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Research Performance of Maharishi Markandeshwar University, Mullana during 2007-15: A Scientometric Study

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Abstract: This paper analyzed 648 research publications that MM University-Mullana had published during nine years (2007-15). The publications data for the study was sourced from Scopus International database. The study quantified publication data by combining a variety of indicators to present a comparative view of the University's performance in national setting. The findings revealed that total publications output of MM University-Mullana registered 65.03% annual average growth and averaged citation impact per paper of 3.27 during 2007-15. The usage of university output has been low. For instance 51.33% publication share of the University did not get any citations and 48.77% received low citation rate, just 1+ citations per paper. The University contributed 39.20% share of its total output as national collaborative papers and 9.88% as international collaborative papers. MM University-Mullana was ranked 5th among top 8 universities across Haryana in terms of publications output, average citation per paper, h-index and share of international collaborative papers, and ranked 3rd for its share of highly cited papers during 2007-15. Engineering field contributed largest share (24.23%) in university output, followed by pharmacology, toxicology & pharmaceuticals (20.37%), computer science (19.14%), medicine (15.12%), chemistry (14.35%), biochemistry, genetics & molecular biology (13.27%), physics & astronomy (10.49%), materials science (9.88%), mathematics (8.33%), chemical engineering (7.41%), etc. Top 25 most productive authors accounted for 62.19% and 81.89% share of total publications and citations output of MM University-Mullana. Out of 648 papers by MM University-Mullana, 539 appeared in 162 journals. Top 25 journals together accounted for 29.17% share of the total papers that MM University-Mullana had published in journals during 2007-15. The top 12 highly cited papers authored by MM University-Mullana received 31+ citations per paper, averaging 54.08 citations per paper.

1. Introduction

Maharishi Markandeshwar (MM) University, Mullana is NAAC accredited 'A' grade deemed university near Ambala in the state of Haryana, India. Erstwhile known as Maharishi Markandeshwar Education Trust, it was founded in 1993 with the objective of social, educational and economic upliftment of the society. The Maharishi Markandeshwar Educational Trust established the first self-financing Engineering College, first self-financing Medical College and the first self-financing Deemed University in the state of Haryana. The Maharishi Markandeshwar University has following campuses: (i) Maharishi Markandeshwar University, Mullana in Ambala is Main Campus, (ii) Maharishi Markandeshwar University, Sadopur, Ambala, and (iii) Maharishi Markandeshwar University, Solan Campus. The constituent institutions on the main campus (at Mullana) of this university include:

Maharishi Markandeshwar Institute of Medical Sciences and Research, Maharishi Markandeshwar College of Dental Sciences & Research, Maharishi Markandeshwar Engineering College, Maharishi Markandeshwar Institute of Physiotherapy & Rehabilitation, Maharishi Markandeshwar Institute of Computer Technology & Business Management (Hotel Management), Maharishi Markandeshwar Institute of Computer Technology & Business Management (MCA), Maharishi Markandeshwar Institute of Management, Maharishi Markandeshwar College of Nursing, Department of Law and Maharishi Markandeshwar International School. These institutes are also approved by the regulatory bodies, such as Medical Council of India, Dental Council of India, Indian Nursing Council, Indian Association of Physiotherapist and All India Council for Technical Education (AICTE) [1].

1.1 Literature Review

A number of studies have assessed the performance of individual Indian universities in Haryana based on their publications output and citations received covering different periods. Such studies include the performance of M.D. University, Rohtak [2] and CCS Haryana Agricultural University, Hisar [3]. In this paper, we study the comparative performance of MM University-Mullana in Haryana based on its publications output and citations covering the period 2007-15.

2. Objectives

The main objectives of this study are to study research performance of MM University-Mullana based on its publications output published during 2007-15. The data for the study was sourced from Scopus database. In particular, the study focused on the following objectives:

- To study the growth of its publications and distribution of output by documents types and sources;
- To study the impact of its publications using citations per paper;
- To study the citation pattern of its research output;
- To compare its research performance with leading comparator universities in Haryana state;
- To study distribution of publications by sub-fields;
- To study the publication productivity and citation impact of most productive authors;
- To study the leading medium of communication and characteristics of its highly cited papers

3. Methodology

The study retrieved and downloaded publications data of MM University-Mullana from the Scopus database (<http://www.scopus.com>) covering the period 2007-15. The database was first searched for presence of keyword "Mullana" in the author affiliation byline by using the keyword "Mullana University-Mullana" in the "Affiliation tag". The search string so created was further limited to publication years "2007 to 2015". Further, we analyzed bibliographic data for publication growth, citation quality, publications share by subjects, most productive journals, etc by exploring combination of various search tags as available in Scopus database. The final search statement as used for the purpose is given below.

(AF-ID("Maharishi Markandeshwar University Mullana" 60094525)) AND (LIMIT-TO(PUBYEAR,2015) OR LIMIT-TO(PUBYEAR,2014) OR LIMIT-TO(PUBYEAR,2013) OR LIMIT-TO(PUBYEAR,2012) OR LIMIT-

TO(PUBYEAR,2011) OR LIMIT-TO(PUBYEAR,2010) OR LIMIT-TO(PUBYEAR,2009) OR LIMIT-TO(PUBYEAR,2008) OR LIMIT-TO(PUBYEAR,2007))

The main search string was further restricted to “author name tag”, “source title tag”, “keyword tag” “affiliation tag” and “country/territory tag” in order to collect publications output data by authors, source, significant keywords, collaborating organizations and countries, etc. The study used open citation window for citation analysis. As such citations were counted effective from date of publication of papers till the end of 25 January 2016. The study used both quantitative and qualitative indicators to assess the performance of MM University-Mullana.

Citation impact of papers authored by the University was studied using impact factor, SCImago Journal Rank (SJR), and Source Normalized Impact per Paper (SNIP). SJR is weighted by the prestige of a journal. Subject field, quality and reputation of the journal have a direct effect on the value of a citation. SJR also normalizes for differences in citation behavior between subject fields. SNIP measures contextual citation impact by weighting citations based on the total number of citations in a subject field.

4. Data Analysis & Results

4.1 Publications Growth Analysis

MM University-Mullana contributed a total of 648 publications in physical, life, medical, and engineering sciences in 9 years during 2007-15. Its annual output went up from 9 in 2007 to 133 publications in 2015, averaging 65.03% annual growth. Its five-yearly accumulation increased from 201 (during 2007-11) to 447 publications (during 2012-15), witnessing 122.39% five-yearly growth (Table 1).

