5), Transformed Products (5), Triterpenoid (5), Withanolides (5), α -Glucosidase (4), Amides (4), Anti-Inflammatory (4), Biological (4), *Buxus hyrcana* (4), Coumarins (4), Diterpenoid (4), 11-Methoxyrutacarpine (4), *Fagonia indica* (4), *Fumaria indica* (4), Handbook of Natural Products Data (4), Handbook (4), Indole (4), *Iris bungei* (4), *Iris germanica* (4), Leaves of *Catharanthus roseus* (4), 2D NMR Techniques (4) 2D NMR Techniques (4), Source (4), *Leucoscepterum canum* (4), Medicinal Plants of Pakistan (4), Molecular (4), New Isoquinoline Alkaloid (4), New Withanolides (4), Norditerpenoid Alkaloids (4), Organic (4), *Petchia ceylanica* (4), Potential Biological Importance (4), Reduction (4), Rhazimol (4), Roots of *Buxus papillosa* (4), Selected (4), *Sphaeranthus indicus* (4), Study (4), Towards (4), Two (4), Vinrosidine (4),

Alkaloidal (3), Anti leukaemic Alkaloids (3), Anticancer Alkaloids (3), Anticonvulsant Activities (3), Antioxidant (3), approaches (3), Aqueous Fraction (3), *Bongardia chrysogonum* (3), *Buxus hildebrandtii* (3), Catharanthine (3), *Cephalosporium aphidicola* (3), Cholinesterase Inhibitory Activity (3), 16-epi-19S-Vindolinine (3), Conformational (3), Cyclization (3), *Datura fastuosa* (3), Diterpenoids (3), Encyclopaedia (3), *Fritillaria imperialis* (3), Fruits (3), *Haplophyllum buxbaumii* (3), Imides (3), Inhibitory(3), Inhibitory Activity (3), Leaves of *Buxus sempervirens* (3), Leucosceptrine (3), Magnetic (3), *Medica* (3), Method (3), Modern (3), Moenjodaramine (3), Molecular Structure (3), New Indole Alkaloids (3), New Natural Products (3), New Pregnane-Type Steroidal Alkaloid (3), NMR Studies (3), Nnovel (3), Nuclear Magnetic Resonance (3), Nuclear (3), Organic Chemistry (3), Partial (3), *Planta Medica* (3), *Planta* (3), Quinoline Alkaloid (3), Relationship (3), Resonance (3), Roots of *Buxus sempervirens* Roots of *Delphinium denudatum* (3), Saponins (3), Semperviramidine (3), Sesquiterpene (3), Sesterterpenes (3), Sodium Borohydride (3), *Sophora griffithii* (3), *Spatoglossum variabile* (3), Spices (3), Structure-Activity (3), *Tiliacora racemosa* (3), Trends (3), Triterpenes (3), Absolute (2), *Allium* (2), *Alstonia* species (2), Alternative Method (2), Analytical Chemistry (2), Antihypertensive Alkaloids (2), Anti-leukaemic (2), Arylnaphthalene Lignans (2), Asymmetric Synthesis (2), Autocrine Inflammatory Mediator (2), *Bacopa monniera* (2), Bioactive Constituents (2), Benzopyrone Derivatives (2), *Betula utilis* (2), Bioactivities (2), Biodiversity (2), Biological Evaluations (2), Biological Screening (2), Bisbenzylisoquinoline Alkaloids (2), *Botrytis cinerea* (2), Bridged (2), *Buxus longifolia*(2), *Buxus sempervirens* L. (2), *Buxuspapilosa* (2), *Cadaba fruticosa* (2), Calcium Channel Blocking (2), Cell Suspension Culture (2), Cholinesterase Inhibiting Withanolides (2), *Cocculus hirsute* (2), *Cocculus pendulus* (2), *Colchicum decaisnei* (2), Complex Natural Products (2), Configuration (2), Dihydrocleavamines (2), *Delphinium nordhagenii* (2), Drug Design (2), Cytotoxic (2), Demethoxycarbonyldeoxyvinblastine (2), *Cunninghamella elegans* (2), Design (2), Determination (2), Dimeric Tropane Alkaloids (2), Diphenylbisbenzylisoquinoline Alkaloid (2), Diterpene Lactones (2), Diterpenoid Alkaloids (2), Dynamics (2), Economical (2), Efficient (2), Enamine (2), Erratum (2), *Ervaticine* (2), *Erythroxyllum moonii* (2), Essential (2), Ethanolic Extract (2), Ethers (2), Evaluation (2), Facile (2), Field (2), Five New Peltogynoids (2), Furanoid Diterpene (2), Furanoid (2), Further (2), Gomaline (2), Growth (2), *Halenia corniculata* (2), Harappamine (2), Hecubine (2), Hypoglycemic Activity (2), Identification (2),Imine-Enamine (2), Immunomodulatory Properties (2), Indolic (2), Indolic Imides (2), Inhibitor (2), Inhibitory Constituents (2), Intermediates (2), *Isodon rugosus* (2), Isoflavonoid Glycosides (2), Karachic acid (2), Kinetics (2), Lactones (2), Leaves of *Alstonia macrophylla* (2), Leaves of *Sarcococca oriacea* (2), Legumes of *Rhazya stricta* (2), *Leontice leontopetalum* (2), *Leuconollam sesquihydrate* (2), *Lindelofia stylosa* (2), Lupine Alkaloids (2), Marine Brown Alga (2), Marine Organisms (2), Mestranol (2),Methods (2), Microbial (2), Microbial Metabolism (2), Mixture (2), New Antioxidant (2), New Dihydroindole Alkaloid (2), New Indolenine Alkaloid (2), New Isoflavone (2), New Theory of Memory (2), Nigellimine (2), N-oxide (2), Oil (2), One step Synthesis (2), Oxindole Alkaloid (2), *Paeonia emodi* (2), Papilamine (2), Partial Syntheses (2), Pentacyclic Triterpenes (2), Pentacyclic (2), Perspectives (2), Pharmacophores (2), Phosphodiesterase (2), Phytochemical (2), Potential (2), Pregnane-Type Steroidal Alkaloids (2), Presence (2), Process (2), Protecting Groups (2), Protoberberine Alkaloids (2), *Pteleopsis hylodendron* (2), Quinovic Acid Glycosides (2), Rapid (2), Reactions of Harmaline (2), Rearrangement (2), Recent (2), Recent Advances (2), Recognition (2), Reductive (2), Relationship (2), Revisiting Diterpene Lactones (2), Rhazimal (2), Rhazimine (2), *Rhazya orientalis* (2), Roots of *Rhazya stricta* (2), Rosamine (2), Saponin (2), *Sarcococca brevifolia* (2), *Sarcococca hookeriana* (2), Sesterterpene (2), Sodium Bromate (2), Sodium Hydrogen Sulfite (2), Spectral Deductions (2), Spectroscopic (2), Spectrum (2), Stereochemistry (2), Stricticine (2), *Taxus wallichiana* Zucc. (2), *Terminalia glaucescens* (2), *Trachelospermum jasminoides* (2), Triterpene (2), Triterpenoidal Alkaloids (2), Triterpenoid Alkaloids (2), Triterpenoids (2), Utilization (2), FS-1 Subfraction (2), Interleukin-8 (2), ¹H/¹³C-NMR (2) (-)- Caryophyllene Oxide (2), (-)-Ambrox (2), (+)-Androsta-1,4-Diene-

3,17-Dione (2), (+)-Catharanthine (2), (+)-Eburnamonine (2), (+)-Vincamine (2), 11-Methoxynauclefine (2), 11-Methoxynauclefine (2), 5-Disubstituted-1,3,4-Oxadiazoles (2).

