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Recent Trends in Porang Research via Bibliometrics Analysis Approach

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Abstract. *Porang is a native Indonesian plant with many benefits and has been widely studied by researchers in Indonesia. However, bibliometrics analysis of porang research is still limited. So, this study aims to establish a bibliometric analysis to know the recent trends in porang research. Data were taken from Scopus using Publish or Perish (PoP) software from 2012 to 2022 and processed further using Microsoft Excel and VOSViewer to determine the bibliometric mapping of porang research. The information on publication trends, authors, keywords, journal sources, numbers of publications, author productivity, and citations was analyzed descriptively. The 164 articles were retrieved from the Scopus database using PoP software from 2012 to 2022. The tendency for the number of publications was increased throughout the observation period, with the highest of annual publications in 2022 with 44 articles. Different trends are shown in the fluctuating number of citations each year, and the highest number of citations was found in 2014, with 91 citations. Food Research, Journal of Tropical Life Science, and IOP Conference Series: Earth and Environmental Science are the journals and conference papers that publish the most articles related to porang research, with 4, 4, and 43 articles, respectively, with Wardhani being the most productive as the first author. The "glucomannan", "Amorphophallus muelleri" and "Amorphophallus oncophyllus" were the most title keyword in porang research, with 35, 18, and 18 occurrences, respectively.*

Keywords **:** *A. muelleri; A. oncophyllus; bibliometrics; porang; trends; VosViewer*

INTRODUCTION

Porang, scientifically known as Amorphophallus muelleri, synonymous with *Amorphophallus oncophyllus*, is a native Indonesian biodiversity plant with unique characteristics of yellow flesh and was originally found growing wild around the forests of Java Island (Santosa et al., 2003, 2006; Simon Bambang Widjanarko et al., 2014). The first exploration of *Amorphophallus* spp species on Java Island, Indonesia, was conducted by Ohtsuki, Japan Researcher, in 1967 (Ohtsuki, 1967). Research on porang spans various disciplines, including cultivation, breeding, and processing. Several studies examine the physical and chemical composition, characteristics, biological functions, extraction, and purification methods of porang (Nurlela et al., 2021, 2022; Wardhani et al., 2019, 2020; Widjanarko et al., 2014; Witoyo et al., 2021, 2022, 2023; Yanuriati et al., 2017). Like the konjac tuber, porang tubers contain high water-soluble polysaccharides known as glucomannan and have diverse significant roles in the medical sector, food and food additives, materials research, agriculture, and other sectors (Ulayya et al., 2022; Widjanarko et al., 2022).

Over the last decade, the research on porang has been investigated mainly by Indonesian Scientists and overseas researchers in the Scopus database. Scopus database is a full-text abstracting and indexing database link manufactured by Elsevier Co. from 1966 until now, with 14000 indexed journals. It consists of various life and health sciences disciplines such as chemistry, physics, mathematics, engineering, agriculture, environment, social sciences, physiology, economics, and other general sciences, of which more than 60% of paper comes from outside the United States. Scopus is also indexed on EMTREE, MESH, and others (Burnham, 2006). However, reviewing trends in porang research using bibliometrics analysis is lacking. Bibliometrics analysis is usually used for development and provides practical methods to predict future research in a specific field (Shen & Li, 2022). Bibliometrics is a science that operates in

science by utilizing comprehensive quantitative analysis related to science using a mathematical and statistical approach. This analysis helps researchers and readers conclude a scientific development and determine gaps that are not yet understood and can be applied to general and specific sciences. The quality of bibliometric analysis is determined by the database used as a source of data or articles (Donthu et al., 2021). So, this study used the bibliometric analysis from the Scopus database using PoP software over the last decade, from 2012 to 2022, on porang research.

