Evaluation of Iranian Scientists Productions in Biotechnology and Applied Microbiology based on ISI through 2000 to 2008

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Abstract

In most countries, internationally indexed scientific publications provide the possibility for the scientometric experts to study their scientific progress. In Iran, the number of scientific productions indexed in ISI was 323 in 1993 and rose to 14832 in 2008 showing about 46 manifolds. The main aim of this research is to illustrate the dynamic structure of scientific productions of Iranian biotechnologists and applied microbiologists in WOS database during 2000–2008. The data was gathered through searching WOS database of ISI. The field of search was country (CU=IRAN). 681 scientific products were reported to be indexed in ISI. Iranians' international collaboration has been mainly with Canadian, Swedish and Australian coauthors. Compared to other Iranian universities, University of Tehran, Tarbiat Modares University and Tehran University of Medical Sciences have contributed mostly to ISI. Iranian biotechnologists' and microbiologists' intercontinental collaboration is generally in Biochemistry and Molecular Biology, Engineering and chemical and Biochemical research. There has been an increase in the fundamental research activities in Biotechnology and Applied Microbiology research projects which have triggered motivation for higher contribution to ISI.

Keywords: Applied Microbiology, Biotechnology, Scientific Production, Iran.

Introduction

Historically, the first attempt to index bibliographical citations of scientific texts began in 1958 when Eugene Garfield, the founder of the Institute for Scientific Information (ISI), organized research cooperation in scientific study (Piqueras, 2001). Today the database he created is the main significant source worldwide (Guerrero & Lopez, 2003). During two decades there has been an increase in the number of scientific journals from 3000 volumes reported in 1960 to more than 40,000 in 2001 (Moin, Mahmoudi & Rezaei, 2005). The

assessment of science is done by an approach which is known as 'scientometrics' which allows researchers to assess the quantitative sides of science, technology and innovation systems by objective means for making decision (Adam, 2005; Gauthier, 1998; Schubert, 2001).

Generally, countries' scientific progress is shown through their scientific ranks. (Asnafi, Pakdaman Naeeni & Toosi, 2008; Noroozi Chakoli, Hassanzadeh & Nourmohammadi, 2008). Indeed, scientific publications provide the possibility to learn whether or not the scientific progress in the target countries has happened (Hanney & Gonzalez Block, 2008).

In recent years, the number of academic staff, universities and graduate students of medical sciences has sharply increased in Iran (Malekzadeh, Mokri & Azarmina, 2001). In January 1997, the Iranian Society for Biotechnology (ISB) was established. Its main aim is to promote and improve research and education in Biotechnology (Shojaosadati, 2001). In 2000, 46 academic and research institutes and more than 400 staff members were active in biotechnological investigations all over Iran (Shojaosadati, 2001). Also, in Biomedical Sciences, the quantity of papers indexed in journals raised (Etemad & Emami, 2003; King, 2004; Malekzadeh, Mokri & Azarmina, 2001; Mehrdad, Heydari, Sarbolouki & Etemad, 2004; Moin, Mahmoudi & Rezaei, 2005). The number of scientific productions indexed in ISI was 323 in 1993 and rose to 14832 in 2008 showing about 46 manifolds (Sabouri, 2009). Moreover, it is maintained that Iran has experienced a great rise in the number of scientific outputs reported by the Science Citation Index (SCI) (Jowkar & Ebrahimi, 2008) with 23.4% annual growth rate from 1992 to 2001(Moreno-Borchart, 2004). The budget provided by the Iranian universities has dramatically increased during the last years (Stone, 2005). Other factors relevant to this rise are collaboration of Iranian scientists with the international scientists and the emergence of scientific communities (Osareh & Wilson, 2000 and 2001; Noroozi Chakoli, Hassanzadeh & Nourmohammadi, 2008; Asnafi, Pakdaman Naeeni & Toosi 2008; Shojaosadati, 2001; Afsharnia & Vaez-zadeh, 2005). The present study to our best knowledge is the first investigation of Iranian scientists' productions in Biotechnology and Applied Microbiology in ISI journals between 2000 and 2008. The objectives of this research are to:

(1) discover domain of collaboration networks among Iranian scientists and developed and developing countries;

(2) identify the document type domain of Iranian scientific profiles in Biotechnology and Applied Microbiology;

(3) recognize the top universities and institutes which have contributed most to such publications;

(4) detect the percentage of annually published ISI papers in Biotechnology and Applied Microbiology and to identify citation index of Iranian scientific publications;

(5) discover the annually published ISI papers in Biotechnology and Applied Microbiology in Turkey and Egypt as two developing countries in the region;

(6) show source title field to which Iranian biotechnologists and microbiologists have shown interest to publish their scientific products;

(7) assess Iranian scientific productions and their interests in different areas of Biotechnology and Applied Microbiology;

(8) recognize the most productive Iranian biotechnologists and microbiologists.

