

CITATION ANALYSIS OF DOCTORAL THESES IN CHEMISTRY: A STUDY OF TRIPURA UNIVERSITY

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The study is carried out to find out the different authorship pattern followed in the field of Chemistry by analysing citations from the doctoral theses. The theses submitted to the central library, Tripura University in the area of Chemistry were considered for the study. Theses submitted during 2007-2016 constitute the sample. For this time period, a total of 20 Chemistry theses were found in the library with 6214 citations. 311 citations per thesis were observed from the study. Journals were found to be the most cited type of documents followed by books. It is clearly evident that multi - authorship is dominant in the field of Chemistry with 5423 citations having a share of 87.27 %. Very high collaborative research activities were noticed in Chemistry literature from the study. It was revealed that 2 to 5 authors groups and 6 to 10 groups are more productive group of researchers compared to other research groups. It was shown from the dataset that the researchers in the field of Chemistry use more of recent studies than that of old ones.

Keywords: Authorship pattern, Collaborative pattern, Citation analysis, Doctoral thesis, Chemistry, Tripura, Tripura University

INTRODUCTION

Citation Analysis is the study of citations which applies quantitative methods to the references appended at the end of each chapter. With the help of citation analysis different characteristics such as authorship pattern, type of documents cited, growth and obsolescence, etc. about a particular discipline can be found out. Theses and Dissertations are one of the most authentic research products. Hence, for this study, Chemistry theses from Tripura University were considered as the sample. Researchers use different types of literature for conducting their research. In this study, the type of documents preferred by Chemistry researchers is identified. The results from this type of studies help in library collection development.

Authors can collaborate in many degrees such as individual level, institutional level and country level. Documents can be written by individual

author or by group of authors and this varies from discipline to discipline. In this study, an attempt has been made to understand the authorship pattern in the field of Chemistry. Earlier, no scientometric study has been performed on any literature published from the remotely located state of Tripura, India.

TRIPURA UNIVERSITY, TRIPURA: A BRIEF PROFILE

The inception of Tripura University goes back to 1976 when the University Grants Commission sanctioned a post graduate wing of the Calcutta University, named Calcutta University Post graduate Centre (CUPGC) in Tripura as a result of students' movements demanding a University in the State. The major objective behind establishing the university was "to disseminate and advance knowledge by providing instructional and research facilities". The university was transformed to a central university on 2nd July, 2007 under the Tripura University Act, 2006 as enacted by the Parliament. At present, there are 52 affiliated colleges which include 27 General Degree Colleges, 19 Professional Degree Colleges, 2 Technical Colleges and 4 Polytechnic Institutes under Tripura University. The university has divided its departments under two faculties. 44 courses are offered by different departments and centres and research is conducted in 34 disciplines in the university. The Department of Chemistry, Tripura University was established as a Post Graduate centre in 1976 under Calcutta University and it became Department of Chemistry, Tripura University in 1987. The department is involved in undertaking research in

all major areas of chemistry (<https://www.tripurauniv.ac.in/Page/aboutus>).

REVIEW OF LITERATURE

Mubeen (1996) studies 22 doctoral dissertations in Chemistry submitted to Mangalore University and it is found that single authored papers are dominant in the field and reveals researchers solely depends on journal articles. Barooah et al. (1999) study the doctoral dissertations in Organic Chemistry during 1977-1997 submitted to different Indian Universities and found that journals received the maximum citations and majority of studies are performed by small group of 2 to 3 researchers. Edwards (1999) studies citations in Polymer Science doctoral theses and found that journals to be the most cited type of documents. Gooden (2001) performs citation analysis on doctoral dissertations of Chemistry at The Ohio State University between 1996 and 2000. The frequency of journal citations is found to be more than that of monographs. Vallmitjana and Sabaté (2008) found that journals as the most used documents in the citations of Chemistry Ph.D. theses. Pradhan et al. (2011) investigated the authorship pattern and Degree of Collaboration (DC) in Indian Chemistry literature and found 3.55 to be the average number of authors per article and 0.97 to be the DC for the period 2000-2009.

