

## RESEARCH PRODUCTIVITY OF MIZORAM UNIVERSITY, AIZAWL DURING 2002-2018: A BIBLIOMETRIC ANALYSIS

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The present paper is a bibliometric enquiry of Mizoram University for a period of 17 years, from 2002-2018. The total number of publications during the study period was 586 publications. The aim of this paper is to analyse the pattern of authorship, geographical distribution, types of document, prolific author. It is found from the study that 2016 and 2017 were the most productive years for this university with 108 (18.43%) and 84 (14.33%) publications respectively. The maximum documents published during the study period were in the form of research article (545, 93%) followed by review paper (17, 2.9%). Thapa, R.K. (82 publications, 21.58%) and Tiwari, D. (61 publications, 16.05%) were the most prolific contributors and the highest publications were published in the *Current Science* journal.

**Keywords:** Bibliometrics, Mizoram University, Research Productivity, Publication Pattern, Authorship Pattern, etc.

### INTRODUCTION

Bibliometric studies are used to know the form of publications, authorship, collaboration, citations, and journal coverage to give an insight into the dynamics of the field. It applied primarily to the scientific fields which are based mainly on different metadata elements like author, title, subject, citations, etc. connected to scholarly publication in a discipline. The term Bibliometrics is a combination of two words ‘Biblio,’ originated from the Greek word “biblion”, which means a book and ‘metrics’ is originated from the Greek word “metrikos”, which means measurement. A term Bibliometrics was coined by A. Pritchard (1969) and defined as “the application of mathematical and statistical methods to measure quantitative and qualitative changes in different media”. While bibliometric methods are most recurrently used in the area of library and information science, Bibliometrics has broad applications in the use of other areas. Many research fields’ uses Bibliometrics approaches to determine the impact of the selected field, the impact of a set of researchers group, or the impact of a specific paper.

## ABOUT MIZORAM UNIVERSITY

Mizoram University is a blooming academic community with its green scenic hills, situated at Tenhril in the western area of Aizawl city. The university has 39 departments offering UG, PG, and M.Phil. and Ph.D. programmes and 9 schools of studies. There are 60 Professors, 15 Associate Professors and 125 Assistant Professors currently working in the university. During the last five years, the university has awarded 277 Ph.D. degrees in different disciplines. The Library of the University is fully automated running web OPAC. RFID is installed in the central Library for security purpose. There are 35 affiliated colleges and 1 constituent College, i.e. "Pachhunga University College" under Mizoram University. Mizoram University has signed a Memorandum of Understanding with various National and International Institutes for Research Collaborations and Exchange programme (Source: <https://www.mzu.edu.in/index.php/downloads/106-admission>)

## REVIEW OF LITERATURE

Kumbar et al. (2012) examined the research activity of the University of Mysore in Science and Technology based on published data during 1996-2006 consisting of 1581 articles. It found that the average growth rate of the publication was 23% per annum. The average citation per paper was found increasing from 1.53 in 1996 to 2.62 in 2003. Chemistry, Physics, and Astronomy were the top three most dominating research areas and Chemical Engineering, Energy and Molecular Biology were emerging areas of research. The university has only 14% international collaboration and

USA (51%) was the largest collaborative country during the study period. The most productive author was H. S. Yathirajan (Department of Chemistry) with 41 articles from a total of 139 articles from Chemistry discipline. Baskaran (2013) analysed a bibliometric study on the research productivity of Alagappa University during 1999-2011 based on Web of Science database. It is observed that there was a growth of research publications during the study period. The relative growth rate was in fluctuating trend and doubling time was found in increasing and decreasing trend during the study period. Multi-authored articles were maximum which is 750 (96.64%) and single-authored papers were only 26 (3.35%) out of a total 776 published articles. Degree of Collaboration was fluctuating from 0.92 to 0.98 and the mean observed was 0.96 during the study period. South Korea was the most collaborative country with 7.61% articles from total research output. Central Electrochemical Research Institute was the dominating institutions with 129 (16.62%) publications and Material Science with 172 (22.26%) articles was the most dominating subject during the period of study.

