

INDIAN JOURNAL OF ANIMAL SCIENCE: A SCIENTOMETRIC ASSESSMENT AND APPLICATION OF LOTKA'S LAW (2015-2020)

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ABSTRACT

The Indian Journal of Animal Science is a popular scientific journal in animal breeding, physiology, nutrition, dairying, animal production and fisheries areas as well as respective disease. It is the peer-reviewed and open access journal. This review is aiming to analyse the scientometric attributes of its publications from years 2015-2020. The bibliographic records of publications were retrieved from the Web of Science database on dated 25-11-2021. During the study period, 1720 research papers were published. The data were analysed by using Web of Science and biblioshiny software. The results revealed that maximum number of research papers were published during the year 2020 and also received maximum citations in same year. The research contribution also followed the Lotka's Law. It was interesting to note that the maximum contribution was given by the researchers of ICAR - Indian Veterinary Research Institute, Bareilly. During the study period the highest research publications were also found from India.

Keywords: Scientometrics, Bibliometrics, biblioshiny, Web of Science (WoS), Indian Journal of Animal Science (IJAS), Lotka's Law.

1. Introduction

The Indian Journal of Animal Science (IJAS) is one of the most popular scientific journals in the areas of animal breeding, diseases, physiology, nutrition, dairying, animal production and fisheries. It is a peer-reviewed and open access journal. It is being published by the Indian Council of Agricultural Research (ICAR), New Delhi. IJAS is being regularly indexed in citation database web of science from 1989. IJAS scored 6.28 rank of NAAS in 2021 which is rated as a good score among the Indian journals on animal sciences. According to Journal Citation Report 2020, impact factor of IJAS was 0.316. Thirty three years of continuous and long journey of monthly animal science journal publication motivated the researchers to highlight its contribution through comprehensive Scientometrics study.

2. Literature Review

Patra et.al (2005) analysed growth pattern, core journals and author's distribution in the field of bibliometrics using data from Library and Information Science Abstracts. Braodford's law of scattering and Lotka's Law were also applied. It was observed that the authors' distribution did not follow the Lotka's Law.

Sen (2010) in his short communication demonstrated that it was simpler to calculate the value of 'n' and 'c' for Lotka's Law as compared to the Pao's method.

Rajendran et. al. (2011) analysed 633 research articles published in the Journal of Scientific & Industrial Research for performing Comprehensive Bibliometric study in respect of number authored contribution, authorship pattern, average citations, etc. They observed that out of 633 publications, only 51 were single authored. The degree of collaboration was also found 0.92 which is considered to be a weak collaboration between the authors.

Bankar and Lihitkar (2021) study involved the scientometric analysis of Indian Journal of Animal Research (IJAR). The study period was 2008 to 2020. The data was retrieved from scopus database. The numbers of records were 1890. The analysis covered annual research growth, document type, prolific authors, highly cited documents, etc.

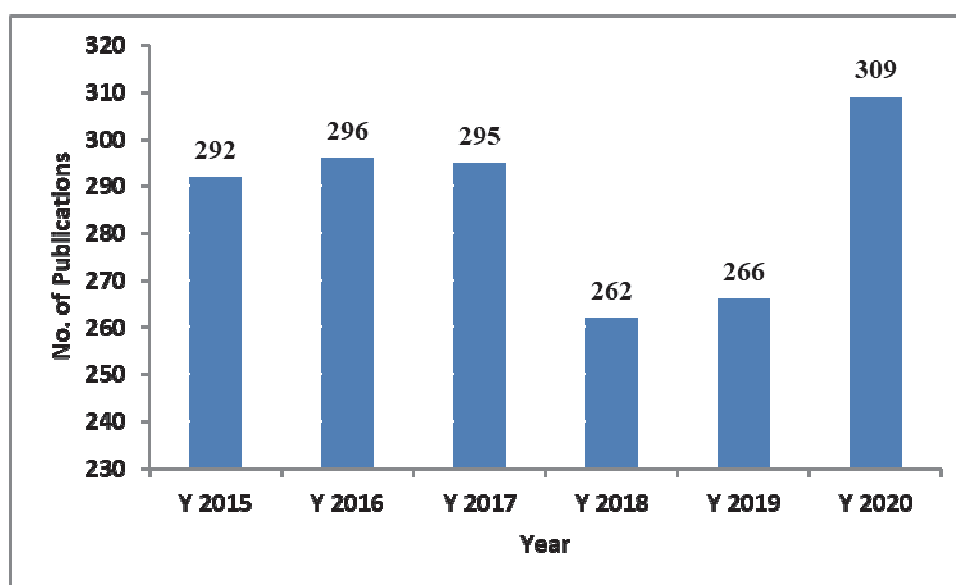
Article published by Nagaiah et.al. (2021) presented a process of assessing the scientific productivity of authors in the field of open education resources as well as checking the applicability of Lotka's Law in the literature of open education resources for the given data set by K-S Test. The results obtained indicated that Lotka's Law did not support the literature of open education resources.