Khaparde (2013) carries out a bibliometric study on the research output of Department of Chemistry, Dr. Babasaheb Ambedkar Marathwada University for the period of 1975-2012 and found that co-authored papers especially four authored

papers dominated the scenario. Zhang (2013) compares citation patterns between Chemistry and Chemical Engineering dissertations and finds that journals receive maximum citations in both the disciplines. Gohain and Saikia (2014) conducted a citation analysis study on doctoral theses of Chemical Science, Tezpur University. Journal found to be the preferred source. Hajam (2014) carries out a bibliometric analysis on 776 articles published in Indian Journal of Clinical Biochemistry and found that there is a pre-dominance of 5 and more authored contributions. An average DC of 0.921 was found for the dataset. Flaxbart (2018) analyses citations in Ph.D. dissertations of Chemistry at the University of Texas and found that chemistry graduate students cites low number of books relative to journal articles. Salami and Olatokun (2018) found that journals to be the most cited sources from their citation analysis study of theses at Faculty of Science, University of Ibadan, Nigeria. Ramalingam and Elangovan (2018) examine the collaborative pattern of authors in the field of Chromosome Anomalies. Journal articles were the most cited documents. Growing trend of solo research was found in this area unlike most other studies. Small and medium research groups were found to be more productive.

Satpute (2019) performs a citation analysis study of Ph.D. theses in Chemistry discipline submitted to Kavayitri Bahinabai Chaudhari, North Maharashtra University and found that Journals to be most preferred source of citation and co-authored papers in general and two authored papers in particular to be dominant. Kumar et al. (2020) reveal that Indian rice

scientists prefer collaborative research practices. Scientists in this area are found to be inclined towards mega-authored publications. Peidu (2020) found that peer reviewed articles received the highest number of citations in life sciences and found that multi-authored papers received more citations. The current study tries to bridge the gap by conducting a citation analysis study based on theses produced from north east India region.

OBJECTIVES OF THE STUDY

This work is based on the following objectives

1. To classify the type of documents used by the scholars per thesis for citations;
2. To determine the pattern of authorship in the field of Chemistry;
3. To test the application of collaborative measures to authorship pattern;
4. To discover productivity of different research groups; and
5. To find the chronological distribution of citations

METHODOLOGY

For conducting the study, theses submitted to central library, Tripura University in the field of Chemistry were considered. Theses submitted during the ten years from July 2007 to June 2016 were considered for the study because the university was converted to central university in July 2007. So, 2007 was taken as a starting point till the next 10 years. For this time period, a total of 20 Chemistry theses found in the library constituting 6214 citations. These citations from

theses were analysed and interpreted in this study. The sample is analysed with Microsoft excel 2010. The Scientometric indicators used are mentioned below:

Degree of Collaboration (DC): Subramanyam (1983) propounded the DC, a measure to compute the fraction of solo and co-authored papers and to infer it as a degree.

$$DC = N_m / (N_s + N_m)$$

Where, N_m = the number of multi-authored papers; N_s = the number of single author papers

Collaborative Coefficient (CC): Ajiferuke et al. (1988) given the formula of CC as

$$CC = 1 - \frac{\sum_{j=1}^A \left(\frac{1}{j}\right) f_j}{N}$$

f_j is the amount of j -authored papers for a particular period, N is the total quantity of papers

Modified Collaborative Coefficient (MCC):

CC fails to get 1 for maximal collaboration except when quantity of authors is continual. It was rectified by Savanur and Srikanth (2010) by the factor $(1 - 1/A)$ with CC and enunciated as

$$MCC = (A/A-1) * \{1 - CC\}$$

Collaboration Index (CI): Collaboration Index has been calculated by using the formula as given by Lawani (1980). With this formula mean number of authors in each paper can be found out.

