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# A Bibliometric study of Papers Published in the Indian Journal of Natural Products and Resources during 2010-2020

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*Indian Journal of Natural Products and Resources* (IJNPR) is a publication of the CSIR-National Institute of Science Communication and Policy Research (CSIR-NIScPR). This study makes a bibliometric assessment of the papers published in the journal from 2010 to 2020. The data was collected from the website of the journal and was analysed using MS Excel. The bibliometric assessment examines the nature and distribution of documents by their types, the geographical distribution of the papers by countries, Indian states, institutions, and authors and the impact of their productivity as reflected by the citation indicators. In addition, the trend in authorship, citations and national and international collaboration was also examined. A total of 587 documents were published during the study period, of which the majority were original research articles. Analysis revealed that during the study period, contributions from 35 countries including India were published in the journal. Maximum contributions from India were from the state of Maharashtra and Tamil Nadu. The study also found that only a small number of papers didn't receive any citations but a substantial number of papers (17.7%) received 6-10 citations and about 1.7% of papers received 100 or more citations. Most of the highly cited papers were reviews. The multi-authored articles were predominant, whereas the least contribution was by single authors.

**Keywords:** Bibliometrics, Citation analysis, i-10 index, *Indian Journal of Natural Products and Resources*

## Introduction

The most significant avenue for communicating research results is the primary journals. They are crucial to disseminate new scientific information and advancements in a discipline. They showcase important issues of a scientific discipline and profession. Several factors like journal productivity and the citation analysis of its documents may be used to rank the journals. Besides the journal impact factor, several journal ranking indicators like SCImago Journal Rank (SJR) and Source-Normalized Impact per Paper (SNIP) have also been suggested as proxies for journal impact measurement.

In the last two decades, many researchers have developed scientometric profiles of individual journals in various scientific disciplines. For instance, Narang[1] evaluated the *Indian Journal of Pure and Applied Mathematics* for 737 papers and 8396 citations received by these articles published during 1998-2002. Results of the study show that the number of documents published has increased in consecutive volumes and also the majority of the papers were written in collaboration. There was almost equal national (India) and international contributions. The top contributor from India was Uttar Pradesh. The University of Delhi was the top contributor from the Indian universities/institutes. In another study, Jena[2] undertook a study of papers published in the *Indian Journal of Fibre and Textile Research* during 1996-2004. It was observed that the number of documents published in each volume started increasing from the year 1996 onwards and the highest number of documents published was three authored. The geographical distribution of authors showed that the maximum contribution was from India. Delhi, Haryana, West Bengal, and Maharashtra together contributed 71.21% of the documents.

Vijay and Raghvan[3] analysed 779 documents published in the *Journal of Food Science and Technology* during 2000-2004. Results of the study showed that there was an increase in the number of documents published in consecutive issues and also that India's contribution was the maximum in all the

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issues. The two authored documents were the maximum. Garg *et al.*[4] analysed the 369 documents published during 2003-2006 in the journal *Mausam*. It was observed that the researchers from the India Meteorological Department were the major contributor. The authors observed that the references cited by the papers were mostly international but majority of the citations were more than a decade old. Kumar *et al.*[5] analysed the documents published during 1982-2006 in the *Pramana: A Journal of Physics*. Authors observed an increasing trend in both the number of documents published and the impact factor of the journal during the study period. An increasing trend in collaborative papers was also observed. About a quarter of the documents published were from outside India. The journal published predominantly in cosmology; super symmetry; chaos; quantum chromo dynamics; phase transition; and quark-gluon plasma.

Nishy *et al.*[6] made a bibliometric assessment of the *Indian Journal of Chemistry Section B* wherein they studied the growth pattern, citations received, and the number of contributing authors, and papers contributed by Indian and foreign authors published during 2005-2009. The study found that the contributions of Indian universities were more as compared to government, private, public and CSIR laboratories. Garg and Singh[7] analysed 1,286 documents published in the *Indian Journal of Traditional Knowledge* during 2002-2015 and found that the number of documents published declined during the later period. The documents were contributed by authors from 24 countries, mostly from India. The Indian State of Uttar Pradesh was the major contributor. Among the institutions, the Central Agricultural University, (Pasighat, Arunachal Pradesh) was the major contributor. Ethnomedicine and traditional medicine was the highest used keywords as was evidenced by the study of the keywords. The paper also identified the most prolific authors and highly cited papers. Bala and Singh[8] studied the documents published in the *Indian Journal of Biochemistry and Biophysics* during 2009-2013. The study found that the maximum number of documents was published in 2013 and the minimum in 2011. About 70% of the contribution was from India. Half of the articles published were multi-authored and had a page length of 3-6 pages. The maximum contribution was from the academic institutions. Kalita[9] analysed 8335 papers published from 2006 to 2015 in the weekly journal *Nature*. These papers were contributed by 107,334 authors from 111 countries and affiliated with 2369 institutes. USA and England contributed the maximum with about 70% and 19% of papers respectively. Japan and China were the only Asian countries among the top 15 countries. Among the institutions, the University of California contributed the maximum with 16.11% of articles followed by Harvard University with 12.57%. Das[10] studied the documents published in the *Journal of Chemical Sciences* during 1987-1996. The results indicated that the greatest number of documents was published in 1993 (127) and the least in 1994 (21) articles. The trend in authorship indicated that 83.5% of papers were jointly authored and the remaining 16.5% were single-authored papers. Predominant research areas included physical and theoretical chemistry (291 articles) followed by inorganic and analytical chemistry (208 articles). Recently, Hassan *et al.*[11], made a bibliometric analysis of 2134 records published during 2009-2019 in the *Arabian Journal of Chemistry*. The result indicated that 94% of the total published records were research articles and the remaining were reviews. The study identified the top 10 countries, institutions, authors and their citation impact. India ranked among the top-producing countries.