Table 1: Publications Growth of M.M. University-Mullana, 2007- 15

Publication Year	M.M.University-Mullana						
	TP	TC	ACPP	NCP	%NCP	ICP	%ICP
2007	9	24	2.67	6	66.67	1	11.11
2008	8	7	0.88	5	62.50	0	0.00
2009	38	434	11.42	18	47.37	2	5.26
2010	66	304	4.61	29	43.94	7	10.61
2011	80	381	4.76	27	33.75	6	7.50
2012	74	304	4.11	31	41.89	6	8.11
2013	105	447	4.26	36	34.29	14	13.33
2014	135	183	1.36	42	31.11	15	11.11
2015	133	37	0.28	60	45.11	13	9.77
2007-11	201	1150	5.72	85	42.29	16	7.96
2012-15	447	971	2.17	169	37.81	48	10.74
2007-15	648	2121	3.27	254	39.20	64	9.88
TP=Total Publications; TC=Total Citations; ACPP=Average Citations Per Paper; NCP=National Collaborative Publications; ICP=International Collaborative Publications							

The citation impact of MM University-Mullana averaged to 3.27 citations per paper during 2007-15. The five-year impact changed from 5.72 to 2.17 average citations per paper during the period between 2007-11 and 2012-15. The university contributed 68.36% (443) of its total output as articles, 16.82% (109) as conference papers, 8.80% (57) as reviews, 2.47% (16) as letters, 1.23% (8) as articles in press,

0.83% (6) as editorial, 0.62% (4 each) as book chapters and as erratum and 0.15% (1) as notes during 2007-15 (Table 1).

4.2 Citation Analysis

The usage of research papers of MM-University-Mullana has been low. For example, bulk of the University publications (51.33% 316) did not get even a single citation (zero citation) since their publication till January 26, 2016. Secondly, most publications (44.29% 287 publications) received low citation rate (1 to 10 citations per paper in 9 years). In addition, 6.48% papers received modest citation rate (11 to 30 citations per paper). Only 2 papers (0.31% out of 648 papers) received high citation rate (100+ citations per paper). In overall, MM University-Mullana averaged low citation rate (3.27 citations per paper) in 9 years during 2007-15.

Table 2: Usage of MM University Publications by Citations, 2007-15

Range of Citations	TP	Citations	% TP	% Citations
0 – 0	316	0	48.77	0
1 – 10	287	935	44.29	44.08
11-30	33	537	5.09	25.32
31-50	9	314	1.39	14.80
51-100	1	59	0.15	2.78
>100	2	276	0.31	13.01
Total	648	2121	100.00	100
TP=Total Publications				

4.3 Comparative Performance of MM University-Mullana in Haryana

MM University-Mullana was ranked 5th amongst top 8 most productive universities in Haryana (648 publications in 9 years). The University also ranked 5th in terms of average citation per paper (3.27), 5th for its h-index, 5th for its share of international collaborative papers, and 3rd for its share of highly cited papers during 2007-15 (Table 3).

Table 3: Scientometric Profile of Top 8 Universities in Haryana, 2007-15

S.No	Name of the University	TP	TC	ACPP	HI	ICP	%ICP	HCP	%HCP
1	Kurukshetra University, Kurukshetra	2166	9955	4.60	34	165	7.62	1	0.046
2	CCS Haryana Agricultural University, Hlsar	1559	3611	2.32	24	124	7.95	2	0.128
3	GJ University of Science & Technology, Hlsar	1216	9903	8.14	44	93	7.65	9	0.740
4	Maharishi Dayanand University, Rohtak	1448	6876	4.75	35	213	14.71	0	0.000
5	M M Mullana University, Mullana	648	2121	3.27	21	64	9.88	2	0.309
6	Deenbandhu Chhotu Ram University of Science & Technology, Murthal	191	562	2.94	13	34	17.80	0	0.000
7	Chaudhary Devi Lal University, Sirsa	284	1369	4.82	17	30	10.56	1	0.352

S.No	Name of the University	TP	TC	ACPP	HI	ICP	%ICP	HCP	%HCP
8	Manav Rachna International University, Faridabad	171	242	1.42	8	23	13.45	0	0.000
TP=Total Publications; TC=Total Citations; ACPP=Average Citations Per Paper; NCP=National Collaborative Publications; ICP=International Collaborative Publications HCP = Highly cited papers (100+ citations per paper)									

4.4 Distribution of Publications by National Collaboration

MM University-Mullana contributed 39.20% share of its total output (254 out of 648 publications) by way of collaboration with a number of universities within Haryana and across north India. Citation impact of these 254 national collaborative papers was low, 4.52 citations per paper but marginally above the overall University average of 3.27 citations per paper. Surely, MM University-Mullana had benefited substantially from national collaboration in terms of higher citation impact. Of the 245 collaborative papers by MM University-Mullana, 145 resulted from its collaboration with organizations within Haryana and 161 from collaboration with organizations across north India. But India-wide national collaborative papers (161) had posted better citation impact (4.99 citations per paper) than that of 145 Haryana-centered collaborative papers (3.0).

Within Haryana state, MM University-Mullana had largest collaboration with Kurukshetra University (52 papers), followed by GJ University of Science & Technology, Hlsar (19 papers), M D University, Rohtak (13 papers), Ambala College of Engineering & Science (8 papers), DCR University of Science & Technology, Murthal (7 papers), YMCA University of Science & Technology, Faridabad (5 papers), National Institute of Technology, Kurukshetra (4 papers), Geeta Institute of Management & Technology, Kurukshetra and CDL University, Sirsa (3 papers each), National Dairy Research Institute, Karnal, Haryana College of Technology & Management, Manav Rachna International University (2 papers each), etc.

Across north India, MM University-Mullana had collaboration with Punjabi University, Patiala and contributed the largest number of collaborative publications (37), followed by Thapar University, Patiala (30 publications), Postgraduate Institute of Medical Education & Research, Chandigarh (16 publications), Dr BR Ambedkar Nation Institute of Technology, Jullandhar (12 publications), Dr Harisingh Gour University, Sagar (10 publications), Guru Nanak Dev University, Amritsar (7 publications), Rani Durga Viswavidalaya and Indian Institute of Technology, Roorkee (7 publications each), Panjab University, Chandigarh and Sant Longowal Institute of Engineering & Technology, S. Anrur (6 publications each), etc.

4.5 Distribution of Publications by International Collaboration

MM University-Mullana contributed 9.88% share of its total output (64 out of 648 publications) by way of international collaboration with 22 countries. The University had highest rate of collaboration with USA which resulted in 18 papers, followed by South Korea (16), Saudi Arabia (9), Greece (6), Bulgaria (5), Taiwan (3), Austria, Canada, Egypt, Ethiopia and Germany (2 each), etc during 2007-15. These 64 international collaborative papers received 221 citations, averaging 3.45 citations per paper.

