Influential WoS indexed papers on Food Technology domain in 2015: An overview of the current influences of Food technology research

Houcemeddine Turki^a, Seyed Mohammad Jafar Jalali^b

^a Faculty of Medicine of Sfax, University of Sfax, Sfax, Tunisia

^b Department of Information Technology Management, Allameh Tabataba'i University, Tehran, Iran

Abstract: In this research paper, we analyzed the h_y-core of Food technology Thomson Reuters Web of Science indexed papers for the year 2015 using Bibliometric and Scientometric techniques to obtain an overview about the main journals, institutions, authors and countries that influence the most Food technology research area nowadays. This study confirmed that the main papers that currently influences Food technology research are either new papers defining innovative techniques and findings or old papers that are mainly cited because they are considered as fundamental in the field by the Food technology research communities. It also proved a major current influence of the old highly cited researchers, of the specialized nationwide research institutes, of the journals with high impact factors that publish papers about all the aspects of Food technology research, and of the United States specifically University of Massachusetts Amherst on Food technology research.

Keywords: Influential papers, Web of Science, Food technology, Research Influences

Introduction

Food Technology research is the one explicitly dealing with the creation, adjustment or application of Chemical or Engineering techniques to analyze, modify or generate food patterns (Moraru, Panchapakesan, Huang, Takhistov, Sean, & Kokini, 2003). It has become an important and influential field of research which can help ameliorate quality and easiness in production of foods and reducing their costs (Alston, Beddow, & Pardey, 2009; Fan & Pardey, 1997; Thompson & Scoones, 2009; Heaton, 2001). That is why the first trials to assess the output quality, the practical effect and the usefulness of food science and technology research were not recent as there is a work that was written in 1948 about the issue (Fisher & Yates, 1949). Nowadays, Food Technology Research Evaluation is still an ongoing research trend as 2.4% of the worldwide scientometric studies deal with Agricultural and Food Science (Gao, 2015). In fact, more interest is given to the evaluation of research productivity (Ravichandran & Vijayakumar, 2015; Glänzel & Veugelers, 2006; Van Raan & Van Leeuwen, 2002) as well as the theoretical and practical effect of Food Technology Research worldwide and even by region (Fan & Pardey, 1997; Alfaraz & Calviño, 2004; Poornima, Surulinathi, Amsaveni, & Vijayaragavan, 2011) or by journal (Vijay & Raghavan, 2007; Gomathi, 2014; Zan & Zan, 2014), to the detection of the significant trends (Ravichandran & Vijayakumar, 2015), to analyze the behavior of the editors of Food technology journals in accepting papers for publication (Amat, 2007) and of the behavior of Food technology researchers in citing papers (Ravichandran & Vijayakumar, 2015; Braun, Glänzel, & Grupp, 1995), choosing topics (Eriksson, 1997) and establishing international or interdisciplinary research collaborations (Ponds, Van Oort, & Frenken, 2007; Zhou, Zhong, & Yu, 2013; Van Raan & Van Leeuwen, 2002; Vijay & Raghavan, 2007; Liu, Guns, Wei, & Yin, 2013; Mazlounian, Helbing, Lozano, Light, & Börner, 2013) and detection of Food technology research topics in need of proliferation (Calo-Mata, Arlindo, Boehme, de Miguel,

Pascoal, & Barros-Velazquez, 2008; Achanta & Okos, 1996; Van Raan & Van Leeuwen, 2002). Such works use basic Bibliometric and Scientometric Analysis methods as well as the analysis of word co-occurrence networks and citation networks to give a detailed overview about food technology research (Van Raan & Van Leeuwen, 2002; Zhou, Zhong, & Yu, 2013).

In the present study, we give a list of the WoS papers that had most influenced the ones published in the year of 2015 to give an overview about the current situation and main influences of Food Technology Research and to verify if the analysis of the metadata of the yearly highly cited papers of a topic gives an idea about the individuals, journals, institutions, and countries that influence the most that field with the same accuracy as the one of the analysis of the metadata of all the papers about that field of interest.

Methods

Paper Selection

Using Thomson Reuters Web of Science Database and Website (Thomson Reuters, 2016), All the Literature about Food Science in all the WoS collections is gathered and their citation reports are exported as XLS files. The papers are then classified according to their number of WoS received citations in 2015 using Microsoft Office Excel 2007 (Microsoft Corporation, 2007) and the works that are not related to food technology research are then manually eliminated.

