

Perspective of Iranian women's scientific production in high priority fields of science and technology

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Abstract This study investigates the contribution of Iranian women in high priority fields of science and technology based on their scientific production and citations according to the records of Web of Science (WoS) during 2000–2010. The methodology relies on scientometrics techniques. The statistical population of this study was composed of 7,138 records extracted from WoS in 2,275 of them women had contributed. The gender data of Iranian authors was obtained via the WoS Excel output, author profile in Scopus, browsing the homepage of author's affiliated organization, searching in internet and sending email to the correspondents of paper. The descriptive results show that women in basic and applied sciences have more cooperation in comparison with technology and the most science products have been done in environmental field. Results show that 99 % of Iranian women research is done as joint publications and the average number of participants is three, four and two respectively. Most of the international cooperation is done with USA scientists and the main Iranian participant organization is Tehran University. The results indicated that there is a significant difference between scientific productivity of Iranian women in eight high priority fields of science and technology but no significant difference between pure and applied fields of science. Also, there is positive, direct and significant relationship between the number of authors and the score of citation to scientific products of women in high priority fields of science and technology.

Keywords Bibliometrics · Citation · Collaboration Iran · Science and technology priorities · Women scientists

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Introduction and background

Each country needs research with the proper bias in the various fields of science and technology to achieve development and continuity of its growth. Because with these kinds of researches—needed knowledge for society that is called local knowledge—make blossom and meet community needs. Expert human resources both men and women are main base of researches and one of the most valuable funds of the society (Halek 1996). A lot of money, Time and human resources have been spending on their training and some efforts were made by themselves. Hence, the necessity of using them in different fields to utilize their knowledge and science in order to improve society's circumstances is so considerable and significant (Ayatollahi 2006). On the other side, there is a plenty of economic competitions in developed and developing countries, so considering to the professional human resources is more than before (Burke 2007). Therefore, women as half of human resources and also as potential capacity of the society are the best item for increasing power of competition with other societies in various fields especially science and technology (Frietsch et al. 2009). Being awareness of women's scientific participation in terms of being successful in planning and development plans of human resources of country will be important.

A lot of researches with wide range and various dimensions in the field of women's scientific productivity in different countries have been done. Most of them are evaluated qualitatively and quantitatively in the comparison of women's scientific productions with men's scientific productions. Results of some of them (for example, Cole and Zuckerman 1984; Xie and Shauman 1999; Price 2002; Mauleón and Bordons 2006; Mozaffarian and Jamali 2008; Aksnes et al. 2011; Davarpanah and Moradi Moghadam 2012; Hildrun et al. 2012) show that women in comparison with men have less scientific productivity. While result of Leta and Lewison's research (2003) showed that scientific outputs and inputs for men and women are the same. Only a few studies have been devoted to survey women's works. For example Frietsch et al. (2009) that surveyed women's science and technology productions of 14 countries, their results have been shown that growth processing of women's scientific production has been positive and progressive. Another set of studies also have been surveyed reasons of less productivity of women in science and solutions (Lewison and Markusova 2011; Isfandyari-Moghaddam et al. 2012).

The present study aims to analyze the score of Iranian women's contribution in the production of science, qualitative and quantitative evaluation of scientific outputs of women on the separated groups of subjects and organization, identifying of prolific female authors, studying language diversity, document type and numbers of author colleague, identifying excellent organizations and countries in their collaboration, surveying of significant differences between the score citation to women's scientific outputs in two subject fields of science and technology and eventually investigating the correlation between the number of authors of scientific production and the number of citation to these works in other articles in high priority fields of science and technology of Islamic republic of Iran in Web of Science (WoS) database during 2000–2010.

