# Bibliometric analysis of Thai journals indexed in Scopus

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## Abstract

The purposes of this study were; (1) to provide statistical data of the top 20 Thai scientific journals in terms of historical data from The Scimago Journal & Country Rank (SJR) scores, (2) to analyze the bibliometric data of the journal whose report as best practices identified by the SJR 2021, and (3) To visualize the best practices identified by the SJR 2021 in terms of keyword co-occurrences as well as authorship network at author and country level. The data included citations, number of publications, author's affiliation and cooperation. Quantitative instruments used were timeline analysis and descriptive statistics, e.g. percentage, mean, and standard deviation. Pearson correlation was used to find the relationship between SJR and citations. Further, the VOS viewer was used to illustrate the co-authorship network and keyword co-occurrence.

The results showed that (1) distribution of Thai-owned journals comprised journals in the field of environmental and agricultural sciences and in engineering. Most of these journals were indexed in the Scopus database after 2010, and (2) the bibliographic analysis of best practice journals according to the SJR Ranking 2021, the *Asian Pacific Journal of Allergy and Immunology* shows that the two outstanding researches about COVID-19 contributed to the journal ranking in 2021. Additionally, VOS viewer visualization also illustrates the most prominent countries in each cluster were from Thailand. Furthermore, the data exhibited six clusters of word co-occurrence, and the term "Human" appeared prominently in several clusters.

**Keywords:** Bibliometric, Thai Journals, Scopus, Scimago Journal & Country Rank (SJR), Visualization

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# การวิเคราะห์บรรณมิติของวารสารไทยในฐานข้อมูล Scopus

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## บทคัดย่อ

การศึกษาชิ้นนี้มีวัตถุประสงค์เพื่อ 1) เพื่อแสดงค่าสถิติการดำเนินงานของวารสารวิชาการสาขาวิทยาศาสตร์อันดับ 1-20 ที่ตีพิมพ์โดยองค์กรในประเทศไทย จากการจัดอันดับของ SJR โดยใช้ข้อมูลทางบรรณมิติ ตั้งแต่ปี ค.ศ. 1999- 2021 และ 2) วิเคราะห์บรรณมิติของวารสารสาขาวิทยาศาสตร์ที่มีคะแนน SJR ในปี 2021 สูงที่สุดจำนวน 1 วารสาร และ 3) แสดงลักษณะของวารสารอันดับ 1 ในปี 2021 ในแง่ของคำสำคัญที่ปรากฏในวารสาร ความร่วมมือของผู้นิพนธ์ในระดับบุคคลและระดับประเทศ โดยรวบรวมข้อมูลเชิงปริมาณ ข้อมูลที่ใช้ประกอบด้วย จำนวนการถูกอ้างอิง จำนวนบทความที่ตีพิมพ์ในแต่ละปี และความร่วมมือระหว่างประเทศ ศึกษาวิจัยโดยวิธีวิเคราะห์เชิงปริมาณโดยใช้ เส้นเวลา และเครื่องมือทางสถิติเบื้องต้น เพื่อหาค่าร้อยละ ค่าเฉลี่ย ส่วนเบี่ยงเบนมาตรฐาน รวมถึงสหสัมพันธแบบเพียรสันเพื่อหาความสัมพันธ์ระหว่าง SJR และค่าการถูกอ้างอิง นอกจากนี้เครื่องมือวิเคราะห์บรรณมิติ VOS viewer จะใช้เพื่อสร้างแผนภาพแสดงความร่วมมือของผู้นิพนธ์บทความและสร้างแผนภาพแสดงคำสำคัญของบทความที่ตีพิมพ์ในวารสาร ผลการศึกษาพบว่า 1) วารสารวิชาการสาขาวิทยาศาสตร์ 20 อันดับแรกประกอบด้วยวารสารในสาขาวิทยาศาสตร์สิ่งแวดล้อม วิศวกรรมศาสตร์ วิทยาศาสตร์การเกษตรและวิทยาศาสตร์ชีวภาพ และวารสารในกลุ่มนี้โดยส่วนมากถูกบรรจุเข้าสู่ฐานข้อมูล Scopus หลังจากปี พ.ศ. 2553 2) บรรณมิติของวารสารอันดับที่ 1 ในปี 2021 ของสาขาวิทยาศาสตร์ Asian Pacific Journal of Allergy and Immunology โดยเครื่องมือ VOS viewer แสดงให้เห็นว่าบทความเรื่อง COVID-19 จำนวนสองบทความส่งผลให้วารสารได้คะแนนการอ้างอิงสูง ซึ่งทำให้วารสารได้อันดับที่ 1 ในปี 2021 นอกจากนี้ ผลจากการวิเคราะห์โดย VOS viewer ปรากฏว่าเครือข่ายความร่วมมือที่ใหญ่ที่สุดมาจากประเทศไทย และผลจากการวิเคราะห์คำสำคัญพบว่า มีคำสำคัญที่มีความโดดเด่นจำนวน 6 คำ คำที่โดดเด่นที่สุดและมีความเชื่อมโยงกับหลายกลุ่มได้แก่ คำว่า “มนุษย์”

**คำสำคัญ:** การวิเคราะห์บรรณมิติ, วารสารไทย, ฐานข้อมูล Scopus, Scimago Journal & Country Rank (SJR), การสร้างแผนภาพ

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**Introduction**

Research and publication of research results in the form of research articles are important missions of universities. Publication of research articles aims to distribute knowledge to the public. Publication is also one of the criteria for university ranking by Quacquarelli Symonds (QS), Times Higher Education (THE) and SCImage Institutions Rankings (SIR). Scopus is one resource for ranking universities (SCImago, 2022a; Srisawad, 2019; The Times Higher Education, 2022). For this reason, all universities have invested in a research department and academic journals which are published to disseminate knowledge, technology, ideas, and innovations derived from research as well as movement in academic areas. Therefore, an academic journal is a source of new knowledge for education, business and other fields of activity. The research articles published in academic journals are reviewed by distinguished experts in the field of study. All content published in the journals is controlled by an editorial board, a team of experts in the journal's field. Accordingly, the content of academic journals is a highly reliable source for academicians (Davidson, 1969).