Analyzing all the papers requires advanced computer definitions (Grivel, Polanco, & Kaplan, 1997). That is why the analysis has been limited to a significant number of papers. Nowadays, it has been proved that the Hirsch core of a scientist (Cabrerizo, Alonso, Herrera-Viedma, & Herrera, 2010; Hirsch, 2005; Glänzel, 2008) or a topic (Banks, 2006) can reflect the characteristics of all the set of the papers from which it has been derived because the papers of the h-core are generally highly cited and consequently they are very likely to be cited in the other works of their original set. Similarly, the h_y -core of a set of papers can represent the current trends of that set of papers. In fact, this h_y -core is the set of papers having a number of received citations in year y that is superior or equal to the h_y -index or the yearly h-index (Cabrerizo, Alonso, Herrera-Viedma, & Herrera, 2010; Sidiropoulos, Katsaros, & Manolopoulos, 2007), defined as h_y such that h_y of the papers of the original set have each h_y or more citations received in year y and also the other papers of the original set have each h_y or less citations received in year y (Sidiropoulos, Katsaros, & Manolopoulos, 2007). As the number of the received citations of these h_y -core papers in a given year y is significant and the number of papers issued in the same year y for a topic is limited, the papers of the h_y -core would be cited in quite all the works of the year y and would consequently represent the research trends and influences of the field of the initial set of papers in the year y .

Therefore the h_y -index of the WoS indexed Food technology related papers for the year 2015 has been calculated through WoS website and the h_y -core of the papers has been considered to study the current influences in Food Chemistry research.

The data about each research paper including titles, authors, author affiliations, journals, and years of publication have been retrieved using Thomson Reuters Web of Science website as a plain text.

Data Processing

To study the influence of authors, countries, names, journals and papers in Food technology research in 2015, HistCite has been used to retrieve the lists of the most published authors, countries, institutions and journals as well as the citation relationships in the set from the obtained plain text (Thomson Reuters, 2012), Developed by Eugene Garfield (Garfield E. , 2009), the software has proved to be efficient in doing such retrievals to study other scientific fields (Lucio-Arias & Leydesdorff, 2008; Bornmann & Marx, 2012).

Results and Discussion

The obtained set of WoS influential papers about Food technology research in 2015 involves 46 papers (Appendix A). All of them were written in English and included in Web of Science Core Collection. This language bias is explained by the lack of coverage of the scientific literature written in languages other than English in WoS databases (Van Leeuwen, Moed, Tijssen, Visser, & Van Raan, 2001).

As shown in Fig. 1, most of the papers are unsurprisingly published after 2006 and evocating new and breakthrough findings in Food technology research. However, there are some papers that are still highly cited in 2015 even if there are considerably old. This is mainly explained by the fact that these papers, or rather Citation Classics, have added a fundamental theory in the field of Food technology (Abt, 1998; Garfield, 1986).

Fig. 1: Repartition of the papers according to years of publication

In fact, these papers have even been references for some of the more recent highly cited papers in 2015 as shown in Fig. 2. Such papers can remain highly cited even after decades of their creation (Abt, 1998).

Fig. 2: Direct citation network of local citations for the 46 influential papers

As the types of the 46 documents are retrieved, it is seen that 30 of the papers are reviews (65.217%), 16 are articles (34.783%) and 7 are proceedings papers (15.217%). This is mainly explained by the important tendency of the scientists to cite the works of synthesis that review and evaluate the main research works about Food Technology as they involve all the recent advances in the field (Bornmann & Daniel, 2008; Case & Higgins, 2000).