Methodology

Two subject categories of technology (including: aerospace, biotechnology, environmental, information & communication, micro, nano, nuclear, oil and gas) and pure and applied science (including: condensed matter, cryptography & coding, medicinal plants, new &

renewable energy, recycling & energy conversion, stem cells) of Iran comprehensive map was chosen in order to gather data of each field, Science Citation Index Expanded (SCIE) database is used. At first, related keywords with each of the fields of science and technology were extracted from thesauri and subject headings. Then, for gathering data the formula “TS = Keywords AND CU = Iran” was used and in advanced search field search strategy was limited to 2000–2010 years in SCIE database. Totally, 7,138 records included 30,322 authors retrieved and saved in an Excel file. After that, authors’ gender with the usage of AU, AF, and C1 of WoS Excel output, author profile in Scopus, browsing the homepage of author’s affiliated organization, searching in internet and sending email to the correspondents of paper was identified. After separation of documents according to gender, unrelated documents were deleted and 2,275 records by at least one female author affiliated to one Iranian organization were left. 9,782 authors were contributed in these works who male are involved 55.02 %, female 34.16 %, unknown gender 4.47 % and foreigners 6.35 % (Fig. 1).

Excel software for descriptive statistics and SPSS software (version 19) for analytical statistics were used.

The rate of women’s contribution in Iran scientific productivity in the high priority fields of science and technology

Table 1 shows that women in the fields of “stem cells” and “medicinal plants” respectively with 65.5 and 63.69 % of all productions have more contribution in the development of knowledge boundaries and in the subjects of “aerospace” and “new & renewable energies” respectively with 6.93 %, 6.98 % of all scientific outputs have less contribution than the other fields. Also, the most percentage of indexed scientific works of women in the Iranian priority fields of science and technology in WoS database indicate that numbers of papers belongs to environmental (503) and Nano (372). Women in the subjects such as “aerospace” and “new & renewable energies” with the production of 14 and 3 documents rather than other fields have less scientific outputs.

The score of citation to women’s scientific productions and average citations to each document

In most cases, citations present evidence of useful and valid cited works that are linked with citing works (Diamond 1986). Hence, the present study sought to assess citations as a technique of qualitative assessment tools to survey women’s scientific outputs during 2000–2010. According to Table 2, subjects of “medicinal plants” and “stem cells” of pure and applied sciences with 73.04 and 70.06 % of all citations in each field, have the most portions. On the other hand, subjects of “new & renewable energies”, “recycling & energy

Fig. 1 Percentage presence of authors in scientific product

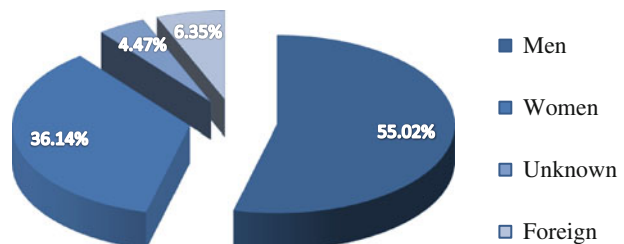


Table 1 List of high priority fields, with short codes, and presence of female within Iranian sources

High priority fields (HPF)	Code	No. of sources	Percentage
Stem cells	SC	224	65.5
Medicinal plants	MP	100	63.69
Biotechnology	BI	28	49.12
Recycling	R	122	37.65
Condensed matter	CM	18	36.73
Nano	NA	372	36.65
Information & communication technology	ICT	35	35.35
Environmental	EN	503	33.49
Nuclear	NU	317	32.22
Micro	MI	220	28.65
Cryptography & coding	CC	293	21.25
Oil & gas	OG	26	11.98
Renewable energy	RE	3	6.98
Aerospace	AE	14	6.93

conversion” and “micro” respectively with 12, 8.08 and 7.27 % have the highest average citation to per document in each field.

The goal of this research is to analyze the scientific output of Iranian scientists according to their gender based on a citation analysis approach. According to the data presented in Table 2, Iranian female scientists have basically received fewer citations compared to the male competitors in almost all fields with an exception in the field of renewable energy.