4.6 Comparative Subject Analysis

The total research output of MM University-Mullana was subdivided under 13 major subfields in accordance with Scopus Classification. Engineering contributed the largest share (24.23%) of the University, followed by pharmacology, toxicology & pharmaceuticals (20.37%), computer science (19.14%), medicine (15.12%), chemistry (14.35%), biochemistry, genetics & molecular biology (13.27%), physics & astronomy (10.49%), materials science (9.88%), mathematics (8.33%), chemical engineering (7.41%), etc. Pharmacology, toxicology & pharmaceuticals registered the highest impact (4.89) in terms of citations per paper, followed by chemistry (4.41), computer science (4.35), materials science (3.95), mathematics (3.59), medicine (2.89), chemical engineering (2.83), engineering (2.68), biochemistry, genetics & molecular biology (2.47), physics & astronomy (2.32), agricultural & biological sciences (2.27), immunology & microbiology (2.15) and environment science (1.26) during 2005-14 (Table 4).

Table 4. Subject-Wise Distribution of M.M. University-Mullana Output during 2007-15

S.No	Subject	TP	TC	ACPP	%TP
1	Engineering	157	421	2.68	24.23
2	Pharmacology, toxicology & pharmaceuticals	132	646	4.89	20.37
3	Computer science	124	540	4.35	19.14
4	Medicine	98	283	2.89	15.12
5	Chemistry	93	410	4.41	14.35
6	Biochemistry, genetics & molecular biology	86	212	2.47	13.27
7	Physics & astronomy	68	158	2.32	10.49
8	Materials science	64	253	3.95	9.88
9	Mathematics	54	194	3.59	8.33
10	Chemical engineering	48	136	2.83	7.41
11	Agricultural & biological sciences	44	100	2.27	6.79
12	Environment science	39	49	1.26	6.02
13	Immunology & microbiology	26	56	2.15	4.01
	Total of the university	648			
TP=Total Publications; TC=Total Citations; ACPP=Average Citations Per Paper					

A more detailed comparative study with top 7 Haryana universities output across broad subject areas is presented below:

4.6.1 Engineering Sciences - MM University-Mullana contributed 60.66% share of its total output (393 out of 648) in engineering sciences during 2007-15. Engineering sciences covered only such select areas in which the University conducted its academic programmes such as (i) **engineering field** which contributed 24.23% share (157 out of 648 publications), (ii) **computer science** which contributed 19.14% share (124 publications), (iii) **material science** which contributed 9.88% share (64 publications), and (iv) **chemical engineering** which contributed 7.41% share (48 publications).

Engineering: MM University-Mullana was ranked 4th among top 8 most productive universities in Haryana in engineering field (157 publications), 6th for its average citations per paper, and 4th for its h-

index during 2007-15 (Table 5). The average citation per paper and h-index registered by its 157 publications was 2.68 and 9 respectively. MM-University-Mullana contributed 52.87% share as national collaborative papers and 7.74% as international collaborative papers in engineering field during 2007-15. Five-yearly publications output of the University in engineering field increased from 50 (during 2007-11) to 107 publications during 2012-15, registering 114% five-yearly growth.

Table 5 . Scientometric Profile of Top 8 Haryana Universities in Engineering 2007-15

S.No	Name of the University	TP	TC	ACPP	HI
1	Kurukshetra University, Kurukshetra	468	1388	2.97	17
2	GJ University of Science & Technology, Hlsar	214	1817	8.49	20
3	Maharishi Dayanand University, Rohtak	193	976	5.06	16
4	M M Mullana University, Mullana	157	421	2.68	9
5	Manav Rachna International University, Faridabad	82	98	1.20	
6	Deenbandhu Chhotu Ram University of Science & Technology, Murthal	65	233	3.58	8
7	Chaudhary Devi Lal University, Sirsa	61	207	3.39	8
8	CCS Haryana Agricultural University, Hlsar	56	19	0.34	3

Computer Science: MM University-Mullana was ranked 2nd among top 8 most productive universities in Haryana in computer science (124 publications), ranked top for its highest average citations per paper and for its highest h-index during 2007-15 (Table 6). The average citation per paper and h-index registered by its 124 publications was 4.35 and 9 respectively. MM University-Mullana contributed 54.03% share as national collaborated papers and 7.26% as international collaborative papers in computer science during 2007-15. Five-yearly publications output in computer science increased from 61 (during 2007-11) to 63 publications during 2012-15, registering 3.28% five-yearly growth.

Table 6 . Scientometric Profile of Top 8 Haryana Universities in Computer Science 2007-15

S.No	Name of the University	TP	TC	ACPP	HI
1	Kurukshetra University, Kurukshetra	164	300	1.83	9
2	M M Mullana University, Mullana	124	540	4.35	9
3	Maharishi Dayanand University, Rohtak	95	149	1.57	6
4	GJ University of Science & Technology, Hlsar	70	184	2.63	7
5	Deenbandhu Chhotu Ram University of Science & Technology, Murthal	45	143	3.18	7
6	Manav Rachna International University, Faridabad	33	16	0.48	2
7	Chaudhary Devi Lal University, Sirsa	16	43	2.69	3
8	CCS Haryana Agricultural University, Hlsar	4	12	3.00	2

Materials Science: MM University-Mullana was ranked 5th amongst top 8 most productive universities in Haryana in materials science (64 publications), 6th for its average citations per paper, and 5th for its h-

index during 2007-15 (Table 7). The average citation per paper and h-index registered by its 64 publications was 3.95 and 7 respectively. MM University-Mullana contributed 75% share as national collaborative papers and 18.75% as international collaborative papers in materials science during 2007-15. Five-yearly publications output of the University in materials science increased from 25 (during 2007-11) to 39 publications during 2012-15, registering 56% five-yearly growth.

Table 7 . Scientometric Profile of Top 8 Haryana Universities in Materials Science 2007-15

S.No	Name of the University	TP	TC	ACPP	HI
1	Kurukshetra University, Kurukshetra	356	1781	5.00	19
2	GJ University of Science & Technology, Hlsar	181	1258	6.95	18
3	Maharishi Dayanand University, Rohtak	125	798	6.38	16
4	Chaudhary Devi Lal University, Sirsa	82	461	5.62	11
5	M M Mullana University, Mullana	64	253	3.95	7
6	Manav Rachna International University, Faridabad	33	105	3.18	7
7	Deenbandhu Chhotu Ram University of Science & Technology, Murthal	28	150	5.36	7
8	CCS Haryana Agricultural University, Hlsar	26	16	0.62	3

Chemical Engineering: MM University-Mullana was ranked 4th amongst top 8 most productive universities in Haryana in chemical engineering (48), 7th for its average citation per paper and 5th for its h-index during 2007-15 (Table 8). The average citation per paper and h-index registered by its 48 publications was 2.835 and 7 respectively. MM University-Mullana contributed 62.5% share as national collaborative papers and 8.33% as international collaborative papers in chemical engineering during 2007-15. Five-yearly publications output of the University in chemical engineering increased from 13 (during 2007-11) to 35 publications during 2012-15, registering 169.23% five-yearly growth.