With identification of the leading authors, it is clear that David Julian McClements from University of Massachusetts Amherst (United States) is the most influential author of the set with 4 publications followed by Eric Andrew Decker from University of Massachusetts Amherst with 3 publications and Ibrahim M Banat from University of Ulster (United Kingdom), Hannu Korhonen from MTT Agrifood Research Finland (Finland) and Jochen Weiss from University of Massachusetts Amherst with 2 publications. This fact is confirmed when calculating their h-indices using Google Scholar as it is seen that $h \geq 55$ proving that these scientists are in the main reference scientists in this field of research (Hirsch, An index to quantify an individual's scientific research output, 2005). It is clear that the works of these scientists had even ameliorated the influence of their institutions on the field as they are among the eight best published institutions in the set of 46 papers as shown in Bold in Table 1. The advantage of the University of Massachusetts Amherst is mainly explained by the fruitful collaboration between McClements, Decker and Weiss (McClements, Decker, Park, & Weiss, 2009). In fact, it has been confirmed in many studies that multiauthored papers can have more effect than papers written by a single author mainly when all the collaborating authors are important scientists (Hirsch, 2010; Van Hooydonk, 1997; Tscharncke, Hochberg, Rand, Resh, & Krauss, 2007; Oromaner, 1975).

Institution	Country	Paper
University of Massachusetts Amherst	United States	4
Consejo Superior de investigaciones científicas CSIC	Spain	3
Agriculture Agri Food Canada	Canada	2

Council of Scientific Industrial Research CSIR	India	2
Institut National de la Recherche Agronomique	France	2
Monash University	Australia	2
MTT AgriFood Research Finland	Finland	2
University of Ulster	United Kingdom	2

Table 1: Repartition of the papers according to their issuing institutions

Quite all the remaining institutions are national research institutes or structure about Food technology as shown in *Italics* in Table 1 and this is evident as such institutions are co-editing all the Food Technology papers of the country they exist in (Picard, Darmon, & Pradoura, 1990).

When seeing the list of most published countries, it is clear that the countries of the eight ranked institutions are featured as shown in **Bold** in Table 2.

Country	Papers
United States	11
Germany	5
Spain	5
United Kingdom	4
India	4
Australia	3
France	3
Ireland	3
Finland	2
Netherlands	2
Canada	2

Table 2: Repartition of the papers according to their issuing countries

The existence of other countries in the ranking and by that their influence in Food Technology research is mainly explained by the existence of nationwide leading food science research institutes that monitor and adjust the quality of Food technology research in these countries (Picard, Darmon, & Pradoura, 1990; Lafferty, Commings, & Walsh, 1999) or by the

involvement of these countries in these influential papers through international collaborations (Aksnes, 2003; Zhou, Zhong, & Yu, 2013). In fact, both facts are common in the publication of highly cited papers (Picard, Darmon, & Pradoura, 1990; Aksnes, 2003). The existence of these countries can also be explained by their history and weight in Food technology research. In fact, all the countries showed in the Table are cited in previous studies as the most productive and cited countries as well as the oldest ones in Food technology research (Fisher & Yates, 1949; Braun, Glänzel, & Grupp, 1995; Scimago Lab, 2015; Surwase, Mohan, Kademani, & Bhanumurthy, 2014; Van Raan & Van Leeuwen, 2002).

As for the most influential journals in 2015, they are the main specialized journals having an $IF \geq 2.4$ that publish original researches contributing to the advancement of all aspects of Food Technology as shown in Table 3. Journals like Meat Science that are contributing to a particular aspect of Food technology do not exist even if they have important Impact Factors (Thomson Reuters, 2015).

Journal	Papers	2014 Impact Factor (Thomson Reuters, 2015)
TRENDS IN FOOD SCIENCE AND TECHNOLOGY	6	4.651
INTERNATIONAL JOURNAL OF FOOD MICROBIOLOGY	4	3.082
CRITICAL REVIEWS IN FOOD SCIENCE AND NUTRITION	3	5.176
APPLIED MICROBIOLOGY AND BIOTECHNOLOGY	2	3.337
FOOD CHEMISTRY	2	3.391
LWT FOOD SCIENCE AND TECHNOLOGY	2	2.416

Table 3: Repartition of the papers according to their issuing journals

This is evident because a research about Meat Technology can only be used in researches about that particular field of Food technology. However, general developments and amelioration of techniques in Food technology can be used in all aspects of Food technology including Meat Research (Bornmann & Daniel, 2008).