Methodology

Data was collected through searching WOS database of ISI which contains the most current data on scientific publications accessible up to 2008. The search field was country (CU=IRAN) between 2000 and 2008 and subject types were Biotechnology and Applied Microbiology. All the papers were in English language.

Results

During the period of the study, 681 scientific products were reported to be indexed in ISI. Figure 1 shows the collaboration networks of Iranian scientists with scientists in other countries based on ISI papers during 2000-2008. As the figure shows, the greater part of the Iranians' international collaboration has been with Canadian, Swedish and Australian coauthors with 3.96%, 2.79% and 2.5% respectively. Figure 2 shows the types of documents of Iranian scientific profiles in Biotechnology and Applied Microbiology. As can be seen, 87.37%, 8.08%, 2.5%, 1.32%, 0.44% and 0.29% of total scientific productions belong to articles, meeting abstracts, reviews, proceeding papers, corrections and letters to editor respectively. Figure 3 shows organizational contributors of top 15 universities and institutions of Iran. According to this figure, University of Tehran, Tarbiat Modares University and Tehran University of Medical Sciences and Islamic Azad University are the top universities which have contributed most to ISI during 2000 to 2008 with 20.26%, 17.91% and 7.49% of the total publications respectively. Figure 4 (A) shows the percentage of annually published ISI papers in Biotechnology and Applied Microbiology. The analysis of data indicates that the highest percentage rates are 24.38% and 22.70% in years 2008 and 2007 but the lowest percentage rates are 3.38% and 2.79% in years 2001 and 2000. Iranian scientific publications in Biotechnology and Microbiology were compared [Figure 4 (B)] which shows a dramatic increased rate. Figure 5 shows the percentage of annually published ISI scientific publications of Turkish (A) and Egyptian (B) biotechnologists and microbiologists from 2000 to 2008**.** The most favorite journals for the Iranian biotechnologists and microbiologists have been African Journal of Biotechnology, Journal of Biotechnology and Biochemical Engineering Journal with 13.22%, 5.43% and 4.99% of total publications (Figure 6). Figure 7 shows the distribution of subject areas of Iranian scientific productions. As can be seen, their intercontinental collaboration in ISI journals is most generally in Biochemistry and Molecular Biology, chemical Engineering and biochemical research with 14.54%, 12.48% and 9.54% of

total research fields. It is rarer in Immunology, Microbiology, Agricultural Engineering, Energy and Fuels, Genetics and Heredity, Cell Biology and Food Science and Technology. Figure 8 shows top 16 Iranian authors in ISI and the percentage of their published ISI papers.

Discussion

Based on the data obtained (Figure 1), we understand that the greater part of the Iranians' major international scientific co-authorship in the period of study has been with Canadian, Swedish and Australian coauthors with 3.96%, 2.79% and 2.5% respectively. This is probably due to the migration of Iranian scholars to these countries during the eight years of Iran-Iraq war. Many of these scholars on their return have kept scientific contact with their host countries. Another reason might be the postdoctoral research, sabbatical leave and fellowship grants offered by the above-mentioned countries. England, Netherlands, USA and France have the fourth, fifth, sixth and seventh collaboration ranks. In comparison, the Turkish biotechnologists and microbiologists had major co-authorship with USA, England and Germany in the same period of study. The most co-authorship of Egyptian biotechnologists and microbiologists has been with USA, Germany and Japan during 2000-2008 (results not shown). Figure 2 shows the types of documents of Iranian scientific outputs. As can be seen, 87.37%, 8.08%, 2.5%, 1.32%, 0.44% and 0.29% of total scientific products are articles, meeting abstracts, reviews, proceeding papers, corrections and letters to editor, respectively. The same is true for the scientific products of Turkish and Egyptian biotechnologists and microbiologists. This may be due to the fact that scientific articles are more frequently accepted in journals. Figure 3 shows organizational contributors of top 15 universities and institutions of Iran. Current data indicated that the Iranian Universities such as University of Tehran, Tarbiat Modares University, Tehran University of Medical Sciences and Islamic Azad University are the top contributors to ISI. This is due to the higher investment of these universities and their increasing number of postgraduate students. Figure 4 shows the percentage of annually published ISI papers. Based on the data in Biotechnology and Applied Microbiology, we observe a dramatic increase, which is about 8.73-fold rise. Factors relevant to this rise are Iran-Iraq ceasefire, returning of a large number of postgraduate students from abroad, availability of better electronic services for international cooperation, improved access to international databases through internet and finally greater financial support of research by the Iranian universities. To this one we may add improved economic condition of academic staff and an increase in research payments. Recently, centers for a health research system (HRS) have been established. HRS financially supports academic investigations related to planning, managing and monitoring of health. (Asefzadeh, 2005). Since 1999, the Iranian Ministry of Science, Research and Technology has initiated the move to encourage Iranian scientists to publish their papers in foreign languages preferably English and in the top ranking scientific journals. Researchers are also heartened by prizes given to them for

