

Analysis of US Patents Granted to Indian Inventors

K Guruprasad*, P Kanagavel, K Srikanth, K Radhika and S Sonal

Centre for Cellular and Molecular Biology, Uppal Road, Hyderabad 500 007

(Received 24 December 2002)

An analysis 1,566 US patents granted to Indian inventors, which are available in the US Patent and Trademark Office (USPTO) database indicates a steady rise in the patenting activity during the last eight years. About 39% patents are of a collaborative nature. Majority of the patents are in chemistry and metallurgy. Out of the 42 Indian patent assignees, the Council of Scientific & Industrial Research (CSIR) is the major contributor to the US patents.

A patent is an exclusive monopoly issued by respective governments in different countries to an inventor for an invention that must be “novel”, “useful” and “non-obvious” although the rules for what may be patented varies from country to country. A patent ensures the inventor to seek protection of the product / process for a specified period subject to the full disclosure of the invention¹. India recognizes only “process” patents at the moment and the rule of “first to file”² as opposed to “first to invent” as in the United States in order to be granted a patent. The number of patents held by a country is an indicator of the technological advance of that country. Statistical information about them gives important clues about the rate and direction of innovative activities.

In view of the Trade-Related Aspects of Intellectual Property Rights (TRIPS) Agreement³ and the recent efforts on the part of various institutions / organizations in promoting patent awareness, we intended to analyse the current status and trends in patenting in USA by Indian inventors, based on the information available in USPTO database, during the period 1976-2002. USPTO represents the largest body where patents are filed from all over the world.

Objectives

The objectives of the study are to:

- (i) Examine the growth in Indian patenting activity as compared to rest of the world
- (ii) Examine the growth in CSIR patenting activity as compared to non-CSIR patenting activity

*Corresponding author
E-mail:guru@ccmb.res.in

- (iii) Examine the trend of collaborative vs non-collaborative patenting activity
- (iv) Identify the area where most of the patents have been filed
- (v) Identify the assignees mainly responsible for filing of patents

Data and Methodology

In order to carry out the analysis outlined above, we obtained the relevant records corresponding to patent entries from the USPTO database available at the website <http://patft.uspto.gov/netahtml/search-bool.html> by selecting the option "IN" (for India) against the Inventor Country in our search procedure. The survey covered the period from January 1976 till 27th August 2002. All patents retrieved were classified as either collaborative or non-collaborative. If any inventor on a patent represented a country code different from "IN", the patent was classified as a collaborative patent by Indian inventors with inventors of other countries. In order to extract the biotechnology patents, we followed the International Patent Classification (IPC) scheme. We normalized the international as well as Indian output during the period 1976-2002 using Activity Index (AI). AI has been suggested by Frame⁴ and elaborated by Schubert and Braun⁵. Karki and Garg⁶ have used it to compare India's performance with the world performance in the field of alkaloids for different years.

AI characterizes the relative research effort of a country to a given subject

field. AI = 100 indicates that the country's research effort in the given field corresponds precisely to the world average. AI > 100 reflects higher activity than the world average, and AI < 100 indicates lower than average effort dedicated to the field. However, in the present case it has been modified and has been used to calculate the AI of India vs rest of the world as well as the AI of CSIR with non-CSIR institutions for different block years.

$$\text{AI (for India)} = \left\{ \frac{\text{Indian output in a particular year}}{\text{total Indian output}} \div \frac{\text{world output in a particular year}}{\text{total world output}} \right\} \times 100.$$

Similarly, AI for rest of the world, CSIR and non-CSIR institutions has been calculated. Patents pertaining to different categories were also examined.

Results and Discussion

Activity Index for India vs Rest of the World

Patent data corresponding to India, rest of the world and the total number of patents in the USPTO for the period 1976-2002 (27 years) are given in Table 1. Indian patents output in USPTO during the period mentioned above constituted about 0.06% of the total patents. Table 1 indicates a steady increase in the number of Indian patents during the last four years, i.e. 1997-2002.