3. Objectives

1. To find out the year wise production of publications.
2. To find out the citations of publication year wise.
3. To check the Lotka's Law applicability on IJAS publications.
4. To find out the affiliation wise contribution.
5. To find out the funding agencies of research.
6. To find out the country wise authored research papers.

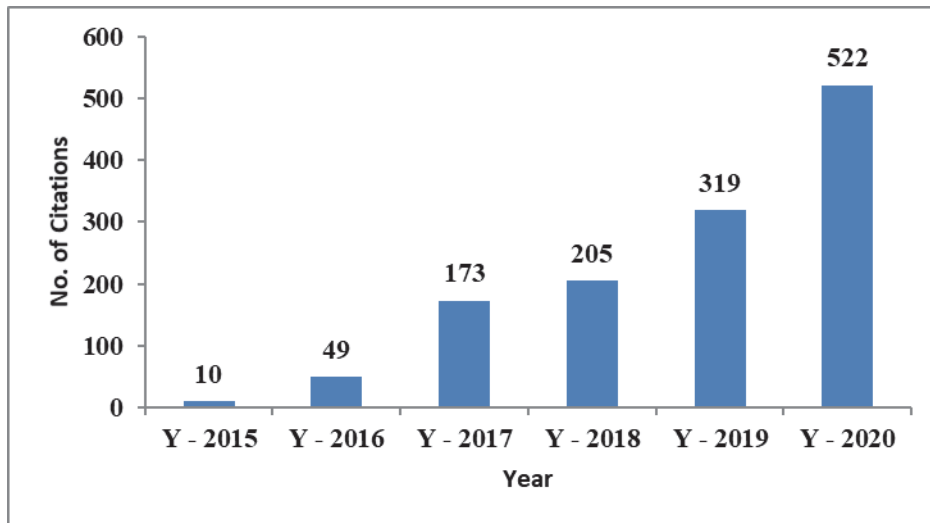
4. Data Analysis and Interpretation

1. **Year - wise publications:** Graph 1 shows the year - wise publications of IJAS. It is evident from the graph that the maximum publications were counted as 309 in the year 2020 while the minimum 262 in the year 2018.



Graph 1: Year- wise production of research publications.

2. **Year- wise citations of publications:** Graph 2 reflects the year- wise citations received by the publisher of IJAS as per Web of Science citation database. It is evident from the graph that the maximum (522) citations received were of the year 2020 followed by (519) in the year 2019. The minimum (10) citations received were of the year 2015. The total citations received from 2015 to 2020 by the published articles were 1278.



Graph 2: Year wise citations of research publications.

3. Lotka’s Law applicability on Research Publications:

Equation of Lotka’s Law is – $x^n * y = c$ [Equation 1]

Where, x = No. of Papers

y = No. of Authors

c = Constant

* = multiplication

To calculate the value of n and c, B.K.Sen’s easy method was applied. Table 1 manifests the distribution of number of articles according to authors.

Table 1: Distribution of number publications according to authors

No. of Articles (x)	N. of Authors (y)
1	2575
2	574
3	251
4	133
5	82
6	61
7	43
8	31
9	30
10	15

Calculation of value of c, putting the values x=1 and y=2575 in equation 1.