Where,

f_j is the number of J authored papers published in a discipline during a certain period of time; N is the total amount of research papers for a period of time

Co-authorship Index (CAI): Garg and Padhi (1999) suggested formula to compute CAI

$$CAI = \frac{N_{ij}}{N_{io}} * 100$$

Where, N_{ij} = Number of papers having j author for a time period; N_{io} = Total production for the certain period; N_{oj} = Number of papers having j authors for all blocks; N_{oo} = Total number of papers for all authors and all blocks. CAI = 100 means the number of papers matches up to the average within a co-authorship pattern. CAI > 100 means the quantity of papers are more than the average. CAI < 100 indicates the amount of papers are lesser than the average.

RESULTS AND DISCUSSIONS

Type of documents wise distribution of citations

The present study covers 20 theses and a total of 6214 citations with an average of 311 citations per thesis. The table 1 reports the list of documents preferred and average citation per thesis count. It is revealed that Journals are the most preferred type of documents with a total of 5581 citations in 20 theses with 89.81% share, followed by Books (501, 8.06%). Other sources such as Dictionary, Proceeding, Encyclopaedia, Patent and Websites are cited very few times having the share of less than 1% for each type of document. Miscellaneous sources account for 0.11% share of citations which includes Atlas, Standards, Glossary, Magazine, Symposium, thesis and WHO report.

From the table 1, it is evident that journals received an average of 279 citations per thesis, followed by books received 25 average citations

Table 1: Type of documents wise distribution of citations

Sl. No.	Type	Citations	Average citations /thesis	Percentage (%)
1	Journals	5581	279	89.81
2	Books	501	25	8.06
3	Dictionaries	15	1	0.24
4	Proceedings	14	1	0.23
5	Encyclopaedias	9	0	0.14
6	Patents	4	0	0.06
7	Websites	3	0	0.05
8	Miscellaneous	7	0	0.11
9	Unidentified	80	5	1.29
Total		6214	311	100.00

per thesis. Dictionary and proceeding received 1 citation each. Unidentified documents received 5 citations per thesis.

Authorship Pattern

Studying the pattern of authors is one of the significant characteristics in the Scientometrics analysis. The authorship pattern in the field of Chemistry is explained in table 2. It is found from the table that out of the total 6214 citations, maximum i.e. 1352 (21.76%) number of citations belong to three authored papers, followed by two authored papers (1247, 20.07%); four authored papers with 966 (15.55%) citations, followed by single authored papers and five authored papers (735, 11.83). More than eight authored papers were cited 211 times with share of 3.40%. Corporate authors were cited 37 times with a share of 0.60%. Anonymous authors were cited 2 times with 0.03% share. 17 citations did not have authors' details. The highest collaborated paper was found to have 32 authors.

Table 2: Authorship Pattern in Chemistry

Sl. No.	Number of Authors	Citations	Percentage (%)
1	One	735	11.83
2	Two	1247	20.07
3	Three	1352	21.76
4	Four	966	15.55
5	Five	735	11.83
6	Six	513	8.26
7	Seven authored	243	3.91
8	Eight authored	156	2.51
9	Nine authored	64	1.03
10	Ten authored	44	0.71
11	Eleven authored	22	0.35
12	Twelve authored	28	0.45
13	Thirteen authored	4	0.06
14	Fourteen authored	2	0.03
15	Fifteen authored	5	0.08
16	Thirty two authored	1	0.02
17	et al	41	0.66
18	Anonymous	2	0.03
19	corporate	37	0.60
20	Author not mentioned	17	0.27
Total		6214	100.00

Single vs. Multiple Authors Contribution

The contribution of single and multiple authors is reported in the table 3. It is clearly evident that multi - authorship is dominant in the field of Chemistry with 5423 citations having a share of 87.27% and single authors with 735

(11.83%) share. DC fluctuates from 0 to 1 from single authored papers to the multiple authored papers. DC is established to be 0.8806 which indicates the dominance of multi authorship documents in Chemistry. Other category in the table includes corporate authors, anonymous authors and authors not mentioned categories.