Aswathy and Gopikuttan (2014) examined the research productivity of University of Kerala during 2000 to 2012. Web of Science was taken as the source of data. A total of 1068 papers were found with biology as the most prolific field of research followed by chemistry. Highest numbers of the articles were published in *Current Science*. Balasubramani and Parameswaran (2014) evaluate the productivity of research of Banaras Hindu University and have found that annual average research productivity of Banaras Hindu University was

578 and the Collaboration with foreign authors is good. *Current Science* is one of the most chosen journals from the researchers of BHU. Yazdani et al. (2014) conducted a five year Scientometric analysis of research centres affiliated to Tehran University of Medical Sciences and found that there was an increasing trend in a total number of the published papers and the total number of indexed papers until 2009 but was a decrease in 2010 and 2011. The number of Iranian papers published in international journals was the highest. The factors affecting the research output were also stated. Gautam and Mishra (2015) conducted a Scientometric study on research trend of Banaras Hindu University based on Indian Citation Index during the period of 2004-2013. The authors analyse research publications of BHU. A total of 1041 articles were found from ICI the study period. The study measured the year-wise sharing of publication output, co-authorship index, etc. It found that the research productivity was increasing at the average rate of 104.1 publications per years and maximum articles were contributed by joint authors. The most prolific author was A. K. Singh (Department of Physics) with 18 articles. Out of 1041 publications, 60 (5.76%) articles have collaborated with 18 different countries of the world. The USA was the highest collaborative country. Indian Agricultural Research Institute (IARI) was the topmost collaborative institute. *Current Science* was the most prolific journal which was preferred by the scientists. The most productive author was T. S. Anirudhan from the Department of Chemistry with 114 (10.67%) articles during 2000-2012.

Satpathy and Sa (2015) conducted a bibliometric analysis of research outout of

Odisha's state universities during 2010 - 2014 using scopus database. The study found that Utkal University was the most prolific institution in the state. Physics and Astronomy have maximum number of papers compared to other subjects and *Optics Communications* and *Indian Journal of Physics* were the most preferred journals. The contributions of Multi authored paper are more than single authored paper. Amsaveni and Haneefa (2015) conducted a scientometric study of the research output of University of Calicut based on Web of Science database. The study analysed the pattern of publication, authorship, growth rate of publications and journals coverage of researchers in University of Calicut. During the period of study, the authors found a total of 940 articles of the university. The highest numbers of articles were published on Chemistry followed by Physics and Botany. Vellaichamy and Ramalingam (2015) evaluated the research productivity of Pondicherry University through Scopus database. In this study, the authors found that 84.8% of research output were having joint authorship pattern. Physics and astronomy have maximum number of papers compared to other subjects.

Siwach and Parmar (2018) conducted a bibliometric study to explore the publishing behaviour of researchers of CCS Haryana Agricultural University, Hisar during 2001-2015 which was ranked fourth in the ICAR ranking of Agricultural University, 2016-2017. The study is focused on year-wise research productivity, key subject categories, national and international collaboration, topmost journals for publications, etc. A total of 2649 articles were calculated during the study with the help of the Scopus. The average publication was 177 per

year and an average citation was 5.77 per articles from the University during the study period. *Annals of Biology* with 325 publications was the most preferred journal and N. Khetarpaul (Department of Food and Nutrition) with 63 publications was the most prolific author during the study period. 97.17% publications were with two or more than two authored articles. Three authored publications dominated and collaboration coefficient was calculated as 0.668. Cherukodan and Mumthas (2019) conducted a scientometric study of fifty one years on research in the University of Calicut, India. They found that a total number of 2158 scholarly articles have been published by the university, more papers were published on Agricultural and Biological Sciences (30%). The majority of articles (58%) were published during the last ten years (58%).

### **SCOPE OF THE STUDY**

The scope of present study is limited to analyse the research productivity of Mizoram University on the basis of bibliometric parameters Web of Science (WOS) database. The study is further confined to 17 years (i.e. 2002-2018) because the university was established in April, 2000 and started functioning from July, 2001 only.

### **OBJECTIVES OF THE STUDY**

The specific objectives of the study are to:

1. analyse the year wise research output of the Mizoram University (2002-2018).
2. assess the document type of the research output.
3. discover the most contributed institutions during the period under study.

4. discover the contribution of different countries.
5. find out the most prolific authors contributed for publication during the period under study.

### **METHODOLOGY**

The present study aims to measure the research productivity of Mizoram University using Web of Science database. The data was retrieved from an online database Web of Science (WOS) (<https://www.webofknowledge.com/>). Data were retrieved on 25<sup>th</sup> March 2019 by using search syntax OO=(Mizoram University OR MIZORAM UNIVERSITY) Timespan: 2002-2018. Indexes: SCI-EXPANDED, SSCI, A&HCI. Total 586 articles were found and then the collected data were scrutinized with the help of MS-Excel. The calculated data has been scrutinised by the bibliometric tools and techniques to find out the desired result to fulfil the research objectives.