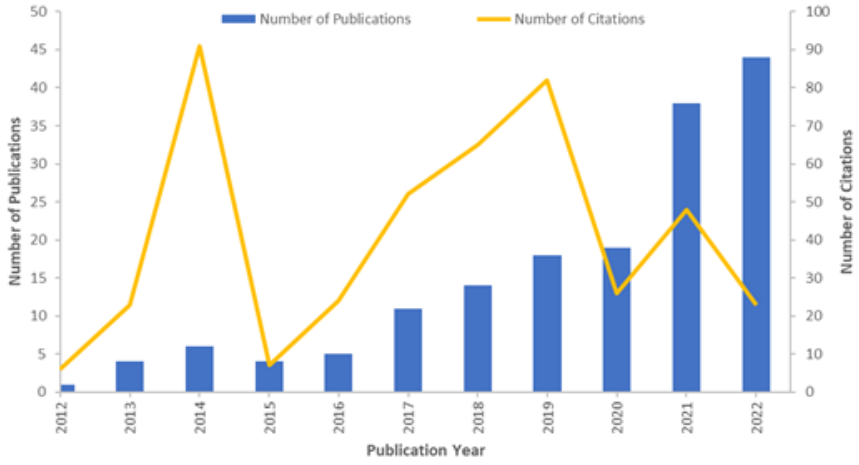
METHODS

The data used in this study was collected from the Scopus database using "Publish and Perish (PoP)" Ver. 8 software with the keyword "Porang" or "Amorphophallus muelleri" or "Amorphophallus oncophyllus" over the last decade, which is 2012 to 2022. The 164 paper was successfully retrieved from the Scopus database by PoP software, including the title of papers, author's name, journal name, article type, years of publication, ranking, and number of citations. The information data from PoP were exported to RIS and CSV format for further analysis using VosViewer Software. Moreover, information about the author's name, journal name, article type, years of publication, and the number of citations was analyzed using Microsoft Excel 2019 Home and Student Version (Utoro & Rosadi, 2022).

RESULT

Trends of Publications and Citations

Based on the Scopus Database, 164 articles on porang research were found during the last decade, from 2012 to 2022, as research outcomes. Figure 1 shows annual publications and citations in porang research from 2012 to 2022. Based on Figure 1, the annual publication in porang research increased from 2012 to 2014, then declined in 2015. Furthermore, the annual publications in 2016 climbed up again until the last year, 2022. The 2012 and 2022 years are the lowest and the highest annual publications, with 1 and 44 articles in sequence. The highest trend increase in annual publications was found in 2021, with 38 papers, or an increase of 100% compared to 2020, which only published 19 articles. Moreover, the total number of citations from 2012 to 2022 was 449, and the trend of annual citations is exhibited in Figure. 1, with the yellow line mark. The annual citation from 2013 to 2022 fluctuated. The highest number of citations was found in 2014, with 91 citations, a significant increase of 295.65% (68 citations) than in 2013.



Source: processed data

Figure 1
The trend of publications and citations on porang research from 2012 to 2022

Types of Documents and Analysis of Journal Sources

Of the 164 documents retrieved from the Scopus database from 2012 to 2022 regarding porang research, the articles can be divided into four groups: articles, conference papers, notes, and book chapters. These documents have been communicated in various scientific journals, notes, conference proceedings, and book chapters, summarized in Table 1. The

articles dominated the document with 57,93%, followed by the conference papers (40,24%), notes (1,22%), and book chapters in the rest. The research related to porang research was communicated in the 10 proceedings, 2 notes, 1 book chapter, and 74 reputable scientific journals. *Food Research* and *Journal of Tropical Life Science* are the journals that publish the most articles related to porang research, each publishing four articles, followed by *Acta Horticulturae*, *Biodiversitas*, *Food Science and Technology (Brazil)*, and *International Journal on Advanced Science, Engineering and Information Technology* each with three articles. Moreover, *Acta Horticulturae Sinica*, *Carbohydrate Polymers*, *Chemistry and Chemical Technology*, *Journal of Genetics*, *Media Peternakan*, *Molekul*, and *Pakistan Journal of Nutrition* are ranked 3rd in publishing the most on porang research, with two articles. Apart from reputable journals, porang research is also communicated in conferences, such as conference papers. *IOP Conference Series: Earth and Environmental Science* dominate with 43 articles, followed by *AIP Conference Proceedings* and *IOP Conference Series: Materials Science and Engineering* with 9 and 4 articles, respectively.