(-) –Ambrox, (-) Pinene, (-)-Isolongifolol, (-)-isolongifolol, (+)-16-Hydroxydihydrocleavamine, (+)-Adrenosterone, (+)-Cycloisolongifol-5-ol, (+)- α - and β -Dihydrocleavamines, (+)-Cycloisolongifol-5- β -ol, (+)-16-Methoxycarbonyldihydrocleavamine, (+)-Dihydrocatharanthine, (+)-di-OMethyl Syringaresinol, (+)-N-Formylharappamine, (+)-epi -lbogamine, (+)-lbogamine, (+)-N-formylpapilicine, (+)-N-Methyltiliamosine, (+)-N-Acetyl-N-dimethylcyclomicrobuxeine, (+)-Methifloramine, (+)-Scareolide, (1R,2S,5R)-(-)-Menthol, (2,4,6-trihydroxyphenyl), (4-Hydroxyphenyl), (4R)-Thiazolidine Carboxylic Acid, (E)- α -Pinene, (deacetylakuammiline), (R)-synephrine hydrochloride, 1,2,3,6,11-Hexahydro-3-oxoindolizino (8,7-b), 1,2-Dehydroaspidospermidine N-oxide, 1,5-Benzothiazepine Derivatives, 10,12,12-Tris(3,3-dimethylallyl)-6,7-Dihydroxy-2,2,9-Trimethyl-1H-pyrano [2,3-b]antr-acen-5(12H)-one, 11-Hydroxyepipachysamine-E, 11-methoxy Indoloquinolizidines, 11-Methoxy-5,6-dihydrosempervirine, 12-Epinapelline, 16-Hydroxydihydrocleavamines, 20-dihydrocondylocarpine, 16-Methoxycarbony-dihydrocleavamine, 19, 19,20-E - Vallesamine, 19,20-Z-Vallesamine, 1D, 15-Acetoxydihydrocatharanthine, 1-Isopropenyl-3a,5a,5b,8,8,11a-hexamethylcosahydro-1H-cyclopenta-[a]chrysen-9-yl,4-hydroxy-3-methoxycinnamate, 20-Dimethylamino-3 α , α -methylamino-5 α -pregnane 217 α -Ethynelestradiol, 17 α -dimethoxy-5 α -estra-1, 10 α -Hydroxycolumbine, 7 α -Hydroxyfrullanolide, 7-Hydroxy-4-Methyl-2H-Chromen-2-One, 17-Ethynele-3, 7-Hydroxy-4,5-Dimethyl-2H-Chromen-2-,One2, 20-N-Ethyl-1,8,14-trihydroxy-16 α ,18-dimethoxylycoctonine, 15, 20-anhydrovinblastine, 2-Amino-2-Deoxy-D-Mannose, 2-Methoxy-1,2-dihydrorhazimine, 2-Methoxycarbonyl succinilic acid, 2-Substituted 50,6-Dihydro-5-oxo-4H-1,3,4-oxadiazine-4-propanenitriles and of Their Intermediates, 2-Substituted Analogues, 3-(2-Furanyl)-2-Propenoic Acid, 3-(2-Thienyl)-2Propenoic Acid, 3-(3,7-Dimethylocta-2,6-dienyloxy)-1,8-dihydroxy-6-methyl-9,10-anthraquinone, 35 (10)-triene, 30-Acetoxy-Na-benzoylbuxidienine, 3-Acetoacetyl-7-Methylpyrano-[4,3-b]pyran-2,5-Dione, 3-Substituted Isocoumarins, 4-Vinylquinoline Alkaloid, 6-Methoxymethylmorphinol, 6S-11, 13-Dihydroeremanthine, 7-Hydroxycoumarin, 7-Hydroxyfrullanolide, β -Glucuronidase, Abietane Diterpenes, Absolute Configurations, α -Carbons, Acetic acid, Acetonitrile Combination, Acetyl, Acetylharmaline, α -Chymotrypsin, Acid Lability, Aconitum falconeri, Aconitum karakolicum, Aconitum leave, Actinidia Deliciosa, Activation, Active, Activities, Addition, Adhatoda vasica Nees, Against, β -Glucuronidase, β -Lactone, Alcohols, β -Hydroxyvincadifformine, Aldehydes, Alioline, Along with, Alstozine N-Oxide, Alzheimer's disease therapy, Aminothiophene, Analysis, Analysis Based Studies, Anamirta cocculus, Anhydrovinblastine, Anilines Carboxamides, Anticholinergic Activity, Anticonvulsant effect, Anti-Depressant Activities, Antidiarrhoeal, Antiferility Agents, Antileishmanial Activity, Antileishmanial Physalins, Antimicrobial Activities, Antimicrobial Activity, Antimicrobial Sesquiterpene Lactone, Antimicrobial Ellagic Acid Derivatives, Antisecretory, Antispasmodic, Aplysia juliana, Apocynaceae, Aporphine-benzylisoquinoline Alkaloid, Apparicine, Application, Arachidonic Acid, Areca catechu, Arginine, Arjunglucoside I chloromethane 0.25-solvate monohydrate, Aromatic Amines, Aromatic Carboxylic Scids, Aromoline, Arylsulphonyl, Aryltetralin, Aspergillus terreus, Aspidospermidose, Bacteria, Bannucine, Barks of Xylophia aethiopica, Barley Extracts, Based, Basis, enzodiazepine, Benzoyl-16-acetylcyclohexobuxidine, Benzylisoquinoline Alkaloids, Berberis aristata, Berberis waziristanica, Betaine, Betavulganrin, Bhimberine, Bicuculline-induced Epileptiform Activity, Binary Indole Alkaloids, Bioactive chemical constituents, Bioactive Compounds, Bioactive Flavonoids and Saponin, Bioactive Phenolic Compounds, Bioactive Substances, Bioassay, Biocontrol Agents, Bio-Informatics, Biological Activity, Biological Activities, Biosynthesis, Bipiperidine, Biscoumarin, Blood Pressure, Bowellia papyrifera Brideliandellensis, Broncho, Broncho-vasodilatory Activity, Buxaceae, BuxaminolG, Buxaminone, Buxapapillinine, Buxapapillosin, Buxaquamarine, Buxus Species, C-6 Substituents, Cadabine, Calcium antagonistic properties, Calcium-channel blockingpotential Calculations, Candidate, CarbazoleSynthesis,