Table 8 . Scientometric Profile of Top 8 Haryana Universities in Chemical Engineering 2007-15

S.No	Name of the University	TP	TC	ACPP	HI
1	Kurukshetra University, Kurukshetra	144	994	6.90	15
2	Maharishi Dayanand University, Rohtak	128	565	4.41	13
3	GJ University of Science & Technology, Hlsar	112	2444	21.82	26
4	M M Mullana University, Mullana	64	253	3.95	7
5	CCS Haryana Agricultural University, Hlsar	30	208	6.93	7
6	Deenbandhu Chhotu Ram University of Science & Technology, Murthal	23	86	3.74	4
7	Chaudhary Devi Lal University, Sirsa	20	271	13.55	7
8	Manav Rachna International University, Faridabad	14	27	1.93	2

4.6.2 Physical Sciences

MM University-Mullana contributed 39.19% share of its total output (254 out of 648) in physical sciences during 2007-15. Physical sciences covered only such select areas in which the University conducted its academic programmes such as (i) **chemistry** which contributed 14.35% share (93 out of 648 publications), (ii) **physics & astronomy** which contributed 10.49% share (68 publications), (iii) **mathematics** which contributed 8.33% share (54 publications), and (iv) **environment science** which contributed 6.02% share (39 publications).

Chemistry: MM University-Mullana was ranked 4th amongst top 8 most productive universities in Haryana in chemistry (93 publications), 4th for its average citations per paper, and 4th for its h-index during 2007-15 (Table 9). The average citation per paper and h-index registered by its 93 publications was 4.41 and 11 respectively. MM University-Mullana contributed 53.76% share as national collaborative papers and 8.60% as international collaborative papers in chemistry during 2007-15. Five-yearly publications output of the University in chemistry increased from 26 (during 2007-11) to 67 publications during 2012-15, registering 157.69% five-yearly growth.

Table 9 . Scientometric Profile of Top 8 Haryana Universities in Chemistry 2007-15

S.No	Name of the University	TP	TC	ACPP	HI
1	Kurukshetra University, Kurukshetra	459	3151	6.86	23
2	Maharishi Dayanand University, Rohtak	351	2493	7.10	26
3	GJ University of Science & Technology, Hlsar	215	1734	8.07	21
4	M M Mullana University, Mullana	93	410	4.41	11
5	CCS Haryana Agricultural University, Hlsar	53	58	1.09	4
6	Chaudhary Devi Lal University, Sirsa	31	125	4.03	7
7	Deenbandhu Chhotu Ram University of Science & Technology, Murthal	19	77	4.05	5
8	Manav Rachna International University, Faridabad	13	30	2.31	3

Physics & Astronomy: MM University-Mullana was ranked 5th amongst top 8 most productive universities in Haryana in physics & astronomy (68 publications), 7th for its average citation per paper and 5th for its h-index during 2007-15 (Table 10). The average citation per paper and h-index registered by its 68 publications was 2.32 and 6 respectively. MM University-Mullana contributed 76.47% share as national collaborative papers and 23.53% as international collaborative papers in physics & astronomy during 2007-15. Five-yearly publications output of the University in physics & astronomy increased from 28 (during 2007-11) to 40 publications during 2012-15, registering 42.85% five-yearly growth.

Table 10 . Scientometric Profile of Top 8 Haryana Universities in Physics & Astronomy 2007-15

S.No	Name of the University	TP	TC	ACPP	HI
1	Kurukshetra University, Kurukshetra	524	9955	19.00	34
2	GJ University of Science & Technology, Hlsar	198	909	4.59	15
3	Maharishi Dayanand University, Rohtak	155	795	5.13	16
4	Chaudhary Devi Lal University, Sirsa	101	448	4.44	11

S.No	Name of the University	TP	TC	ACPP	HI
5	M M Mullana University, Mullana	68	158	2.32	6
6	Deenbandhu Chhotu Ram University of Science & Technology, Murthal	23	63	2.74	5
7	Manav Rachna International University, Faridabad	22	97	4.41	6
8	CCS Haryana Agricultural University, Hlsar	1	1	1.00	1

Mathematics: MM University-Mullana was ranked 3rd amongst top 8 most productive universities in Haryana in mathematics, top rank for its average citation per paper and 3rd for its h-index during 2007-15 (Table 11). The average citation per paper and h-index registered by its 54 publications was 3.59 and 6 respectively. MM University-Mullana contributed 74.07% share as national collaborative papers and 20.37% as international collaborative papers in mathematics during 2007-15. Five-yearly publications output of the University in mathematics increased from 17 (during 2007-11) to 34 publications during 2012-15, registering 100% five-yearly growth.

Table 11 . Scientometric Profile of Top 8 Haryana Universities in Mathematics 2007-15

S.No	Name of the University	TP	TC	ACPP	HI
1	Kurukshetra University, Kurukshetra	158	424	2.68	10
2	Maharishi Dayanand University, Rohtak	100	208	2.08	6
3	M M Mullana University, Mullana	54	194	3.59	6
4	GJ University of Science & Technology, Hlsar	36	63	1.75	5
5	Deenbandhu Chhotu Ram University of Science & Technology, Murthal	33	56	1.70	4
6	Chaudhary Devi Lal University, Sirsa	9	30	3.33	2
7	Manav Rachna International University, Faridabad	5	1	0.20	1
8	CCS Haryana Agricultural University, Hlsar	5	0	0.00	0

Environment science: MM University-Mullana was ranked 5th amongst top 8 most productive universities in Haryana in environment science (39 publications), 6th for its average citation per paper and 6th for its h-index during 2007-15 (Table 12). The average citation per paper and h-index registered by its 39 publications was 1.26 and 4 respectively. MM University-Mullana contributed 51.28% share as national collaborative papers and 5.13% as international collaborative papers in environment science during 2007-15. Five-yearly publications output of the University in environment science increased from 11 (during 2007-11) to 26 publications during 2012-15, registering 136.36% five-yearly growth.

