Ranking of Indian Institutions in Food Science and Technology Research during 2004-2013

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ARTICLE INFO	ABSTRACT
	Research on food science and technology is necessary to fuel food industries, it will leads to generation of employment, growth of agriculture, increase in export and improvement of economy. During last five years, Indian food processing sector show 8.4% growth but country is dependent on import of technologies. India needs domestic technologies for agro-based rural industries, value addition, food preservation and processing, nutrition enhancement and management of food wastage (Economic Survey 2013-2014).

Introduction

This study reports research performance on food science and technology of Indian institutions on national and international platform during 2004 to 2013. The scienometic studies are major tool for research evaluation because personal knowledge is not sufficient for evaluation and understanding research and developments in various interlinked sectors. Therefore, present communication is vital for policy planners to identify well performing institutions and decide funding (King and Pendlebury 2013). The data on h-index, publication and citation counts were downloaded from *Web of Science* (*WoS*) and top 50 institutes were identified by number of publications (www.http://thomsonreuters.com/web-of-science-core-collection/).

Most productive institutes were identified by counting of publications. Total number of publications (*P*) measures productivity but does not measure importance of papers. Hence, citations (*C*) have been enumerated. But total citations may be inflated by high citations of one or two papers. This problem is fixed by average citations per paper or impact (*C/P*) but it may gives high score to author/institution have less number of publications and *vice versa*. Therefore, h-index and p-index were calculated. The h-index and p-index measure quality and quantity of publications by single number but p-index is better indicator for comparative studies (Hirsch 2005, Prathap 2010). In addition, ratio of p-index to h-index is provided because if it is more than 1.5, it means not many papers are below h-index and if it is around 0.5, most of the papers are not cited (Prathap 2010). Therefore, concept of "relative measure, not just absolute count" was applied during the study for better mapping (Martin 1996, Pendlebury 2010).

A total of 50 institutes with high publications during past 10 years period from 2004 to 2013 are enlisted in Table 1. Together, these institutes have published 4243 papers with 61.52% publication to cumulative publication by India. The Central Food Technological Research Institute is on the top in food science & technology research with 966 records and 14.08% domestic share, followed by National Dairy Research Institute (3.35%), IIT, Kharagpur (3.17%), Bhabha Atomic Research Centre (2.69%), Guru Nanak Dev University (2.65%), Punjab Agricultural University (2.58%), Defence Food Research Laboratory (2.4%), etc. Table 2 shows ranking of top 10 domestic institutions by p-index, h-index and total citations. Ranking by citation consider quality whereas p-index, h-index are more composite indicators consider quality as well as quantity. Except Central Food Technological Research Institute, rests of the institutions have changed their position. On the basis of quality of publications Guru Nanak Dev University, National Institute for Interdisciplinary Science and Technology, Banaras Hindu University moves upwards and National Dairy Research Institute, Indian Veterinary Research Institute moves down.

Only seven Indian research institutes have find place in top 500 institutes of the world. Except CFTRI (rank 32) none of them are in top 250. However, altogether CSIR laboratories have 5th rank in world (Table 3). A total of 191,649 records were available on global level. Indian was on 11th rank with 6896 publications. USA is on top with 35,164 records, followed by Japan (14,943), China (14,906), Spain (13,016), Germany (9,738), Italy (9,048), South Korea (8,608), France (7,099) and Canada (6,930). In table 3, one more indicator was used to measure performance of institution on global level *i.e.* Exergy (*X*). It gives better result when publication and citations have very high value. The exergy is better indicator for performance, as it consider impact (*i* = citation/publication) and number of publications (*P*) or impact (*i*) and citation (*C*), calculated as follows: *Exergy* $(X) = i^2 \times P = i \times C$ (Prathap 2013). The present study indicates that performance of most of the Indian institutions in food science and technology research is not up to the mark.

