THE DYNAMICS OF SCIENTIFIC RESEARCH IN THE AREA OF FOOD SCIENCE IN EASTERN EUROPE

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Abstract. Based on scientific metrics (the number of published works, their citations, the H-factor, the Scopus database), it was conducted the analysis of the development of food science research in Eastern Europe (EU, Poland, Romania, Bulgaria) and post-Soviet countries (Russia, Ukraine, Moldova). There have been presented the main information channels of the global information area in this research domain, as well as the most important information channels of Eastern Europe. It is shown that if the first are represented by the journals of the first quartile (in accordance with the SJR data), then the latter are represented, in the best case, by the 2-nd quartile journals. Leading countries in this area of research on the total number of publications and the H-factor have been identified. It is analyzed the dynamics of the number of publications (per million inhabitants) for EU countries surveyed and the post-Soviet countries. It is shown that in all countries there is a positive dynamics, but the publication activity is significantly higher in the EU countries (21 million people per year in Poland, ~ 8 in Bulgaria and Romania, ~ 2 in Russia, Ukraine and Moldova, data of 2017).

Key words: *Eastern Europe, food science, science of science, scientometric indicators*

Introduction

The development of research in the field of food science is one of the trends of modern development of civilization. This, in particular, manifests itself in the fact that the sciences about man are increasingly determining in the direction of the development of science, and food science is one of its most important sections. This science defines as "...the discipline in which the engineering, biological and physical sciences are used to study the nature of foods, the causes of deterioration, the principles underlying food processing, and improvement of food for the consuming public" [1]. The textbook of food science defines of food science in terms as "...the application of basic sciences and engineering to study the physical, chemical and biochemical nature of foods and the principles of food processing" [2] Obviously, this is interdisciplinary, complex science. Complexity science is a science, that studies the complex systems, which consist of a large number of components that interact which each other to produce nontrivial phenomena that cannot be explained by analyzing the individual constituent elements [3].The quantitative analysis of the science development in general and food science, in particular, is possible scientometrics methods [3-6]. In this paper, we will analyze the development of

science in the above area on the basis of the Scopus database [7] - one of the main databases of the world information area, indexing 21 thousand scientific titles (journals, conference materials, serial books) in the field of natural, technical, medical and human sciences.

Methodological part

The purpose of this work was an statistical study of the main scientific publications in the field of food science in the world and Eastern Europe.

In Tables 1, 2 shows the main information channels (journals) that have the best quantitative indicators within the information model of science (science as the world information process), and therefore, the most popular in the area of food science. In Table 1, they are classified by such an indicator as SJR, and in Table 2 by the H-factor [6]. SJR is an analogue of IF (average citation of work), but taking into account the "weight" of the journal in which this work is cited. As you can see, SJR is significantly lower than IF, but in the Scopus database, this parameter is determined by the quartile Q (rank) of the journal. As you can see, all the logs shown in the Table 1 and 2 belong to the category of 1-st quartile. Obviously, SJR is an indicator that takes into account the average weighted citation of the journal. The data presented in the Table 1 and 2 differ, because the factor H takes into account not only the citation but is an integrated indicator, taking into account, along with the citations and the activity of general publication [6].

Table 1

The world's leading journals in the field of food science (ranking by SJR)

	Title	↓ SJR	H index	Cites / Doc. (2years)(IF)
1.	Comprehensive Reviews in Food Science and Food Safety	2.996Q1	72	7.65
2.	Annual Review of Food Science and Technology	2.966Q1	43	9.66
3.	Trends in Food Science and Technology	2.344Q1	151	7.23
4.	Advances in Nutrition	2.196Q1	56	6.44
5.	Food Hydrocolloids	1.991Q1	118	5.01
6.	Food Policy	1.950Q1	76	3.46
7.	Global Food Security	1.809Q1	24	3.66
8.	Food Chemistry	1.793Q1	204	5.15
9.	Applied and Environmental Microbiology	1.684Q1	281	3.67
10.	Molecular Nutrition and Food Research	1.666Q1	104	4.81

The data presented in the Table 1 and 2 scientific journals are journals published in American or European journals (Elsiver, Springer). They are the main channels of information, essentially determining the scientific "policy" in the analyzed area of science.

As for the journals published in the countries of Eastern Europe, their degree of influence on the global information process is significantly lower. The most significant of these are Polish journals (Polish Journal of Food and Nutrition Sciences, Journal of Animal and Feed Sciences, Acta Scientiarum Polonorum, Technologia Alimentaria Q2, SJR 0.651-0.385). The Czech Journal, Q3, SJR 0.355, the Slovak Journal of Food and Nutrition Research, Q3, SJR 0.313 etc. should also be mentioned in Croatian journals Food and Biotechnology

journal, Mijekastvo, Q3, SJR from 0.365 to 0.273. The IF of these journals varies between 1.7 - 0.6, which indicates them as very important channels of scientific information. Despite the fact that they all belong to the category of magazines of the second and third quartiles, they can be regarded as magazines that have a significant impact on the world information process in the field of science in question.