publishing their papers in the worldwide journals (Osareh & Wilson, 2000). This move has given rise to a more English language proficiency of Iranian scientists and their better familiarity with research methods causing an increase in the number of published ISI papers. The rise of scientific productions in Biotechnology and Applied Microbiology in Iran, Turkey and Egypt shown in Figures 4 and 5 are in agreement with a previous paper reporting the number of published articles in journals listed in the ISI for Turkey, Iran and Egypt as the most scientificly productive countries in the region (Noroozi Chakoli, Nourmohammadi, Vaziri & Etemadifar, 2007). According to the Essential Science Indicators (ESI) reports, Iran stands in the second place after Turkey among Islamic countries for its contribution to ISI (Noroozi Chakoli, Hassanzadeh & Nourmohammadi, 2008).

African Journal of Biotechnology, Journal of Biotechnology, and Biochemical Engineering Journal (Figure 6) have been the main sources for Iranian published papers. One reason is that these journals are rather newly established ones wishing to accept papers in their field of interest. For example, African Journal of Biotechnology was established in 2002. The other reason is the frequency of publication of the above journals which is 12, 24, and 6 respectively. Figure 7 shows the distribution of subject area of Iranian scientific productions. As can be seen, Biochemistry and Molecular Biology, Engineering and chemical, biochemical research are the top subject areas in which Iranian biotechnologists and microbiologists have had the highest interest. The reason may be the extensive use of these subjects in medicine and industry. Our research shows that Biochemistry and Molecular Biology are the second in Turkey and in Egypt are the third subject of interest for biotechnologists and microbiologists. Figure 8 shows top lists of 16 Iranian prolific authors in ISI and the percentage of their publication output. Research facilities and supervision of a large number of postgraduate students may be two main reasons for their achievements.

Conclusion

Iranian researchers have come to understand collaboration to contribute to international scientific community. This has triggered an acceleration of knowledge development (Habibzadeh & Vessal, 2006; Rezaei-Ghaaleh & Azizi, 2007; EMBO reports, 2004; Osareh & McCain, 2008; Moreno-Borchart, 2003; Osareh & McCain, 2008; Wagner, Brahmakulam, Jackson, Wong & Yoda, 2001).Wagner, Brahmakulam, Jackson, Wong & Yoda (2001) categorized Iran as one of 24 scientifically developing countries in terms of research funding put on science and technology. Scientometric analysis is an important way of measuring and specifying scientific progress in the developing countries. This study was in line with the objectives of scientometrics. Obviously, to have a better picture of scientific progress, we need further scientometric research to include other areas of academic achievements of the developing countries.

