Malaysian Journal of Library & Information Science, Vol.12, no.1, July 2007:23-33

ECONOMIC BOTANY: A BIBLIOMETRIC STUDY

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ABSTRACT
The study has been conducted with 358 original contributions published in the journal Economic Botany during 1994-2003. Contributions by single author and small teams comprising two or three authors account for about 80% of the papers. Among the citations, books accounted for 59%, and articles 41%. E citations started appearing from 1998 are still negligible in number. Charts, diagrams, photos and tables included in the articles total 396, 427, 859 and 925 respectively. The length of maximum number of articles (38%) ranges from six to 10 pages. Articles occupying 11 to 15 pages rank next accounting for 31%. The highest number of articles totaling 217 (60.61%) has emanated from academic institutions such as universities. The articles originate from 45 countries. The first four countries are responsible for 51.7%, the first ten countries for 67.8%, and the first 15 countries for 78.6% of the articles.

Keywords: Bibliometrics; Economic botany; Informetrics; Scientometrics; Whole journal bibliometric study; Single journal bibliometric study

INTRODUCTION

For about half a century now single journal bibliometric studies have been going on in the world. In this kind of study data is gathered from a single primary, secondary or tertiary journal covering a particular period and analysed from various angles to find out year-wise distribution of articles, authorship pattern, citation pattern, length of articles, institution-wise distribution of articles, and subject-wise break-up of articles. The results quite often bring out interesting facts. Tiew (1997) conducted a good survey of such studies basing *LISA Plus* and *CRLIS* databases and could locate 102 papers on the topic originated from various countries of the world.

With the passage of time single journal bibliometric studies have proliferated in different directions. In some studies citations are analysed to generate various indicators. For example, Sengupta (1974) analysed the citations of *Annual Review of*

Microbiology for selecting microbiology periodicals. Gupta (1977) analysed the citations in *Geliotekhnika* (a Russian journal of solar energy engineering) to detect among others the incidence of bibliographic coupling, and cocitations. Kundu (1981) analysed citations of *Annals of Library Science and Documentation* to study the incidence of self-citations. Raina (1984) analysed citations of *Annual Review of Biochemistry* to check the stability of ranks of some important journals of the subject. Rao (1984) analysed citations of *Research Quarterly* to rank research periodicals devoted to physical education. Mandal and Sain (1993) examined author affiliations to find out collaborativeness in research activities. Ghosh and Neufeld (1974) carried out the study of uncitedness basing citing articles of the *Journal of the American Chemical Society*.

Sometimes a journal as a whole is taken for bibliometric study. We can term such studies as *whole journal bibliometric study*. In such studies, the contents of the journal or parts thereof are analysed from various angles. A substantial number such studies have been carried out in the world. Some of them are listed in this paper (Anand,1981; Nag, 1984; Vaidyanathan, 1985; Anand, 1991/92; Subramanian and Navaneetham, 1992; Verma, 1994/95; Bose and Goria, 1995; Dalai and Ramesh, 1995; Kalyane and Sen, 1995; Sarala, 1995; Tiew, 1996; Halkar, Senapati and Chand, 1998; Ramesh Babu and Muthusamy 1998; Tiew, 1998 (1); Tiew, 1998 (2), Thajuddin, 1998; Vij and Bedi, 1998; Dhiman,2000; Prasher, 2001; Tiew, Abrizah and Kiran, 2001; Narnag, 2004).

OBJECTIVES

To our knowledge no bibliometric study has been conducted so far with a journal of economic botany. Hence, this study has been undertaken to examine the following**:**

i) Year-wise distribution of the articles
ii) Authorship pattern of the articles
iii) Average number of references per article
iv) Average length of the articles in terms of pages
v) Illustrations included in the articles
vi) Institution-wise distribution of the articles
vii) Subject breakdown of the articles
viii) Geographical distribution of the articles
ix) Year-wise distribution of the articles
x) Authorship pattern of the articles.