Table 2

Leading scientific journals in the field of food science (ranking by H)

	Title	Type	↓H index	Cites / Doc. (2years)(IF)
1.	Applied and Environmental Microbiology	1.684 Q1	281	3.67
2.	Food Chemistry	1.793 Q1	204	5.15
3.	International Journal of Food Microbiology	1.366 Q1	162	3.52
4.	Journal of Dairy Science	1.350 Q1	159	2.68
5.	Trends in Food Science and Technology	2.344 Q1	151	7.23
6.	Journal of the Academy of Nutrition and Dietetics	1.505 Q1	146	3.02
7.	Journal of Food Engineering	1.279 Q1	142	3.24
8.	Food and Chemical Toxicology	1.144 Q1	139	3.91
9.	Journal of Animal Science	0.848 Q1	131	1.31
10.	Meat Science	1.643 Q1	131	2.76

Contribution of various countries of Eastern Europe to the world information process in the area of food science

In the Table 3 shows the scientometric indicators of the publication activity (the number of articles published in scientific journals included in the Scopus database in 2017) as well as the H factor values for these countries for 1996-2017 years. Comparison of these values allows us to conclude that, in general, there is a correlation between them. However, tracing dynamics based on the H-factor is hardly possible. However, tracing dynamics based on the H-factor is hardly possible. Therefore, in the future, for the analysis of dynamics, such an indicator as publication activity (the number of publications in the most important scientific journals). Because this value depends largely on the country's "scale", especially its population, K was used, which is the number of publications per year per 1 million inhabitants of this country (Figure 1).

Table 3

Comparative publication activity of Eastern European countries in the field of food science

	Country	**Documents**	**↓H index**
1.	Poland	807	88
2.	Czech Republic	266	70
3.	Slovenia	81	63
4.	Croatia	133	61
5.	Hungary	98	59

Table 3 (continuation)

6.	Russian Federation	245	56
7.	Serbia	204	49
8.	Bulgaria	55	47
9.	Slovakia	177	47
10.	Lithuania	55	35
11.	Ukraine	76	34
12.	Estonia	21	27
13.	Latvia	186	22
14.	Bosnia and Herzegovina	21	17
15.	Macedonia	27	17
16.	Georgia	7	12
17.	Moldova	7	12
18.	Albania	7	9
19.	Armenia	3	6

Dynamics of scientific development based on the index of public activity K

The results presented in Table 3 and Figure 1 allow us to conclude that within the information science model, the greatest development of food science in Eastern European countries was achieved in Poland.

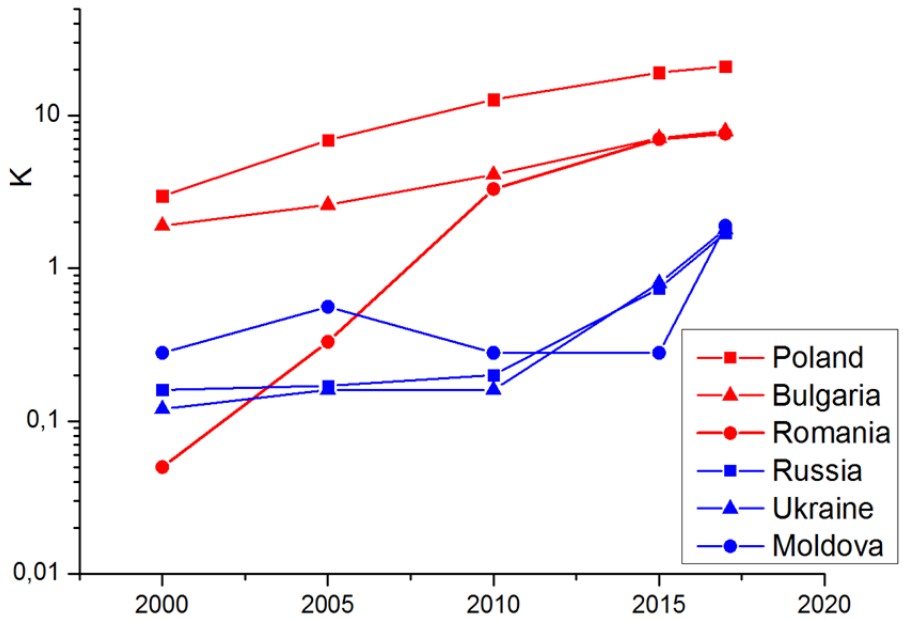

Figure 1. Dynamics of publication activity

It has the highest indicators, both in the importance of scientific journals published in the country, and in the number of publications, as well as an integral indicator that takes into account the number of publications and their citation (H-factor). The results shown in the figure also allow one to compare the intensity of food science in the EU countries and the post-Soviet countries. It is seen that it is much higher in EU countries.

Conclusions

As for the dynamics of scientific development, it should be noted that it is positive in all countries. However, this trend is the most pronounced for Romania. If at the beginning

of the 21st century the relative intensity of scientific development in this area was practically the same as that observed in the post-Soviet countries (and even lower), by 2017 it is several times higher than the indicators of the post-Soviet countries (~ 8 articles per 1 million inhabitants in Romania against 2 in Russia, Ukraine and Moldova). During the period under review, the publication activity, estimated by the number of publications in leading journals per 1 million inhabitants, increased 160 times in Romania. It is also necessary to note the proximity of this indicator separately for a group of post-Soviet countries, as well as Romania and Bulgaria. Obviously, this fact is explained by the peculiarities of funding research in the EU and post-Soviet countries. A significant difference in the intensity of scientific development in EU and post-soviet countries was shown in [8]. The results of the analysis carried out in this study indicate that this conclusion expends to food science.

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