Table 1
Journal name, number of publications, and document type related to porang research

Journal Name	Number of Publications	Document Type
2018 Electrical Power, Electronics, Communications, Controls, and Informatics Seminar, EECCIS 2018	2	Conference paper
9th International Conference on ICT for Smart Society: Recover Together, Recover Stronger and Smarter Smartization, Governance and Collaboration, ICISS 2022	1	Conference paper
AACL Bioflux	1	Article
Acta Horticulturae	3	Article
Acta Horticulturae Sinica	2	Article
Acta Scientiarum Polonorum, Technologia Alimentaria	1	Article
Advanced Science Letters	1	Article
African Journal of Food, Agriculture, Nutrition and Development	1	Article
Agrivita	1	Article
Agronomy	1	Article
AIP Conference Proceedings	9	Conference paper
Annals of Biology	1	Article
ARPN Journal of Engineering and Applied Sciences	1	Article
Bali Medical Journal	1	Article
Bangladesh Journal of Plant Taxonomy	1	Article
Biocatalysis and Agricultural Biotechnology	1	Article
Biodiversitas	3	Article
Bioscience Journal	1	Article
Bulletin of Chemical Reaction Engineering & Catalysis	1	Article
Carbohydrate Polymers	2	Article
Carbohydrate Research	1	Article
Carpathian Journal of Food Science and Technology	1	Article
Chemistry and Chemical Technology	2	Article
Current Research in Nutrition and Food Science	1	Article
Drying Technology	1	Article
E3S Web of Conferences	1	Conference paper
Electronic Journal of General Medicine	1	Article
Engineering in Life Sciences	1	Article
F1000Research	1	Article
Farmacia	1	Article
Food Research	4	Article
Food Science and Technology (Brazil)	3	Article
Frontiers in Microbiology	1	Article
Frontiers in Plant Science	1	Article
Gums and Stabilisers for the Food Industry 17 - The Changing Face of Food Manufacture: The Role of Hydrocolloids	1	Conference paper
Heliyon	1	Article
Horticulture Journal	1	Article
Indonesian Journal of Forestry Research	1	Article

Heliyon	1	Article
Horticulture Journal	1	Article
Indonesian Journal of Forestry Research	1	Article
International Journal of Applied Pharmaceutics	1	Article
International Journal of ChemTech Research	1	Article
International Journal of Dairy Science	1	Article
International Journal of Plant Biology	1	Article
International Journal of Poultry Science	1	Article
International Journal on Advanced Science, Engineering and Information Technology	3	Article
IOP Conference Series: Earth and Environmental Science	43	Conference paper
IOP Conference Series: Materials Science and Engineering	4	Conference paper
Iraqi Journal of Agricultural Sciences	1	Article
Italian Journal of Food Science	1	Article
Journal of Animal and Plant Sciences	1	Article
Journal of Animal and Plant Sciences	1	Article
Journal of Applied Horticulture	1	Article
Journal of Engineering Science and Technology	1	Article
Journal of Genetics	2	Article
Journal of Natural Remedies	1	Article
Journal of Physics: Conference Series	3	Conference paper
Journal of Plant Pathology	1	Note
Journal of the American Society for Horticultural Science	1	Article
Journal of the Indonesian Tropical Animal Agriculture	1	Article
Journal of Tropical Biodiversity and Biotechnology	1	Article
Journal of Tropical Life Science	4	Article
Livestock Research for Rural Development	1	Article
Media Peternakan	2	Article
Molecules	2	Article
Molekul	2	Article
Nature Environment and Pollution Technology	1	Article
Open Access Macedonian Journal of Medical Sciences	1	Article
Open Agriculture	1	Article
Pakistan Journal of Nutrition	2	Article
Pharmaceutical Biology	1	Article
Physiological and Molecular Plant Pathology	1	Article
Plant Disease	1	Note
Plant Signaling and Behavior	1	Article
PLoS ONE	1	Article
Potravinarstvo Slovak Journal of Food Sciences	1	Article
Proceedings of the 2021 IEEE International Conference on Aerospace Electronics and Remote Sensing Technology, ICARES 2021	1	Conference paper
Proceedings of the International Conference on Industrial Engineering and Operations Management	1	Conference paper
Scientific Reports	1	Article
Scientific Study and Research: Chemistry and Chemical Engineering, Biotechnology, Food Industry	1	Article
Scientific World Journal	1	Article
Thermal Science	1	Article
Trends in Carbohydrate Research	1	Article
Trends in Sciences	1	Article
Tropical Animal Science Journal	1	Article
Universal Journal of Agricultural Research	1	Article
Urban Development and Lifestyle	1	Book Chapter
Veterinary World	1	Article
Walailak Journal of Science and Technology	1	Article