Table 3: Single Vs. Multiple Authors Contribution

Sl. No.	Number of Authors	Citations Count	Percentage (%)	Cumulative Percentage (%)	DC
1	Single author	735	11.83	11.83	0.8806
2	Multiple authors	5423	87.27	99.10	
3	others	56	0.90	100.00	
Total		6214	100.00		

Table 4: Decennial year wise distribution of authorship pattern

Sl.No.	Period	N u m b e r o f a u t h o r s																Total
		One	Two	Three	Four	Five	Six	Seven	Eight	Nine	Ten	Eleven	Twelve	Thirteen	Fourteen	Fifteen	Thirt y two	
1	Before 1900	15	16															31
2	1901- 1910																	0
3	1911 - 1920	10	1															11
4	1921 - 1930	8	2	2														12
5	1931 - 1940	15	12	1														28
6	1941 - 1950	6	6															12
7	1951 - 1960	18	37	8	1													64
8	1961 -1970	61	80	53	13	4	1											212
9	1971 - 1980	65	123	70	33	9	5		1	1								307
10	1981 - 1990	163	170	157	104	49	22	4	2	2			2					675
11	1991 - 2000	174	314	333	229	149	85	39	36	8	11	4	1					1383
12	2001 - 2010	147	378	569	437	382	268	140	79	34	22	13	9	2	1	3	1	2485
13	2011 - 2015	33	92	148	144	139	131	59	37	19	11	5	16	2	1	2		839
	Total	715	1231	1341	961	732	512	242	155	64	44	22	28	4	2	5	1	6059
	year not mentioned	20	16	11	5	3	1	1	1									58
	et al, corporate, anonymous and author not mentioned																	97
Total																		6214

Decennial year wise distribution of authorship pattern

Authorship pattern in blocks of ten years is reported in table 4. Since only a few papers were noticed in 1800s and 1990s, they were not segregated into blocks of ten years. It is quite evident that until 1940s, single authored papers dominated the scenario and in the recent years the trend is shifting towards large group collaborations. This may be due to the rapid advancement of technology that people from different corner of the globe can come together to work in a project.

Authorship pattern and collaborative methods

The table 5 represents the different collaborative measures applied in this study. It is found that DC was minimum at 0.09 during 1911 to 1920 and maximum at 0.96 during 2011 to 2015. The pattern of DC is in increasing trend from top to bottom which shows the trend towards multi authorship. The rate of CC is zero as soon as single-authored papers dominate. This implication shows that higher the value of CC means higher the possibility of multi- authored papers in a discipline. CC was lowest during 1911 - 1920 (0.0455). It was at the highest value of

Table 5: Authorship pattern and collaborative measures

Sl. No.	Period	Single authored	Multiple authored	Total	DC	CC	CI	MCC	MCC-CC
1	Before 1900	15	16	31	0.52	0.2581	1.52	0.2667	0.0086
2	1911 - 1920	10	1	11	0.09	0.0455	1.09	0.0501	0.0046
3	1921 - 1930	8	4	12	0.33	0.1944	1.5	0.2121	0.0177
4	1931 - 1940	15	13	28	0.46	0.2381	1.5	0.2469	0.0088
5	1941 - 1950	6	6	12	0.50	0.2500	1.5	0.2727	0.0227
6	1951 - 1960	18	46	64	0.72	0.3841	1.88	0.3902	0.0061
7	1961 -1970	61	151	212	0.71	0.4204	2.16	0.4224	0.0020
8	1971 - 1980	65	242	307	0.79	0.4757	2.43	0.4773	0.0016
9	1981 - 1990	163	512	675	0.76	0.4948	2.75	0.4955	0.0007
10	1991 - 2000	174	1209	1383	0.87	0.5982	3.45	0.5986	0.0004
11	2001 - 2010	147	2338	2485	0.94	0.6804	4.18	0.6807	0.0003
12	2011 - 2015	33	806	839	0.96	0.7230	4.8	0.7239	0.0009