Developing a scientometric profile of an individual journal may be useful for librarians in deciding which journals to acquire for the library collection besides giving information about the development of the journal[12]. It may also help in preparing a road map of the journal for the future. Stamm *et al.*[13] have evaluated the nature of submissions, the impact of the blind peer review, and factors affecting the decision of documents of the journal *Head & Face Medicine*.

For a detailed review of studies on individual journals, readers can refer to Kevin *et al.*[14]. The authors made a review of 82 bibliometric studies of individual journals in different disciplines published during 1998-2008. The study found that "the Indian authors contributed 28% of the total articles with 36.6% unique titles".

An in-depth literature review pointed out no bibliometric study has been undertaken to analyse the *Indian Journal of Natural Resources and Products* (IJNPR). IJNPR, a quarterly, open-access journal having both print and online editions is published by CSIR-National Institute of Science Communication and Policy Research (NIScPR) (erstwhile CSIR-National Institute of Science Communication and

Information Resources). Earlier, it was a bi-monthly publication under the name *Natural Product Radiance* (NPR) that was first published in 2002. In 2010, NPR was split into the *Natural Products and Resources Repository* (NPARR) and the *Indian Journal of Natural Products and Resources*. The journal publishes original research papers, reviews, and short communications. The journal caters to research areas relevant to academicians, researchers, entrepreneurs, technologists, policymakers, etc. The journal is multidisciplinary and of applied nature. The journal is indexed by the Scopus database of Elsevier (2006 onwards), the Emerging Sources Citation Index (2015 onwards) of Clarivate Analytics (USA), and included in the Directory of Open Access Journals (2017 onwards). The journal is also indexed by the National Academy of Agricultural Scientists, New Delhi in its NAAS score of science journals. Besides, it is also covered in many other national and international abstracting and indexing services. Hence, the present study, aimed to conduct a bibliometric assessment of the documents published in the journal from 2010 to 2020.

## Materials and Methods

### Objectives of the study

The present study provides a detailed bibliometric analysis of the documents published in IJNPR during 2010 - 2020 (11 years) with the following objectives:

(a) To examine the type of documents and chronological distribution of output during 2010-2020;

(b) To assess the geographical distribution of documents (national and international) and their impact as seen in terms of citations per paper and i-10 index;

(c) Identification of most prolific institutions and authors and the impact of their productivity;

(d) To assess the trend in citations received and highly cited papers;

(e) To assess the trend in authorship, national and international linkages.

### Data collection and analysis

The journal under study is an open-access journal[15]. The authors collected the bibliometric data from the journal website for 11 years from volume 1 (2010) to volume 11 (2020). Data management and analysis were conducted using Ms-Excel. The citation data for the published documents were collected from Google Scholar in April 2022. The citations received by the documents were searched in Google Scholar by using the title of the document. The impact of the published papers was examined using citation per paper (CPP) and the i-10 index. Highly cited articles were identified based on the citations received by the documents. The complete count (CC) method was used to assess of document's output and the citations received. The CC method is dissimilar to the first author count in which only the first author gets credit. In the CC, all the countries/ institutions/ authors in multi-authored papers get unit credit leading to inflation of the number of contributions and citations. Due to this method, the number of documents in the present study also inflated from 587 to 2050.

### Bibliometric indicators

The study used the following bibliometric indicators: Total number of publications (TNP), the total number of citations (TNC) received by documents as reflected by Google Scholar till April 30, 2022, and Citation per Paper (CPP) for comparing the influence of countries, Indian States, institutions, and authors[16]. Besides these, authors also used i-10 index suggested by Google Scholar to identify documents that received 10 or more citations.

## Results and Discussion

Results of the study on different parameters as outlined in the objectives are described below.

### Type of documents

During the study period of 2010-2020 (11 years), IJNPR published 587 records. Of these, 484 (82.5%) were articles, the remaining were review articles and short communication. The share of review articles and short communications was 58 (9.8%) and 45 (7.7%) respectively. Like other scientific journals, the share of research articles was highest in INJPR also. Table 1 depicts the year-wise distribution of research and review papers besides the number of short communication published in the journal during 2010-2020. Data depicted in Table 1 indicates that the share of research papers was lowest in the years 2015 and 2016, while the number of review papers and short communications was highest in the same period.

### Chronological distribution of output

The journal published 587 documents in 44 issues published in 11 volumes during 2010-2020. On average, 53.4 papers were published in each volume and 13.3 documents per issue. Table 1 highlights that the journal published more than an average number of