Excellent organizations in women’s scientific productivity

Surveying of indexed scientific outputs of Iranian women during 11 reviewed years in WoS database according to priorities of science and technology on the separation of parts and also excellent organization in the production of science and citation indicate that academic organizations that take advantage of governmental financial support have more portions in women’s scientific outputs and receive more inputs. On the other words, private part just in two fields of “new & renewable energies” and “stem cells” has considerable collaboration. Totally, Tehran University of Medical Science with the production of 274 documents in three fields of environmental, medicinal plants and nuclear are the most cited women’s organizations (Tables 3, 4).

Prolific female authors

Surveying of women’s scientific productions in the field of “aerospace” and “new & renewable energies” showed that there is no excellence among female authors in these two fields. Surveying of excellent Iranian female authors in high priority of science and technology showed that “Masoumeh Nasiri-Kenari” with productivity or collaboration of 26 documents in the field of “cryptography and coding” in Sharif University of Technology and then “Mansoreh Movahedin” with publication of 14 documents in the field of “stem cells” of Tarbiat Modares University and “Farnoush Faridbod” with the publication

Table 2 Iranian scientific production by citation and gender

HPF	Gender	MP	SC	NU	MI	NA	R	EN	CM	BI	CC	ICT	RE	OG	AE
Percentage citation score	Women	73.04	70.06	40.64	35.91	35.76	33.79	33.16	31.82	26.72	19.56	13.52	11.92	10.1	4.95
	Men	60.14	71.7	99.24	69.83	69.66	73.81	59.16	66.45	74.8	69.82	76.54	66.54	76.37	74.69
Average citations per document	Women	7.26	6.76	5.25	7.27	6.02	8.08	6.65	5.83	3.32	4.11	2.09	12	2.77	1.86
	Men	4.19	4.83	4.92	4.39	4.09	6.69	2.65	4.64	3.76	3.17	5.56	3.82	2.46	1.99

Table 3 Iranian women scientific production by academic sector

Sectors	HPF													
	AE	BI	CC	CM	EN	ICT	MI	MP	NA	NU	OG	R	RE	SC
Academic sector (%)	85.71	82.14	88.4	94.44	93.24	94.29	89.09	94	87.1	82.33	88.89	95.08	33.33	52.23
Non-academic sector (%)	14.29	17.86	11.6	5.56	6.76	5.71	10.91	6	12.9	17.67	11.11	4.92	66.67	47.77

Table 4 Iranian women scientific production by top Institution

HPF	High production inst.	<i>N</i>	%	High citation inst.	<i>N</i>	%
AE	Amirkabir Univ.	5	35.71	Amirkabir Univ.	15	57.69
BI	Tehran Univ.	8	23.53	Tehran Univ.	30	28.3
CC	Tehran Univ.	66	14.9	Tehran Univ.	379	19.07
CM	Gilan Univ.	15	65.22	Gilan Univ.	83	71.55
EN	Tehran Univ. Med. Sci.	169	20.92	Tehran Univ. Med. Sci.	888	17.49
ICT	Tehran Univ.	5	11.9	Sharif Univ.	18	21.69
MI	Tehran Univ. Med. Sci.	30	10	Tehran Univ.	353	17.54
MP	Shiraz Univ. Med. Sci.	24	15.48	Tehran Univ. Med. Sci.	276	24.82
NA	Tarbiat Modarres Univ.	46	9.66	Tarbiat Modarres Univ.	362	12.18
NU	Tehran Univ. Med. Sci.	51	10.94	Tehran Univ. Med. Sci.	324	13.99
OG	Tehran Univ.	10	37.04	Tehran Univ.	38	35.51
R	Shahid Beheshti Univ.	16	10.6	Shahid Beheshti Univ.	209	15.94
RE	–	–	–	Atomic Energy Organization	20	55.56
SC	Academic Center for Education, Culture and Research	107	27.44	Academic Center for Education, Culture and Research	981	37.94