Carbohydrate, Carbohydrate metabolic enzyme, Case, Cassia absus L. (Chaksu), Catalyzed, Catharine, Cathovaline, CD In situ Complexation Method, Ceiba pentandra, Centaurium pulchellum, Centaurium pulchellum Druce, Century, Cesium Fluoride-Celite, Cesium Iodide, Chalcone, Cholinesterase Inhibitors, Chasmaconitine 0.5-Methanol Solvate, Chemistry and Mechanism, Chemistry of Natural Products, Chemotaxonomy, Chemotherapy, Chloride Adduct, Cholinesterase inhibitory pregnane-type steroidal alkaloids, Cholinesterase Inhibiting Activities, Cholinesterase Inhibiting New Steroidal Alkaloids, Cholinesterase Inhibitory, Cholinesterases, Cinnamate Derivatives, Cinnamates, Cinnoline Derivative, Circular Dichroism, Cleavages, Clerodendron inerme, Climacoptera obtusifolia, Coagulin-H: Human IL-2 Novel Natural Inhibitor, Cohirsine, Colchicine Alkaloids, Colocynthis vulgaris, Combinational Library, Commiphora mukul, Competitive Inhibitors, Complex, Complexes, Computer Guided Planned Synthesis, Concurrent Inhibitor, Conformation, Conformationally Constrained Peptide Metal Complexes, Conformations, Consolida hohenackeri, Containing, Control, Convenient, Conversion, Coronaridine, Cortisol, Cottonogenic, Creatinine, Crude Extracts, Cs/BF₃. Et₂O System, CsF-Celite/alkyl halides/CH₃CN combination, Cucurbitacin Q-1, Cucurbitacins, Cucurbitane Glycosides, Cultured Hippocampal Neurons, Cussonia bancoensis, Cyclic, Cycloartane, Cyclobuxoviricine, Cyclohexanone, Cyclohexanoneoxalyl, Cyclomicrobuxine monohydrate, Cymbopogon citrates, Cysteine Based Novel Noncompetitive Inhibitors of Urease(s), Cytotoxic Natural Products, Cytotoxicity, Danazol, Degradative, Dehassia kurzii, Dehydroepiandrosterone, Delphinium carduchorum, Demulsification, Deoxyvinblastine, Desmethylpecyline, Desorption, Detoxification, Dicarboxylic Acid, Dicoumarols, Dihydro catharanthine, Dihydrocorynantheol, Dimensional, Dimensional Nuclear Magnetic Resonance Spectroscopy, Discaria febrifuga, Dimeric Hydrogen-Bonded Supramolecular Complex, Dimeric Podophyllotoxin-Type Lignan, Diploclisia glaucescens, Discoveries, Distinctive Inhibition Susceptibility, Distribution, Diterpene Alkaloids, Diterpenoid Lactone, Ditopic Receptor, Docking Studies, Drug, Drug Discovery, Dual Inhibitor, Duranta repens, Dynamic, Ervatamia coronaria, E.O. Ajaiyeoba, Easy, Eatty Ester, Effects, Efficacy, Efficient Solvent Evaporating System, Elixirs of Love, Emodinol, Enamine Reactions, Enantiomers, Endoperoxide Synthase, Enzyme inhibition studies, Enzyme Inhibitory Activities, Enzyme Inhibitory Effects, Enzymes, Enzymes Inhibition Activity, Esterase, Examples, Exciting, Exotic Withanolides, Expedient Esterification, Extracts, Extracts of Barley, Facile Route, Factors, Fast atom Bombardment Mass Spectrometry, Fatty Ester, Favours, Fermentation, Fern Adiantum incisum, Ferula mongolica, Fight Against Cancer, First, First Microwave-Assisted Synthesis, Five, Five New Withanolides, Flowers, Focused Library of Oxadiazoles, Four New Flavones, Fraction, Fragmentation, Fructo-oligosaccharides, Fruit Extract, FS-1 isolated, Fumarizine, Fungal Metabolites of (E)-Guggulsterone, Fungus Rhizopus stolonifer, Furanoid Bisnorditerpenoid, Furanoid Diterpenoid, Fusarium lini, Gambirtannine, Gelidiella acerosa, Gelomuilide, Generation, Genus Buxus, Glycolipid, Glycopeptides, Glucose Derivatives, Gossypium herbaceum, Griffithine, Guanidino Function of Arginine, Haloxylon griffithii, Harepermine, Harmaline (4,9-dihydro-7-methoxy-1-methyl-3H-pyrido-[3,4-b] indole), Harmaline (4-9-dihydro-7-methoxy-1-methyl-3H-pyrido-[3,4-b] indole), Harmidine, Harmine, Hederagenin, Heterocycle, Hexacyanoferrate, Highly Selective Indination of Alcohols, Highly Versatile Iodination Method, Hippocampal Pyramidal Neurons, Human Neutrophils, Human Platelet Aggregation, Human sperm motility, Hunteria alkaloids, Hyderabadin, Hydrazides, Hydroxy, Hydroxylated, Hydroxylation, Hydroxyprogesterones, Hypolipaemic E-Guggulsterone, Identity, Imidazolone, Imines, Immunostimulant Sesquiterpene Glycoside, Imperatives for the Promotion of Science and Technology in Pakistan, Imperatorin, Imperialine Derivatives, Improved, Improved Method, Improved synthesis of sildenafil (Viagra) analogs, In vitro Inhibition, In Vitro Leishmanicidal Activity, Incorporation of 2-Amino-2-Deoxy-D-Glucose, Indaconitine 0.5-Acetone Solvate, Indole-4-ium, Indolic Imino, Indoline Alkaloid, Induced Platelet Aggregation, Influencing, Inhibit, Inhibitory Effects, Inhibitory Potential, Inula viscosa, Iridoid, Iris Germanica Rhizomes, Iris soforana, Irradiation, Isobenzofuran-

