Publication growth pattern of medicinal and aromatic plants literature - a bibliometric analysis

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Abstract

This paper analyses the publication growth of literature on Medicinal and Aromatic Plants (MAP) from 1991-2006 using Biological Abstracts Online, presents the publication profile on the growth of MAP literature at the global level and highlights the importance of MAP in health care. Year-wise distributions of MAP (Medicinal and Aromatic Plants) literature and their growth trends are discussed and future projection for MAP literature growth are given.

Keywords: aromatic plants, bibliometry, herbal plants, medicinal plants, trend analysis.

INTRODUCTION

There is increasing interest in industry, academia and the health sciences on the Medicinal and Aromatic Plants (MAP). MAP have received great attention of the research community recently and consequently there has been a rapid growth of research activities during the last few decades. The research activities and growth trends in MAP are of unique interest not only to the scientists in the concerned subject, but also to the other Research and Development institutions and Research and Policy decision makers. Further more the implications of MAP research have wider perspectives in accelerating the advancement of technology in agriculture, medicine, nutriceuticals, pharmaceuticals, cosmetics and industrial biotechnology. So it is essential to evaluate the trends on MAP literature outputs to understand the interdisciplinary applications of the subjects as well.

Moreover, many nations (in the Orient and the West as well) and Research Foundations have been investing more and more money into the field of MAP and its allied subfields generating more research and literature outputs. Hence, there is a need to analyse and examine the publication outputs in the field of MAP research.

Bibliometric techniques have been used to study literature growth during certain period and to identify research trends and growth of knowledge in various subjects and to forecast publishing trends. For eg., Anwar (2003) carried out a bibliometric analysis of the literature on *Nigella sativa* or black seed by studing the growth of literature, author patterns, topical focus and geographic origin of the literature in detail. The author

searched twenty related databases and several online catalogues of libraries to identify a final list. The findings showed the increase in the volume of literature from 1971 onwards starting from one citation per year to 46 papers per year during the late 1990s with most of the literature coming from Medical Sciences and Chemistry. Further more the findings confirmed that the literature on this plant is of interdisciplinary nature and its literature might continue to grow in the future. Paredes and Portela, (1997) analyzed research on garlic as published in Argentina, Brazil, Chile, and Uruguay over a period of twenty years with regard to areas of research and productivity of each particular country and growth of literature. Fan, (2001) analysed 10,185 citations dealing with 'neoplasm' covering the period from 1984 to 1998 retrieved from the TCMLARS database (Traditional Chinese Medical Literature Analysis and Retrieval System). The characteristics studied included the neoplasm type, year of publication, author's organizational affiliation, type of literature and the research grant. Senthilkumaran and Vadivel (2004) analysed the *Spice India Journal* for the period 1997-2001 and the authors examined the year-wise distribution of articles, authorship pattern, length of articles, year-wise distribution of citation, subject-wise break-up of articles and prolific authors. In a similar bibliometric study, earlier by the same authors, *Journal of Spices and Aromatic Crops* was analysed for the period 1992-2002 (Senthilkumaran and Vadivel, 2003). They examined the year-wise distribution of articles, authorship pattern, length of articles, subject-wise break up of articles and prolific authors and suggested some inferences based on the output of the growth of literature. Garcia-Garcia *et al.*, (2008) performed a study on publication related to phytotherapy in the psychiatry during the period 1986-2006. The herbal plants indicator was selected from EMBASE and MEDLINE databases and a total of 21, 409 documents were downloaded and

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analysed. As a bibliometric indicator of the production, Price's Law was applied. They found that the countries with the highest percentages of documents were the United States (29.44%), Germany (9.41%) and Japan (8.75%) and those with highest proportions were India and China. Their findings revealed that the productivity on medicinal plants used for psychiatric treatment increased during the period 1986-2006. Nevertheless, documents about therapeutic herbs in the medicinal field were found to be still relatively few in number. Bharvi *et al.*, (2007) made a comparative assessment of the status of herbal research in India and China using different Scientometric parameters. They analysed of 2183 papers published by Chinese researchers and 1034 papers published by Indian researchers in the field of herbal medicine during 1990-2004 and Indexed by PubMed (MEDLINE). Results, indicated that the output of China was more than twice of the Indian output. Medical universities and colleges mainly contributed China's output while the Indian outputs mainly were from academic institutions. Chinese researchers mainly emphasized on aspects of chemical analysis, extraction and isolation and drug herbal interaction while Indian researchers emphasised on the herbal medicine for the treatment of diseases such as diabetes. Al-Qallaf, (2009) studied the growth of literature on the *Punica Granatum* L (pomegranate) to determine trends and patterns by searching thirty one related databases and the online catalogs of two United States National libraries. The final data, which consisted of 3306 items were sorted and analysed using the software package Pro Cite. The results showed that the literature has grown consistently from 1970 onwards to significant proportions beginning in 2000. Most of the publications were the results of author collaboration with English being the predominant language. India and USA were found to be the leading contributors to the literature and academic institutions made up more than 50% of the author's affiliation. The major subject areas covered were plant diseases, growth, botanical chemistry, pharmacognosy and plant products.