Table 12 . Scientometric Profile of Top 8 Haryana Universities in Mathematics 2007-15

S.No	Name of the University	TP	TC	ACPP	HI
1	GJ University of Science & Technology, Hlsar	160	3554	22.21	30
2	Kurukshetra University, Kurukshetra	125	583	4.66	12
3	CCS Haryana Agricultural University, Hlsar	113	426	3.77	11

S.No	Name of the University	TP	TC	ACPP	HI
4	Maharishi Dayanand University, Rohtak	104	640	6.15	14
5	M M Mullana University, Mullana	39	49	1.26	4
6	Chaudhary Devi Lal University, Sirsa	14	60	4.29	5
7	Manav Rachna International University, Faridabad	6	2	0.33	1
8	Deenbandhu Chhotu Ram University of Science & Technology, Murthal	5	0	0.00	

4.6.3 Life Sciences

MM University-Mullana contributed 24.07% share of its total output (156 out of 648) in life sciences during 2007-15. Life sciences covered only such select areas in which the University conducted its academic programmes such as (i) biochemistry, genetics & molecular biology which contributed 13.27% share (86 out of 648 publications), (ii) agricultural & biological sciences which contributed 6.79% share (44 publications), (iii) immunology & microbiology which contributed 4.01% share (26 publications).

Biochemistry, Genetics & Molecular Biology: MM University-Mullana was ranked 5th amongst top 8 most productive universities in Haryana in biochemistry, genetics & molecular biology (86 publications), 5th for its average citation per paper, and 5th for its h-index during 2007-15 (Table 13). The average citation per paper and h-index registered by its 86 publications was 2.46 and 7 respectively. MM University-Mullana contributed 51.16% share as national collaborative papers and 11.63% as international collaborative papers in biochemistry, genetics & molecular biology during 2007-15. Five-yearly publications output of the University in biochemistry, genetics & molecular biology increased from 14 (during 2007-11) to 72 publications during 2012-15, registering 414.29% five-yearly growth.

Table 13:.. Scientometric Profile of Top 8 Haryana Universities in Biochemistry, Genetics & Mol Biology 2007-15

S.No	Name of the University	TP	TC	ACPP	HI
1	Maharishi Dayanand University, Rohtak	361	2336	6.47	25
2	Kurukshetra University, Kurukshetra	281	1991	7.09	21
3	CCS Haryana Agricultural University, HIsar	144	550	3.82	12
4	GJ University of Science & Technology, HIsar	139	1132	8.14	16
5	M M Mullana University, Mullana	86	212	2.47	7
6	Chaudhary Devi Lal University, Sirsa	37	91	2.46	5
7	Manav Rachna International University, Faridabad	24	43	1.79	4
8	Deenbandhu Chhotu Ram University of Science & Technology, Murthal	13	19	1.46	2

Agricultural & biological sciences: MM University-Mullana was ranked 6th amongst top 8 most productive universities in Haryana in agricultural & biological sciences (44 publications), 5th for its average citation per paper, and 6th for its h-index during 2007-15 (Table 14). The average citation per paper and h-index registered by its 44 publications was 2.27 and 5 respectively. MM University-Mullana contributed 68.18% share as national collaborative papers and 11.36% as international collaborative

papers in agricultural & biological sciences during 2007-15. Five-yearly publications output of the University in agricultural & biological sciences increased from 6 (during 2007-11) to 38 publications during 2012-15, registering 533.33% five-yearly growth.

Table 14 . Scientometric Profile of Top 8 Haryana Universities in Agricultural & Biological Sciences 2007-15

S.No	Name of the University	TP	TC	ACPP	HI
1	CCS Haryana Agricultural University, Hlsar	1267	2574	2.03	21
2	Kurukshetra University, Kurukshetra	228	784	3.44	13
3	Maharishi Dayanand University, Rohtak	217	1099	5.06	18
4	GJ University of Science & Technology, Hlsar	182	1263	6.94	17
5	Chaudhary Devi Lal University, Sirsa	78	532	6.82	11
6	M M Mullana University, Mullana	44	100	2.27	5
7	Deenbandhu Chhotu Ram University of Science & Technology, Murthal	6	4	0.67	1
8	Manav Rachna International University, Faridabad	5	1	0.20	1

Immunology & microbiology: MM University-Mullana was ranked 5th amongst top 8 most productive universities in Haryana in immunology & microbiology (26 publications), 6th for its average citation per paper, and 6th for its h-index during 2007-15 (Table 15). The average citation per paper and h-index registered by its 26 publications was 2.15 and 6 respectively. MM University-Mullana contributed 80.77% share as national collaborative papers and 11.54% as international collaborative papers in immunology & microbiology during 2007-15. Five-yearly publications output of the University in immunology & microbiology increased from 2 (during 2007-11) to 24 publications during 2012-15, registering 1100% five-yearly growth.

Table 15 . Scientometric Profile of Top 8 Haryana Universities in Immunology & Microbiology 2007-15

S.No	Name of the University	TP	TC	ACPP	HI
1	Kurukshetra University, Kurukshetra	88	751	8.53	16
2	Maharishi Dayanand University, Rohtak	86	393	4.57	11
3	CCS Haryana Agricultural University, Hlsar	76	539	7.09	12
4	GJ University of Science & Technology, Hlsar	42	706	16.81	14
5	M M Mullana University, Mullana	26	56	2.15	4
6	Chaudhary Devi Lal University, Sirsa	18	276	15.33	7
7	Deenbandhu Chhotu Ram University of Science & Technology, Murthal	8	16	2.00	2
8	Manav Rachna International University, Faridabad	7	0	0.00	0

4.6.3 Medical Sciences

MM University-Mullana contributed 15.12% share of its total output (98 out of 648) in medical sciences during 2007-15. Medical science in the University is represented only by medicine which contributed 15.12% share (98 publications).

Medicine: MM University-Mullana was ranked 4th amongst top 8 most productive universities in Haryana in medicine (98 publications), 6th for its average citation per paper, and 4th for its h-index during 2007-15 (Table 16). The average citation per paper and h-index registered by its 98 publications was 2.89 and 9 respectively. MM University-Mullana contributed 45.92% share as national collaborative papers and 11.22% as international collaborative papers in medicine during 2007-15. Five-yearly publications output of the University in medicine increased from 21 (during 2007-11) to 77 publications during 2012-15, registering 266.67% five-yearly growth.