Table 1 — Type of documents and total papers published in IJNPR during 2010-2020

| Year (volume) | Research papers (%) | Review papers (%) | Short communications (%) | TNP (%) |
|---|---|---|---|---|
| 2010 (1) | 65 (82.3) | 9 (11.4) | 5 (6.3) | 79 (13.5) |
| 2011 (2) | 61 (80.3) | 8 (10.5) | 7 (9.2) | 76 (12.9) |
| 2012 (3) | 70 (88.6) | 3 (3.8) | 6 (7.6) | 79 (13.5) |
| 2013 (4) | 53 (85.5) | 4 (6.5) | 5 (8.1) | 62 (10.6) |
| 2014 (5) | 44 (80.0) | 5 (9.1) | 6 (10.9) | 55 (9.4) |
| 2015 (6) | 34 (73.9) | 7 (15.2) | 5 (10.9) | 46 (7.8) |
| 2016 (7) | 33 (73.3) | 6 (13.3) | 6 (13.3) | 45 (7.7) |
| 2017 (8) | 32 (80.0) | 5 (12.5) | 3 (7.5) | 40 (6.8) |
| 2018 (9) | 32 (84.2) | 4 (10.5) | 2 (5.3) | 38 (6.5) |
| 2019 (10) | 25 (89.3) | 3 (10.7) | 0 (0.0) | 28 (4.8) |
| 2020 (11) | 35 (89.7) | 4 (10.3) | 0 (0.0) | 39 (6.6) |
| Total | 484 (82.5) | 58 (9.8) | 45 (7.7) | 587 |

Number of articles/volume = 587/11 = 53.4

Table 2 — Distribution of output and impact of most prolific countries

| S. No. | Country | TNP (%) | TNC | CPP |
|---|---|---|---|---|
| 1 | India | 1851 (90.3) | 30167 | 16.3 |
| 2 | Malaysia | 24 (1.2) | 103 | 4.3 |
| 3 | Indonesia | 22 (1.1) | 57 | 2.6 |
| 4 | Iran | 19 (0.9) | 138 | 7.3 |
| 5 | Vietnam | 12 (0.6) | 9 | 0.8 |
| 6 | South Africa | 11 (0.5) | 521 | 47.4 |
| 7 | Bangladesh | 10 (0.5) | 150 | 15.0 |
| | Sub-total | 1949 (95.1) | 31145 | 15.8 |
| | *Other 28 countries | 101 (4.9) | 878 | 8.7 |
| | Total | 2050 (100) | 32023 | 15.6 |

*France & Nepal each 8, Cuba, Egypt & Mexico each 7, Algeria, Brazil, Morocco, Nigeria, Pakistan & Oman 5 each, Japan & Ukraine each 4, Germany, Philippines, & USA each 3, Bulgaria, Ethiopia, Turkey & United Arab Emirates each 2, Australia, Cameroon, Romania, Russia, Saudi Arabia, Sri Lanka, South Korea & Switzerland each 1.

documents during 2010-2012. The number of documents published declined considerably from 2015 onwards. The journal published the highest number of articles in Volume 1 (2010) and Volume 3 (2012) closely followed by Volume 2 (2011). The lowest number of articles was published in volume 11 (2019). Thereafter in 2020, the number of papers published was at par with the year 2017-2018. To find out the current trend, the authors looked at the journal website, which revealed that the journal published 67 articles in 2021, which is more than the articles published during 2013-2020. Hence, it can be said that post-2019, there has been an increase in the number of papers published, which may be due to an increased inflow of papers and improved footprints of the journal. Improved visibility may be due to the inclusion of the journal in the Emerging Sources Citation Index of Clarivate Analytics, Directory of Open Access Journals, etc. There has been variation in the number of papers published during different years. The findings are comparable to the result of Garg and Singh[7], for papers published in the *Indian Journal of Traditional Knowledge* during 2002-2015. Fig. 1 shows the share of national and international contributions (in percentage) of the papers published during 2010-2020. The share of international contributions was very low at the time of the start of the journal and it reached its peak in the year 2018. No international contribution was made to the journal during the years 2010 and 2015.

**Geographical distribution of contributions and their productivity impact**

The analysis of data indicates that 35 countries including India, contributed papers to the journal during the study period. Regional distribution of countries indicates that the majority of the contributing countries were from Asia (16) followed by Europe and Africa (7 each), and North America (3). The remaining two countries were Brazil and Australia. Table 2 gives the geographical distribution of output and its impact in terms of citations per paper (CPP) for seven countries which produced half per cent or more of the output. Among these seven

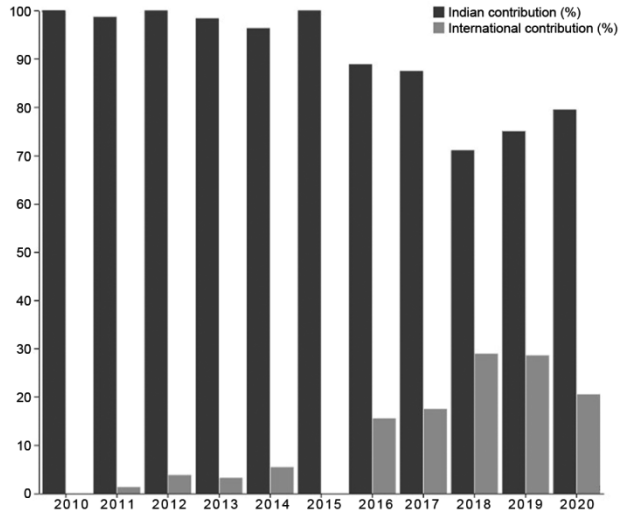


Fig. 1 — National and international contributions.

countries, India contributed about 90% of the total output. India being the host country of the journal may be the reason for maximum contributions being from India. The contribution of India is also more in journals published in India like *Indian Journal of Traditional Knowledge*[7], and *Indian Journal of Biochemistry and Biophysics*[8]. The other six countries listed in Table 2 contributed about five per cent of the documents. Twenty-eight countries which produced less than half per cent of the papers also contributed about five per cent of the total documents. The output trend highlights a highly skewed distribution of documents as 34 countries contributed only about 10 % of the total output. The overall value of CPP for all countries is 15.6. Among the seven prolific countries listed in Table 2, the highest value of CPP is for South Africa (47.4) followed by India (16.3) and Bangladesh (15.0), which is very close to the overall value of CPP. For the remaining 32 countries, the value of CPP is much less than the overall value of CPP. The other 28 countries have been listed in the bottom row of Table 2. It indicates that among these only few developed countries namely France, Japan, Germany, USA, Switzerland and Australia contributed papers to the journal. The number of papers by them is given against each.