### **DATA ANALYSIS AND INTERPRETATION**

#### **Distribution of Publications with Annual Growth Rate**

The table-1 shows the distribution of publication for Mizoram University during 2002-2018. There are a total of 586 publications with an average annual growth rate is 84.90 during the mentioned period of study. In the beginning, the publication growth was very slow but with the time it increased especially after 2007. The highest publications were recorded in 2016, followed by 2017 and 2018. The annual growth rate of Mizoram University publications are shown in figure-1 and it varies from year to year. The highest positive growth rate was in 2007 while the highest negative growth rate was recorded in 2006.

**Table1: Distribution of Publications with Annual Growth Rate**

| Year  | No. of Publications | Percentage (%)                           | Annual Growth Rate (%) |
|-------|---------------------|--|------------------------|
| 2002  | 1                   | 0.17                                     | -                      |
| 2003  | 1                   | 0.17                                     | 0                      |
| 2004  | 1                   | 0.17                                     | 0                      |
| 2005  | 5                   | 0.85                                     | 400                    |
| 2006  | 1                   | 0.17                                     | -400                   |
| 2007  | 13                  | 2.21                                     | 1200                   |
| 2008  | 23                  | 3.92                                     | 76.92                  |
| 2009  | 33                  | 5.63                                     | 43.47                  |
| 2010  | 24                  | 4.09                                     | -27.27                 |
| 2011  | 32                  | 5.46                                     | 33.33                  |
| 2012  | 38                  | 6.48                                     | 18.75                  |
| 2013  | 43                  | 7.33                                     | 13.15                  |
| 2014  | 41                  | 6.99                                     | -4.65                  |
| 2015  | 63                  | 10.75                                    | 51.21                  |
| 2016  | 108                 | 18.43                                    | 71.42                  |
| 2017  | 84                  | 14.33                                    | -22.22                 |
| 2018  | 75                  | 12.79                                    | -10.71                 |
| Total | 586                 | Annual Average Growth Rate- <b>84.90</b> |                        |

**Authorship Pattern in Publications**

The table 2 states the complete summary of period-wise authorship pattern of papers published during the period under study i.e. 2002-2018. It is found that out of 586 publications, the majority of publications in a collaborative way

rather than single publications. The highest number of publications (23.2%) was authored by e” six authors, followed by three authors (21.33%) and four authors (20.3%) respectively. There were few contributions in the form of single authorship i.e. 7.84% only.

**Table 2: Authorship Pattern in Publications**

| Year        | One          | Two           | Three          | Four          | Five          | Six           | Total |
|-------------|--------------|---------------|----------------|---------------|---------------|---------------|-------|
| 2002        | 0            | 0             | 0              | 0             | 1             | 0             | 1     |
| 2003        | 0            | 0             | 0              | 0             | 0             | 1             | 1     |
| 2004        | 0            | 0             | 0              | 0             | 1             | 0             | 1     |
| 2005        | 2            | 1             | 1              | 1             | 0             | 0             | 5     |
| 2006        | 0            | 0             | 0              | 1             | 0             | 0             | 1     |
| 2007        | 0            | 2             | 4              | 3             | 1             | 3             | 13    |
| 2008        | 3            | 6             | 6              | 2             | 5             | 1             | 23    |
| 2009        | 7            | 3             | 5              | 14            | 2             | 2             | 33    |
| 2010        | 7            | 3             | 3              | 4             | 4             | 3             | 24    |
| 2011        | 3            | 6             | 7              | 9             | 4             | 3             | 32    |
| 2012        | 6            | 12            | 6              | 3             | 4             | 7             | 38    |
| 2013        | 2            | 12            | 16             | 8             | 1             | 4             | 43    |
| 2014        | 2            | 7             | 11             | 11            | 3             | 7             | 41    |
| 2015        | 4            | 2             | 13             | 20            | 9             | 15            | 63    |
| 2016        | 4            | 13            | 20             | 19            | 17            | 35            | 108   |
| 2017        | 4            | 13            | 19             | 14            | 8             | 26            | 84    |
| 2018        | 2            | 10            | 14             | 10            | 10            | 29            | 75    |
| Grand Total | 46<br>(7.84) | 90<br>(15.35) | 125<br>(21.33) | 119<br>(20.3) | 70<br>(11.94) | 136<br>(23.2) | 586   |