Analysis of data using AI for India and rest of the world indicates that AI for India increased considerably during 1997-99 and 2000-2002. The values of

Table 1—Indian patent output in USPTO

Period	Indian patent output in USPTO	World patent output in USPTO	Total	Activity index (India)*	Activity index (world)*
1976-78	60	2,16,035	2,16,095	49	100
1979-81	42	1,90,029	1,90,071	39	100
1982-84	48	1,98,258	1,98,306	43	100
1985-87	57	2,44,138	2,44,195	41	100
1988-90	75	2,86,801	2,86,876	46	100
1991-93	118	3,25,837	3,25,955	63	100
1994-96	167	3,52,214	3,52,381	84	100
1997-99	359	4,62,591	4,62,950	137	100
2002-02	640	4,82,408	4,83,048	234	100
Total	1566	27,58,311	27,59,877		

*Rounded off to the nearest whole number

AI during 1997-99 and 200-2002 were respectively 137 and 234, much higher than rest of the world, which remained static at 100 during all these years. The increase in AI for India was 2.7 and 4.7 times higher than the AI in the year 1976-79.

Activity Index of CSIR vs Non-CSIR Institutions

Patent data corresponding to CSIR, non-CSIR and total Indian outputs are given in Table 2. CSIR patents constituted about 20% of the total Indian patents output in USPTO. Table 2 indicates a sharp increase in the number of CSIR as well as non-CSIR patents in the last two blocks, *viz* 1997-99 and 2000-2002. However, analysis of data using AI indi-

cates a different picture. Patent activity of non-CSIR institutions have gone down from 121 in the block year 1976-78 to 106 in the block year 2000-02. Reversed has happened in case of CSIR, where the patenting activity have increased 8 to 9 times in the last two blocks as compared to the block year 1976-78.

The increased activity in patenting, particularly in recent years, is the result of the successful campaigns in India aimed at promoting protection of our intellectual property. Noteworthy amongst these prime movers are the Department of Biotechnology (DBT), Government of India, and CSIR, New Delhi, through organizing seminars, workshops and sponsored projects⁷⁻¹¹. The DBT

Table 2—CSIR and non-CSIR patent output in USPTO

Period	CSIR patents*	Non-CSIR patents	Total	Activity index (CSIR)**	Activity index (Non-CSIR)**
1976-78	2	58	60	14	121
1979-81	0	42	42	0	0
1982-84	2	46	48	17	120
1985-87	2	55	57	14	121
1988-90	9	66	75	54	110
1991-93	14	104	118	53	110
1994-96	26	141	167	73	106
1997-99	81	278	359	115	97
2000-02	180	542	640	131	106
Total	316	1,250	1,566		

*In the year 2002 alone, the CSIR patents in the USPTO have crossed 100 (recent personal communication, as on 7-11-2002, Office of the Director-General, CSIR, New Delhi).

**Rounded off to the nearest whole number

created a patent facilitator cell in early '90s to assist Indian inventors to protect their biotech inventions through patenting. It also pioneered in transferring institutionally developed technologies to the industry¹². CSIR established this facility under its Intellectual Property Management Division (IPMD). It encourages scientists to be creative and innovative in order to generate patents that would protect our inventions, generate revenues for the laboratory, create wealth for the nation and prepare us to face the opportunities and challenges ahead^{13,14}. The Department of Science and Technology (DST), Government of

India, too around the same time in late '90s created a Patenting Facilitating Cell to assist all Indian inventors to protect their inventions in all branches of science and technology.

Collaborative vs Non-Collaborative Patents

Analysis of data on collaborative patents indicates that about 60% patents are collaborative patents only inventors from India. About 39% patents are such where Indian Inventors collaborate with inventors from other countries. The number of patents by Indian inventors is on the rise,

Table 3—Collaborative vs non-collaborative Indian patent output

Period	All Indian inventors (%)	Indian inventor as collaborator (%)	Total Indian patents
1976-78	36 (60)	24 (40)	60
1979-81	23 (54)	19 (45)	42
1982-84	28 (58)	20 (41)	48
1985-87	22 (38)	35 (61)	57
1988-90	43 (57)	32 (42)	75
1991-93	57 (48)	61 (51)	118
1994-96	83 (49)	84 (50)	167
1997-99	225 (62)	134 (37)	359
2000-02	429 (67)	211 (32)	640
Total	946 (60)	620 (39)	1566

while patents where Indian inventors collaborate are on the decline (Table 3).