**Distribution of output by performing sectors**

The bulk of funding for R&D in India as well as in foreign countries comes from the government. However, in developed countries industrial houses also are a major source of funding for R&D. For analyzing the output data by performing sectors, we have classified output data into different sectors like academic institutions, research institutions under different scientific agencies, institutes of technology, institutions funded by state governments etc. (Table 3). An analysis of data indicates that the academic institutions contributed the highest (41.5%) publications followed by the Indian Council of Agricultural Research (ICAR) which contributed 13.3% of output and colleges of pharmacy (10.1%). These three sectors contributed slightly less than two-thirds (64.9%) of papers. The remaining one-third of the output was contributed by other sectors listed in Table 3. Among these, the Medical colleges of Ayurved contributed the maximum number of papers followed by the Council of Scientific and Industrial Research (CSIR).

Table 3 — Distribution of output by performing sectors

| S. No. | Contributors | TNP (%) |
|---|---|---|
| 1 | Academic Institutions | 852 (41.6) |
| 2 | Indian Council of Agricultural Research (ICAR) | 273 (13.3) |
| 3 | Colleges of Pharmacy (CPHAR) | 208 (10.1) |
| 4 | Medical Colleges of Ayurveda (MEDCA) | 107 (5.2) |
| 5 | Council of Scientific and Industrial Research | 99 (4.8) |
| 6 | Institutes of Technology including IITs | 77 (3.8) |
| 7 | State Governments (Kerala 43) | 65 (3.2) |
| 8 | Private Research Institutions | 60 (2.9) |
| 9 | Research institutions under different scientific agencies | 47 (2.3) |
| 10 | Ministry of Environment and Forests | 29 (1.4) |
| 11 | NGOs & Societies | 23 (1.1) |
| | Sub total | 1840 (89.8) |
| | Foreign contributions | 180 (8.8) |
| | Others institutions | 30 (1.5) |
| | Total | 2050 (100) |

**Distribution and impact of output by the Indian states**

***Productivity***

Table 4 lists 19 Indian States and Union Territories (UT) that contributed about two per cent of the total output along with the total citations received by each and the values of CPP and i-10 index. Among these, the State of Maharashtra closely followed by Tamil Nadu topped the list with 216 and 215 publications respectively. Karnataka ranked third in order of productivity. The rest of the documents were contributed by 16 states and UTs. Of these, Uttar Pradesh and Uttarakhand contributed 8.2% and 6.3% of papers respectively. Thus these five states together contributed about half (48.4%) of the total output.

***Impact***

The authors analysed the impact of the output of the listed states and UTs using CPP and i-10 index.

Table 4 — Distribution of output and impact of most prolific Indian States

| S. No. | States | TNP (%) | TNC | CPP | i-10 index (%) |
|---|---|---|---|---|---|
| 1 | Maharashtra | 216 (11.7) | 3493 | 16.2 | 96 (44.4) |
| 2 | Tamil Nadu | 215 (11.6) | 3168 | 14.7 | 121(56.3) |
| 3 | Karnataka | 198 (10.7) | 2802 | 14.2 | 90 (45.5) |
| 4 | Uttar Pradesh | 151 (8.2) | 4801 | 31.8 | 100 (66.2) |
| 5 | Uttarakhand | 117 (6.3) | 1850 | 15.8 | 59 (50.4) |
| 6 | *Andhra Pradesh | 115 (6.2) | 1443 | 12.5 | 44 (38.3) |
| 7 | Himachal Pradesh | 91 (4.9) | 1370 | 15.1 | 41 (45.1) |
| 8 | Assam | 88 (4.7) | 594 | 6.8 | 18 (20.5) |
| 9 | Gujarat | 85 (4.6) | 804 | 9.5 | 15 (17.6) |
| 10 | Kerala | 79 (4.3) | 1253 | 15.9 | 62 (78.5) |
| 11 | West Bengal | 77 (4.2) | 999 | 13.0 | 34 (44.2) |
| 12 | Madhya Pradesh | 69 (3.7) | 1046 | 15.2 | 38 (55.1) |
| 13 | Delhi | 66 (3.6) | 2259 | 34.2 | 33 (50.0) |
| 14 | Rajasthan | 66 (3.6) | 1205 | 18.3 | 29 (43.9) |
| 15 | Punjab | 35 (1.9) | 516 | 14.7 | 20 (57.1) |
| 16 | Odisha | 34 (1.8) | 564 | 16.6 | 20 (58.8) |
| 17 | Manipur | 32 (1.7) | 594 | 18.6 | 14 (43.8) |
| 18 | Haryana | 23 (1.2) | 626 | 27.2 | 12 (52.2) |
| 19 | Jammu & Kashmir | 21 (1.1) | 147 | 7.0 | 5 (23.8) |
| | Sub-total | 1778 (96.1) | 29534 | 16.6 | 851 (47.8) |
| | **Other 11 states | 73 (3.9) | 633 | 8.7 | 31 (42.5) |
| | Total | 1851(100) | 30167 | 16.3 | 882 (47.6) |