*The figures in parenthesis indicate percentages*

### Degree of Collaboration in Publications

Degree of Collaboration states the important area of query demonstrating the inclination in patterns of single authorship and joint authorship in the publication of Mizoram University. The Degree of Collaboration “C” is calculated using the following formula given by Subrahmanyam (1983).

$$C = N_M / (N_M + N_S)$$

The table-3 reveals the Degree of Collaboration in Mizoram university publication during 2002-2018 and analysis resolved that

academia of Mizoram University prefers to publish their research output in collaborative pattern and during the period of study only 46 publications out of 586 were published in single-author form. During the whole period, the Degree of Collaboration was more than 0.60 and during 2002, 2003, 2004, 2006, 2007 it was 1, while majority of the time it is nearer to 1, which shows the very high Degree of Collaboration. The lowest Degree of Collaboration was recorded in the year 2005 while the average Degree of Collaboration was 0.92.

**Table 3: Degree of Collaboration in Publications**

| Year  | No. of Single Author(N <sub>S</sub> ) | No. of Multiple Authors(N <sub>M</sub> ) | Total (N <sub>S</sub> +N <sub>M</sub> ) | Degree of Collaboration (C) |
|-------|---------------------------------------|--|---|-----------------------------|
| 2002  | 0                                     | 1  | 1                                       | 1                           |
| 2003  | 0                                     | 1  | 1                                       | 1                           |
| 2004  | 0                                     | 1  | 1                                       | 1                           |
| 2005  | 2                                     | 3  | 5                                       | 0.6                         |
| 2006  | 0                                     | 1  | 1                                       | 1                           |
| 2007  | 0                                     | 13                                       | 13                                      | 1                           |
| 2008  | 3                                     | 20                                       | 23                                      | 0.86                        |
| 2009  | 7                                     | 26                                       | 33                                      | 0.78                        |
| 2010  | 7                                     | 17                                       | 24                                      | 0.70                        |
| 2011  | 3                                     | 29                                       | 32                                      | 0.90                        |
| 2012  | 6                                     | 32                                       | 38                                      | 0.84                        |
| 2013  | 2                                     | 41                                       | 43                                      | 0.95                        |
| 2014  | 2                                     | 39                                       | 41                                      | 0.95                        |
| 2015  | 4                                     | 59                                       | 63                                      | 0.93                        |
| 2016  | 4                                     | 104                                      | 108                                     | 0.96                        |
| 2017  | 4                                     | 80                                       | 84                                      | 0.95                        |
| 2018  | 2                                     | 73                                       | 75                                      | 0.97                        |
| Total | 46                                    | 540                                      | 586                                     | 0.92                        |

### Distribution of papers by types of documents

The figure 1 displays the type of document which authors preferred in their research. Out of the total 586 documents, maximum, i.e. 545 (93%) were the journal articles and more

preferred document type, followed by Reviews with 17 (2.90%), Proceedings papers with 12 (2.04%), Meeting Abstracts with 9 (1.53%), Corrections with 7 (1.19%), Letters with 4 (0.68%), Editorial Material with 3 (0.51%), Book

review with 1 (0.17%), and Retracted publication with 1 (0.17%) respectively. This shows that 93% of the researchers frequently like article type document and only 7% of researchers like other types of documents.

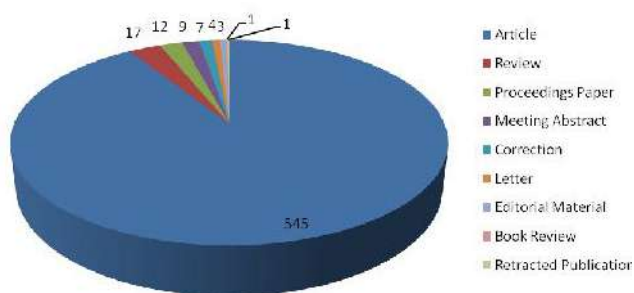


Figure 1: Distribution of papers by types of document

### Most Prolific Authors (Top 8)

The table 4 shows the top 8 prolific authors' contribution during the period of study. From the observation of the table it was found that Thapa, R.K. secured first rank with 82 (21.58%) publications, followed by Tiwari, D. with 61 (16.05%) publications, Lee, S.M. with 51 (13.42%) publications, Kumar, N.S. with 46 (12.11%) publications, Sandeep with 45 (11.84%) publications, Shankar, A. with 35 (9.21%) publications, Singh, B.P. with 33 (8.68%) publications, and Tiwari, R.P. with 27 (7.11%) publications ranked second to eighth respectively based on the study.