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Table 1. Scientometric data for top 50 Indian institutions based on papers published during 2004-2013 according to the SCI databases

	Institutions	P	C	C/P	h	p	p/h
1.	Central Food Technological Research Institute	966	10090	10.45	42	47.24	1.12
2.	National Dairy Research Institute	231	1428	6.18	21	20.67	0.98
3.	Indian Institute of Technology, Kharagpur	219	2118	9.67	23	27.36	1.19
4.	Bhabha Atomic Research Centre	186	1709	9.19	21	25.04	1.19
5.	Guru Nanak Dev University	183	2276	12.44	27	30.48	1.13
6.	Punjab Agricultural University	178	763	4.29	13	14.84	1.14
7.	Defence Food Research Laboratory	166	997	6.01	17	18.16	1.07
8.	National Institute for Interdisciplinary Science and Technology	107	1630	15.23	22	29.17	1.33
9.	Indian Veterinary Research Institute	106	849	8.01	14	18.95	1.35
10.	Banaras Hindu University	104	1351	12.99	20	25.99	1.30
11.	Indian Agricultural Research Institute	102	877	8.60	14	19.61	1.40
12.	G. B. Pant University of Agriculture and Technology	102	386	3.78	10	11.35	1.13
13.	Annamalai University	98	833	8.50	16	19.20	1.20
14.	Central Institute for Medicinal and Aromatic Plants	94	389	4.14	9	11.72	1.30
15.	University of Mysore	88	885	10.06	16	20.72	1.30
16.	University of Mumbai	82	803	9.79	17	19.89	1.17
17.	Panjab University	81	854	10.54	16	20.80	1.30
18.	Indian Institute of Technology, Delhi	81	735	9.07	15	18.82	1.25
19.	Jadavpur University	80	408	5.10	10	12.77	1.28
20.	CCS Haryana Agricultural University	78	229	2.94	8	8.76	1.10
21.	Sant Longowal Institute of Engineering and Technology	72	527	7.32	13	15.68	1.21
22.	University of Calcutta	65	503	7.74	11	15.73	1.43
23.	Central Institute of Post-Harvest Engineering and Technology	65	524	8.06	15	16.17	1.08
24.	Bharathiar University	65	484	7.45	13	15.33	1.18
25.	Indian Institute of Chemical Technology	61	418	6.85	13	14.20	1.09
26.	Central Institute of Fisheries Technology	59	408	6.92	11	14.13	1.28
27.	Institute of Chemical Technology	58	417	7.19	8	14.42	1.80
28.	Tamil Nadu Agricultural University	54	248	4.59	8	10.44	1.31
29.	Jamia Hamdard University	54	527	9.76	13	17.26	1.33
30.	University of Delhi	53	241	4.55	9	10.31	1.15
31.	Institute of Himalayan Bioresource Technology	52	543	10.44	15	17.83	1.19
32.	Indian Institute of Toxicology Research	50	621	12.42	13	19.76	1.52
33.	University of Madras	49	472	9.63	12	16.57	1.38
34.	Kumaun University	49	242	4.94	8	10.61	1.33
35.	Sri Venkateswara University	48	381	7.94	13	14.46	1.11
36.	Aligarh Muslim University	48	474	9.88	12	16.73	1.39
37.	Central Tuber Crops Research Institute	47	306	6.51	9	12.58	1.40
38.	Central Institute of Post-Harvest Engineering and Technology	45	219	4.87	8	10.21	1.28
39.	Central Institute of Agricultural Engineering	39	161	4.13	6	8.73	1.45
40.	National Botanical Research Institute	38	762	20.05	16	24.81	1.55
41.	National Research Centre on Meat	37	286	7.73	9	13.03	1.45
42.	Vellore Institute Of Technology	36	173	4.81	8	9.40	1.18
43.	Osmania University	36	235	6.53	10	11.53	1.15
44.	Indian Institute of Technology, Madras	36	275	7.64	11	12.81	1.16
45.	DDU Gorakhpur University	35	533	15.23	15	20.10	1.34
46.	Anand Agricultural University	34	94	2.76	5	6.38	1.28
47.	Thapar University	33	93	2.82	5	6.40	1.28
48.	Tamil Nadu Veterinary and Animal Sciences University	33	119	3.61	6	7.54	1.26
49.	Maharaja Sayajirao University of Baroda	33	265	8.03	8	12.86	1.61
50.	National Chemistry Laboratory	32	567	17.72	9	21.58	