1(3H)-ones Phthalides), Isoflavones Irilin B, Isoflavonoids, Isolongifolen-4-one, Isomeric Derivatives, Iso-N-Formyl-5-en-honemorphine, Isoquino [1-2-b] quinazoline derivative, Isoquinoline Alkaloid, Isotamarixen, Isovallesiachotamine, Jamtine N-Oxide, Jolyna laminarioides, Juliflorine, Karachicine, Karachine, Lahoricine, Laurencia pinnatifida, Leading, Leaves of *Buxus hildebrandtii*, Leaves of *Erthoxylum moonii*, Leaves of *Ervatamia coronaria*, Leaves of *Ferula oopoda*, Leaves of *Murraya paniculata*, Leaves of *Podophyllum hexandrum*, Lactones, Leurosine, Leurosine, Levonorgestrel, Lignans, Linear etabolite, Linkage, Linked Scan Measurements, Linn, Lipid Profile, Lipoxygenase, Lipoxygenase Activity, Lipoxygenase Enzyme, Logical Approach, Loranthol, Lowering Action of Active Principle, Macroxine, Mahanine, Malabarolide, Malarial Glycoproteins, Marine Zoanthid, Markownikov, Mass Spectral Fragmentation, Mass Spectroscopic Studies, Mass Spectroscopic Study, Medicinal Lichen, Mehranine, Mesterolone, Metabolism, Metabolites, Metal Ion-Catalyzed Reduction, Metal Salts, Metal-Ion, Methanone monohydrate 737. 18. (5R, 6S, 8S, 9R, 14R, 15R, 17R, 18S, 21S, 24R, 26S, 27R)-Chloro-16, 24-cyclo-13, 14-Secoergosta-2-ene-18,26-dioicacid-14:17,14:27-diepoxy-6,13, 20, 22-tetrahydroxy-1, 15-dioxo- α -lactone α -lactone methanol solvate monohydrate, Methoxycarbonyl-dihydrocleavamines, Methyl [2,4,5-trihydroxy-6-(hydroxymethyl)-perhydropyran-3-yl]carbamate, Methyl Ether Analogues of Sildenafil (Viagra) Possessing, Methylacrylate, Microbial Hydroxylation, Microbial Oxidation, Microbiological Hydroxylation, Microwave, Microwave-Assisted Synthesis, *Mimusops elengi*, *Mitragyna stipulosa*, Mnuclear oxovandadium (IV) complexes, Modification, Modified, Mongolian Medicinal Plant, Monoterpenes, *Murraya paniculata*, N, N'-Diphenylsuccinamide, Nahagenin, N-Alkylation, Na-Methylsecodine, N-Arylated, Natural cholinesterase, Natural Compounds, Natural Inhibitors, Naturally Occurring Spatozoate, Nb-Demethylalstophylline oxindole, N-Benzoyl-30-acetoxycyclobuxidine-F, N-Benzylsecodine, Nb-Methylstrictamine, Neighbouring Group Participation, Nematicidal Activity, New Antibacterial Steroidal Alkaloids, New Anticholinergic Steroidal Alkaloid, New Antifungal Steroidal Lactones, New Approaches, New Arylnaphthalene Lignans Glucosides, New β -Adrenoceptor Agonist, New Benzylisoquinoline Alkaloid, New Binary Indole Alkaloid, New Biscoumarin Derivatives, New Bisindole Alkaloids, New Class of Acid Phosphatase Inhibitors, New Class of Cholinesterase Inhibitors, New Class of human recombinant nucleotide pyrophosphatase phosphodiesterase-1 inhibitors, New Class of natural cholinesterase inhibitors, New Class of Sesterterpene, New Class of Steroidal Alkaloids, New class of Urease inhibitors, New Coumarin, New Crystal-Engineering Motif, New Crystalline Cevane Alkaloid, New Cyclopeptide Alkaloids, New Diepoxy-ent-kauranoid Regosinin, New Dimeric Indoline Alkaloid, New Dinitro Derivatives, New Diterpene Isopimara-7,15-Dien-19-OIC Acid, New Diterpenoids, New Eudesmane Type Sesquiterpene, New Eudesmanolides, New Fungal Metabolites of Sclareol, New Furanoid Diterpenoidal Constituents, New Glycosides, New Indazole Alkaloid, New Isatin Derivatives, New Life to Computer Sciences, New Mavacurine Type Alkaloid, New Non-nitrogenous Triterpenoids, New Natural Dibenzocycloheptylamine Alkaloids, New Norditerpenoid, New Pharmacophores, New Piperidine Alkaloid, New Pseudoindoxyl Alkaloid, New Sesquiterpene Lactone, New Steroidal Lactones, New Tetrahydrofuranoid Steroidal Alkaloids, New Triterpene, N-Formylanonaine, N-Glycosidic, N-Formylcyclohexobuxeine, N-Imidotryptamines, Nitric Oxide, Nitrogen Heterocycles, Nitrogenous Compounds, N-Methyltiliamosine, NMR, Norditerpene, Norethisterone, Nortropane Alkaloids, Nucleophilic, O-Acetylgerbin, *Oranthus grewinkii*, Organosulfur Compounds, Organtin, Origin, Oxazolone, Oxidative, Oxidative Fragmentation, Oxyberberine, Pakistan Encyclopaedia Planta Medica, Papaverine Derivative, Papilicine, Papillamide, Papraine, Parasitemia, *Peganum harmala*, Pentacyclic System Isomeric, Pentylene-tetrazole, Peptide Alkaloids, Persicanidine B, Pharmacological Evaluation, Pharmacological Screening, Phenolic glycosides, Phenolics, Phenyl Polypropanoids, Phospholipase D Activity, Photochemical Cyclization, Photocyclization, Photolysis, *Phyllanthus fraternus*, Physalin H, *Physalis minima*, Phytochemical Diversity, *Podophyllum emodi*, Phytopathogens, Phytotherapy, Phytotoxic Defects, Phytotoxic Effects, Picralima Alkaloids, Picralstonine, Pinatol,

Pinnatazane, Piperidines, Plant Pathogenic Fungus *Botrytis cinerea*, Plant Ureases, Plants and Aids, *Plasmodium falciparum*, Platelet Activating Factor, Polymeric Over, Possessing, Possible Catabolic Route, Potassium, Potent Immunosuppressant, Potent natural peripheral anionic-site-binding inhibitor, Potential Source, Prednisone, Pregnenolone Derivatives, Prevost Reaction, Principles and Guidelines, Problems, Production, Progress, Prolyl Endopeptidase, Promising New Free-Radical Scavengers, Prostaglandin, Protocol, Pseudoaconitine, Pseudobenzylisoquinoline Alkaloid, *Pseudomonas aeruginosa*, p-Toluenesulfonic Acid, Pulegone, Pure Constituents, Pyrazoline Derivative, Quettamine - type Alkaloids, Quinolizidine Alkaloid, Quinolizidine Alkaloids, Radical- Scavenging Screening, Rapamycin, Rapid Metal Mediated Method of Isolation, Rapid Procedure, Rat Hippocampal Pyramidal Neurons, Rat Liver, Rats Fed on Highfat diet, Reactions of Imines, Recent Discoveries, Reduction Indolic Imides, Reinvestigation, Relationships, Remarkable, Research, Reserpine Analogues, Reserpine analogues, Respiratory Burst, Rhazicine, Rhazidigenine - N-oxide, Rhazimanine, Rhazizine, *Ritchiea capparoides* var. *longiedicellata*, Rodents, Root Rot Infection in Cotton, Rosicine, *Ruta montana*, Saifine-N-methylleuconolam, *Salsola foetida*, Salutaridinmethine, *Salvia napifolia*, Sapatozoate, *Sarcococca zeylanica*, Sarsasapogenin, Scareolide, Scholaricine, Scientific ducation in Muslim Countries, Sclareolide, Secokara Conitine, Sesquiterpene Lactone Achilin, Sesquiterpenes, Sesquiterpenes, Several, Showing, Significance, Simulation Studies, Six, Solation, Solid, Snake Venom Phosphodiesterase, Soil, Solid phase, Solving, Sophazrine, *Sophora alopecuroides*, Spasmolytic Potential, Specific otations, Spectral Data, Spectral Generalizations, Spectroscopic Studies, Sri Lankan marine red alga, Stachydrine, StachydrineL, Stapfinine, Stems and Roots of *Caesalpinia crista*, Stereochemical Aspects, Stereoselectivity, Steroidal, Steroidal Alkaloids, III, Steroidal Glycoside, Steroids, Stimulating, Stockerine, *Stockeyia indica*, Stricanol, Strictamine, Strictine, Structures, Subcellular, Substituted, Successful, Succinylanthranilic Acid Ester, Suggested, Sulfono, Support, Supramolecular network, Sustained Repetitive Firing, *Swertia cordata*, ynthesized, Talatisamine, *Tamarix hispida*, *Tamarix ramosissima*, Taraxerol, Tautomerism, Tautomerism-Nucleophilic, Taxane Diterpenes, Taxilamine, *Taxus baccata*, Techniques, Terminalin A, Terpinolene, Tertiary Aromatic Amides, Testosterone, Tetrafluoroborate, Tetrahydroalstonine, Tetrahydrofuranoid, The Nuts and Bolts, The Role of Natural Products in Modern Medicine, Theory of memory, Thiadiazoles, Three New Steroidal Amines, Three Tyrosinase Inhibitors, Three Withanolides, Thrombin inhibitory Constituents, Thrombin nhibitory Diterpenoids, Through, Tiliaresine, Timber of *Neonauclea zeylanica*, Time for 'enlightened moderation, Tocolytic Activities, *Trachyspermum ammi* (L.) Sprague, Traditional Medicine, Transformations Xenobiotic, Trends in ethnopharmacology, Trianilinophosphine oxide, Triazoles, *Trichothecium roseum*, Triterpenoid Saponins, Triterpnoidal Alkaloids, Trosinase Inhibition Studies, Turkish, Two - Dimensional NMR Spectroscopy, Two Isofavones and Bioactivity Spectrum, Two New Aurones, Two New Cinnamic Acid Esters, Two New Ergostane-type Steroidal Lactones, Two New Isoflavanoids, Two New Leucosesterterpenes, Two New Quinones, Two New Rearranged Taxoids, Two New Triterpene Lactones, Two new Triterpenes, Two Saponins, Tyrosinaseinhibition activities, Unique, Unusual, Ursolic Acid, *Usnea longissima*, V - A One-Step Synthesis, Variably Substituted Chalcones, Variably Substituted Pyrazolo[4,3-d]Pyrimidin-7-ones, Varninasterol, Vasodilatory, Vinca Alkaloid, *Vinca major*, Vincadine, Vindoline, Vindolinine, Viral Diseases, Viruses, Voaphylline, Weak aromatic acids, *Withania species*, Wonderful, Xanthones, Zinc/Ethano, *Zizyphus lotus*, Zoanthaminone.