Table 4: Top 8 Authors during 2002- 2018

| Sl. No. | Name of Author | No. of Publications | Percentage (%) | No. of citations | Average citations per paper | h-Index |
|---------|----------------|---------------------|----------------|------------------|-----------------------------|---------|
| 1       | Thapa, R.K.    | 82                  | 21.58          | 509              | 6.2                         | 13      |
| 2       | Tiwari, D.     | 61                  | 16.05          | 1177             | 19.62                       | 19      |
| 3       | Lee, S.M.      | 51                  | 13.42          | 1007             | 19.75                       | 17      |
| 4       | Kumar, N.S.    | 46                  | 12.11          | 165              | 3.58                        | 8       |
| 5       | Sandeep        | 45                  | 11.84          | 290              | 6.44                        | 11      |
| 6       | Shankar, A.    | 35                  | 9.21           | 207              | 5.91                        | 10      |
| 7       | Singh, B.P.    | 33                  | 8.68           | 322              | 9.75                        | 10      |
| 8       | Tiwari, R.P.   | 27                  | 7.11           | 293              | 10.85                       | 9       |

### Top 10 journals preferred by the authors

The table 5 reveals the top 10 journals during the study where out of 586 publications *Current Science* with 15 (2.56%) publications was leading journal among all the journals, trailed by *Indian Journal of Physics* with 12 (2.04%) publications,

*Chemical Engineering Journal* and *Journal of Alloys and Compounds* with 11 (1.87%) publications each, *Zootaxa* with 10 (1.70) publications, *Environmental Science and Water Pollution Research* with 9 (1.53%) publications, *Desalination and Water Treatment* and

*Environmental Monitoring and Assessment* with 8 (1.36%) publications each, *Indian journal of Agriculture sciences* and *Genetic Resources and*

*Crop Evolution* with 7 (1.19%) publications each during the period of study.

**Table 5: Top 10 Journals preferred by authors during 2002- 2018**

| Sl. No. | Name of Journal                                     | Publisher   | Impact Factor | No. of Publications | Percentage (%) |
|---------|---|---|---------------|---------------------|----------------|
| 1       | <i>Current Science</i>                              | Current Science Association (India)   | 0.756         | 15                  | 2.56           |
| 2       | <i>Indian Journal of Physics</i>                    | Springer Science & Business Media   | 1.242         | 12                  | 2.04           |
| 3       | <i>Chemical Engineering Journal</i>                 | Elsevier  | 8.355         | 11                  | 1.87           |
| 4       | <i>Journals of Alloys and Compounds</i>             | Elsevier  | 3.779         | 11                  | 1.87           |
| 5       | <i>Zootaxa</i>                                      | Magnolia Press (New Zealand)  | 0.931         | 10                  | 1.70           |
| 6       | <i>Environmental Science and Pollution Research</i> | Springer Verlag   | 1.620         | 9                   | 1.53           |
| 7       | <i>Desalination and Water Treatment</i>             | Taylor & Francis  | 0.65          | 8                   | 1.36           |
| 8       | <i>Environmental Monitoring and Assessment</i>      | Springer (Netherlands)  | 1.959         | 8                   | 1.36           |
| 9       | <i>Indian Journal of Agricultural Sciences</i>      | Indian Journal of Fisheries for the Indian Council of Agricultural Research | 0.29          | 7                   | 1.19           |
| 10      | <i>Genetic Resources and Crop Evolution</i>         | Springer Verlag   | 0.67          | 7                   | 1.19           |

### Top 10 Collaborative Institutions with Mizoram University

The table 6 states the top 10 collaborative institutions with Mizoram University during the study. Out of 586 publications Catholic Kawndong university with 53(9.04%) publications was the highest collaborative institutions during the period of study, trailed by Council of Scientific Industrial Research CSIR India with 28 (4.77%) publications, NIT Silchar with 26 (4.43%) publications, University De Mascara with 25

(4.26%) publications, Assam University Silchar and Department of Science Technology India with 21(3.58%) publications each, NEHU Shillong with 19 (3.24%) publications, Condensed Matter Phys Res CTR with 17 (2.90%) publications, University of North Bengal with 16 (2.73%) publications, and Banaras Hindu University with 15 (2.56%) publications during the period of study. This shows that Mizoram University has a good number of collaborative works with other Indian Institutions.