Table 5 Prolific Iranian women

HPF	Researchers	No. of document	Institution
BI	Fatemeh Rahbarizade	3	Tarbiat Modarres Univ.
CM	Seyedeh Zahra Mostashari	6	Gilan Univ.
CC	Masoumeh Nasiri-Kenari	26	Sharif Univ.
EN	Farnoush Faridbod	11	Tehran Univ. Med. Sci.
ICT	Elham Maserat	2	Shahid Beheshti Univ. Med. Sci.
MP	Katayoun Javidnia	10	Shiraz University Univ. Med. Sci.
MI	Roya Molaei	7	Univ. Science and Technology
NA	Homa Sadeghzadeh	8	Tarbiat Modarres Univ.
NU	Zahra Talebpour	9	Alzahra Univ.
OG	Shohreh Fatemi	3	Tehran Univ.
R	Fatemeh Farash Bamoharram; Minoos Dabiri	6	Islamic Azad Univ. Mashhad Shahid Beheshti Univ.
SC	Mansoreh Movahedin	14	Tarbiat Modarres Univ.

of 11 documents in the field of “environmental” of Tehran University of Medical Science rather than other female researcher have more collaboration in Iran scientific productivity (Table 5).

Language diversity and document type in Iranian women’s scientific productions

Surveying of indexed scientific outputs of Iranian women in high priority of science and technology in WoS database have been shown that totally their productions have been published in six languages. All available documents in subject fields of information and

Table 6 Iranian women scientific production by language

Language	HPF														Total
	ICT	RE	R	CC	EN	SC	BI	MP	CM	MI	NA	OG	NU	AE	
Arabic <i>N</i>	-	-	-	-	-	2	-	-	-	-	-	-	-	-	2
%	-	-	-	-	-	0.89	-	-	-	-	-	-	-	-	0.09
Chinese <i>N</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.04
English <i>N</i>	35	3	122	291	502	208	28	100	18	220	371	26	311	14	2249
%	100	100	100	99.32	99.8	92/86	100	100	100	100	99/73	100	98/11	100	98.86
German <i>N</i>	-	-	-	-	1	-	-	-	-	-	-	-	-	-	1
%	-	-	-	-	0.2	-	-	-	-	-	-	-	-	-	0.04
Persian <i>N</i>	-	-	-	-	-	-	-	-	-	-	-	-	5	-	5
%	-	-	-	-	-	-	-	-	-	-	-	-	1.58	-	0.22
Unspecified <i>N</i>	-	-	-	2	-	14	-	-	-	-	1	-	-	-	17
%	-	-	-	0.68	-	6.25	-	-	-	-	0.27	-	-	-	0.75

Table 7 Iranian women scientific production by type domain

Document type	HPF														Total
	AE	BI	CC	CM	EN	ICT	MI	MP	NA	NU	OG	R	RE	SC	
Article	10	24	274	17	476	32	197	92	351	296	25	119	2	181	2096
	71.43	85.71	93.52	94.44	94.63	91.43	89.55	92	94.35	93.38	96.15	97.54	66.67	80.8	92.13
Article; proceedings paper	4	2	16	1	8	1	15	1	8	5	1	2	-	4	68
	28.57	7.14	5.64	5.56	1.59	2.86	6.82	1	2.15	1.58	3.85	1.64	-	1.79	2.99
Correction	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1
	-	-	0.34	-	-	-	-	-	-	-	-	-	-	-	0.04
Editorial material	-	-	-	-	-	2	-	1	-	3	-	-	-	-	6
	-	-	-	-	-	5.71	-	1	-	0.95	-	-	-	-	0.26
Letter	-	-	-	-	1	-	-	-	-	-	-	-	-	3	4
	-	-	-	-	0.2	-	-	-	-	-	-	-	-	1.34	0.18
Meeting abstract	-	1	1	-	3	-	3	5	2	4	-	-	-	24	43
	-	3.57	0.34	-	0.6	-	1.36	5	0.54	1.26	-	-	-	10.71	1.89
Review	-	1	1	-	14	-	5	1	11	9	-	1	1	12	4
	-	3.57	0.34	-	2.78	-	2.27	1	2.96	2.84	-	0.82	33.33	5.36	0.18
Review; book chapter	-	-	-	-	1	-	-	-	-	-	-	-	-	-	56
	-	-	-	-	0.2	-	-	-	-	-	-	-	-	-	2.46