SOURCE JOURNAL

The journal *Economic Botany* has been taken as the source journal. It is an

internationally noted journal in the area and was first published by the New York Botanical Garden Press, Bronx, New York in 1947. It is published quarterly and fully devoted to applied botany and plant utilization and contains original works and reviews on advances in economic plant and plant resource covering practical, technical and scientific aspects. So far 58 volumes of the journal have been published.

METHODOLOGY

All the articles of volumes 48-57 (1994-2003) of the journal were scanned manually and data relating to subject, author, author affiliation, geographic distribution, number of references and the number of pages were recorded and tabulated. Finally, the collected data was analyzed for generating information. Economic botany being an interdisciplinary subject includes a number of interrelated fields. The subjects of the articles and their facets have been classified with the help of experts. Short communications and book reviews have been excluded.

RESULTS AND DISCUSSIONS

Year-wise Distribution of Articles and Their Lengths

Table 1 shows the year-wise distribution of articles in the journal. The number of articles varied from 29 to 46. The highest number of articles, i.e. 46, was published in 2003 and lowest number i.e., 29 in 1997. A total of 358 articles were published during the period distributed over 40 issues of the journals. On average nine articles were published per issue and 36 per volume. The average length of the articles varied between nine and 13 pages with an average of 11 pages per article.

Table 1: Year-wise Distribution of Articles and their Lengths

Year	No. of articles	Percentage (%)	Length (in pages)	Average Page/article*
1994	40	11.17	370	9
1995	36	10.05	385	11
1996	36	10.05	424	12
1997	29	8.10	374	13
1998	33	9.21	376	11
1999	33	9.21	377	11
2000	34	9.49	434	13
2001	36	10.05	455	13
2002	35	9.77	338	10
2003	46	12.84	569	12
Total	358	100.00	4102	11

* Rounded off to the nearest figure

Authorship Pattern

It is seen from Table 2 that the highest number of articles, i.e. 109 (30.45%) are by single authors. Two- and three-authored contributions number 85 and 89 and account respectively for 23.74% and 24.86% of the total contributions. The number of joint contributions by four or more authors is found to be 75 (20.95%). It is observed that still the contributions by single author and small teams comprising two or three authors are dominating the field.

Table 2: Authorship Pattern

No. of Author/s	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	Total	%
One	16	10	10	10	10	6	11	9	13	14	109	30.45
Two	12	10	5	6	10	8	5	10	10	9	85	23.74
Three	10	10	10	10	7	8	10	10	2	12	89	24.86
Four	2	3	8	1	3	4	2	3	4	8	38	10.61
Five	-	1	2	1	2	3	3	1	2	1	16	4.47
>Five	-	2	1	1	1	4	3	3	4	2	21	5.87
Total	40	36	36	29	33	33	34	36	35	46	358	100

Citation Analysis

The distribution of citations for the study period is shown Table 3. It reveals that a total of 13,525 citations are appended to 358 articles. The number of citations per year varied from a minimum of 984 citations in 2002 to a maximum of 2066 citations in 2003. The average number of citations per article varied from 28 in 2002 to 45 in 2003. On the whole it is 38 per article. It is interesting to note that books are cited more in this subject compared to journal articles. The percentage of books cited varied from 54% in 1995 and 1996 to 66% in 1998. The overall average is 59%. The percentage of articles cited varied from 34% in 1998 and 1999 to 46% in 1995 and 1996. The overall average is 41%. E documents started appearing as citations from 1998. Their overall average is still very much less than 1%.

Analysis of Illustrations

Table 4 indicates the number of charts, diagrams, photos and tables that are included in the articles which respectively are as follows: 396, 427, 859 and 925. The highest number of charts, diagrams photos and tables appeared in the year 1998 (63), 2003 (81), 1995 (130) and 2003 (125) respectively. The average number of charts, diagrams, photos and tables per article is 1.10, 1.19, 2.39 and 2.58 respectively. Among the illustrations, tables are used more compared to other types.