Areas of Patents

The IPC scheme classifies patents into 8 main sections, which are further divided into sub-sections. The 1,566 patents of Indian inventors in the USPTO classified according to the 8 main sections are shown in Table 4. Analysis of data presented in Table 4 indicates nearly 45% patents correspond to chemistry and metallurgy, whereas, patents under agriculture, foodstuffs, tobacco, health, amusement, domestic

articles account ~18%, instruments ~14% and electricity ~9%. Patents filed in case of textiles and paper as well as fixed construction are much less as compared to other sub-disciplines mentioned above. Analysis of data using AI for the pre- and post-WTO period indicates that patenting activity has increased in human necessities, chemistry, metallurgy and electricity in the post-WTO period, while the activity has decreased in performing operations, transporting, mechanical engineering and physics. Based on the analysis of 1,566 patents according to the IPC and manual inspection of patent titles, abstracts or documents, we observed that nearly 7% patents, relate to biotechnology. These are mainly in the areas of antibiotics, vaccines, enzymes, genetic engineering, therapy, tissue culture, hormones or diagnosis. In order to serve as a ready reference, we have provided the list of 1566 patent numbers, their corresponding patent titles, filing and acceptance dates in the USPTO that may readily be accessed from our website at (<http://www.ccmb.res.in/bioinfo/USPTO-IN-patentinfo>).

We have also included the biotech patent list separately on the website. Links to the original USPTO database at the website (<http://www.uspto.gov>) are provided in order to retrieve the abstracts and related information.

Patent Assignees

Analysis of data on assignees indicates that nearly 50% of the patents correspond to the Indian patent assignees represented by 42 patent assignees.

Table 4—Activity index for the patent categories*

Year	A	B	C	D	E	F	G	H	Total
1976-1990	27 (54)	37 (167)	150 (116)	13 (380)	5 (198)	14 (136)	21 (153)	15 (61)	282
1991-2002	252 (110)	86 (85)	566 (196)	6 (38)	9 (78)	43 (92)	201 (110)	121 (109)	1284
Total	279	123	716	19	14	57	222	136	1566

Figures within parenthesis indicate activity index

*According to the IPC seventh edition

Sections: A—Human Necessities, B—Performing Operations; Transporting, C—Chemistry; Metallurgy, D—Textiles; Paper, E—Fixed Constructions, F—Mechanical Engineering; Lighting; Heating; Weapons; Blasting, G—Physics, H—Electricity

Subsections: Under A—Agriculture, Foodstuffs; Tobacco, Personal Or Domestic Articles, Health; Amusement, Under B—Separating; Mixing, Shaping, Printing, Transporting, Micro-Structural Technology; Nanotechnology, Under C—Chemistry, Metallurgy, Under D—Textiles Or Flexible Materials Not Otherwise Provided For, Paper, Under E—Building, Earth Or Rock Drilling; Mining, Under F—Engines Or Pumps, Engineering In General, Lighting; Heating, Weapons; Blasting, Under G—Instruments, Nucleonics, Under H—Electricity