We know $[1^n = 1]$, so

$1^n * 2575 = c$; Therefore **c = 2575**

Now calculation of value n, putting the from the 2nd row of table 1, i.e. x=2, y=574 and c=2575

$2^n * 574 = 2575$

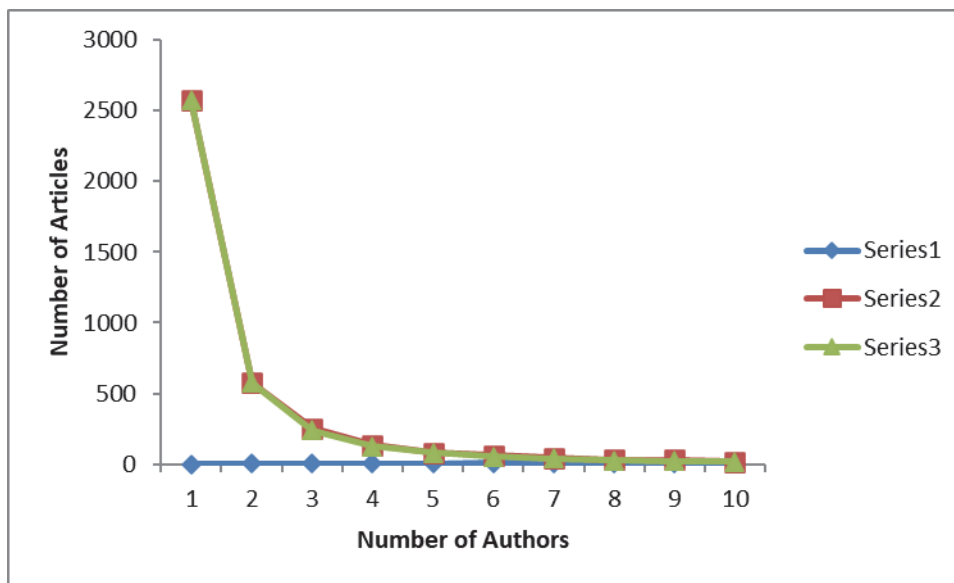
$2^n = 2575/574 = 4.486$

Taking log both Sides $n \log 2 = \log 4.486$
 $n * 0.301 = 0.651$ Therefore, $[\log 2 = 0.301]$
 $n = 0.651/0.301$
 $n = 2.16$

Table 2: Observed values of y and calculated value of y when n=2.16

No. of Articles (x)	No. of Authors (y) Observed Values	No. of Authors (y) With value n=2.16
1	2575	2575
2	574	576
3	251	239
4	133	128
5	82	79
6	61	53
7	43	38
8	31	28
9	30	22
10	15	17

Graph 3: Indicates that publications of IJAS followed the Lotka’s Law. In graph series 2(observed values) & 3(calculated values n=2.16) have overlapped on each other, hence we can thus follow the Lotka’s Law.



4. To find out the affiliation - wise contribution in IJAS during study period.

The data analysis and results reflected by Web of Science of top 15 ICAR Institutes and State Universities given in Table 3 revealed that out of the 15 top entries, 09 are of ICAR institutes and rest from state universities. ICAR-Indian Veterinary Research Institute (IVRI), Bareilly stood at 1st position with 266 research papers and ICAR-National Dairy Research Institute (NDRI), Karnal was on 2nd position with 245 numbers of contributions.

Table 3: Top 15 affiliations and their contributions in IJAS.

Sr. No.	Affiliation	No. of Publications
1.	ICAR-Indian Veterinary Research Institute, Bareilly	266
2.	ICAR-National Dairy Research Institute, Karnal	245
3.	Guru Angad Dev Veterinary Animal Science University	125
4.	ICAR-National Bureau of Animal Genetic Resources	94
5.	ICAR-Central Avian Research Institute	72
6.	Tamil Nadu Veterinary Animal Sciences University	65
7.	ICAR Central Institute for Research on Goats	60
8.	Maharashtra Animal Fishery Science University	45
9.	ICAR Research Complex for NEH Region	44
10.	Lala Lajpat Rai University of Veterinary Animal Sciences	44
11.	U P Pandit Deen Dayal Upadhyaya Pashu Chikitsa Vigyan Vishwavidyalaya Evam Go	44
12.	ICAR Central Institute for Research on Cattle	42
13.	ICAR Directorate of Poultry Research	41
14.	ICAR Central Sheep Wool Research Institute	38
15.	West Bengal University of Animal Fishery Sciences	37