Table 3: Citation Pattern

Year	No. of articles	No. of citations	Av. no. citations / article	No. of cited books	Av. No of cited books	No. of cited articles	Av. No of cited articles	No. of cited e-docs.	Av. no of cited e-docs.
1994	40	1585	40	879 (55%)	22	706 (45%)	18	0	0.00
1995	36	1166	32	635 (54%)	18	531 (46%)	15	0	0.00
1996	36	1234	34	670 (54%)	19	564 (46%)	16	0	0.00
1997	29	1044	36	658 (63%)	23	386 (37%)	13	0	0.00
1998	33	1263	38	829 (66%)	25	433 (34%)	13	1	0.03
1999	33	1438	43	932 (65%)	28	495 (34%)	15	11	0.33
2000	34	1294	38	800 (62%)	25	492 (38%)	14	2	0.05
2001	36	1451	40	866 (60%)	24	583 (40%)	16	2	0.05
2002	35	984	28	567 (58%)	16	413 (42%)	11	4	0.11
2003	46	2066	45	1177 (57%)	26	848 (41%)	18	41	0.89
Total	358	13525	38	8013 (59%)	22.38	5451 (40%)	15.22	61	0.17

Table 4: Distribution of Illustrations

Year	Article	Chart	Av./ article	Diagram	Av/. article	Photo	Av./ article	Table	Av./ article
1994	40	15	0.37	25	0.62	124	3.10	51	1.27
1995	36	35	0.97	47	1.30	130	3.60	71	1.97
1996	36	58	1.61	31	0.86	64	1.77	115	3.19
1997	29	31	1.06	42	1.44	48	1.65	83	2.86
1998	33	83	1.90	28	0.84	73	2.21	110	3.33
1999	33	30	0.90	35	1.06	38	1.15	96	2.90
2000	34	29	0.85	81	2.38	103	3.02	93	2.73
2001	36	59	1.63	29	1.11	76	2.11	112	3.11
2002	35	26	0.74	28	0.8	108	3.08	69	1.97
2003	46	50	1.08	81	1.76	95	2.06	125	2.71
Total	358	396	1.10	427	1.19	859	2.39	925	2.58

Distribution of Articles According to Pages

Table 5 shows that the length of maximum number of articles (38) is within 6-10 pages. Articles occupying 11-15 pages rank next accounting for 31%. Short articles occupying 1-5 pages account for 13% and long articles of 20 or more pages for 8%.

Table 5: Distribution of Articles According to Pages

Year Pages	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	Articles	%
1-5	9	3	3	4	2	2	3	9	9	3	47	13.
6-10	20	20	16	8	13	13	12	10	10	15	137	38
11-15	7	9	8	11	13	13	10	10	10	20	111	31
16-20	2	2	7	2	3	3	6	2	6	4	37	10
>20	2	2	2	4	2	2	3	5	-	4	26	8
Total	40	36	36	29	33	33	34	36	35	46	358	100.0

Organization-wise Distribution

Table 6 shows the articles emanating from different organizations. The highest number of articles totaling 217 (60.61%) has emanated from academic institutions like universities. Non-academic institutions and organizations account for 88 (24.58%), professional associations 34 (9.49%) and others 19 (5.3%).

Table 6: Organization-wise Distribution

Organizations	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	Total	Percent
Academic	30	24	17	16	13	16	23	24	24	30	217	60.61
Non-academic organizations/ institutions	8	7	15	7	14	9	6	9	5	8	88	24.58
Professional associations	2	1	4	4	4	8	3	2	1	5	34	9.49
Others	-	4	-	2	2	-	2	1	5	3	19	5.30
Total	40	36	36	29	33	33	34	36	35	46	358	100

Country-wise Distribution

Table 7 reveals that the articles have emanated from 45 countries. The geographical distribution of articles has been decided basing the address of the first author. From the analysis it is observed that the highest number of publications are from U.S.A. i.e. 100 (27.9%). Next comes U.K. with 36 articles (10.1%) followed by Mexico with 33 articles (9.2%). India ranks 4th with 16 articles (4.5%). It may be noted that the first

four countries are responsible for 51.7% of the articles, the first ten countries for 67.8%, the first 15 countries 78.6% of the articles.