Source: processed data

Authors Productivity

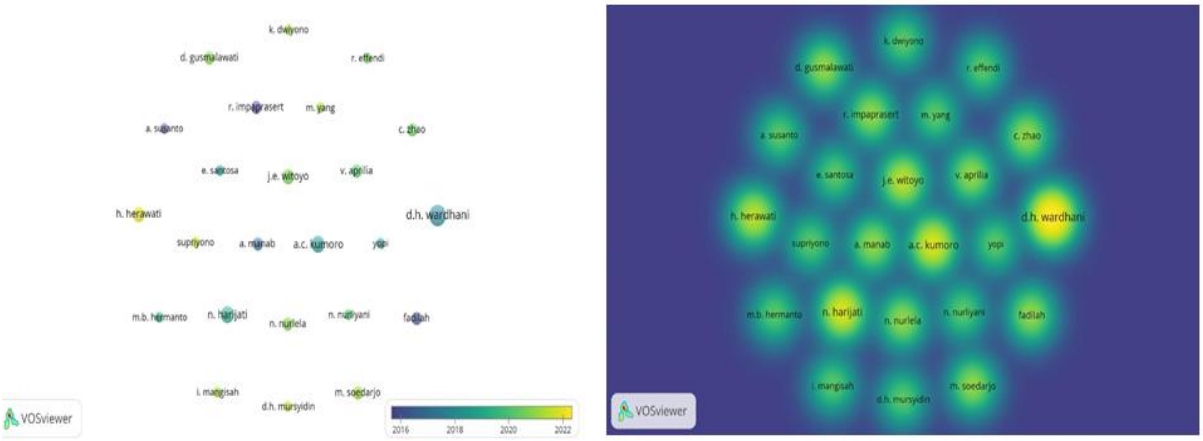
Based on the Scopus database, 24 authors have an article with at least two articles related to porang research and presented in Table 2. Table 2 shows that Wardhani was the most productive as the first author in porang research from 2012 to 2022, with 8 publications, followed by Kumoro and

Harijati, each published 5 articles, and in third position, Herawati and Witoyo with published four articles each. The overlay and density visualization of the author with at least two articles was processed using VosViewer was revealed in Figure 2 the brighter and more significant circle size in Figure 2 shows more published and indexed documents in the Scopus database related to porang research (Utoro & Rosadi, 2022).

Table 2
List of Authors who have published at least 2 articles

Authors Name	Number of Publications
A. C. Kumoro	5
A. Manab	3
A. Susanto	2
C. Zhao	3
D. Gusmalawati	3
D.H. Wardhani	8
D.H. Mursyidin	2
E. Santosa	2
Fadilah	3
H. Herawati	4
I. Mangisah	2
J.E. Witoyo	4
K. Dwiyono	2
M.B. Hermanto	2
M. Soedarjo	3
M. Yang	2
N. Harijati	5
N. Nurlela	3
N. Nurliyani	2
R. Effendi	2
R. Impaprasert	3
Supriyono	2
V. Aprilia	3
Yopi	2