5. Funding Agency of Contributed Research

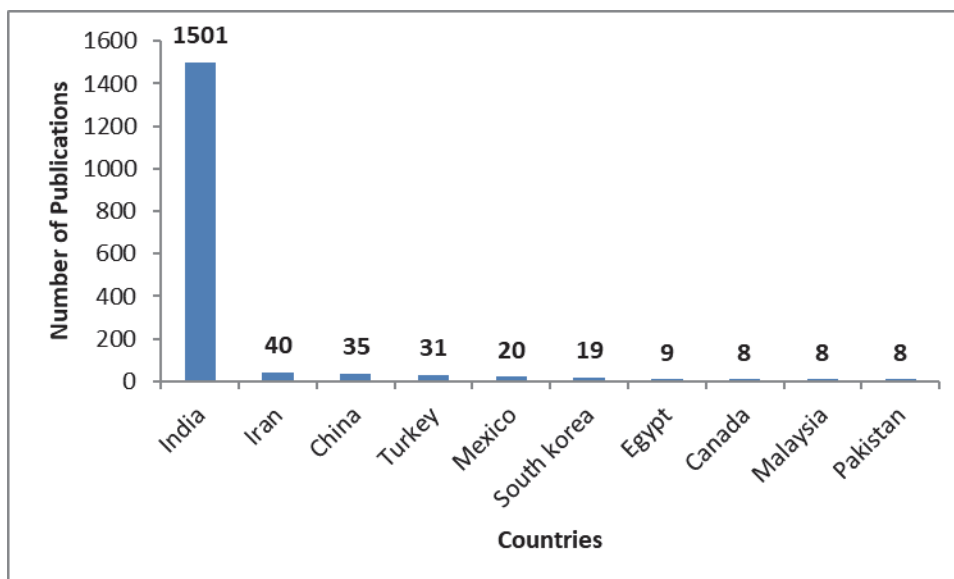
It is evident from the Table 4 that, Indian Council of Agricultural Research (ICAR) funded maximum 130 projects during the period of study followed by Department of Biotechnology DBT, India with 57 projects.

Table 4: Top 10 funding agencies and their funded projects

Sr. No.	Funding Agency	No. of Research
1.	Indian Council of Agricultural Research	130
2.	Department of Biotechnology DBT India	57
3.	University Grant Commission, India	22
4.	Department of Science & Technology, India	13
5.	National Natural Science Foundation of China	12
6.	ICAR-NDRI, Karnal	10
7.	Council of Scientific Industrial Research (CSIR) India	8
8.	ICAR- Indian Veterinary Research Institute, Bareilly	7
9.	Consejo Nacional De Ciencia Y Tecnologia Conacyt	6
10.	ICAR-NBAGR	5

6. Country-wise authored research papers

It is clear from graph 4 that maximum number of papers (1501) authored by Indian authors followed by Iran (40), China (35), Turkey (31), Mexico (20), South Korea (19), Egypt (9), Canada (8), Malaysia (8) and Pakistan (8). These data also witness a good reputation of IJAS among the abroad countries.



Graph 4: Country- wise contribution of top 10 countries

5. Findings of study

In the comprehensive bibliometric study of journal, following findings are obtained by authors:

1. The Indian Journal of Animal Science (IJAS) is a popular scientific journal in animal breeding, diseases, physiology, nutrition, dairying, animal production and fisheries areas.
2. Researchers showing keen interest in this journal for publishing their research in animal science domain.
3. The journal shows significant growth in number of publications as well as day by day increase in citation of research papers. Web of Science database indexing IJAS from 1989 continuously.
4. Publication of IJAS follow the Lotka's law with value $n=2.16$.
5. India is most contributed country in publications.
6. ICAR-IVRI, Bareilly contributed maximum papers followed by ICAR-NDRI Karnal.

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