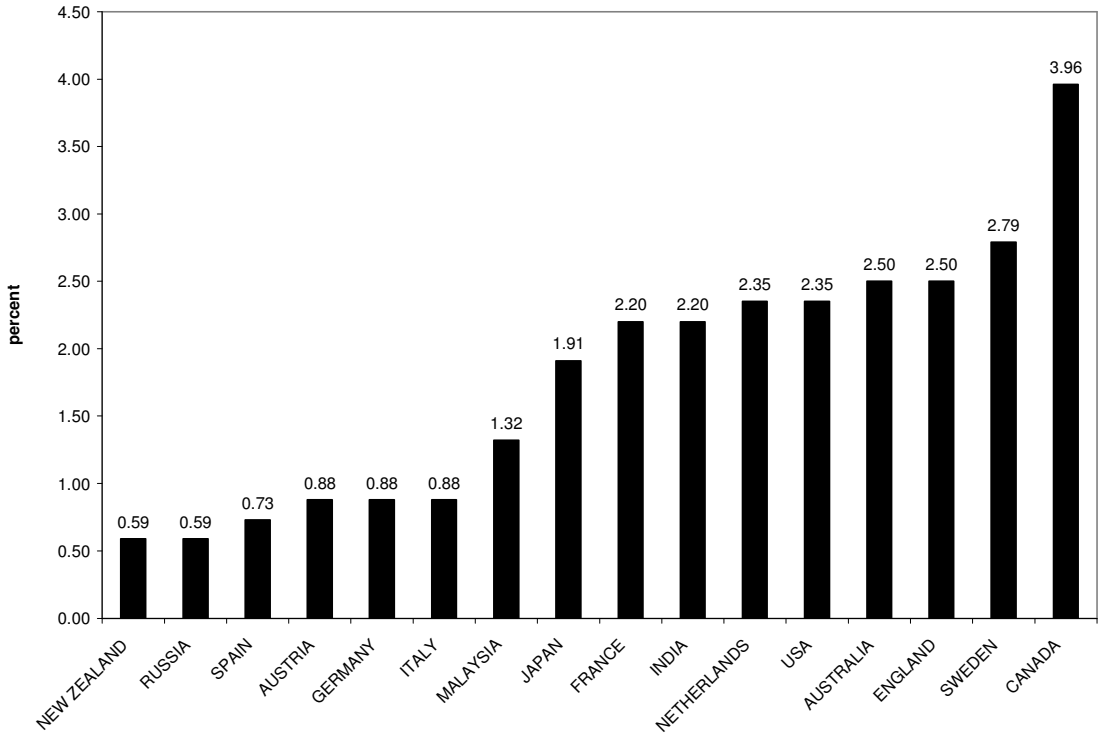

Figure 1. Collaboration networks of Iranian scientists with scientists in other countries based on ISI papers in biotechnology and applied microbiology during 2000-2008.

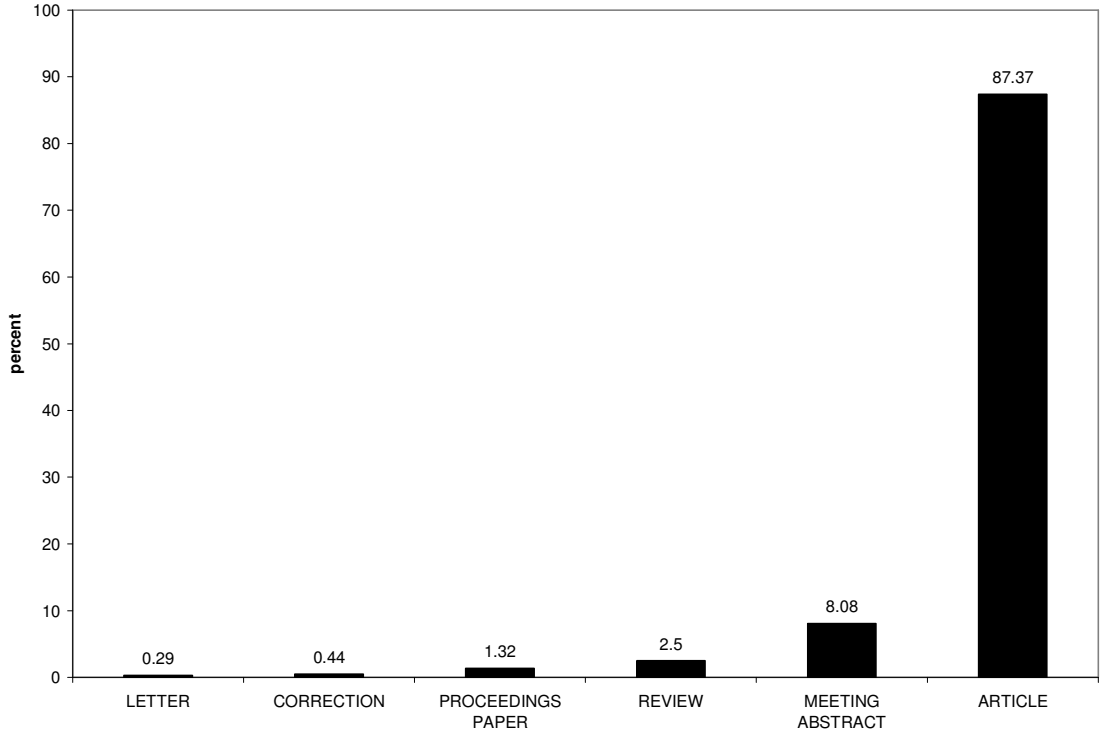

Figure 2. The document type domain of Iranian scientific profiles in biotechnology and applied microbiology during 2000-2008.