Table 8 Iranian men scientific production by type domain

Document type	HPF														Total
	AE	BI	CC	CM	EN	ICT	MI	MP	NA	NU	OG	R	RE	SC	
Article	184	37	1204	47	1295	94	655	126	898	806	196	292	31	235	6100
Article; proceedings paper	94.36	74	91.84	97.92	93.23	89.52	91.48	91.3	93.06	91.9	93.33	95.42	75.61	78.6	91.8
Correction	9	4	88	1	39	8	39	1	41	26	12	7	2	7	284
Editorial material	4.62	8	6.71	2.08	2.81	7.26	5.45	0.72	4.25	2.96	5.71	2.29	4.88	2.34	4.27
Letter	1	-	2	-	-	-	1	-	1	2	-	-	-	1	8
Meeting abstract	0.51	-	0.15	-	-	-	0.14	-	0.1	0.23	-	-	-	0.33	0.12
News item	-	-	-	-	1	1	1	2	-	6	-	1	1	2	15
Review	-	-	-	-	0.07	0.95	0.14	1.45	-	0.68	-	0.33	2.44	0.67	0.23
Review; book chapter	-	-	2	-	-	-	-	-	-	-	-	-	-	4	6
	-	-	0.15	-	-	-	-	-	-	-	-	-	-	1.34	0.09
	-	-	2	-	8	-	5	6	3	7	-	1	-	32	64
	-	-	0.15	-	0.58	-	0.7	4.35	0.31	0.8	-	0.33	-	10.37	0.96
	-	-	-	-	1	-	-	-	-	-	-	-	-	-	1
	-	-	-	-	0.07	-	-	-	-	-	-	-	-	-	0.02
	1	9	13	-	41	2	15	3	22	28	2	5	7	18	166
	0.51	18	0.99	-	2.95	1.9	2.09	2.17	2.28	3.19	0.95	1.63	17.07	6.02	2.5
	-	-	-	-	1	-	-	-	-	-	-	-	-	-	1
	-	-	-	-	0.07	-	-	-	-	-	-	-	-	-	0.02

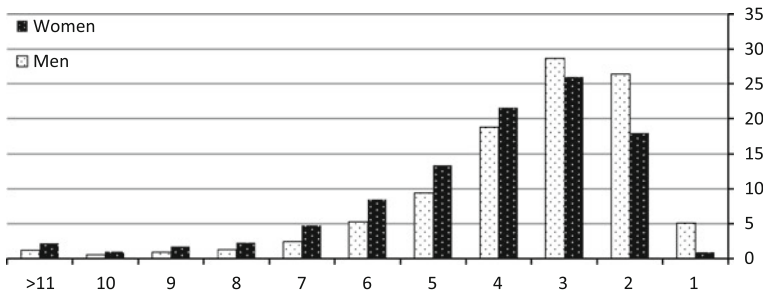


Fig. 2 Iranian researchers’ international contribution by number of co-authors and gender

communications, new & renewable energies, recycling & energy conversion, biotechnology, medicinal plants, condensed matter, micro, oil and gas and aerospace have been written in English language and most documents in fields of cryptography and coding (99.32 %), environmental (99.8 %), stem cells (92.86 %), nano (99.73 %) and nuclear (98.11 %) have been published in English language (Table 6).

Moreover, surveying them has been shown that totally their productions have been published in 8 document types. In all 14 subject fields article format with 92.13 % rather than other 7 document types have more portions.

The scientific output of Iranian researchers in high priority fields indexed in WoS is summarized in Tables 7 and 8. The first table reveals that in general, Iranian female scientists have used nice types of documents to publish their work among them ‘article’ is the dominant format. Table 8 instead shows the male scientists’ production types which shows more productivity compared to women.