The present paper examines the status of MAP research, as reflected in world research output during 1991-2006 and its growth trends.

METHODOLOGY AND DATA SOURCE

The basic publication data used in this paper is derived form the Biological Abstracts an International Database Online. The raw publication bibliographic data has been downloaded for the sixteen years (1991 - 2006). The search terms used for downloading were "Aromatic Plants" or "Medicinal Plants" or "Herbal Plants". The search was made using the Boolean Operator "OR" for the incidence of the keywords in all the fields. The records thus downloaded were in the form of a text file. All the records downloaded were converted into MS

Access Database. In a special process, the captured data were cleaned by removing the possible discrepancies. The total records thus obtained in the final format came to 28824 in number. The obtained data were input into indigenously developed software for computations and analysis.

RESULTS

Year-wise Distribution in MAP Literature.

Growth of MAP literature at global level has been given in table 1.

Table 1. Growth of MAP literature at the global level.

Country	Medical & Aromatic Plant Species	MAP literature outputs	MAP literature growth (% of the global publication)
China	26 092	4941	18.9
India	15 000	3000	20
Indonesia	22 500	1000	4.4
Malaysia	15 500	1200	7.7
Nepal	6 973	700	10
Pakistan	4 950	3006	6.1
Philippines	8 931	850	9.5
Sri Lanka	3 314	550	16.6
Thailand	11 625	1800	15.5
USA	21 641	2564	11.8
Viet Nam	10 500	1800	17.1
Average	13 366	1700	12.5
World	422000	52885	12.53

Table 2 displays the annual records of research output in MAP at the global level for the study period. Excepting a fall in 1993, overall there is an increasing trend. A gradually increasing trend was noticed during the first five years from 1991 to 1997. There was a drop in the growth rate during 1998, which later once again showed an increasing trend upto 2001. From 2002 to 2005, there was a good acceleration in the MAP research literature output. In 2006, the growth is minimal when compared to the previous year (2005). Overall, there was an increasing trend in MAP research across the study period. The annual growth rate of MAP literature was found to be at a maximum in the year 1997 and minimum in the year 2006. Further it was found that there was a negative growth rate in the year 1993. The overall growth rate was found to be 23.46%.

Table 2. Pattern of MAP Literature from 1991-2006

S. No.	Year	No. of articles	Growth Rate (%)
1	1991	225	
2	1992	295	31.11
3	1993	250	-15.25
4	1994	329	31.60
5	1995	411	24.92
6	1996	639	55.47
7	1997	1101	72.30
8	1998	1137	03.27
9	1999	1400	23.13
10	2000	1686	20.43
11	2001	1749	03.74
12	2002	2373	35.68
13	2003	3131	31.94
14	2004	3801	21.40
15	2005	5130	34.96
16	2006	5167	00.72
	Total	**28824**	**23.46**

Time series analysis on MAP literature was used to measure the trend of the MAP growth (Table 3)

Table 3. MAP Research Output Trend: Time Series Analysis

S. No	Year	Count (Y)	X	X²	XY
1	1991	225	0	0	0
2	1992	295	1	1	295
3	1993	250	2	4	500
4	1994	329	3	9	987
5	1995	411	4	16	1644
6	1996	639	5	25	3195
7	1997	1101	6	36	6606
8	1998	1137	7	49	7959
9	1999	1400	8	64	11200
10	2000	1686	9	81	15174
11	2001	1749	10	100	17490
12	2002	2373	11	121	26103
13	2003	3131	12	144	37572
14	2004	3801	13	169	49413
15	2005	5130	14	196	71820
16	2006	5167	15	225	77505
	Total	28824	120	1240	327463

The estimated Straight Line equation for the trend $(Y_c = a + bX)$ was $Y_c = 1.5+240X$

So the estimated literature projection for 2010 would be

$X = 2010 - 1991 = 19 = 1.5 + 240 * 19 = 1.5 + 4560 =$ **4561.5**

and the estimated literature output in 2015 would be

$X = 2015 - 1991 = 24 = 1.5 + 240 * 24 = 1.5 + 5760 =$ **5761.5**

From the above projections, it can be inferred that the Medicinal and Aromatic Plant research might show a declining trend in the year 2010 while it might increase in 2015.

The major findings of the present study are as follows.

• The overall growth rate of MAP literature output has been found to be positive with an increasing trend in MAP research throughout the study period.

• The average growth rate of literature output in MAP research, was 23.46 per cent during the present study period. The growth rate was found to be at its maximum in 1997 and minimum in the year 1996.

• Time series analysis of the growth rate indicated that eventhough MAP research might show a declining trend in the year 2010, it might positively gain momentum in the year 2015.

CONCLUSIONS

The investigation of literature growth studies might be useful in understanding the research trends and patterns in various disciplines. The analyses of the present study revealed that the overall upward trend in MAP study. Herbs are staging a comeback and herbal 'renaissance' is happening all over the globe. The herbal products today symbolise safety in contrast to the synthetics that are regarded as unsafe to human and environment. As a result, the blind dependence on synthetics is over and people are returning to the naturals with the hope of safety and security. As such the present bibliometric study confirms the importance of MAP research outputs.

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