*Telangana merged with Andhra Pradesh as it was carved out of Andhra Pradesh

** Bihar (2), Goa (2), Mizoram (3), Imphal (4), Jharkhand (4), Puducherry (4), Arunachal Pradesh (7), Sikkim (7), Tripura (11), Meghalaya (13), Chhattisgarh (16)

The average value of CPP for all states and UTs was 16.3. Among these, five states and the UT of Delhi had a higher value of CPP than the overall value of CPP. Other states and UTs had a low value of CPP than the overall value of CPP. Among all the States and UTs, the highest value of CPP was for the UT of Delhi (34.2) followed by Uttar Pradesh (31.8) and Haryana (27.2). The lowest value of CPP was for Assam (6.8) and Jammu and Kashmir (7.0). Of the 1,851 papers published in the journal, 882 (47.6%) documents received 10 or more citations. Among the listed 19 states, the share of articles having 10 or more citations was more than 47.6% for nine states and for the remaining ten states it was less than 47.6%. Among the 19 states, the share of papers cited 10 or more times was highest (78.5%) for the state of Kerala followed by the state of Uttar Pradesh (66.2%) and Odisha (58.8%). The lowest share of papers cited 10 or more times was for Gujarat, Assam and Jammu and Kashmir.

**Most prolific institutions and the impact of their productivity**

Total research output came from 593 institutions located in India and abroad. Table 5 lists 21 institutions which contributed 14 or more papers along with the citations received by these papers and the values of the i-10 index. These 21 institutions were located in 12 Indian States. Maximum institutions were located in Karnataka and Maharashtra (3 each) followed by Tamil Nadu and Uttar Pradesh (2 each). The remaining 11 institutions are in 11 different Indian States as depicted in Table 4. These 21 institutions contributed about 16.2% of the total output and attracted 15.6% of total citations. Among these 21 institutions, the highest number of papers was contributed by Dr. Yashwant Singh Parmar University of Horticulture and Forestry (YSPUHF), Himachal Pradesh followed by Gujarat Ayurved University. No foreign institution could find a place in the category of prolific institutions as the number of papers contributed by these institutions was less than 14.

***Impact***

The overall value of CPP for the complete output is 15.4. Among the 21 prolific institutions, CPP is more than the overall value of the entire output for nine institutions and for the remaining 12, CPP is less than the overall value. A look at the prolific institutions revealed that the greatest value of CPP (44.6) is CSIR-National Botanical Research Institute (UP) followed by The Oxford College of Pharmacy,

Table 5 — Distribution of output and impact of most prolific institutions

| S. No | Name of the institution | TNP | TNC | CPP | i-10 index (%) |
|---|---|---|---|---|---|
| 1 | Dr YSPUHF, Himachal Pradesh (Himachal Pradesh) | 57 | 781 | 13.7 | 24 (42.1) |
| 2 | Gujarat Ayurved University (Gujarat) | 45 | 171 | 3.8 | 4 (8.9) |
| 3 | *TBGRI (Kerala) | 40 | 696 | 17.4 | 40 (100.0) |
| 4 | Dibrugarh University (Assam) | 36 | 129 | 3.6 | 1 (2.8) |
| 5 | **CSIR-CIMAP (UP) | 30 | 716 | 23.9 | 27 (90.0) |
| 6 | Andhra University (Andhra Pradesh) | 19 | 180 | 9.5 | 10 (52.6) |
| 7 | Punjab Agricultural University (Punjab) | 19 | 144 | 7.6 | 10 (52.6) |
| 8 | GBPUAT (Uttarakhand) | 18 | 486 | 27.0 | 13 (72.2) |
| 9 | CSIR-National Botanical Research Institute (UP) | 18 | 802 | 44.6 | 12 (66.7) |
| 10 | Institute of Chemical Technology (Maharashtra) | 18 | 287 | 15.9 | 10 (55.6) |
| 11 | M.S. Ramaiah College of Pharmacy (Karnataka) | 18 | 269 | 14.9 | 10 (55.6) |
| 12. | Kuvempu University (Karnataka) | 17 | 323 | 19.0 | 7 (41.2) |
| 13 | Manipur University (Manipur) | 17 | 359 | 21.1 | 7 (41.2) |
| 14 | The Oxford College of Pharmacy (Karnataka) | 16 | 587 | 36.7 | 12 (75.0) |
| 15 | Banaras Hindu University (UP) | 15 | 198 | 13.2 | 11 (73.3) |
| 16 | Bharathiar University (Tamil Nadu) | 14 | 311 | 22.2 | 13 (92.9) |
| 17 | Bharati Vidyapeeth Deemed University (Maharashtra) | 14 | 202 | 14.4 | 14 (100.0) |
| 18 | Jadavpur University (West Bengal) | 14 | 202 | 14.4 | 11 (78.6) |
| 19 | North Maharashtra University (Maharashtra) | 14 | 112 | 8.0 | 3 (21.4) |
| 20 | Botanical survey of India | 14 | 114 | 8.1 | 7 (50.0) |
| 21 | St. Xaviers College (Tamil Nadu) | 14 | 155 | 11.1 | 9 (64.3) |
| | Sub total | 333 (16.2) | 4927 (15.6) | 14.8 | 172 (51.7) |
| | Other 580 institutions | 1717(83.8) | 26575 | 15.5 | 754 (43.9) |
| | Total | 2050 | 31502 | 15.4 | 926 (45.2) |