Table 16 . Scientometric Profile of Top 8 Haryana Universities in Medicine 2007-15

S.No	Name of the University	TP	TC	ACPP	HI
1	Maharishi Dayanand University, Rohtak	165	578	3.50	12
2	Kurukshetra University, Kurukshetra	160	945	5.91	17
3	GJ University of Science & Technology, Hlsar	114	696	6.11	15
4	M M Mullana University, Mullana	98	283	2.89	9
5	CCS Haryana Agricultural University, Hlsar	40	172	4.30	8
6	Chaudhary Devi Lal University, Sirsa	19	11	0.58	3
7	Manav Rachna International University, Faridabad	14	21	1.50	3
8	Deenbandhu Chhotu Ram University of Science & Technology, Murthal	13	57	4.38	4

4.7 Contribution and Citation Impact of Top 25 Authors

In all, 350 authors participated in research conducted by MM University-Mullana during 2007-15. The top 25 most productive authors individually published 9 to 32 publications and together contributed 403 publications and 1737 citations, accounting for 62.19% and 81.89% share respectively of the total publications and citations of MM University-Mullana.

Eleven authors registered average productivity above the 25-authors group average (16.12) per author: V. Beniwal (32 papers), R.B. Patel (29 papers), V. Kumar and G.K. Gupta (27 papers each), A.K. Sharma and H.K. Sharma (22 papers each), V. Saini, S. Kamboj and V. Gupta (19 papers each), S. Bala (18 papers) and A.Nair (17 papers) during 2007-15 (Table 17).

Nine authors registered citation impact above the 25-authors group average (4.31 citations per paper): K. Kaur (12.20). A.K. Sharma (9.27), R.B. Patel (8.76), G.K. Gupta (8.70), A.Nair (6.82), A.Kumar (6.10), A.Agrawal (5.33), V. Kumar (5.30) and R. Singh (4.69) during 2007-15.

Eleven authors registered h-index above the 25-authors group average (3): G.K. Gupta (10), A.K. Sharma and A.Nair (6 each), K. Kaur, R.B. Patel, V. Kumar, R. Singh and H.K. Sharma (5 each), A.Kumar, M Singh and V. Beniwal (4 each) during 2007-15.

Thirteen authors contributed national collaborative papers (NCP) above the 25-authors group average (50.12%): R. Maan (100.0%), V.Mehta (90.0%), D. Gupta (83.33%), H.K. Sharma and S. Singh (81.82%

each), P.Ailawalia and A. Asthana (77.78% each), A.Kumar (70.0%), R.B. Patel (65.52%), V. Saini and V. Beniwal (57.89% each), A. Agrawal (55.56%) and V. Gupta (52.63%) during 2007-15.

Seven authors contributed international collaborative papers (ICP) above the 25-authors group average (9.68%): S. Singh (81.82%), V. Gupta (52.63%), A.Nair (35.29%), S. Gupta (33.33%), A.K. Sharma (27.27%), A. Agrawal (11.11%) and K. Kaur (10.00%) during 2007-15.

Table 17: Top 25 Most Productive Authors of M.M. University-Mullana during 2007-15

S.No	Name of Author	Affiliating Department/ Institute/Center	TP	TC	ACPP	HI	ICP	%ICP	NCP	%NCP
1	V. Beniwal	Biotechnology	32	55	1.72	4	1	3.13	18	56.25
2	R.B. Patel	Computer science	29	254	8.76	5	2	6.90	19	65.52
3	V. Kumar	Chemistry	27	143	5.30	5	1	3.70	4	14.81
4	G.K. Gupta	Pharmaceutical chemistry	27	235	8.70	10	1	3.70	7	25.93
5	A.K. Sharma	Biotechnology	22	204	9.27	6	6	27.27	5	22.73
6	H.K. Sharma	Chemistry	22	77	3.50	5	0	0.00	18	81.82
7	V. Saini	Pharmacy	19	68	3.58	3	0	0.00	11	57.89
8	S. Kamboj	Pharmacy	19	53	2.79	3	1	5.26	7	36.84
9	V. Gupta	Mathematics	19	9	0.47	2	8	42.11	10	52.63
10	S. Bala	Pharmacy	18	50	2.78	3	1	5.56	7	38.89
11	A.Nair	Pharmacy	17	116	6.82	6	6	35.29	6	35.29
12	M Singh	Computer science	15	39	2.60	4	0	0.00	6	40.00
13	R. Singh	Pharmacy	13	61	4.69	5	1	7.69	5	38.46
14	D. Gupta	Mathematics	12	3	0.25	1	0	0.00	10	83.33
15	A. Khanna	Mathematics	12	27	2.25	3	0	0.00	5	41.67
16	S. Gupta	Pharmacy	12	21	1.75	2	4	33.33	6	50.00
17	R. Maan	Chemistry	11	35	3.18	3	0	0.00	11	100.00
18	S. Singh	Physics	11	26	2.36	3	5	45.45	9	81.82
19	K. Kaur	Chemistry	10	122	12.20	5	1	10.00	3	30.00
20	A.Kumar	Pharmacy	10	61	6.10	4	0	0.00	7	70.00
21	V.Mehta	Physics	10	7	0.70	1	0	0.00	9	90.00
22	J.Grover	Computer science	9	3	0.33	1	0	0.00	0	0.00
23	P.Ailawalia	Applied science	9	19	2.11	3	0	0.00	7	77.78
24	A.Asthana	Pharmacy	9	1	0.11	1	0	0.00	7	77.78
25	A.Agrawal	Medicine	9	48	5.33	3	1	11.11	5	55.56
	Total of 25 authors		403	1737	4.31	3,64	39	9.68	202	50.12
	Total papers of the University		648	2121						
	Share of 25 authors in total output of the University		62.19	81.89						

4.8 Medium of Communication

Out of 648 papers by MM University-Mullana, 539 papers appeared in 162 journals, 76 in conference proceedings, 28 in book series, 4 as books and 1 as trade publications during 2007-15. The distribution 539 papers in 162 journals is skewed. 71 journals published 1 paper each, 48 journals 2 papers each, 16 journals 3 papers each, 11 journals 4 papers each, 5 journals each 5 each, 3 journals 6 papers each, 1 journal each published 7, 8 and 13 papers respectively, 1 journal each published 14, 16, 17 and 20 papers respectively during 2007-15. The top 25 journals together contributed 189 papers, accounting for 29.17% share of the total journal output of MM University-Mullana during 2007-15. The largest number of papers (20) appeared in *International Journal of Pharmacy & Pharmaceutical Science*, followed by *Research Journal of Chemistry & Environment* (17 papers), *International Journal of Pharmaceutical Science Review & Research* (16 papers), *International Journal of Applied Engineering Research* and *Medicinal Chemistry Research* (14 papers each), etc during 2007-15 (Table 18)