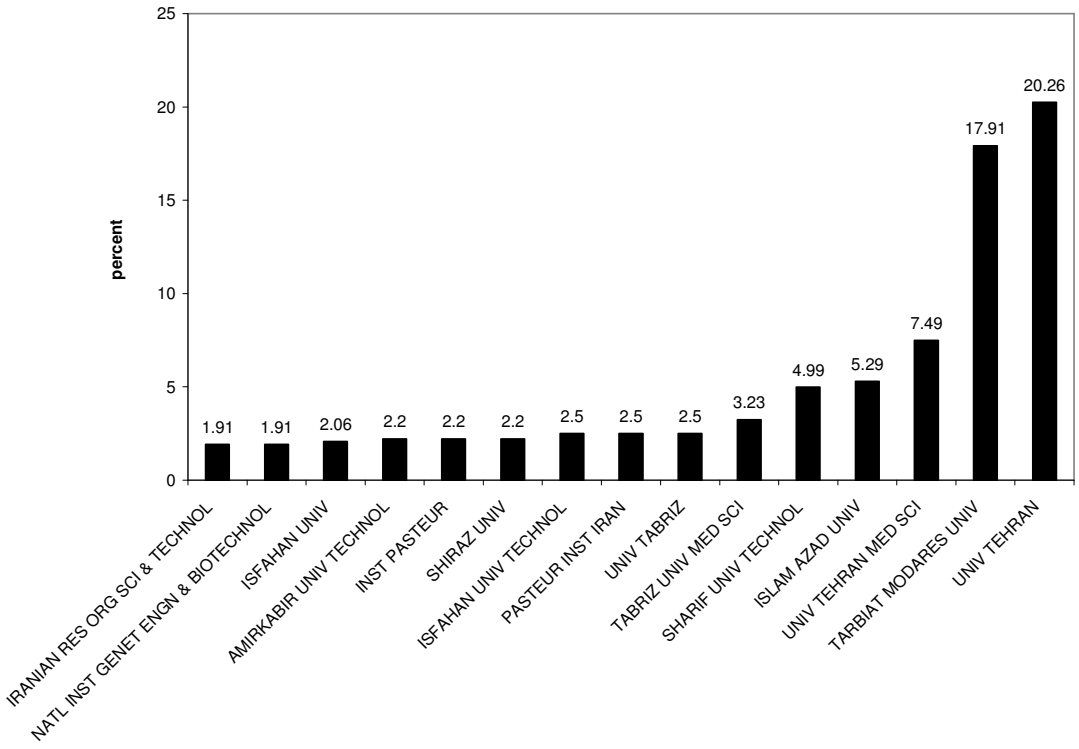

Figure 3. Percentage of ISI papers published during 9 years of study in Biotechnology and Applied Microbiology in top 15 Iranian universities and institutions.