*TBGRI: Tropical Botanic Garden and Research Institute; **CSIR-CIMAP: Central Institute of Medicinal and Aromatic Plants

Karnataka and Govind Ballabh Pant University of Agricultural Technology (GBPUAT), Uttarakhand. The value of CPP is lowest for Dibrugarh University, Assam and Gujarat Ayurved University, Gujarat. Analysis of i-10 index data reveals that of all the published papers, about 45% received 10 or more citations and the remaining 55% were cited less than 10 times. Further, it was observed that all articles published by TBGRI, Kerala and Bharati Vidyapeeth Deemed University received 10 or more citations. More than ninety per cent of papers of Bharathiar University (Tamil Nadu) and CSIR-CIMAP (UP) were also cited 10 or more times. Of the 36 papers published by Dibrugarh University, Assam, only one paper was cited ten times and the rest of the 35 papers received less than 10 citations. Similarly, four papers out of 45 papers published by Gujarat Ayurved University (Gujarat) were cited 10 or more times.

**Prolific authors and their productivity impact**

The entire set of documents was contributed by 1,806 authors scattered in different parts of India and abroad. The average number of authors per paper is 1.1. Table 6 lists 25 authors with four or more papers. Of these 25 authors, seven authors were from TBGRI (Kerala), three from Gujarat Ayurved University (Gujarat), and two each from CIMAP (UP), M S Ramaiah College of Pharmacy (Karnataka) and YSPUHF, Himachal Pradesh. These 25 authors published 121 (5.9%) papers. The rest 94.1% of the papers were contributed by 1,781 authors highlighting a highly skewed distribution of documents among the authors. These authors contributed articles in the range of one to three. Among all the authors, the highest impact in terms of CPP was for Paarakh, P.M. of Oxford College of Pharmacy, Karnataka, followed by Sharma. R. of YSPUHF (Himachal Pradesh) and Prakash, O. of GBPUAT, Uttarakhand. The value of CPP for these three authors was 56.7, 26.6, and 26.0 respectively. The lowest value of CPP was for Mohan Mahalaxmi (2.5), Kakoti, B.B. (2.8), and Acharya, R.N. (3.0). The value of CPP for these authors is much less than the overall value of CPP.

**Pattern of citations**

Citation counts are an indicator of the impact of an article published in a journal. The impact was examined by counting the number of times a document is cited by other documents. Citation counts estimate the visibility and impact of a document. The

Table 6 — Highly prolific authors of IJNPR during 2010-2020

| S. No. | Author | Institution | TNP | TNC | CPP |
|---|---|---|---|---|---|
| 1 | Acharya, R.N. | Gujarat Ayurved University, Gujarat | 8 | 24 | 3.0 |
| 2 | Ashok, B.K. | Gujarat Ayurved University, Gujarat | 8 | 46 | 5.8 |
| 3 | Ravishankar, B. | SDM College of Ayurveda, Karnataka | 8 | 43 | 5.4 |
| 4 | Joshi, V.K. | YSPUHF , Himachal Pradesh | 7 | 150 | 21.4 |
| 5 | Paarakh, P.M. | The Oxford College of Pharmacy, Karnataka | 7 | 397 | 56.7 |
| 6 | Madhavan, V. | M S Ramaiah College of Pharmacy, Karnataka | 5 | 77 | 15.4 |
| 7 | Sharma. R. | YSPUHF, Himachal Pradesh | 5 | 133 | 26.6 |
| 8 | Yoganarasimhan, S.N. | M S Ramaiah College of Pharmacy, Karnataka | 5 | 77 | 15.4 |
| 9 | Anuja, G.I. | TBGRI, Kerala | 4 | 72 | 18.0 |
| 10 | Biradar, S.D. | Dnyanopasak College, Maharashtra | 4 | 60 | 15.0 |
| 11 | Chand, S. | CIMAP, UP | 4 | 91 | 22.8 |
| 12 | Kakoti, B.B. | Dibrugarh University, Assam | 4 | 11 | 2.8 |
| 13 | Laddha, K.S. | Institute of Chemical Technology, Maharashtra | 4 | 31 | 7.8 |
| 14 | Laitonjam, W.S. | Manipur University, Manipur | 4 | 36 | 9.0 |
| 15 | Latha, P.G. | TBGRI, Kerala | 4 | 72 | 18.0 |
| 16 | Meena, K.L. | MLV Government College, Rajasthan | 4 | 51 | 12.8 |
| 17 | Mohan, Mahalaxmi | MGV College of Pharmacy, Maharashtra | 4 | 10 | 2.5 |
| 18 | Patra, D.D. | CIMAP, UP | 4 | 91 | 22.8 |
| 19 | Prakash, O. | GBPUAT, Uttarakhand | 4 | 104 | 26.0 |
| 20 | Rajsekharan, S. | TBGRI, Kerala | 4 | 72 | 18.0 |
| 21 | Ravishankar, B. | Gujarat Ayurved University, Gujarat | 4 | 24 | 6.0 |
| 22 | Shine, V.J. | TBGRI, Kerala | 4 | 72 | 18.0 |
| 23 | Shyamal, S. | TBGRI, Kerala | 4 | 72 | 18.0 |
| 24 | Sini, S. | TBGRI, Kerala | 4 | 72 | 18.0 |
| 25 | Suja, S.R. | TBGRI, Kerala | 4 | 72 | 18.0 |
| | | Sub total | 121 | 1960 | 16.2 |
| | | Other 1781 authors contributing papers in the range of 1-3 | 1929 | 29542 | 15.3 |
| | | Total | 2050 | 31502 | 15.4 |

greater the citation, the higher may be the influence and visibility of the paper. Table 7 depicts the citation pattern of documents published in the journal during the study period as seen in the last week of April 2022. The 587 documents were cited a total of 9,856 times. It was observed that only a small number i.e., 55 (9.4%) documents were not cited. Of the remaining documents, about 30 % were cited 1-5 times. The rest of the documents were cited five times or more. About 4.4% of documents were cited 50 times or more and about 1.7% of documents were cited 100 times or more.