Abbreviations: C, citation; P, publication; C/P, citation/publication; p, p-index; h, h-index; p/h, p-index/h-index

Table 2. Top 10 institutions of India ranked using various schemes

Rank	Using p-index	Using h-index	Using citation
1.	Central Food Technological Research Institute	Central Food Technological Research Institute	Central Food Technological Research Institute
2.	Guru Nanak Dev University	Guru Nanak Dev University	Guru Nanak Dev University
3.	National Institute for Interdisciplinary Science and Technology	Indian Institute of Technology, Kharagpur	Indian Institute of Technology, Kharagpur
4.	Indian Institute of Technology, Kharagpur	National Institute for Interdisciplinary Science and Technology	Bhabha Atomic Research Centre
5.	Banaras Hindu University	Bhabha Atomic Research Centre	National Institute for Interdisciplinary Science and Technology
6.	Bhabha Atomic Research Centre	National Dairy Research Institute	National Dairy Research Institute
7.	National Botanical Research Institute	Banaras Hindu University	Banaras Hindu University
8.	National Chemistry Laboratory	University of Mumbai	Defence Food Research Laboratory
9.	Panjab University	Defence Food Research Laboratory	University of Mysore
10.	University of Mysore	National Botanical Research Institute	Indian Agricultural Research Institute

Table 3. Global ranking of top Indian intuitions/organizations in food science technology research

Rank	Institution/Organization	P	% share	C	C/P	h-index	p-index	X
1.	United States Department of Agriculture	5277	2.75%	62379	11.82	76	90.34	62374.14
2.	Consejo Superior De Investigaciones Cientificas	3552	1.85%	51014	14.36	70	90.15	51006.72
3.	Institut National De La Recherche Agronomique	2817	1.47%	36737	13.04	65	78.25	36733.68
4.	University of California System	2074	1.08%	22717	10.95	59	62.9	22710.30
5.	Council of Scientific & Industrial Research, India	1642	0.86%	16428	10	52	54.78	16420.00
6.	Wageningen University Research Center	1627	0.85%	20131	12.37	53	62.92	20125.99
7.	Agriculture and Agri-Food Canada	1608	0.84%	19427	12.08	53	61.68	19424.64
8.	University of California, Davis	1598	0.83%	16588	10.38	50	55.63	16587.24
9.	Universidade De Sao Paulo	1400	0.73%	11170	7.98	40	44.67	11172.00
10.	Cornell University	1387	0.72%	16215	11.69	54	57.45	16214.03
11.	Chinese Academy of Sciences	1375	0.72%	12416	9.03	44	48.22	12416.25
12.	China Agricultural University	1354	0.71%	10919	8.06	38	44.49	10913.24
13.	National Agricultural Research Center, Japan	1343	0.70%	10792	8.04	41	44.26	10797.72
14.	University of Guelph	1320	0.69%	14186	10.75	46	53.42	14190.00
15.	Universidade Estadual De Campinas	1251	0.65%	10550	8.43	38	44.64	10545.93
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32.	Central Food Technological Research Institute	966	0.50%	10090	10.45	42	47.24	10090.00
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262.	National Dairy Research Institute	231	0.12%	1428	6.18	21	20.67	1428.00
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280.	Indian Institute of Technology, Kharagpur	219	0.11%	2118	9.67	23	27.36	2118.00
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339.	Bhabha Atomic Research Centre	186	0.10%	1709	9.19	21	25.04	1709.00
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349.	Guru Nanak Dev University	183	0.10%	2276	12.44	27	30.48	2276.00
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358.	Punjab Agricultural University	178	0.09%	763	4.29	13	14.84	763.00
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388.	Defence Food Research Laboratory	166	0.09%	997	6.01	17	18.16	997.00

Abbreviations: C, citation; P, publication; C/P, citation/publication; X= (impact) × (Citation)

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