Table 7: Country-wise Distribution of Articles

Sl. No	Country	Years										Total	%
		1994	1995	1996	1997	1998	1999	2000	2001	2002	2003		
1.	USA	15	8	5	8	9	9	13	12	9	12	100	27.9
2.	UK	3	6	3	4	2	2	1	4	6	5	36	10.1
3.	Mexico	3	6	3	6	2	3	3	4	2	1	33	9.2
4.	India	1	-	3	-	3	1	4	2	2	-	16	4.5
5.	Spain	1	1	1	-	2	1	2	2	1	2	13	3.6
6.	China	1	1	1	-	2	-	3	1	-	2	11	3.1
7.	Brazil	-	-	1	3	-	2	1	1	-	1	9	2.5
8	Italy	-	2	1	1	-	1	1	1	2	-	9	2.5
9.	Argentina	1	-	-	1	-	1	1	2	-	2	8	2.2
10.	Canada	1	-	2	1	-	1	-	1	1	1	8	2.2
11.	Indonesia	1	-	1	-	1	-	2	1	-	2	8	2.2
12.	Japan	-	1	1	-	1	1	2	-	2	-	8	2.2
13.	South Africa	-	1	1	-	1	1	2	-	1	1	8	2.2
14.	Turkey	-	1	-	1	1	-	2	-	2	1	8	2.2
15.	Denmark	2	-	2	-	1	-	-	2	-	-	7	2.0
16.	Chile	1	1	-	2	1	1	-	-	-	-	6	1.7
17.	Australia	1	1	-	-	-	1	-	1	-	1	5	1.4
18.	New Zealand	1	-	1	1	1	1	-	-	-	-	5	1.4
19	Guatemala	2	-	1	-	-	-	-	-	-	1	4	1.1
20	Greece	-	-	1	1	1	-	-	-	-	1	4	1.1
21	Netherlands	-	-	1	2	-	-	1	-	-	-	4	1.1
22.	Cambodia	-	1	1	-	-	-	1	-	-	-	3	0.8
23	Ecuzdor	-	1	-	-	1	-	1	-	-	-	3	0.8
24	Israel	-	-	1	-	1	-	-	-	-	1	3	0.8
25	Norway	-	-	-	1	-	-	-	-	1	1	3	0.8
26	Nicaragua	-	-	1	-	-	1	1	-	-	-	3	0.8
27	Peru	-	1	-	1	-	-	-	1	-	-	3	0.8
28	Sweden	2	-	-	1	-	-	-	-	-	-	3	0.8
29	Zimbabwe	-	-	1	-	1	-	1	-	-	-	3	0.8
30	Belgium	-	1	-	-	-	-	-	1	-	-	2	0.6
31	France	1	-	1	-	-	-	-	-	-	-	2	0.6

Sl. No	Country	Years										Total	%
		1994	1995	1996	1997	1998	1999	2000	2001	2002	2003		
32	Germany	-	-	-	-	-	-	-	1	1	-	2	0.6
33	Korea	-	-	1	-	-	1	-	-	-	-	2	0.6
34	Kenya	1	-	-	-	-	1	-	-	-	-	2	0.6
35	Lebanon	-	-	1	-	-	-	-	-	-	1	2	0.6
36	Switzerland	-	-	-	-	1	-	-	-	-	1	2	0.6
37	Singapore	1	-	-	-	-	-	-	1	-	-	2	0.6
38	Bolivia	-	1	-	-	-	-	-	-	-	-	1	0.3
39	Finland	-	-	-	-	-	-	-	-	1	-	1	0.3
40	Iran	-	-	-	-	-	-	1	-	-	-	1	0.3
41	Jamaica	1	-	-	-	-	-	-	-	-	-	1	0.3
42	Nepal	-	-	-	-	1	-	-	-	-	-	1	0.3
43	Philippines	-	-	-	1	-	-	-	-	-	-	1	0.3
44	Sierra Leone	-	-	1	-	-	-	-	-	-	-	1	0.3
45	Syria	-	-	-	1	-	-	-	-	-	-	1	0.3
	Total	40	34	37	36	33	29	43	38	31	37	358	100