Source: processed data



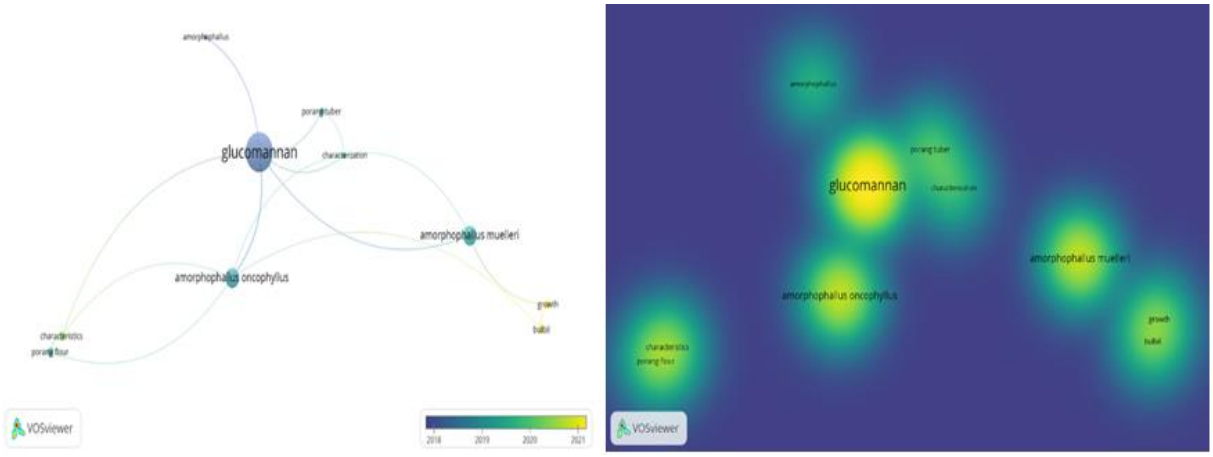
Source: processed data

Figure 2
The overlay and density visualization of authors with at least two articles using VosViewer

Keywords Analysis

Keywords are thought of as a mirror of an article that aids in the study and identification of research trends in any subject area and is commonly represented by two or more keyword nodes connected by a line of varying thickness that demonstrates the relationship between them (Mikhail et al., 2020; Yeasmen et al., 2021). In this study, one used keywords from the article's titles, which

also became a limitation of this paper. The overlay and visualization research on porang research is exhibited in Figure 3. Based on Vos Viewer software, the title keyword was divided into 4 clusters: cluster 1 to cluster 4. Cluster 1 consists of 3 keywords: "*Amorphophallus muelleri*", "*bulbil*", and" *growth"*. Cluster 2 consists of 3 keywords: "*Amorphophallus oncophyllus*", "*characteristics*", and" *porang flour"*. The keywords of "*characterization"* and "*porang tuber*" joined in Cluster 3, and the keywords of "*Amorphophallus"* and "*glucomannan*" joined in Cluster 4. The keyword of "*glucomannan*" was the most title keyword with 35 occurrences, followed by "*Amorphophallus muelleri*" and "*Amorphophallus oncophyllus*", with 18 occurrences each. It is indicated as the brighter and bigger a node, and the more occurrences can be found, as shown in Figure 3.



Source: processed data

Figure 3
The overlay and density visualization research publications by title keywords

CONCLUSION

From 2012 to 2022, 164 articles were retrieved from the Scopus database using PoP software based on porang research. Throughout the observation period, the number of publications increased, with 2022 having the highest annual publications with 44 articles. The number of citations fluctuated per year during 2012-2022, and 2014 had the highest number of citations, with 91. *Food Research*, *Journal of Tropical Life Science*, and *IOP Conference Series: Earth and Environmental Science* are the journals and conference papers that publish the most articles related to porang research, with 4, 4, and 43 articles, respectively, with Wardhani being the most productive as the first author. The most common title keywords in porang research were "*glucomannan*","*Amorphophallus muelleri*" and "*Amorphophallus oncophyllus*" with 35, 18, and 18 occurrences, respectively.

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