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Appendix A

Table 6 Collaborator Dynamics (Comprehensive)

Sr. No.	Authors	NP	NP _{syn}	NP _{isol}	NP _{x-ray}	NP _{nmr}	SY	MC	SP	AC	Misc.	F	CF	%	C. Period
1	Atta-ur-Rahman	90	9	428	9	16	131	24	23	8	28	766	766	23.23	1966-07
2	M. I. Chaudhary	57		252	9	3	55	10	5	5	2	398	1164	12.07	1984-07
3	K. M. Khan	5		12			25			1		43	1207	1.31	1990-05
4	B. Sener	6		35	1							42	1249	1.27	1988-05
5	S. Anjum	14		20	1		3					38	1287	1.15	1996-07
6	S. Pervin	1		18	1		15					35	1322	1.06	1987-06
7	F. Shaheen			27			3	1				31	1353	0.94	1994-07

8	Habib-ur-Rahman	1	18	1	3	3	1	27	1380	0.82	1985-96
9	A. Farooq	4	18		2			24	1404	0.73	1992-02
10	M. Parvez	2	17	3	2			24	1428	0.73	1997-07
11	V. U. Ahmad	2	6	4	4	4	2	22	1450	0.67	1976-04
12	S. Ahmed	1	17		2	2		22	1472	0.67	1976-91
13	S. Turkoz	1	21					22	1494	0.67	1988-91
14	Hoong-Kun Fun	10	10		1			21	1515	0.64	2003-06
15	S. Malik		19			1		20	1535	0.61	1984-07
16	A. Dar	1	4		1		14	20	1555	0.61	1997-06
17	M. Bashir		16		3			19	1574	0.58	1980-87
18	A. Khalid	3	13	1	2			19	1593	0.58	1998-06
19	S. G. Musharraf	1	17		1			19	1612	0.58	2002-07
20	K. Zaman	1	11		2	2	1	17	1629	0.52	1984-96
21	M. Nisa		15			1		16	1645	0.49	1983-89
22	A. Pervin		12	2		2		16	1661	0.49	1988-95
23	S. Hayat		7		9			16	1677	0.49	1999-06
24	S. A. Nawaz		14		2			16	1693	0.49	2003-07

58	A. Abbas Khan			10							10	2100	0.3	06	
59	N. Waheed					9					9	2109	0.27	1976-81	
60	S. Firdous			4		4		1			9	2118	0.27	1976-93	
61	Y. Ahmad			5		4					9	2127	0.27	1977-96	
62	M. Alam			9							9	2136	0.27	1987-94	
63	M. S. Shekhani	1		6	1	1					9	2145	0.27	1989-06	
64	S. Naz	3		6							9	2154	0.27	1991-02	
65	S. A. Jamal			8		1					9	2163	0.27	1991-05	
66	A. Ahmad	2		4		2			1		9	2172	0.27	1997-06	
67	M. T. H. Khan			5		3			1		9	2181	0.27	2003-06	
68	K. P. Devkota	1		8							9	2190	0.27	2003-07	
Sr. No.	Authors	NP	NP _{syn}	NP _{isol}	NP _{x-ray}	NP _{nmr}	SY	MC	SP	AC	Misc.	F	CF	%	C. Period
69	P. W. Le Quesne	3		4			1					8	2198	0.24	1977-88
70	K. Fatima			7			1					8	2206	0.24	1977-96
71	M. Sultana			1			7					8	2214	0.24	1982-84
72	G. A. Miana	1		4	2		1					8	2222	0.24	1982-96
73	N. Daulatabadi			6					1	1		8	2230	0.24	1983-86
74	Z. Iqbal			7			1					8	2238	0.24	1989-

														94
75	S. Zareen		5		3					8	2246	0.24	1990-05	
76	Z. Perween	1	7							8	2254	0.24	1995-06	
77	A. Nasreen	1	5	2						8	2262	0.24	1995-99	
78	T. Makhmoor	1	6		1					8	2270	0.24	2000-05	
79	A. Yasin		8							8	2278	0.24	2002-05	
80	M. A. Lodhi	1	3		4					8	2286	0.24	2004-06	
81	A. J. Freyer		7							7	2293	0.21	1982-87	
82	F. N. Ngounou		6		1					7	2300	0.21	1990-05	
83	R. A. Siddiqui	2	2		2			1		7	2307	0.21	1990-06	
84	S. Qureshi		7							7	2314	0.21	1995-05	
85	Z. Amtul	1	5		1					7	2321	0.21	1997-07	
86	M. Shabbir		7							7	2328	0.21	1997-99	
87	M. Yaqoob		7							7	2335	0.21	1998-06	
88	W. Gul	2	3	2						7	2342	0.21	1998-99	
89	A. M. Khan		5		1			1		7	2349	0.21	1999-03	
90	N. Nahar		7							7	2356	0.21	2000-04	
91	I. Baig		7							7	2363	0.21	2001-04	

92	E. Bayer			2		5						7	2370	0.21	2001-06
93	S. Nasim	1		5	1							7	2377	0.21	2002-05
94	Z. A. Siddiqui			4		3						7	2384	0.21	2003-07
95	R. Ranjit			7								7	2391	0.21	2004-07
96	J. Harley Mason					6						6	2397	0.18	1966-80
97	S. Farhi			6								6	2403	0.18	1983-89
98	M. A. Khan	1		4		1						6	2409	0.18	1984-95
99	W. S. J. Silva			6								6	2415	0.18	1987-90
100	S. A. Abbas			6								6	2421	0.18	1987-91
101	A. Nelofar			5					1			6	2427	0.18	1987-91
102	E. Asif			6								6	2433	0.18	1988-92
103	B. L. Sondengam			6								6	2439	0.18	1990-05
104	M. Feroz			5		1						6	2445	0.18	1991-95
Sr. No.	Authors	NP	NP _{syn}	NP _{isol}	NP _{x-ray}	NP _{nmr}	SY	MC	SP	AC	Misc.	F	CF	%	C. Period
105	K. H. C. Baser	1		5								6	2451	0.18	1998-02
106	M. Yousuf	1		4						1		6	2457	0.18	1998-06
107	Shahida Shujaat			4			1	1				6	2463	0.18	2000-04