Table 18: Top 25 Core Journals of Interest to MM University-Mullana, 2007-15

S.No	Name of the Journal	TP	SJR 2014	SNIP 2014	S.No	Name of the Journal	TP	SJR 2014	SNIP 2014
1	International Journal of Pharmacy & Pharmaceutical Science	20	0.298	0.643	14	International Journal of Engineering & Technology	5	0.175	0.468
2	Research Journal of Chemistry & Environment	17	0.185	0.295	15	International Journal of Mathematical Analysis	5	0.228	0.566
3	International Journal of Pharmaceutical Science Review & Research	16	0.202	0.349	16	Asian Journal of Chemistry	5	0.153	0.198
4	International Journal of Applied Engineering Research	14	0.130	0.166	17	International Journal of Vehicle Structures & Systems	5	0.149	0.225
5	Medicinal Chemistry Research	14	0.409	0.759	18	Indian Journal of Palliative Care	4	0.250	0.664
6	Journal of Materials Science Materials in Electronics	13	0.547	1.023	19	Acta Pharmaceutica Scientia	4	0.182	0.604
7	International Journal of Pure & Applied Mathematics	8	0.322	0.635	20	Acta Poloniae Pharmaceutica Drug Research	4	0.319	0.756
8	Optoelectronics & Advanced Materials Rapid Communications	7	0.208	0.380	21	Proceedings of the Institute of Mechanical Engineers. Part B	4	0.705	0.878
9	European Journal of Medicinal Chemistry	6	1.004	1.611	22	International Journal of Earth Sciences & Engineering	4	0.168	0.156
10	International Journal of Pharma & Biosciences	6	0.329	0.643	23	International Journal of Advanced Manufacturing Technology	4	1.139	1.818
11	Biocatalysis & Agricultural Biotechnology	6	0.440	0.901	24	Journal of Neuroscience & Rural Practice	4	0.251	0.651
12	Current Pharmaceutical Biotechnology	5	0.854	0.807	25	Der Pharma Chemica	4	0.229	0.529
13	Journal of Chemical & Engineering Data	5	0.965	1.202		Total	189		

4.9 Highly Cited Papers

The MM University-Mullana contributed 12 papers that received 31+ citations per paper in 9 years during 2007-2015. These papers were considered as highly cited papers of the University. Together these 12 highly cited papers received 649 citations with an average of 54.08 citations per paper during 2007-15. These 12 papers had resulted from single institution participation (zero collaboration in 1 publication) and from 2 or more institutions participation (10 national collaborative papers and 1 international collaborative paper) during 2007-15. These 12 highly cited papers (5 articles and 7 reviews) involved participations of 38 authors and 29 organizations. These 12 papers were published in high impact journals (IF range 0.817 to 3.447), such as *Acta Pharmaceutica Scientia*, *Beilstein Journal of Organic Chemistry* (IF=2.757), *Clinical Neurology and Neurosurgery*(IF=1.127), *Computer Communications* (IF=1.695), *European Journal of Medicinal Chemistry* (IF=3.447), *International Journal of Computers, Communications and Control* (IF=0.746) , *Journal of Ethnopharmacology*, (IF=2.998), *Journal of Materials Processing Technology* IF=2.236), *Journal of Pharmacy and Pharmacology* (IF=2.264), *Life Sciences* (IF=2.702), *Pattern Recognition* (IF=3.096), *Tropical Animal Health and Production*(IF=0.817) during 2007-15.

These 12 highly cited papers resulted from collaboration that MM University had with north-Indian organizations such as Centre for Development of Advanced Computing (CDAC), Mohali, Punjab Engineering College (PEC), Chandigarh, , Punjab Engineering College, Chandigarh, Guru Nanak Dev Engineering College, Ludhiana, Thapar University, Patiala, G.J. University, Hisar, Haryana, Punjabi University, Patiala, M. D. University, Rohtak, National Institute of Mental Health and Neurosciences, Bangalore, R.D. University, Jabalpur . PGIMER, Chandigarh, Kurukshetra University, Kurukshetra, etc. A list of these 12 highly cited papers is shown in Appendix 1.

5. Summary & Conclusions

This paper analyses research publications authored by of MM University-Mullana for studying research performance of the University and comparing with universities across Haryana state to present a multifaceted view of the University's comparative performance in research as well as the factors that may improve its future position.

The number of publications by MM University-Mullana published 648 publications during 2007-15, increasing from 9 to 133 from year 2007 to 2015, witnessing an average growth rate of 65.03%. The university cumulative publications increased from 201 to 447 publications from 2007-11 to 2012-15, with a growth rate of 122.39%. The university total publications registered an average citation per paper of 3.27 during 2007-15, which decreased from 5.72 to 2.17 from 2007-11 to 2012-15. Only 48.77% publications of the university received 1 or more citations: 44.29% (287 publications received 1 to 10 citations) registered 44.08% (935) of total citations in contrast to only 0.31% (2 publications received >100 citations) registered 13.01% citation share (276) during 2006-15. Amongst the 8 most productive Haryana universities, MM University-Mullana stood at 5th rank in terms of publications output, average citation per paper and share of international collaborative papers and 3rd rank in share of high cited papers during 2007-15. Among the various sub-fields, engineering made the largest contribution (24.23%) in university output, followed by pharmacology, toxicology & pharmaceuticals (20.37%),

computer science (19.14%), medicine (15.12%), chemistry (14.35%), biochemistry, genetics & molecular biology (13.27%), physics & astronomy (10.49%), materials science (9.88%), mathematics (8.33%), chemical engineering (7.41%), etc. Among the different subject fields, pharmacology, toxicology & pharmaceuticals registered the highest impact (4.89) in terms of citation per paper, followed by chemistry (4.41%), computer science (4.35), materials science (3.95), mathematics (3.59), medicine (2.89), chemical engineering (2.83), engineering (2.68), biochemistry, genetics & molecular biology (2.47), physics & astronomy (2.32), agricultural & biological sciences (2.27), immunology & microbiology (2.15) and environment science (1.26) during 2005-14

On comparing MM University-Mullana with other 7 most productive universities of Haryana, it was found that MM University-Mullana : (i) in publication output secured 2nd rank in computer science, 3rd rank in mathematics, 4th rank in engineering, chemical engineering, chemistry and medicine, 5th rank in materials science, physics & astronomy, biochemistry, genetics & molecular biology and immunology & microbiology and 6th rank in agricultural & biological sciences during 2007-15; (ii) in average citation per paper secured 1st rank in computer science and mathematics, 4th rank in chemistry, 5th rank in biochemistry, genetics & molecular biology, and agricultural & biological sciences, 6th rank in engineering, materials science, environment science, immunology & microbiology and medicine and 7th rank in chemical engineering and physics & astronomy during 2007-15 and (iii) in h-index secured 1st rank in computer science, 3rd rank in mathematics, 4th rank in engineering, chemistry and medicine, 5th rank in materials science, chemical engineering, physics & astronomy and biochemistry, genetics & molecular biology during 2007-15,