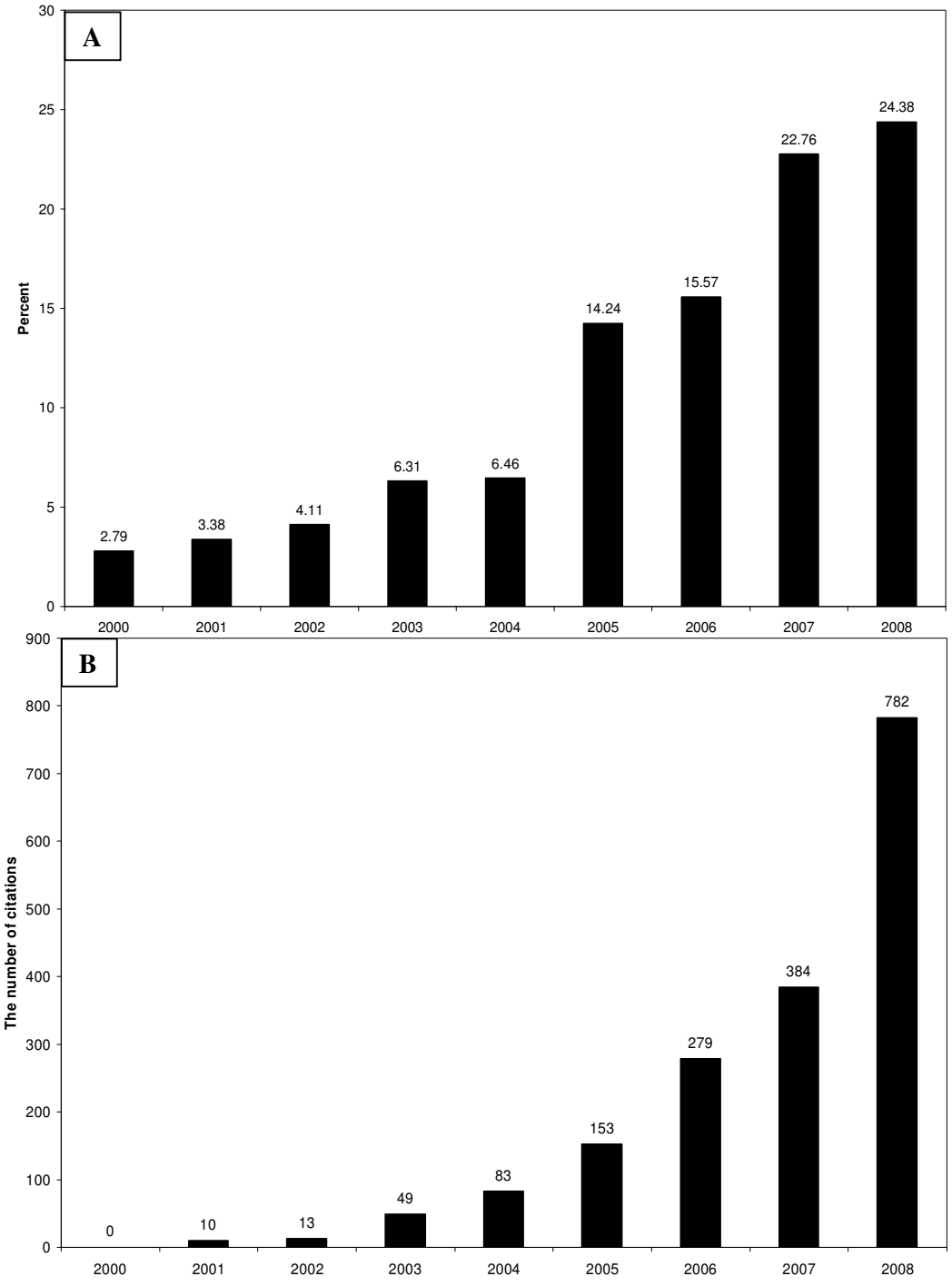

Figure 4. (A) The scientific publications of Iranian biotechnologists and microbiologists (2000-2008); (B) The comparison of citation index of Iranian scientific publications in Biotechnology and Microbiology (2000–2008).