CI=Collaborative index, DC=Degree of collaboration, CC=Collaborative co efficient, MCC=Modified collaborative co-efficient

0.7230 during 2011 - 2015. The value of CC has increased from peak to base which shows that the trend is towards multi authorship. CI is used to find out the mean number of authors per paper. It cannot be interpreted as a “degree” because it has no upper value limit. CI was lowest for the period 1911 to 1920 (1.09) and it is the highest during 2011 to 2015 at 4.80. MCC is a customized version of CC but unlike CC, which remains strictly less than 1 for infinitely many authors, MCC smoothly tends to 1 when the Degree of Collaboration becomes maximum. The study found that MCC was lowest from 1911 to 1920 with 0.0501 and the highest from 2011 to 2015 with 0.7239. Mean difference between CC and MCC is revealed to be 0.0062 from the table. During 2001-2010 the smallest amount of difference between CC and MCC (0.0003) is

seen. The highest difference CC and MCC which is 0.0834 is observed during the period before 1800.

It can be summarized that very high collaborative research activities are noticed in Chemistry literature. No significant difference can be observed between CC values and MCC values, and also this variation narrows down when the number of authorships increases. For the collaborative measure studies, corporate, anonymous author, author not mentioned and year not mentioned categories are not included as they do not provide specific number of authors.

Productivity of Research Groups

The table 6 represents the efficiency of research groups of different strengths. Out of the total 6059 documents, groups consisting of 2 to

Table 6: Productivity of Research Groups

Sl. No.	Period	Single Author	No. of documents with 2 to 5 Authors (Small group)	No. of documents with 6 to 10 Authors (Medium group)	No. of documents with >10 Authors (large group)	Total
1	Before 1900	15	16			31
2	1911 - 1920	10	1			11
3	1921 - 1930	8	4			12
4	1931 - 1940	15	13			28
5	1941 - 1950	6	6			12
6	1951 - 1960	18	46			64
7	1961 -1970	61	150	1		212
8	1971 - 1980	65	235	7		307
9	1981 - 1990	163	480	30	2	675
10	1991 - 2000	174	1025	179	5	1383
11	2001 - 2010	147	1766	543	29	2485
12	2011 - 2015	33	523	257	26	839
Total		715	4265	1017	62	6059

5 researchers termed as small groups produced maximum i.e. 4265 documents, followed by medium groups which produced 1017 number of documents and single authors produced 715 documents. Large group having more than 10 authors produced only 62 documents. The productivity of small groups of 2 to 5 authors only started after 1950; the productivity of medium group started after 1960 and the productivity of large group started after 1980. So, it is clear that these highly collaborated studies are a recent phenomenon. It clearly reveals that 2-5 and 6-10 authored groups of researchers are the most productive research group compared to other research groups. It also discloses that when the number of authors in the group increases the productivity decreases. From the period of 2001 to 2010 and 2011 to 2015 there was a decreasing trend in all the groups is identified. However, all

the research groups show increasing trend of productivity in the field of Chemistry.

Co-authorship Index

The table 7 exemplifies the measured numbers of Co-authorship Index (CAI) for publications having one, two, three, four and more than four authors termed as mega authors. CAI measures the tendency of co-authorship and it is measured with formula given in methodology numbered (h). $CAI = 100$ indicates that the co-authorship for kind of authorship matches to the overall average, $CAI > 100$ reveals more than average co-authorship effort and $CAI < 100$ proves lesser than average co-authorship attempt. The table 7 reports that value of CAI for one author have decreased from 565 to 33, which means there is a considerable decrease in the single authorship with respect to overall output. The CAI