125	H. Ahmad	1		3			1					5	2567	0.15	89
126	D. Lontsi			5								5	2572	0.15	1990-03
127	E. Dagne	2		3								5	2577	0.15	1990-95
128	T. H. Al-Tel			5								5	2582	0.15	1991-95
129	F. Noor-e-Ain	1		4								5	2587	0.15	1992-97
130	M. Ashraf	1		4								5	2592	0.15	1994-02
131	I. Orhan			4	1							5	2597	0.15	2002-04
132	M. N. Akhtar	1		4								5	2602	0.15	2002-04
133	S. Sultan			5								5	2607	0.15	2002-04
134	Atia-tul-Vakhab			2	1		1			1		5	2612	0.15	2003-05
135	M. Ahmad			4			1					5	2617	0.15	2003-07
136	N. Hasan			4								4	2621	0.12	1983-93
137	S. Hasan			3					1			4	2625	0.12	1985-00
138	Y. Badar			4								4	2629	0.12	1986-96
139	A. K. Ray			3					1			4	2633	0.12	1988-91
140	B. Mukherjee			3					1			4	2637	0.12	1988-91
Sr. No.	Authors	NP	NP _{syn}	NP _{isol}	NP _{x-ray}	NP _{nmr}	SY	MC	SP	AC	Misc.	F	CF	%	C. Period
141	G. Ahmad			4								4	2641	0.12	1988-

													91
142	S. K. Mitra		3				1		4	2645	0.12		1988-91
143	S. A. Saeed		4						4	2649	0.12		1988-95
144	G. Mukhopadhyay		3				1		4	2653	0.12		1989-91
145	M. K. Bhatti		4						4	2657	0.12		1989-95
146	M. Shameel		4						4	2661	0.12		1991-97
147	U. L. B. Jayasinghe		4						4	2665	0.12		1992-00
148	Khalid Aftab		2				2		4	2669	0.12		1993-96
149	N. Ahmad		4						4	2673	0.12		1993-97
150	O. Purev		4						4	2677	0.12		1995-06
151	A. Ulubelen		4						4	2681	0.12		1995-99
152	S. Begum		1			3			4	2685	0.12		1997-04
153	F. Asif		4						4	2689	0.12		1998-00
154	S. A. M. Ayatollahi		3	1					4	2693	0.12		1998-06
155	F. Demirci	1	2			1			4	2697	0.12		2000-02
156	Z. A. Abilov	1	3						4	2701	0.12		2001-06
157	M. Mosihuzzaman		4						4	2705	0.12		2002-06
158	M. Z. Khan					4			4	2709	0.12		2002-04

159	Azizuddin		4						4	2713	0.12	2002-06
160	S. A. A. Shah		4						4	2717	0.12	2003-04
161	F. Feroz		4						4	2721	0.12	2004-04
162	S. Hussain		3		1				4	2725	0.12	2004-07
163	S. T. A. Shah		2		2				4	2729	0.12	2005-06
164	F. Zehra		2		1				3	2732	0.09	1973-84
165	N. Perveen		2		1				3	2735	0.09	1980-83
166	G. Blasko		3						3	2738	0.09	1982-84
167	I. Hassan		1		2				3	2741	0.09	1983-84
168	T. Zamir		3						3	2744	0.09	1984-85
169	H. M. Said		1					2	3	2747	0.09	1986-86
170	K. P. Guha		2				1		3	2750	0.09	1988-90
171	D. S. Rycroft		3						3	2753	0.09	1988-91
172	P. M. Shah		3						3	2756	0.09	1990-97
173	Y. Al Abed		3						3	2759	0.09	1990-98
174	M. A. Maqbool	2	1						3	2762	0.09	1994-97
175	M. Abid	2	1						3	2765	0.09	1994-97

192	Mudassir Asrar	1	2						3	2816	0.09	06
193	S. Shahnaz.		3						3	2819	0.09	2003-03
194	F. Ayanoglu		2	1					3	2822	0.09	2003-04
195	S. Channa	1	2						3	2825	0.09	2003-06
196	S. Murad				2		1		3	2828	0.09	2003-06
197	C. T. Supuran				3				3	2831	0.09	2004-04
198	H. Y. Gondal		3						3	2834	0.09	2004-04
199	M. Rani				3				3	2837	0.09	2004-05
200	S. Iqbal		1		1		1		3	2840	0.09	2004-06
201	Allan B. Reitz					3			3	2843	0.09	2004-06
202	Cheryl P. Kordik				1	2			3	2846	0.09	2004-06
203	S. Khan		3						3	2849	0.09	2004-06
204	Z. Ismail				2		1		3	2852	0.09	2004-06
205	A. Sami		3						3	2855	0.09	2004-07
206	M. Atif		3						3	2858	0.09	2004-07
207	S. Nahar Khan		1		2				3	2861	0.09	2004-07
208	B. Tashkhodzhaev	1			1		1		3	2864	0.09	2005-05
209	C. Karalai	2	1						3	2867	0.09	2005-

															05
210	K. K. Turgunov	1					1		1		3	2870	0.09	2005-05	
211	S. Chantrapromma	2		1							3	2873	0.09	2005-05	
212	J. A. Beisler						2				2	2875	0.06	1966-80	
Sr. No.	Authors	NP	NP _{syn}	NP _{isol}	NP _{x-ray}	NP _{nmr}	SY	MC	SP	AC	Misc.	F	CF	%	C. Period
213	M. Hafeez			2								2	2877	0.06	1980-83
214	N. Munugesan			2								2	2879	0.06	1982-84
215	S. A. Drexler			2								2	2881	0.06	1982-84
216	A. N. Mistry			2								2	2883	0.06	1983-84
217	S. Kaleem			2								2	2885	0.06	1983-84
218	K. Albert			2								2	2887	0.06	1984-86
219	M. Asif			2								2	2889	0.06	1985-86
220	K. Jahan			2								2	2891	0.06	1985-87
221	I. H. Qureshi						2					2	2893	0.06	1986-87
222	T. Begum						2					2	2895	0.06	1986-87
223	T. Rasheed			2								2	2897	0.06	1987-87
224	S. Wasti			2								2	2899	0.06	1987-88
225	M. Shaiq Ali			1				1				2	2901	0.06	1988-03

226	I. I. Vohra		2							2	2903	0.06	1988-88
227	S. Juma Karimini		2							2	2905	0.06	1988-88
228	T. Wehler		1					1		2	2907	0.06	1988-88
229	K. Wurst		2							2	2909	0.06	1988-89
230	P. Hutter		2							2	2911	0.06	1988-89
231	W. Hiller		2							2	2913	0.06	1988-89
232	S. Balasubramaniam		2							2	2915	0.06	1988-92
233	R. Zaidi		1					1		2	2917	0.06	1988-93
234	D. Shehnaz		2							2	2919	0.06	1988-97
235	A. Yasmin		2							2	2921	0.06	1989-90
236	M.Y. Khan					2				2	2923	0.06	1990-91
237	G. Topc		2							2	2925	0.06	1993-95
238	M. Hasan		1			1				2	2927	0.06	1994-94
239	H. Echner		1			1				2	2929	0.06	1994-95
240	A. Ghaffar		2							2	2931	0.06	1994-97
241	S. Shamim		2							2	2933	0.06	1994-97
242	S. N. Ali		2							2	2935	0.06	1995-05