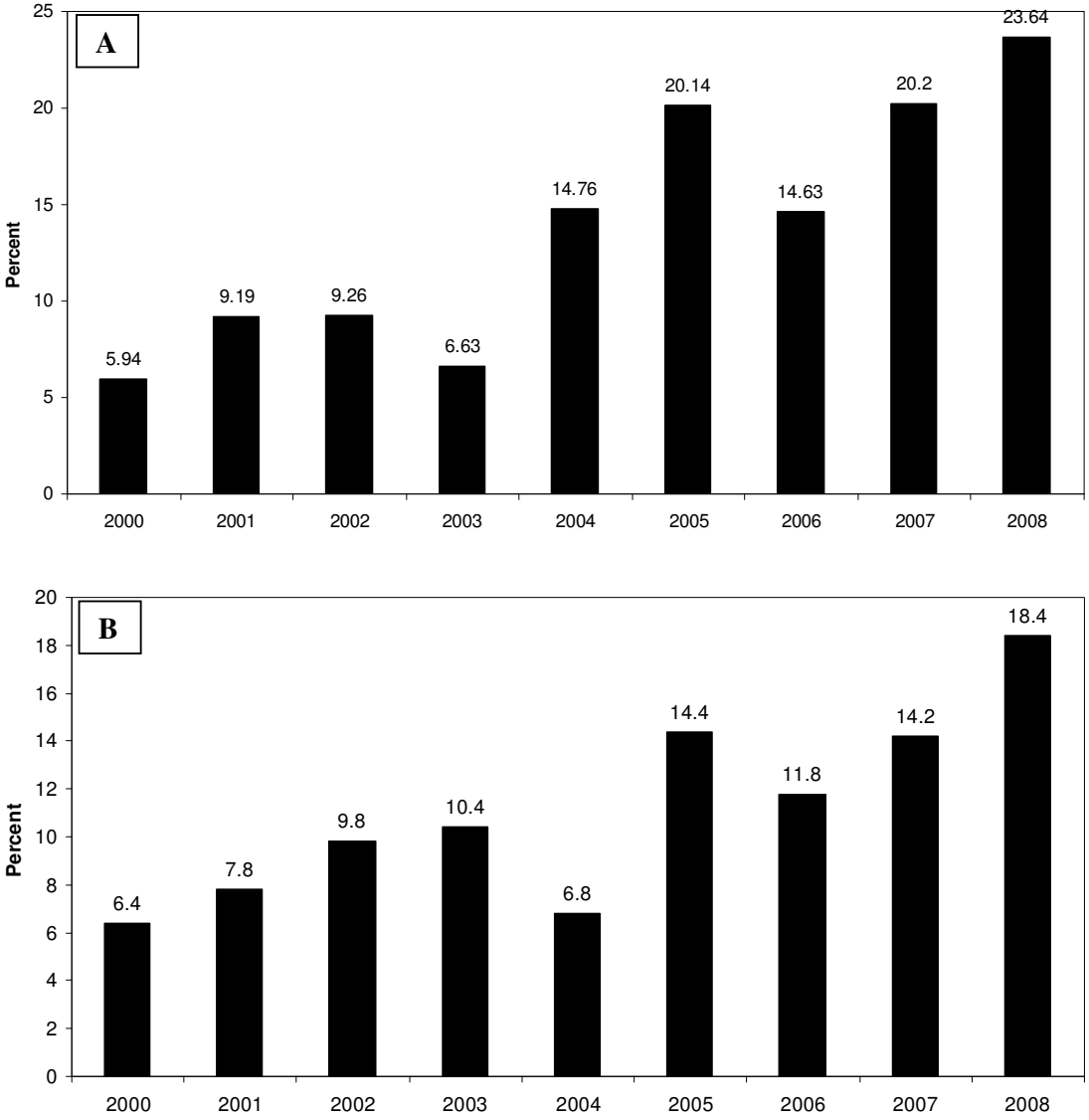

Figure 5. Percentage of annually published ISI scientific publications of Turkish (A) and Egyptian (B) biotechnologists and microbiologists in ISI (2000-2008)**.**

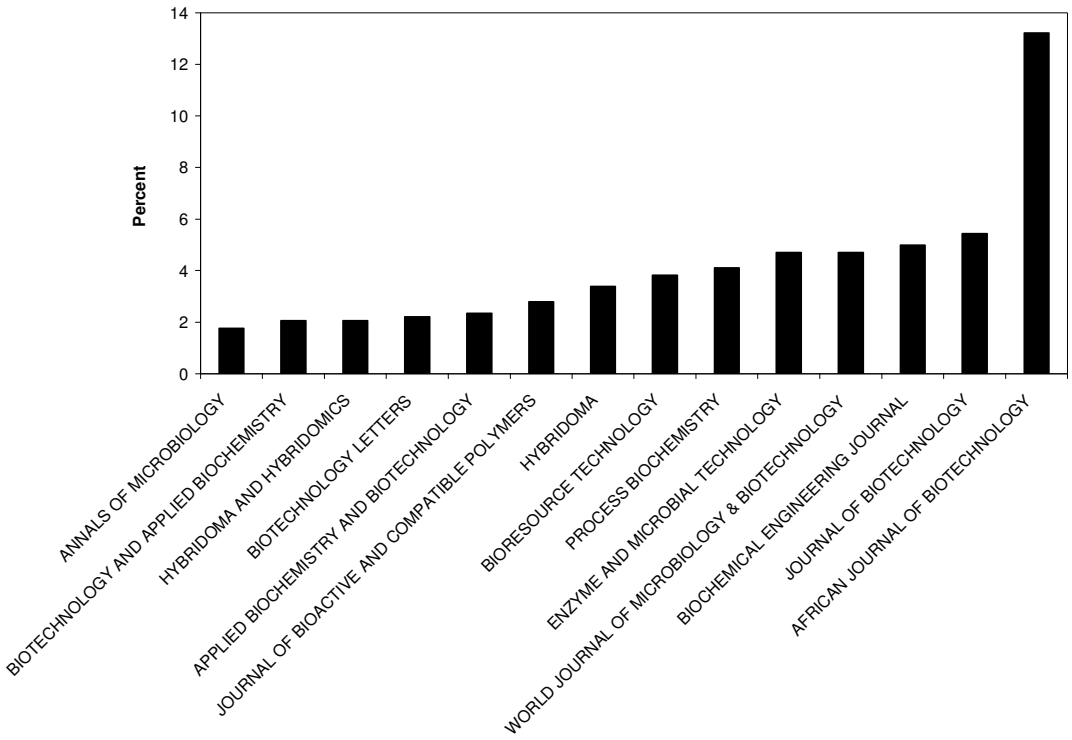

Figure 6. Source title field in which Iranian biotechnologists and microbiologists have had interest to publish (2000-2008).