Around 39.20% and 9.88% publications of MM University-Mullana were involved in national and international collaboration during 2007-15. Among national collaborative publications in Haryana, Kurukshetra with 52 publications was the largest collaborating organization, followed by GJ University of Science & Technology, Hlsar (19 publicatons), M D University, Rohtak (13 publications), Ambala College of Engineering & Science (8 publications), DCR University of Science & Technology, Murthal (7 publications), YMCA University of Science & Technology, Faridabad (5 publications), etc. Amongst national collaborating organizations outside Haryana. (37) were with Punjabi University, Patiala collaborated in 37 papers, followed by Thapar University, Patiala (30 publications), Postgraduate Institute of Medical Education & Research, Chandigarh (16 publications), Dr BR Ambedkar Nation Institute of Technology, Jullandhar (12 publications), Dr Harisingh Gour University, Sagar (10 publications), Guru Nanak Dev University, Amritsar (7 publications), Rani Durga Viswavidalaya and Indian Institute of Technology, Roorkee (7 publications each), Panjab University, Chandigarh and Sant Longowal Institute of Engineering & Technology, Sangrur (6 publications each), etc. Amongst international collaborative publications of the university, the largest number of papers (18) came from USA, followed by South Korea (16), Saudi Arabia (9), Greece (6), Bulgaria (5), Taiwan (3), Austria , Canada, Egypt, Ethiopia and Germany (2 each), etc during 2007-15.

Among 648 papers by the university, around 350 authors participated in research, of which the top 25 most productive authors accounted for 62.19% and 81.89% share of total publications and citations of MM University-Mullana. The average productivity per author, citation per paper, h-index and share of national and international collaborative papers by 25 most productive authors was 16.12, 4.31, 3.64 ,

50.12% and 9.68% during 2007-14. Out of 648 papers, 539 papers by MM University-Mullana appeared in journals and these were published in 162 journals. The top 25 journals together accounted for 29.17% share of the total journal output of MM University-Mullana during 2007-15.

The top 12 comparatively higher cited papers of MM University-Mullana appeared in citation range from 31 to 170 together account for 649 citations, leading to average citation per paper of 54.08. These 12 publications involve the participation of single institution (zero collaboration) in 1 publication and participation of 2 or more institutions (10 national collaborative and 1 international collaborative) during 2007-15. These 12 high cited papers (5 articles and 7 reviews) involve the participations of 38 authors and 29 organizations and are published in 12 journals such

Conclusion: MM University-Mullana's research base is still not a well-rounded and impactful across most research fields compared to universities across Haryana and north India. Given its low rate of publication productivity, low citation impact of its research papers, and low share of international collaborative papers, it is evident that the University needs to improve significantly in terms of quantity and quality of its research. At present the University is ranked 5th amongst top eight universities across Haryana state. In order to improve its ranking position and to make it as the focal point for research across the State, the University has to make concentrated efforts to expand its research faculty base, expand Ph.D. students research base, encourage collaboration with key national and international collaborating hubs, encourage researchers international mobility, and encourage Ph.D. students participation in international conferences and workshops. In addition, the University needs to make more efforts to attract extra-mural grants and get big research projects from major national and international funding agencies.

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Appendix – 1

List of Highly Cited Papers

1. Kumar, D., Aseri, T.C., Patel, R.B. **EEHC: Energy efficient heterogeneous clustered scheme for wireless sensor networks (Article)**. *Computer Communications*, 2009, 32 (4), pp. 662-667. Cited 170 times.

Centre for Development of Advanced Computing (CDAC), Department of Product Design and Technology, Mohali; Punjab Engineering College (PEC), Department of Computer Science and Engineering, Chandigarh; Department of Computer Science and Engineering, Maharishi Markandeshwar University (MMU), Mullana, Ambala, 133 203, India
2. Kumar, S., Singh, R., Singh, T.P., Sethi, B.L. **Surface modification by electrical discharge machining: A review (Review)**. (2009) *Journal of Materials Processing Technology*, 2009, 209 (8), pp. 3675-3687. Cited 106 times.

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Guru Nanak Dev Engineering College, Mechanical and Production Engineering Department, Ludhiana;
Thapar University, Mechanical Engineering Department, Patiala
, Maharishi Markandeshwar University, Mechanical Engineering Department, Mullana
3. Kumar, V., Kaur, K., Gupta, G.K., Sharma, A.K. **Pyrazole containing natural products: Synthetic preview and biological significance (Review)**. *European Journal of Medicinal Chemistry*, 2013, 69, pp. 735-753. Cited 59 times.

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Maharishi Markandeshwar University, Department of Pharmaceutical Chemistry, Mullana;
Maharishi Markandeshwar University, ° Department of Biotechnology, Mullana
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Maharishi Markandeshwar University, Department of Biotechnology, Mullana;
Food and Agriculture Organisation, AGAS, Rome, Italy
8. Shukla, D., Devi, B.I., Agrawal, A. **Outcome measures for traumatic brain injury (Review)**. *Clinical Neurology and Neurosurgery*, 2011, 113 (6), pp. 435-441. Cited 36 times.

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9. Narasimhan, B., Kumar, P., Sharma, D. **Biological activities of hydrazide derivatives in the new millennium (Article)**. *Acta Pharmaceutica Scientia*, 2010, 52 (2), pp. 169-180. Cited 36 times.

Maharshi Dayanand University, R Faculty of Pharmaceutical Sciences, R ohtak;
M. M. College of Pharmacy, Maharishi Markandeshwar University, Mullana

10. Tuli, H.S., Sharma, A.K., Sandhu, S.S., Kashyap, D. **Cordycepin: A bioactive metabolite with therapeutic potential (Review)**. *Life Sciences*, 2013, 93 (23), pp. 863-869. Cited 32 times.

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11. Kumar, D., Aseri, T.C., Patel, R.B. **EECDA: Energy efficient clustering and data aggregation protocol for heterogeneous wireless sensor networks (Article)**. *International Journal of Computers, Communications and Control*, 2011, 6 (1), pp. 113-124. Cited 32 times.

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PEC University of Technology, Chandigarh, India
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Maharishi Markandeshwar University, Department of Chemistry, Mullana,