276	L. A. Taponjoun			2									2	3003	0.06	02
277	Z. Ahmed			1			1						2	3005	0.06	2002-03
278	R. B. Tareen			2									2	3007	0.06	2003-03
279	N. T. Khan			1			1						2	3009	0.06	2003-03
280	N. Riaz			2									2	3011	0.06	2003-05
281	S. M. Haider						2						2	3013	0.06	2004-04
282	Zahid H. Chohan						2						2	3015	0.06	2004-04
283	S. Nawaz			2									2	3017	0.06	2004-05
284	M. K. Azim			1			1						2	3019	0.06	2005-05
Sr. No.	Authors	NP	NP syn	NP isol	NP x-ray	NP nmr	SY	MC	SP	AC	Misc.	F	CF	%	C. Period	
285	N. Ambreen			2									2	3021	0.06	2005-05
286	S. Naheed	1						1					2	3023	0.06	2005-05
287	T. H. Khan			2									2	3025	0.06	2005-05
288	Afshan Begum			2									2	3027	0.06	2005-06
289	M. U. Anwar			1			1						2	3029	0.06	2005-06
290	N. Butt	1		1									2	3031	0.06	2005-06
291	N. R. Abdullah						1			1			2	3033	0.06	2005-06
292	S. Goswami			2									2	3035	0.06	2005-

														06
293	Samreen		2							2	3037	0.06	2005-06	
294	Shafique-ur-Rehman		2							2	3039	0.06	2005-06	
295	B. Coldman	1					1			2	3041	0.06	2005-07	
296	B. Springer (ed.)	1					1			2	3043	0.06	2005-07	
297	M. Zeeshan		2							2	3045	0.06	2006-06	
298	W. Kausar		1			1				2	3047	0.06	2006-06	
299	E. Foresti Serantoni			1						1	3048	0.03	1972-72	
300	L. Riva de Sanseverino					1				1	3049	0.03	1972-72	
301	T. Burney					1				1	3050	0.03	1972-72	
302	N. H. Khan					1				1	3051	0.03	1974-74	
303	B. A. Solheim					1				1	3052	0.03	1977-77	
304	J. L. Occolowitz					1				1	3053	0.03	1977-77	
305	R. L. Garnic					1				1	3054	0.03	1977-77	
306	D. Smith							1		1	3055	0.03	1983-83	
307	A. Urzaua		1							1	3056	0.03	1984-84	
308	T. Z. Ismail		1							1	3057	0.03	1984-84	
309	G. Sariyar		1							1	3058	0.03	1985-85	

310	He Cun-Heng			1								1	3059	0.03	1985-85	
311	A. Q. Khan			1								1	3060	0.03	1987-87	
312	Ademir F. Morel			1								1	3061	0.03	1987-87	
313	Chitra K. Ratnayake			1								1	3062	0.03	1987-87	
314	H. Guinaudeau			1								1	3063	0.03	1987-87	
315	L. S. R. Arambewala			1								1	3064	0.03	1987-87	
316	M. D. Colton			1								1	3065	0.03	1987-87	
317	A. L. Gunatilaka			1								1	3066	0.03	1988-88	
318	C. B. Gamlath			1								1	3067	0.03	1988-88	
319	F. Amjad			1								1	3068	0.03	1988-88	
320	G. Crank			1								1	3069	0.03	1988-88	
Sr. No.	Authors	NP	NP syn	NP isol	NP x-ray	NP nmr	SY	MC	SP	AC	Misc.	F	CF	%	C. Period	
321	H. W. M. W. Herath			1									1	3070	0.03	1988-88
322	Helen S.M. Lu			1									1	3071	0.03	1988-88
323	I. Haq			1									1	3072	0.03	1988-88
324	K. M. I. Navaratne			1									1	3073	0.03	1988-88
325	L. B. De Silva			1									1	3074	0.03	1988-88

343	N. Molla						1					1	3092	0.03	91
344	R. R. Naqvi						1					1	3093	0.03	1991-91
345	T. Parveen			1								1	3094	0.03	1991-91
346	T. Sultana			1								1	3095	0.03	1991-91
347	Z. H. Zaidi						1					1	3096	0.03	1991-91
348	A. Badshah						1					1	3097	0.03	1992-92
349	A. Jamal			1								1	3098	0.03	1992-92
350	F. Mahmood			1								1	3099	0.03	1992-92
351	G. P. Wannigama			1								1	3100	0.03	1992-92
352	M. Danish						1					1	3101	0.03	1992-92
353	M. Mazhar						1					1	3102	0.03	1992-92
354	Nazar-ul-Islam						1					1	3103	0.03	1992-92
355	R. U. Simjee			1								1	3104	0.03	1992-92
356	G. Snatzke			1								1	3105	0.03	1993-93
Sr. No.	Authors	NP	NP _{syn}	NP _{isol}	NP _{x-ray}	NP _{nmr}	SY	MC	SP	AC	Misc.	F	CF	%	C. Period
357	T. Hussain			1								1	3106	0.03	1993-93
358	A. Zaman						1					1	3107	0.03	1994-94
359	C. Schroder			1								1	3108	0.03	1994-

377	M. Kartal			1									1	3126	0.03	1995-95
378	M. M. Ahmad	1											1	3127	0.03	1995-95
379	N. M. Tirmzi	1											1	3128	0.03	1995-95
380	Omm-e-Hany	1											1	3129	0.03	1995-95
381	R. Siddiqui	1											1	3130	0.03	1995-95
382	S. H. Khan						1						1	3131	0.03	1995-95
383	S. Kurucu			1									1	3132	0.03	1995-95
384	S. Sadiq Hasan			1									1	3133	0.03	1995-95
385	T. L. Maksimovna			1									1	3134	0.03	1995-95
386	U. Sonmez			1									1	3135	0.03	1995-95
387	R. A. O'Neill						1						1	3136	0.03	1996-96
388	S. I. Ahmad							1					1	3137	0.03	1996-96
389	T. Sarfaraz						1						1	3138	0.03	1996-96
390	A. A. Davidson			1									1	3139	0.03	1997-97
391	A. H. Khan1			1									1	3140	0.03	1997-97
392	A. R. Siddiqui			1									1	3141	0.03	1997-97
Sr. No.	Authors	NP	NP syn	NP isol	NP x-ray	NP nmr	SY	MC	SP	AC	Misc.	F	CF	%	C. Period	