Table 5—Indian patent assignees

S No	Assignee name	No of patents
1	Council of Scientific & Industrial Research (New Delhi)	312
2	Individuals	166
3	Ranbaxy Laboratories Limited (New Delhi)	39
4	Dr Reddy's Research Foundation (Hyderabad); Reddy Cheminor, Inc (Ridgewood, NJ)	22
5	Indian Oil Corporation Limited (Mumbai)	14
6	National Institute of Immunology (New Delhi)	12
7	Panacea Biotec Limited (New Delhi)	11
8	Dabur Research Foundation (Ghaziabad)	11
9	Lupin Laboratories Limited (Bombay)	10
10	Indian Petrochemicals Corporation Limited (Gujarat)	8
11	National Research Development Corporation (New Delhi)	7
12	Indian Explosives Limited of I.C.I. House (Calcutta)	6
13	Gem Energy Industry Limited (Chennai)	6
14	Council of Scientific & Indus. Res. & Dept. of Biotech. (New Delhi)	5
15	Fine Jewellery (India) Ltd (Bombay)	4
16	The Chief Controller, Research & Development Organization (New Delhi)	4
17	Torrent Pharmaceutical Ltd (Gujarat)	4
18	Others	< 4

Some of the patents assigned outside India relate to patents by Indian inventor as collaborator. The list of Indian patent assignees is shown in Table 5. This includes only patent assignees with 4 or more patents filed with USPTO. The complete list can be accessed from our website referred earlier. CSIR leads the list significantly, followed by individuals and few pharmaceutical companies.

Conclusion

The study indicates that presence of Indian patents in the USPTO database have increased significantly in the period 1997-2002. CSIR and DST have played important role in the creation of patent awareness in the country. The maximum numbers of patents are in chemistry and metallurgy.

Acknowledgement

Authors acknowledge the partial financial support of the National Information System for Science and Technology (NISSAT), New Delhi, for the present study. We thank referees for their valuable suggestions and comments.

References

- 1 *General Information for Filing Patent Application* (Patent Office, Government of India, Calcutta), 2001
- 2 <http://www.indialawinfo.com>
- 3 *Agreement on Trade-Related Aspects of Intellectual Property Rights* (Marrakech Agreement Establishing the World Trade Organization (WTO), Annex IC, Legal Instruments – Results of the Uruguay Round) Vol. 31, 33 I.L.M.81, 15 April 1994.
- 4 Frame J D, Mainstream research in Latin America and the Caribbean, *Interciencia*, **2**, 1977, 143
- 5 Scubert A and Braun T, Relative indicators and relational charts for comparative assessment of publication output and citation impact, *Scientometrics*, **9**, 1986, 281
- 6 Karki M M S and Garg K C, Bibliometrics of alkaloid chemistry research in India, *Journal of Chemical Information and Computer Sciences*, **47**, 1997, 157-161
- 7 Govindarajulu V, Patent Information for R&D Industry and Society, <http://www.patentmatics.com/pub28.htm>
- 8 International Seminar on New Dimensions of Intellectual Property in Changing Scenario, Institute of Intellectual Property Research & Practice [IIPRP] & Technology Information Forecasting and Assessment Council [TIFAC], New Delhi, 21-22 January 2002
- 9 Workshop on IPR in Biotechnology, Centre for Cellular and Molecular Biology, Hyderabad & National Information System for Science and Technology (NISSAT), Department of Scientific and Industrial Research, New Delhi, October 2001
- 10 Kardam K S, Patenting of Biotechnology: Procedural Aspects. National Roving Seminar on Intellectual Property Rights in Biotechnology, Department of Biotechnology, Government of India in collaboration with World Intellectual Property Organization (WIPO), Geneva, at Centre for DNA Fingerprinting and Diagnostics (CDFD), Hyderabad, 01 October 2002
- 11 International Conference on Healthcare and Food: Challenges of Intellectual Property Rights, Biosafety and Bioethics, National Institute of Science, Technology and Development Studies, New Delhi 110 012,

- Supported by the Third World Academy of Sciences, Commonwealth Science Council and Food and Agricultural Organization, 1-5 December 2002
- 12 Ghosh P K, Indian experience in commercializing institutionally developed biotechnologies, *Journal of Scientific & Industrial Research*, **55**, 1996, 860-872
 - 13 Mashelkar R A, Views on Intellectual Property Rights, *Journal of Intellectual Property Rights*, **6**, 2001, 138-141
 - 14 Mashelkar R A, Intellectual Property Management in India: New Challenges and Opportunities Ahead, *Journal of Intellectual Property Rights*, **6**, 2001, 369-376