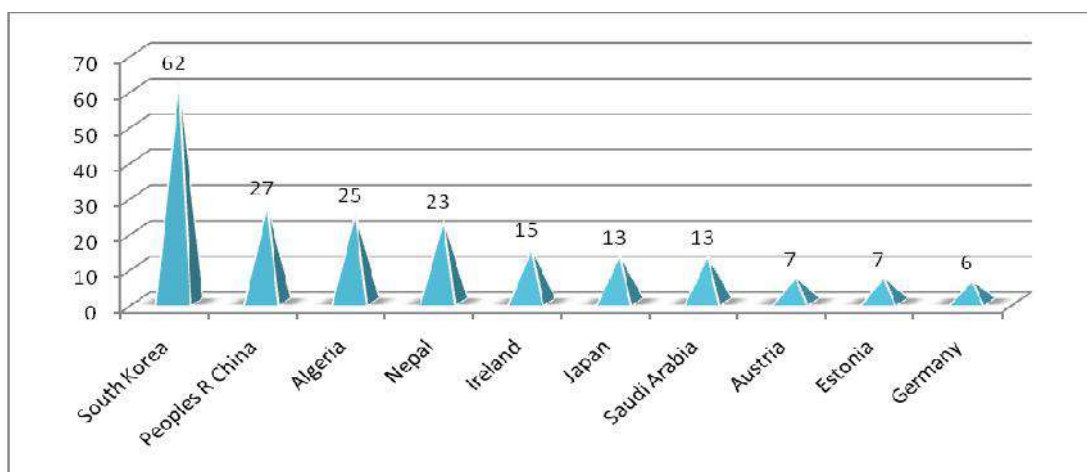
**Table 6: Top 10 Collaborative Institutions with Mizoram University during 2002- 2018**

| Sl. No. | Name of Institution                                  | Name of Country | No. of Publications | Percentage (%) | No. of citations |
|---------|--|-----------------|---------------------|----------------|------------------|
| 1       | Catholic Kwandong University                         | South Korea     | 53                  | 9.04           | 1026             |
| 2       | Council of Scientific Industrial Research CSIR India | India           | 28                  | 4.77           | 440              |
| 3       | NIT Silchar  | India           | 26                  | 4.43           | 109              |
| 4       | University De Mascara                                | Algeria         | 25                  | 4.26           | 123              |
| 5       | Assam University Silchar                             | India           | 21                  | 3.58           | 122              |
| 6       | Department of Science and Technology India           | India           | 21                  | 3.58           | 239              |
| 7       | NEHU Shillong  | India           | 19                  | 3.24           | 208              |
| 8       | Condensed Matter Phys Res CTR                        | Nepal           | 17                  | 2.90           | 101              |
| 9       | University of North Bengal                           | India           | 16                  | 2.73           | 63               |
| 10      | Banaras Hindu University                             | India           | 15                  | 2.56           | 215              |

**Top 10 Collaborative countries with Mizoram University**

The figure 2 deals with top 10 collaborative countries with Mizoram University during the study. Out of total of 586 publications South Korea with 62 (10.58%) publications was the highest collaborative country during the study, followed by Peoples R China with 27 (4.60%) publications, Algeria with 25 (4.26%) publications, Nepal with 23 (3.92%) publications, Ireland with 15 (2.56%) publications, Japan and Saudi Arabia with 13 (2.21%) publications each, Austria and Estonia with 7 (1.19%) publications each and Germany with 6 (1.02%) publications.

From the observation of the figure it was found that South Korea was the most preferred country for collaboration among all the collaborative countries.



**Figure 2: Top 10 Collaborative countries with Mizoram University during 2002- 2018**

## DISCUSSIONS AND CONCLUSION

The present study deals with the published articles limited to only Mizoram University. One can observe that many authors from various countries have jointly published their articles with Mizoram University during the period of study. Six or more than six authored publications were the most favored authorship pattern among the authors and the single-authored papers were very less during the study period. In the year 2016, the maximum number of publications recorded 108, constituting 18.43% the second highest number of publications in the year 2017 which is 84, constituting 14.33% during the period of study from Mizoram University. The study found that maximum documents published were in the form of article which was 545(93%) followed by review paper 17(2.9%). Thapa, R.K. and Tiwari, D. were the most prolific contributors during the period under study. *Current Science* was the journal published the highest number of publication during the period of study. South Korea has contributed the maximum i.e. 62 (10.58%) publications and Peoples R China has 27 (4.60%) contributions.

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