Subject-wise Distribution of Articles

Table 8 shows that the subject clusters Ethnobotany/ Traditional/ Indigenous Processing/ Cultural/ Folk medicine, and Morphology/ Description/ Character/ Note/ About plant/ Phenotype/ Diversity account for highest number of articles i.e., 32 (17.9%) in each case. Economic plant/ Plant resource/ Plant use/ Plant product utilisation/ Useful plants rank third with the tally of 57(15.9%) papers. Physiology/ Chemistry/ Chemical/ Phytochemistry/ Essential oil/ Chemical compounds/ Fatty oil/ Productivity/ Pharmaceutical rank fourth accounting for 47 (13.1%) articles. Other subject clusters are responsible for less than 10% articles.

SPECIAL FEATURES OF THE ARTICLES

The special features of the articles on economic botany are as follows:

i) Almost all the articles include an abstract and keywords in English.
ii) The contributor's biodata with address and affiliation are also given.
iii) All the articles include references that follow a standard pattern.
iv) Each issue of the journal includes reviews of books and notes on economic plants at the end.
v) The details like month and year of receipt of the article are also provided in each article.

Table 8: Subject-wise Distribution of Articles

Subjects	No. of articles										Total	%
	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003		
S_1	5	5	6	6	4	8	4	6	8	12	64	17.9
S_2	5	5	5	4	11	7	5	4	8	10	64	17.9
S_3	4	4	8	6	5	5	5	6	8	6	57	15.9
S_4	6	8	4	4	4	6	2	5	3	5	47	13.1
S_5	5	6	2	2	3	2	5	3	1	3	32	8.9
S_6	3	6	5	2	2	3	3	4	1	2	31	8.6
S_7	5	1	1	5	0	0	5	4	3	6	30	8.4
S_8	5	1	5	0	4	2	4	4	0	1	26	7.3
S_9	2	0	0	0	0	0	1	0	3	1	7	2.0
Total	40	36	36	29	33	33	34	36	35	46	358	100

S_1 - Ethnobotany, Traditional, Indigenous Processing, Cultural, Folk medicine; S_2 - Morphology, Description, Character, Note, About plant, Phenotype, Diversity; S_3 Economic plant, Plant resource, Plant use, Plant product utilisation, Usefu l plants; S_4 -Chemical, Phytochemis try, Essential oil, Chemical compounds, Fatty oil, Productivity, Pharmaceutical; S_5 - Medicine, Herbal remedy; S_6 - Food, Cereals, Nutritive, Nutritional Fruit, Vegetable, Diet, S_7 - Agro ecysostem, Introduction, Plantation, Agroforestry, Cultivation, Horticulture, Domestication, Agriculture; S_8 - Crop, Fibre, Timber, Non-timer, Wood, Cotton, Spice; S_9 - Biography, Life history, Contribution

SUMMARY

Summary of the findings is as follows:

i) The number of articles in the journal is not consistent and varies from volume to volume.

ii) Single-author articles are dominant (30.44%), followed by three-author (24.86%) and two-author (23.74%) articles.

iii) The average number of 38 citations per article indicates that the authors review a considerable amount of literature before writing an article, which is a healthy sign.

iv) The articles have an average length of 11.45 pages, which more or less conform to the international practice.

v) Inclusion of charts, diagrams, photos and tables in each article indicates that the articles are highly technical in nature.

vi) USA, where from the journal originates accounts for the highest number of articles.

vii) Almost all articles are in English, which is expected as the journal appears from USA.

viii) Most of the articles have emanated from academic institutions.

ix) Almost all articles included a brief abstract and keywords.

ACKNOWLEDGEMENT

We would like to express our gratitude to Dr. G. G. Maity, Professor, Dept. of Botany, University of Kalyani who inspired as well as untiringly helped us especially in grouping and deciding the different subject fields of each article. We also express our heartiest thanks to all the library staff of the Botanical Survey of India (Kolkata) for allowing us to use their rich collection and for their helpful cooperation

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