410	E. Dogru			1						1	3159	0.03	99
411	H. Zhang						1			1	3160	0.03	1999-99
412	K. Harvey	1								1	3161	0.03	1999-99
413	K. Varvey	1								1	3162	0.03	1999-99
414	M. Shabbir Yousaf			1						1	3163	0.03	1999-99
415	R. Thurmer						1			1	3164	0.03	1999-99
416	W. Thomson	1								1	3165	0.03	1999-99
417	Y. Wang						1			1	3166	0.03	1999-99
418	A. G. Abdulkakhimovna						1			1	3167	0.03	2000-00
419	A. L. Meli1			1						1	3168	0.03	2000-00
420	A. Weerasooriya			1						1	3169	0.03	2000-00
421	B. Demirci						1			1	3170	0.03	2000-00
422	B. M. M. Kumarihamy			1						1	3171	0.03	2000-00
423	D.A. Dmitrievich						1			1	3172	0.03	2000-00
424	Dris Touati			1						1	3173	0.03	2000-00
425	F. Toker			1						1	3174	0.03	2000-00
426	Hafiz Rub Nawaz			1						1	3175	0.03	2000-00
427	J. F. Ayafor			1						1	3176	0.03	2000-

																		00
428	K.B. Baurzhanovich						1							1	3177	0.03		2000-00
Sr. No.	Authors	NP	NP syn	NP isol	NP x-ray	NP nmr	SY	MC	SP	AC	Misc.	F	CF	%				C. Period
429	M. Bunderya			1										1	3178	0.03		2000-00
430	N. Jahan			1										1	3179	0.03		2000-00
431	S. Y. Melsovich						1							1	3180	0.03		2000-00
432	T.K. Muboryakovich						1							1	3181	0.03		2000-00
433	Z. Oyun			1										1	3182	0.03		2000-00
434	A. S. Amarasekare							1						1	3183	0.03		2001-01
435	G. A. Premakumara							1						1	3184	0.03		2001-01
436	K. K. S. Ng	1												1	3185	0.03		2001-01
437	M. N. G. James	1												1	3186	0.03		2001-01
438	N. Ullah	1												1	3187	0.03		2001-01
439	W. D. Ratnasooriya							1						1	3188	0.03		2001-01
440	W. Schumann						1							1	3189	0.03		2001-01
441	A. Kursheed										1	1		3190	0.03			2002-02
442	A. Qazi										1	1		3191	0.03			2002-02
443	E. M. Hamed			1										1	3192	0.03		2002-02

444	H. Latif			1							1	3193	0.03	2002-02
445	K. H.C. Basaric			1							1	3194	0.03	2002-02
446	Klaus-Peter Zeller			1							1	3195	0.03	2002-02
447	M. A. Khanfar			1							1	3196	0.03	2002-02
448	M. Ovais								1	1	1	3197	0.03	2002-02
449	N. A. Sultanov			1							1	3198	0.03	2002-02
450	A. Arfan								1	1	1	3199	0.03	2003-03
451	Aziz ur Rahman			1							1	3200	0.03	2003-03
452	D. Abdul Rahman			1							1	3201	0.03	2003-03
453	E. Shaheen			1							1	3202	0.03	2003-03
454	F. R. V. Heerden			1							1	3203	0.03	2003-03
455	Hee-Juhn Park			1							1	3204	0.03	2003-03
456	I. Erdogan			1							1	3205	0.03	2003-03
457	Kyung TaeLee			1							1	3206	0.03	2003-03
458	M. A. Anwar							1			1	3207	0.03	2003-03
459	M. A. Zaidi			1							1	3208	0.03	2003-03
460	M. Mizuno	1									1	3209	0.03	2003-03

494	I. E. Muhammad			1								1	3243	0.03	05
495	J. M. Alam							1				1	3244	0.03	2005-05
496	K. Chantrapromma			1								1	3245	0.03	2005-05
497	K. Yasmen			1								1	3246	0.03	2005-05
498	M. Fecker						1					1	3247	0.03	2005-05
499	M. Imran-ul-Haq			1								1	3248	0.03	2005-05
500	M. Sajid			1								1	3249	0.03	2005-05
Sr. No.	Authors	NP	NP _{syn}	NP _{isol}	NP _{x-ray}	NP _{nmr}	SY	MC	SP	AC	Misc.	F	CF	%	C. Period
501	M. Sher						1					1	3250	0.03	2005-05
502	N. Boonnak	1										1	3251	0.03	2005-05
503	N. Silvere			1								1	3252	0.03	2005-05
504	N. Sultankhodjaev			1								1	3253	0.03	2005-05
505	N. T. Diderot			1								1	3254	0.03	2005-05
506	R. J. Abdel Jalil						1					1	3255	0.03	2005-05
507	R. Srisuwan			1								1	3256	0.03	2005-05
508	S. Aijaz			1								1	3257	0.03	2005-05
509	S. Cheenpracha			1								1	3258	0.03	2005-05
510	S. Dey			1								1	3259	0.03	2005-

														05
511	S. F. Kimbu		1							1	3260	0.03	2005-05	
512	S. G. Mascara		1							1	3261	0.03	2005-05	
513	S. I. Awan	1								1	3262	0.03	2005-05	
514	S. Kharim	1								1	3263	0.03	2005-05	
515	S. R Ali	1								1	3264	0.03	2005-05	
516	S. Umbreen				1					1	3265	0.03	2005-05	
517	Simeon F. Kouam	1								1	3266	0.03	2005-05	
518	T. Etienne		1							1	3267	0.03	2005-05	
519	T. Yousuf				1					1	3268	0.03	2005-05	
520	U. T. Teshebaeva		1							1	3269	0.03	2005-05	
521	Z. Fabien		1							1	3270	0.03	2005-05	
522	Z. A. Khan				1					1	3271	0.03	2005-05	
523	A. A. M. Ayatollahi		1							1	3272	0.03	2006-06	
524	A. Anwar				1					1	3273	0.03	2006-06	
525	A. Hazra		1							1	3274	0.03	2006-06	
526	A. Kulsoom		1							1	3275	0.03	2006-06	
527	A. Nasib		1							1	3276	0.03	2006-06	

528	B. Yeskaliyeva			1								1	3277	0.03	2006-06
529	C. Follmer			1								1	3278	0.03	2006-06
530	G. Sh. Burasheva			1								1	3279	0.03	2006-06
531	H. K. Gill									1		1	3280	0.03	2006-06
532	J. L. Eriksen			1								1	3281	0.03	2006-06
533	M. A. Agzamova									1		1	3282	0.03	2006-06
534	M. Ali					1						1	3283	0.03	2006-06
535	M. I. Isaev									1		1	3284	0.03	2006-06
536	M. Mostafa			1								1	3285	0.03	2006-06
Sr. No.	Authors	NP	NP syn	NP isol	NP x-ray	NP nmr	SY	MC	SP	AC	Misc.	F	CF	%	C. Period
537	M. Q. Fatimi			1								1	3286	0.03	2006-06
538	N. Kausar			1								1	3287	0.03	2006-06
539	R. F. Rozmahel1			1								1	3288	0.03	2006-06
540	R. P. Mamedova									1		1	3289	0.03	2006-06
541	S. A. Kazmi			1								1	3290	0.03	2006-06
542	S. D. Sokeng			1								1	3291	0.03	2006-06
543	S. Jana			1								1	3292	0.03	2006-06

544	S. K. Sadozai					1						1	3293	0.03	2006-06
545	Saifullah			1								1	3294	0.03	2006-06
546	M. Nasir			1								1	3295	0.03	2007-07
547	S. M. Khalil			1								1	3296	0.03	2007-07
548	Z. Ali			1								1	3297	0.03	2007-07
	Total	312	9	2149	48	34	527	66	59	39	54	3297			
	Percentage	9.5	.27	65.2	1.5	1.0	16.0	2.0	1.8	1.2	1.6				