In order to show the average number of authors, Fig. 2 is presented in which it is illustrated that Iranian scientists show more interest to make small groups of authors/researchers i.e. publish articles with three authors. The figure also indicates that Iranian men tend to publish their paper as single authors more than the women. Iranian women scientists also show more interest in publishing articles with more than three authors.

Frequency of Iranian female researcher colleague

Information of Fig. 2 show that about 99.08 % of Iranian women’s scientific productions in high priority fields of science and technology were done as collaborative researches and other 0.92 % of researches were done by just one author. Further, Fig. 2 indicates that women in groups of 3, 4 and 2 people respectively with 25.93, 21.58 and 17.93 % operated. Only, 2.19 % of researches which women were cooperated with the collaboration of more than 10 researchers were done.

Distribution of Iranian women’s scientific collaboration

On scientific view, collaborative researches enhance the chances of success and also increase the accuracy and quality of the results (Giuliani et al. 2010). Therefore, doing scientific collaboration is recognized as a key requirement, and it’s examining is very important. Table 8 shows the distribution of Iranian women’s scientific collaboration, excellent organization and countries in 14 different subject fields of science and technology. The most national scientific collaborations in the field of environmental with

Table 9 Iranian women's scientific collaboration by top organization and country

HPF	Collaboration			
	<i>N</i> domestic %	Top organization <i>N</i>	<i>N</i> foreign %	Top country <i>N</i>
AE	7	Tarbiat Modarres Univ.	2	Spain; Canada
	0.33	2	0.4	1; 1
BI	43	Tehran Univ.	9	Finland; USA
	2.03	11	1.82	2; 2
CC	336	Tehran Univ.	91	USA
	17.25	68	18.42	20
CM	3	Islamic Azad Univ. Shahrerey	–	–
	0.14	3	–	–
EN	453	Tehran Univ.	114	UK
	21.35	72	23.08	16
ICT	19	Iran Univ. Med. Sci.	6	Australia; UK; Italy; Sweden; Canada;
	0.9	3	1.21	1; 1; 1; 1; 1
MI	172	Tehran Univ. Med. Sci.	41	USA
	8.11	28	8.3	12
MP	103	Tehran Univ. Med. Sci.	8	Egypt
	4.85	22	1.62	3
NA	303	Tehran Univ.	67	USA
	14.28	27	13.56	17
NU	385	Academic Center for Education, Culture and Research	107	USA
	18.14	43	21.66	26
OG	5	Tehran Univ.	6	Canada; USA
	0.24	2	1.21	2; 2
R	93	Islamic Azad Univ. Mashhad	7	Canada
	4.38	11	1.42	2
RE	1	Yazd Except Talent Org.	–	–
	0.05	1	–	–
SC	169	Tarbiat Modarres Univ.	36	USA
	7.96	55	7.29	11

Table 10 ANOVA for analysis difference in priority fields of pure and applied sciences

Sig.	<i>F</i>	Mean square	df	Sum of squares	
0.055	2.178	847.439	5	4,237.195	Between groups
		389.143	754	293,413.984	Within groups
			759	297,651.179	Total

numbers of 453 collaborations and the least ones in the field of renewable and new energies are just with one. The most international collaborations in environmental field are 114 numbers and in two fields of new & renewable energies and condensed matter, there is no

Table 11 ANOVA for analysis difference in priority fields of technology

Sig.	<i>F</i>	Mean square	df	Sum of squares	
0.001	3.666	993.635	7	6,955.448	Between groups
		271.014	1,507	408,417.496	Within groups
			1,514	415,372.944	Total

Table 12 Duncan’s post hoc test

HPF	<i>N</i>	Subset for alpha = 0.05		
		1	2	3
AE	14	1.86		
ICT	35	2.43		
OG	26	2.88	2.88	
BI	28	4.04	4.04	4.04
NA	372	7.94	7.94	7.94
NU	317	8.02	8.02	8.02
EN	503		10.65	10.65
MI	220			11.11
Sig.		.133	.050	.076

foreign collaboration. Surveying of excellent organizations in scientific collaboration indicate that “Tehran University of Medical Science” and “Tehran University” rather than other organizations have more collaborative research activities in science and technology field. The United States of America, England and Canada have more collaboration in Iranian women’s science productivity.