Table 7 — Distribution of citations of the papers published during 2010-2020

| Number of citations | Number of Papers (%) | Total citations |
|---|---|---|
| 0 | 55 (9.4) | 0 |
| 1 | 42 (7.2) | 42 |
| 2 | 49 (8.3) | 98 |
| 3 | 22 (3.7) | 66 |
| 4 | 36 (6.1) | 144 |
| 5 | 27 (4.6) | 135 |
| 6–8 | 104 (17.7) | 819 |
| 11–15 | 78 (13.3) | 997 |
| 16–20 | 41 (7.0) | 726 |
| 21–25 | 34 (5.8) | 759 |
| 26–50 | 63 (10.7) | 2276 |
| 51–100 | 26 (4.4) | 1777 |
| > 100 | 10 (1.7) | 2017 |
| Total | 587 (100.0) | 9856 |

**Highly cited papers**

Table 8 gives the bibliometric details of the ten documents that received more than 100 citations. These ten documents attracted a total of 2017 (20.5%) citations. The number of times a document is cited varies over a period of time. To avoid the variation, the Citation per Year (CPY) as used earlier by Garg and Tripathi[17], was calculated.The CPY values revealed that the rank of authors as listed by the total citations received changed if CPY was used. For instance, the author ranked 2 will change to rank 1 if arranged by CPY. The author at rank 4 will change to 2, Rank 1 will change to rank 3, 3 to 4, 10 to 9 and vice versa, 7 will become 6 and vice versa. Nine of the ten highly cited papers are review articles except for the paper at serial number 9. This may be due to the fact that the citability of a review is greater owing

Table 8 — Highly cited papers of IJNPR published during 2010-2020

| S. No. | Bibliographic details of paper | TNC | CPY |
|---|---|---|---|
| 1 | Paarakh, P. M. *Nigella sativa* Linn.–A comprehensive review. *IJNPR*, 1(4), 2010, 409-429. The Oxford College of Pharmacy (Bengaluru), | 286 | 28.6 |
| 2 | Srivastava, P., & Malviya, R. Sources of pectin, extraction and its applications in pharmaceutical industry−An overview. *IJNPR*, 2(1), 2011, 10-18. Advance Institute of Biotech and Paramedical Sciences (Kanpur) and Meerut University of Engineering & Technology (Meerut) | 275 | 30.6 |
| 3 | Madan, S., Ahmad, S., Singh, G. N., Kohli, K., Kumar, Y., Singh, R., & Garg, M. *Stevia rebaudiana* (Bert.) Bertoni - A review. *IJNPR*, 1(3), 2010, 267-286. Central Indian Pharmacopiel Laboratory (Ghaziabad) and Jamia Hamdard (New Delhi) | 271 | 27.1 |
| 4 | Dave, H., & Ledwani, L. A review on anthraquinones isolated from *Cassia* species and their applications. *IJNPR*, 3(3), 2012, 291-319. Institute of Plasma Research (Gandhi Nagar) and Manipal University (Jaipur) | 234 | 29.3 |
| 5 | Niranjan, A., Tewari, S. K., & Lehri, A. Biological activities of kalmegh (*Andrographis paniculata* Nees) and its active principles-A review. *IJNPR*, 1(2), 2010, 125-135. National Botanical Research Institute (Lucknow) | 231 | 23.1 |
| 6 | Karsha, P. V., & Lakshmi, O. B. Antibacterial activity of black pepper (*Piper nigrum* Linn.) with special reference to its mode of action on bacteria. *IJNPR*, 1(2), 2010, 213-215. Sarojini Naidu Vanita Mahavidyalaya (Hyderabad) | 185 | 18.5 |
| 7 | Sumbul, S., Ahmad, M. A., Asif, M., & Akhtar, M. *Myrtus communis* Linn.-A review. *IJNPR*, 2(4), 2011, 395-402. Hamdard University (New Delhi) | 172 | 19.1 |
| 8 | Chudiwal, A. K., Jain, D. P., & Somani, R. S. *Alpinia galanga* Willd.–An overview on phyto-pharmacological properties. *IJNPR*, 1(2), 2010, 143-149. Sinhgad College of Pharmacy (Pune) | 157 | 15.7 |
| 9 | Rajakumar, N., & Shivanna, M. B. Traditional herbal medicinal knowledge in Sagar taluk of Shimoga district, Karnataka, India. *IJNPR*, 1(1), 2010, 102-108. Kuvempu University (Shimoga) | 105 | 10.5 |
| 10 | Singh, T. P., & Singh, O. M. Phytochemical and pharmacological profile of *Zanthoxylum armatum* DC.- An overview. *IJNPR*, 2(3), 2011, 275-285. Manipur University (Manipur) | 101 | 11.2 |
| | Total | 2017 | |