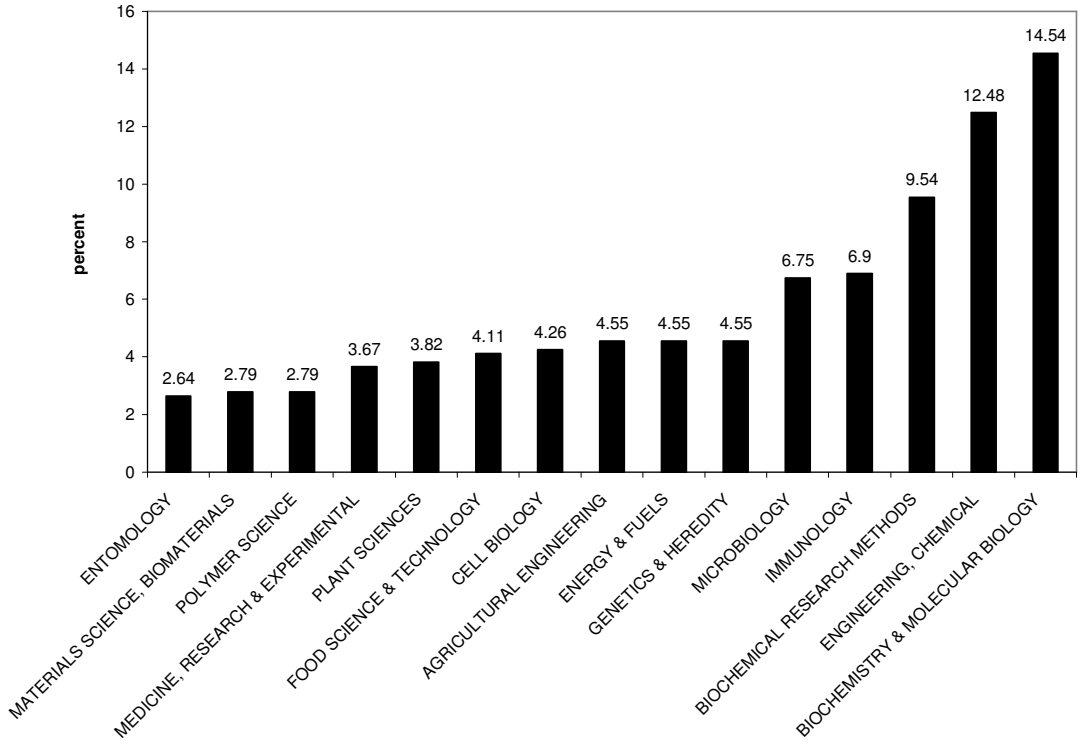

Figure 7. Subject criteria field of Iranian scientific productions (2000-2008)

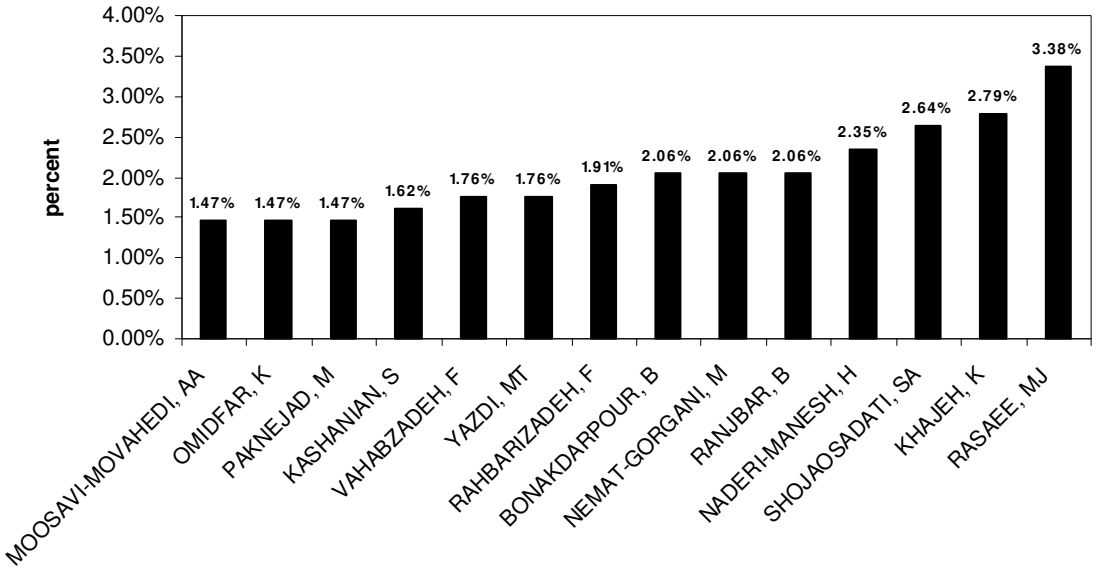

Figure 8. The most productive Iranian authors in ISI (2000-2008)

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