Surveying significance of the difference between the score of citation to women’s scientific productions in the priority fields of pure and applied sciences

Findings have been shown that there is a significant difference between the score of the citation to women’s scientific productions in the priority fields of pure and applied sciences. On the other hand, differences between the average citation to scientific productions of women in six subject fields of pure and applied sciences is surveyed by using analysis of variance test. Results of Table 9 show that $\alpha = 0.05$, $F = 2.178$ and sig. equals 0.05 and is more than α . therefore, zero hypothesis that there is no difference was confirmed. So it is concluded that there is no difference between average of citation to scientific productions of women in six subject fields of pure and applied science (Table 10).

Surveying significance of the difference between the score of citation to women’s scientific productions in the priority fields of technology

There is a significant difference between the scores of citation to women’s scientific productions in the priority fields of technology. On the other hand, differences between the citation average to scientific productions of women in eight subject fields of technology is

Table 13 Spearman for the analysis relationship between citation and collaboration

	Time citation	Number of authors
Spearman's rho		
Time citation		
Correlation coefficient	1.000	0.099**
Sig. (2-tailed)	–	0.000
<i>N</i>	2,275	2,275
Number of authors		
Correlation coefficient	0.099**	1.000
Sig. (2-tailed)	0.000	–
<i>N</i>	2,275	2,275

**Correlation is significant at the .01 level (2-tailed)

surveyed by using analysis of variance test. According to Table 11, results show that $\alpha = 0.05$, $F = 3.666$ and sig. equals 0.001 and is $< \alpha$. So, zero hypotheses were rejected. It's concluded that there is a significant difference between citations to women's scientific productions in the priority fields of technology.

In order to survey the difference, Duncan's post hoc test was used. Results of the test (Table 12) show that there is a significant difference between citation average to scientific productions of women in micro science and technology field and citation average to scientific productions of women in oil and gas, information and communication and aerospace. Also, there is a significant difference between citation average to scientific productions of women in environmental fields and information and communication and aerospace fields. However, there is no difference between citation scores to scientific productions of women in the other fields.

Surveying relationship between rate of citation to scientific productions of women in priority fields of science and technology and numbers of authors of these works

There is a relationship between the rate of citation to scientific productions of women in high priority of science and technology and numbers of authors of these works. Spearman correlation coefficient test is used to survey this relationship. Results show that the Spearman correlation coefficient is equal to 0.099 and significance level equals to 0.000, which 0.01 in this level is significant. It's concluded that there is a direct, significant and positive relationship between the rate of citation to scientific productions of women in high priority of science and technology and numbers of authors of these works. On the other words, thanks to the more numbers of colleague authors in scientific productions of women in Iran, rate of citation to their works will be more (Table 13).

Discussion and conclusion

Surveying of contribution rate of Iranian women in science productions indexed in WoS database have been shown that just in two medicine subdivisions such as “stem cells” and “medicinal plants”, more than half of scientific outputs of Iran during 2000–2010 were with women contribution, however in technical fields such as renewable and new energies and aerospace their contribution is less. Lewison (2001), Webster (2001), Price (2002), Leta and Lewison (2003), Naldi et al. (2005), Lewison and Markusova (2011), Mauleón

et al. (2013) also in their research found the same results of more women presence in scientific productions in medicinal rather than technical fields. It looks that this increasing contribution in medical subdivisions in Iran is due to more numbers of graduated medicine students rather than technical students. According to the statistics of the ministry of science, research and technology, all Iranian female graduated in master level, Ph.D. and professional Ph.D. level during (2003–2008) in medical group equals 11,747 students and in engineering and technical group equals 3,074 graduated students (Ministry of Science, Research and Technology: Institute of Research and Planning in Higher Education 2013).