Table 9 — Authorship pattern of the papers published during 2010-2020

| Year | Single authored | Two authored | Multi authored | Mega authored | Total |
|---|---|---|---|---|---|
| 2010 | 2 | 26 | 37 | 14 | 79 |
| 2011 | 0 | 24 | 42 | 10 | 76 |
| 2012 | 2 | 26 | 39 | 12 | 79 |
| 2013 | 4 | 20 | 30 | 8 | 62 |
| 2014 | 0 | 11 | 33 | 11 | 55 |
| 2015 | 3 | 10 | 20 | 13 | 46 |
| 2016 | 1 | 10 | 19 | 15 | 45 |
| 2017 | 1 | 11 | 14 | 14 | 40 |
| 2018 | 0 | 8 | 18 | 12 | 38 |
| 2019 | 0 | 6 | 13 | 9 | 28 |
| 2020 | 0 | 12 | 16 | 11 | 39 |
| Total | 13 (2.2 %) | 164 (27.9 %) | 281 (47.9 %) | 129 (21.9 %) | 587 |

to it being knowledge and information-dense on a particular topic.

**Authorship pattern of contributors**

To study the pattern of authorship, the data on the number of authors has been divided into four categories. These were single, two, multi and mega-authored papers. Papers having three or four authors have been categorised as multi-authored and papers having more than four authors as mega-authored papers. The authorship pattern is presented in Table 9. Table 9 highlights that the contribution of single-authored articles is the lowest (2.2%) followed by mega-authored (21.9) papers. However, the share of two authored and multi-authored papers declined in the later period. The share of multi-authored papers is highest like the *Indian Journal of Chemistry* Section A and B[18]. This indicates that the discipline of natural products is highly collaborative.

**Trend in national and international collaborations**

Research these days is becoming increasingly complex and it needs the participation of skills from diverse fields to solve the problem. In the twentieth century, endeavours in science have been characterized by a steady rise in the scale and importance of scientific collaboration, where two or more researchers come together with the aim to attain scientific advancement. It has been observed that collaborative scientific work has been increasing gradually for more than half a century[19]. Beaver, has spelt out the reasons behind forging collaboration[20]. Katz and Martin, provide a detailed description of facets and motives for forging collaboration[21]. The authors analysed the number of papers published in national and international cooperation in the present study.

**Domestic collaboration**

Of the total 587 documents published during the study period, 218 (37.1%) had a national alliance. Of these 218 documents, 211 were published by India, two by Vietnam, and one each by Bangladesh, Cuba, Malaysia, Morocco, and Nepal. These 211 papers published by India had 295 domestic collaborative links with different institutions. Among all the institutes, Haffkine Institute for Training, Research & Testing had the highest (5) domestic collaborative links. This was followed by Agra College, Agra, Dr. Y S Parmar University of Horticulture and Forestry (Solan), Dr. VJD Gramin Ayurved College (Maharashtra), *ICAR Research Complex* for North Eastern Hill Region (*Arunachal Pradesh*) and Jadavpur University (Kolkata) each with four links. The number of links for the remaining institutions varied between one and three.

**International collaboration**

Of the total 587 documents, only 18 (3.1%) papers were published in an international collaboration by 11 different countries. Of the 18 papers published in international collaboration, India and Indonesia published three papers each in international collaboration followed by Germany, Algeria and Malaysia two each and one each by Nigeria, Australia, Cuba, Ukraine, Brazil, and the United Arab Emirates. It was found that the highest number of collaborative links was for Universitas Hindu Indonesia (Republic of Indonesia) and the University of Gottingen (Germany). Both these institutions had four collaborative links with four different Indian institutions. Universitas Hindu Indonesia (Republic of Indonesia) had collaborative links with Purnayoo Arogya Nikethenam, Ayurveda and Yoga Research Centre (Kerala), All India Institute of Ayurveda (New Delhi), Gujarat Ayurved University (Jamnagar) and The Himalaya Drug Company (Bengaluru). University of Gottingen (Germany) had collaborative links with the University of Kentucky (USA), the Islamia University of Bahawalpur (Pakistan), the University of Syiah Kuala (Indonesia), and the National Research Centre (Egypt). The remaining institutions had one collaborative link except for the University of Havana (Cuba) which had two collaborative links.

## Conclusion

The present study made an assessment of 587 documents published in the *Indian Journal of Natural Products and Resources* during 2010-2020. The study investigated the publication's profile and trends besides identifying prolific countries, institutions and authors and assessing their productivity and impact based on citation per paper (CPP) and i-10 index. The study also investigated the citation pattern of published papers, identified highly cited papers, and examined national and international collaboration. Analysis of data highlighted a decreasing trend in productivity and then a reversal. Only a minuscule number of papers were published in domestic and international collaboration. Though India published about 90% of articles, over the study period, the contribution of international authors has increased. This may be due to increased visibility and coverage in national and international indexing and abstracting services. The value of CPP was the maximum for South Africa followed by India and Bangladesh. The highest share of papers was by the State of Maharashtra and Tamil Nadu. The highest value of CPP is for the UT of Delhi followed by Uttar Pradesh. Academic institutions published the maximum number of documents. No institutions from abroad could find a place in the list of prolific institutions. Dr. Yashwant Singh Parmar University of Horticulture and Floriculture (Himachal Pradesh) topped the list of prolific institutions followed by Tropical Botanic Garden and Research Institute (Kerala). CSIR-National Botanical Research Institute (UP) had the highest value of CPP. Tropical Botanic Garden and Research Institute (Kerala) produced the highest number of prolific authors. The present study may be a help in shaping the future evolution and development of the journal and may be useful to readers working in the area of natural products and resources.

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