Table 7: Co-authorship Index

Period	Single author	CAI	Two authors	CAI	Three authors	CAI	Four authors	CAI	Mega authors	CAI	Total
Before 1900	15	410	16	254	0						31
1911 - 1920	10	770	1	45	0						11
1921 - 1930	8	565	2	82	2						12
1931 - 1940	15	454	12	211	1	16					28
1941 - 1950	6	424	6	246		0					12
1951 - 1960	18	238	37	285	8	56	1	10			64
1961 -1970	61	244	80	186	53	113	13	39	5	8	212
1971 - 1980	65	179	123	197	70	103	33	68	16	17	307
1981 - 1990	163	205	170	124	157	105	104	97	81	40	675
1991 - 2000	174	107	314	112	333	109	229	104	333	81	1383
2001 - 2010	147	50	378	75	569	103	437	111	954	128	2485
2011 - 2015	33	33	92	54	148	80	144	108	422	168	839
Total	715		1231		1341		961		1811		6059

for two authors does not follow any particular pattern. For three authors group, CAI increased for the period before 1900 to the period of 1991-2000 and it decreases thereafter. For four author group, the CAI increases from the period of 1951 to 1960 and 2001 to 2010 and slightly decreases during 2011–2015. For mega authors, the CAI gradually increases from 1961 to 1970 and 2011 to 2015 which proves the growing trend towards mega authorship.

Chronological distribution of citations in Chemistry

Chronological scattering of citations among the different bibliographic forms is presented in table 8. For the study, a total of 6187 citations are found, excluding the ones where date of publication was not mentioned. The highest, i.e.

2518 number of documents are cited from 2001 to 2010 period with a share of 40.70%, followed by for the period from 1991 to 2000 with 1418 (22.92%); 2011 to 2015 with 857 (13.85%) share. The lowest i.e. 3 (0.05%) citations belong to the period of before 1800.

CONCLUSION

The authors tried to evaluate the patterns of authorship in documents cited by the researchers in the field of chemistry. Citation analysis studies have always been proven to be very insightful as it provides much information about a discipline on application of different metrics. The present study covers 20 theses and a total of 6214 citations with an average of 311 citations per thesis. Thanuskodi (2011) analysed the citations from the *Indian Journal of Chemistry* and found

Table 8: Chronological distribution of citations in Chemistry

Period	Journal article		Book		Proceeding		Miscellaneous		Unidentified		Total	Percentage
	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage		
Before 1900	16	0.26	15	0.24							31	0.50
1911 - 1920	11	0.18		0.00							11	0.18
1921 - 1930	12	0.19		0.00							12	0.19
1931 - 1940	26	0.42	2	0.03							28	0.45
1941 - 1950	11	0.18	1	0.02							12	0.19
1951 - 1960	57	0.92	12	0.19			3	0.05	1	0.02	73	1.18
1961 -1970	182	2.94	50	0.81			1	0.02	2	0.03	235	3.80
1971 - 1980	256	4.14	40	0.65			6	0.10	8	0.13	310	5.01
1981 - 1990	539	8.71	128	2.07			7	0.11	8	0.13	682	11.02
1991 - 2000	1210	19.56	158	2.55	7	0.11	22	0.36	21	0.34	1418	22.92
2001 - 2010	2408	38.92	70	1.13	4	0.06	19	0.31	17	0.27	2518	40.70
2011 - 2015	846	13.67	7	0.11			1	0.02	3	0.05	857	13.85
Total	5574	90.09	483	7.81	11	0.18	59	0.95	60	0.97	6187	100.00

that journals received the maximum citations. This study also revealed that Journals receive an average of 279 citations per thesis, followed by books received 25 average citations per thesis. Dictionary and proceedings received 1 citation each. Unidentified documents received 1 citation per thesis. This result also corroborates the studies done by Mubeen (1996), Gooden (2001), Flaxbart (2018). Khaparde (2013) carried out a bibliometric study on the research output of Department of Chemistry, Dr. Babasaheb Ambedkar Marathwada University and found multiple authorship to be dominant and in this study also, it is clearly evident that multi-authorship is dominant in the field of Chemistry with 5423 citations having a share of 87.27% and single authors with 735 (11.83%) share. Similar studies with similar results were carried out by Hajam (2014), Satpute (2019) and it corroborates the current results.