In this paper, the most scientific outputs of Iranian women in science and technology field in WoS database are related to environmental field and the least ones are related to renewable and new energies. It's offered that scientific policy-makers in order to increase numbers of women's scientific productions Internalize research culture in the society with creating associations, science and technology parks and scientific associations specially for women to solve issues and support female researchers as half of intellectual funds of the community.

Also, Studying citation score to scientific productions and citation average to each document in various fields in this study indicate that qualitative increasing of women's scientific outputs is totally a different topic. Necessarily, quantitative increasing does not cause qualitative increasing. According to these results and citation score to scientific productions and numbers of authors, it's offered that in order to increase quality of female scientific productions, scientific collaborations should be more considerable.

Findings of scientific productions of women in priority fields of science and technology on the separation of affiliations in our research show more scientific productivity of women in academic organization, as was found by Mauleón et al. (2013) in analysis of the Spanish journal authors and editorial board members in all fields of science.

Organizational surveying of the most Iranian women producer in science and technology field in our study showed that the most Iranian women producer from affiliation point, are belonged to prestigious academic and governmental organizations. This result, confirms the results of previous research Davarpanah and Moradi Moghadam (2012). Also, Tarbiat Modarres University due to three excellent researchers in biotechnology, nano and stem cells rather than other institutions have the most prolific researchers.

Studying document type of scientific productions of Iranian female researchers in this paper showed that in reviewing 14 subject fields "article type" have more portions rather than other documents. According to this point that more scientific productions of Iranian women were produced by academic organizations and also teaching theory topics at universities and emphasizing of educational system on articles as an evaluation and upgrading criteria caused that this format being more than other formats.

Our results showed that the most indexed scientific productions of Iranian women were written just in English language, on the other words 98.86 % of female scientific productions were written in English language. However, results of the research of Lewison and Markusova (2011) showed that Russian research women have written most of their works in their local language. It looks that Iranian articles have been written in English language, due to emphasizing of Iranian formal and informal educational system on this language that caused Empowerment of female researchers on the language, also, recognizing English language as an international language in this age, and the most collaboration with countries such as America, England and Canada that their language is English as well.

Finding of our research indicate that just about 1 % of scientific outputs had been done by just one female author and the others by several authors. While, Results of Barrios et al. (2013) show a higher presence of one female author than (9 %) in our studies. And the

most researchers which were done commonly by Iranian men and women respectively were arranged in 3, 2 and 4 & 3, 4 and 2 groups of people. However, Naldi et al. (2005) in their search in order to assess science and technology productions in 6 European countries found that the most scientific collaborations of European women had been in research team included 8, 7 and 9 people. Also, results of the research of Breimer and Nilsson (2010) showed that the most scientific cohort of Swedish female in 2009 had been in research team included five people.

Surveying of scientific collaboration of Iranian women in our study showed that female scientific collaboration in international level is less than national level. Therefore, Mozaffarian and Jamali (2008), Davarpanah and Moradi Moghadam (2012) also, in studying of scientific productions of Iranian women, Lewison and Markusova (2011) in surveying of scientific output of Russians female, and Barrios et al. (2013) in analyzing of scientific production of Spanish women found the same results. Also, female researchers in environmental, nuclear, cryptography and coding than other high priority fields in national and international levels have more collaboration. It looks that holding conferences and professional seminars especially for women in national and international levels in order to create suitable circumstances and conditions for being familiar with other peers to make scientific background collaboration is an appropriate policy and solution.

There is no significant difference between citation averages to scientific productions of Iranian women in high priority fields of pure and applied sciences. While, there is a significant difference of high priority fields of technology. As a result, there is a difference between citation average to female scientific productions in the field of micro science and technology and fields of oil and gas, communication and information and aerospace. Also, environmental fields with communication and information and aerospace field is different. But, there is no difference between citation rates to scientific production of women in other fields.

There is a direct, significant and positive relationship between the numbers of colleague authors with women and the citation score to these works by other authors. Results of Figg et al. (2006) confirm this finding too.

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