Conclusion

The present study provides a snapshot of bibliometric and scientometric methods to examine the current influences of the research driven by Food Technology specialists. Totally 46 documents have been selected as the most pioneer ones. The institutions, journals, scientists and countries which were the main sources of influential contributions have been recognized using bibliometric methods. However, this research has been faced with some limitations which can also provide future research for other scholars. Firstly, our method has just been applied on WoS core collection dataset. The future research can be applied on other well-known datasets such as Scopus. Also, secondly, the future scholars can integrate Scopus and WoS databases to compare the results with current study. The obtained results of the paper

will especially be of interest to Food Technology research community how research into Food Technology field is transforming and for food industry professionals to figure out their international research outreaches, while it is also worthwhile to mention that the methods that has been used in this paper will be of attentiveness to the scientometric scholars

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Appendix A: The list of WoS influential papers in 2015

Title	Authors	Source Title	Publication Year	2015 Citations
Cyclodextrins and their uses: a review	Del Valle, EMM	PROCESS BIOCHEMISTRY	2004	141
Performance comparison of benchtop high-throughput sequencing platforms	Loman, Nicholas J.; Misra, Raju V.; Dallman, Timothy J.; Constantinidou, Chrystala; Gharbia, Saheer E.; Wain,	NATURE BIOTECHNOLOGY	2012	121

	John; Pallen, Mark J.			
Applications of ultrasound in food technology: Processing, preservation and extraction	Chemat, Farid; Zill-e-Huma; Khan, Muhammed Kamran	ULTRASONICS SONOCHEMISTRY	2011	113
Industrial applications of microbial lipases	Hasan, Fariha; Shah, Aamer Ali; Hameed, Abdul	ENZYME AND MICROBIAL TECHNOLOGY	2006	103
Applications of nanotechnology in food packaging and food safety: Barrier materials, antimicrobials and sensors	Duncan, Timothy V.	JOURNAL OF COLLOID AND INTERFACE SCIENCE	2011	86
Bio-nanocomposites for food packaging applications	Rhim, Jong-Whan; Park, Hwan-Man; Ha, Chang-Sik	PROGRESS IN POLYMER SCIENCE	2013	81
An overview of foodborne pathogen detection: In the perspective of biosensors	Velusamy, Vijayalakshmi; Arshak, Khalil; Korostynska, Olga; Oliwa, Kamila; Adley, Catherine	BIOTECHNOLOGY ADVANCES	2010	79
Bioactive peptides: Production and functionality	Korhonen, H; Pihlanto, A	INTERNATIONAL DAIRY JOURNAL	2006	76
Perspectives for chitosan based antimicrobial films in food applications	Dutta, P. K.; Tripathi, Shipra; Mehrotra, G. K.; Dutta, Joydeep	FOOD CHEMISTRY	2009	76
Hyperspectral imaging - an emerging process analytical tool for food quality and safety control	Gowen, A. A.; O'Donnell, C. P.; Cullen, P. J.; Downey, G.; Frias, J. M.	TRENDS IN FOOD SCIENCE & TECHNOLOGY	2007	75
Microbial biosurfactants production, applications and future potential	Banat, Ibrahim M.; Franzetti, Andrea; Gandolfi, Isabella; Bestetti, Giuseppina; Martinotti, Maria G.; Fracchia, Letizia; Smyth, Thomas J.; Marchant, Roger	APPLIED MICROBIOLOGY AND BIOTECHNOLOGY	2010	73
Bacteriocin-based strategies for food biopreservation	Galvez, Antonio; Abriouel, Hikmate; Lopez, Rosario	INTERNATIONAL JOURNAL OF FOOD	2007	71