It can be summarized from the above arguments that very high collaborative research activities are noticed in Chemistry literature. It can be concluded that no significant difference can be observed between CC values and MCC values, and also this variation narrows down when the number of authorships increases. It clearly demonstrates that small and medium group of researchers received more citations compared to publications produced by other research groups. It also discloses that increasing number of authors decreases the productivity. From the period of 2001 to 2010 and 2011 to 2015 decreasing trend in all the groups is identified. However, all the research groups show an increasing trend of productivity in the field of Chemistry. The highest

CAI for two authors is reported during 1951 – 1960, the highest CAI for three authors is reported during 1961 -1970, the highest CAI for four authors is reported during 2001 – 2010 and highest CAI for mega authors is reported during 2011 – 2015. So, it is quite clear from the dataset that the researchers in the field of Chemistry prefer to use more of recent studies than that of old ones. Since, the medium group of 2 to 5 researchers received more citations, the department of Chemistry can motivate the scholars from the department to work in groups for better productivity.

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Appendix

Sl. No.	Title	Guide(s)	Completed Date
1	Investigation on the Physico chemical Properties of Capsular Polysaccharides from Some Serotypes of Klebsiella	Nath, Ranendu Kumar; Panda, Amiya Kumar	2011
2	Chemical constituents of cyperus kyllingia and other medicinal plants of Tripura	Dinda, B	2012
3	Synthesis, structural assessment and reactivity studies on some schiff base and mixed-ligand-fluoro complexes of manganese(III)	Purkayastha, R N Dutta	2012
4	Functionalization of amino group by the catalysis of protic ionic liquid and synthesis of some biologically active nitrogen heterocycles	Majumdar, Swapan	2015
5	Studies on the development of newer methodology for the synthesis of imidazoles and benzimidazoles under environmentally benign condition	Majumdar, Swapan	2016
6	Synthesis characterization and structure elucidation of Cu and Zn complexes with some N O and or S donor ligands	Chowdhury, Shubhamoy	2014
7	Interaction of bacterial polysaccharides with oppositely charged dyes and surfactants physico chemical studies	Nath, R.K.	2015
8	Studies on the photophysical properties of dyes in aqueous micellar media	Nath, R.K.	2013
9	Synthesis characterization and dft studies of copper and rhenium complexes with some N O and S donor ligands	Chowdhury, Shubhamoy	2016
10	Synthesis of mixed ligand complexes of some transition metal ions with nitrogen and sulphur donors and their structural characterization by magnetic and spectroscopic methods	Singh, M.K.	2014
11	Chemical constituents of pouzolzia indica and other medicinal plants of tripura	Dinda, B.	2015
12	Spectroscopic Characterizations of Some Bio Active Molecules in the Restricted Geometry of Ultra Thin Films	Nath, R.K.	2014
13	Spectroscopic characterization of some organized molecular assemblies in the restricted geometry of ultra thin films	Nath, R.K.	2015
14	Chemical constituents of vitex peduncularis and a few other medicinal plants of tripura	Dinda, B.	2015
15	Chemical constituents of artocarpus chaplasha and other medicinal plants of India	Dinda, B.	2014
16	Chemical constituents of sida glutinosa and other medicinal plants of tripura	Dinda, B.	2014
17	Synthesis structural assessment and physico chemical studies on some complexes of zinc	Dutta Purkayastha, R. N.	2016
18	Isolation and structural studies on chemical constituents of Mussaenda roxburghii and some other medicinal plants	De, Utpal Chandra	2016
19	Chemical constituents of Gomphrena globosa and their medicinal plants of Tripura.	Prof. B. Dinda	2007
20	Synthesis structural assessment reactivity studies on some schiff base and mixed-ligand complexes of Manganese	Dr. Pranajit Paul	2016