	Lucas; Ben Omar, Nabil	MICROBIOLOGY		
Pathogen detection: A perspective of traditional methods and biosensors	Lazcka, Olivier; Del Campo, F. Javier; Munoz, F. Xavier	BIOSENSORS & BIOELECTRONICS	2007	69
Engineering the provitamin A (beta-carotene) biosynthetic pathway into (carotenoid-free) rice endosperm	Ye, XD; Al-Babili, S; Kloti, A; Zhang, J; Lucca, P; Beyer, P; Potrykus, I	SCIENCE	2000	67
Food-derived peptides with biological activity: from research to food applications	Hartmann, Rainer; Meisel, Hans	CURRENT OPINION IN BIOTECHNOLOGY	2007	62
Formation, stability and properties of multilayer emulsions for application in the food industry	Guzey, Demet; McClements, D. Julian	ADVANCES IN COLLOID AND INTERFACE SCIENCE	2006	62
Potential commercial applications of microbial surfactants	Banat, IM; Makkar, RS; Cameotra, SS	APPLIED MICROBIOLOGY AND BIOTECHNOLOGY	2000	59
Sub- and supercritical fluid extraction of functional ingredients from different natural sources: Plants, food-by-products, algae and microalgae - A review	Herrero, M; Cifuentes, A; Ibanez, E	FOOD CHEMISTRY	2006	59
A perspective on paper-based microfluidics: Current status and future trends	Li, Xu; Ballerini, David R.; Shen, Wei	BIOMICROFLUIDICS	2012	59
Microencapsulation: industrial appraisal of existing technologies and trends	Gouin, S	TRENDS IN FOOD SCIENCE & TECHNOLOGY	2004	57
Opportunities and challenges in high pressure processing of foods	Rastogi, N. K.; Raghavarao, K. S. M. S.; Balasubramaniam, V. M.; Niranjan, K.; Knorr, D.	CRITICAL REVIEWS IN FOOD SCIENCE AND NUTRITION	2007	57
Significance of biogenic amines to food safety and human health	Shalaby, AR	FOOD RESEARCH INTERNATIONAL	1996	55

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Characterisation of structure-dependent functional properties of lignin with infrared spectroscopy	Boeriu, CG; Bravo, D; Gosselink, RJA; van Dam, JEG	INDUSTRIAL CROPS AND PRODUCTS	2004	55
Electrodialysis, a mature technology with a multitude of new applications	Strathmann, H.	DESALINATION	2010	55
Lactic acid: recent advances in products, processes and technologies - a review	Datta, Rathin; Henry, Michael	JOURNAL OF CHEMICAL TECHNOLOGY AND BIOTECHNOLOGY	2006	54
Structural Design Principles for Delivery of Bioactive Components in Nutraceuticals and Functional Foods	McClements, David Julian; Decker, Eric Andrew; Park, Yeonhwa; Weiss, Jochen	CRITICAL REVIEWS IN FOOD SCIENCE AND NUTRITION	2009	54
Chemistry and uses of pectin - A review	Thakur, BR; Singh, RK; Handa, AK	CRITICAL REVIEWS IN FOOD SCIENCE AND NUTRITION	1997	53
Inactivation of microbes using ultrasound: a review	Piyasena, P; Mohareb, E; McKellar, RC	INTERNATIONAL JOURNAL OF FOOD MICROBIOLOGY	2003	53
Recovery of high added-value components from food wastes: Conventional, emerging technologies and commercialized applications	Galanakis, Charis M.	TRENDS IN FOOD SCIENCE & TECHNOLOGY	2012	53
Bioprocess engineering of microalgae to produce a variety of consumer products	Harun, Razif; Singh, Manjinder; Forde, Gareth M.; Danquah, Michael K.	RENEWABLE & SUSTAINABLE ENERGY REVIEWS	2010	53
Developments in industrially important thermostable enzymes: a review	Haki, GD; Rakshit, SK	BIORESOURCE TECHNOLOGY	2003	52
Natural antioxidants and antioxidant capacity of Brassica vegetables: A review	Podsedek, Anna	LWT-FOOD SCIENCE AND TECHNOLOGY	2007	52

In vitro antioxidant activities of methanol extracts of five <i>Phyllanthus</i> species from India	Kumaran, A.; Karunakaran, R. Joel	LWT-FOOD SCIENCE AND TECHNOLOGY	2007	51
Milk-derived bioactive peptides: From science to applications	Korhonen, Hannu	JOURNAL OF FUNCTIONAL FOODS	2009	51
Antioxidant capacity, vitamin C, phenolics, and anthocyanins after fresh storage of small fruits	Kalt, W; Forney, CF; Martin, A; Prior, RL	JOURNAL OF AGRICULTURAL AND FOOD CHEMISTRY	1999	50
Encapsulation of polyphenols - a review	Fang, Zhongxiang; Bhandari, Bhesh	TRENDS IN FOOD SCIENCE & TECHNOLOGY	2010	50
Emulsion-based delivery systems for lipophilic bioactive components	McClements, D. J.; Decker, E. A.; Weiss, J.	JOURNAL OF FOOD SCIENCE	2007	49
Basic aspects of food preservation by hurdle technology	Leistner, L	INTERNATIONAL JOURNAL OF FOOD MICROBIOLOGY	2000	48
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