The Thai-owned journals are normally evaluated by Thai Journal Citation Index (TCI). TCI provides a national level of indexing the organization of journal articles and reference information. In 2022, there are 1,036 Thai journals listed in TCI (Thai-Journal Citation Index Centre, 2022a). Both qualitative and quantitative criteria are listed in three divisions of TCI; the highest quality accredited journals are classified in TCI tier 1, the lower rank of the journals are classified in TCI tier 2, and the journals that do not meet the assessment criteria are classified in TCI tier 3.

In addition, the journals classified in tier 1 and 2 of TCI will be eligible for evaluation for the Scopus database which contains more than 39,000 journals from all over the world (Apinya, 2019, Nakornthap, 2016; Taterian & Damrongson, 2017). According to Scimago, there are 70 Thai journals listed in Scopus (Scimago Lab, 2022). There are only few Thai journal listed in Scopus due to the high standard of criteria. The basic criteria are 1) journal policy, 2) content, 3) journal standing, 4) publishing regularity, and 5) online availability (Elsevier, 2022a). Every mid-year, the Scopus database announces the journal quality indices, which are 1) SCimago Journal Rank (SJR)

and 2) CiteScore which is a measure reflecting the yearly average number of citations of recent articles published in that journal (Elsevier, 2022a).

From the above-mentioned data, the journals listed in the Scopus database must show competitiveness of published international quality articles which can be measured by statistical data and the Scopus metric. There are some statistical studies on academic journals and their statistical data in the Scopus database which will be discussed in the next section.

There have been many bibliometric analyses of journals in reputable academic databases analyzed from the publisher's perspective using statistical data along with the academic journal performance in several countries. For example, the studies of academic journals from all over the world (Erfanmanesh, Tahira, & Abrizah, 2017; Kipper, Furstenau, Hoppe, Frozza, & Iespen, 2019), Iran and Indonesia (Alizade, 2014; Lukman, Rianto, Al Hakim, Nadhiroh, & Hidayat, 2018), Cuba (Chinchilla-Rodriguez, Arencibia-Jorge, Moya-Anegon, & Corera-Alvarez, E., 2015), the journals rejected from Scopus in South Korea (Jang, 2020), studies of Hindawi indexed journals in Scopus (Okagbue, Atayero, Adamu, Bishop, Oguntunde, & Opanuga, 2018), analysis of publication language in Scopus database (Moed, Moya-Anegonb, Guerrero-Botec, & Lopez-Illescas, 2020), analysis of journal discontinued in Scopus (Krauskopf, 2018), and bibliometric analysis of Walailak Journal of Science and Technology (Sirirak, 2021).

A review of the literature reveals that previous studies have been diverse regarding the data used, analytical methods, and the area where the academic journals are based. Some of the research analyze the global scope of the journal listed in Scopus, while some researches focus on specific country. It is true that to focus on specific countries can provide valuable insights into the unique characteristics and challenges faced by academic journals in those countries. However, the highly ranked journals were overlooked. To analyze the highly ranked journal provides the characteristics of those journals as well as identification of potential areas for improvement and making strategic decisions to increase their chances of being listed in Scopus.

Thailand is one of the countries that forms the group of developing countries. Despite the large number of journals that have been published in Thailand in the recent years, only a small percentage of the journals have been able to be listed in Scopus. This study aims to fill the gaps in

knowledge for journals that are based in Thailand and want to be listed in the Scopus database. Studying academic journals that are currently listed in high ranking of Scopus and based in Thailand will build on previous studies and extend knowledge in this field. The researchers were interested in bibliometric analysis which illustrates the evolution of Thai Journals regarding quantitative data. The performance of top-ranked journals listed in Scopus will be shown. The results of this study will indicate the performance of high-ranked Thai-owned journals which are currently listed in Scopus database. University administrators can use the results of the study to make policies, to forecast supporting budgets to the journals who aim to be listed in Scopus as well as determining the journal operating strategy. The next section will describe the data collection procedure and data analysis.

**Objectives**

1. To collect statistical data of top-ranked science Scopus-indexed Thai owned-academic journals

2. to analyze the bibliometric data of the journal whose report as best practices identified by the SJR 2021.

3. To visualize the as best practices identified by the SJR 2021 in term of keyword co-occurrences as well as authorship network at author and country level

**Research Methodology**

1. Data collection

SJR as well as the Scopus database are two sources where the data were collected.

Data for wholly Thai-owned journals, were identified from the SJR website. In 2022, there were 70 Thai-owned journals shown on the website. The researchers ranked the top 20 journals which were indicated by SJR indicator, using a filter called “journal ranking/countries”. The number of publications, international collaboration, SJR score and number of citations were collected from this website on November 15$^{th}$, 2022, using the name of the journal and ISSN.

The best practice of journal in this study was decided by the SJR country rank of 2021. The selected journal was analyzed using the data export from Scopus database during 1999 - 2021.

1.1 Criteria for choosing period

Although some journals in the list have been indexed in the Scopus during the late 20th Century, the bibliometric data in the SJR can only be traced back to 1999. Considering this, the data period identified for analysis in this research was 1999-2021. This period was also used as a benchmark to analyze the collaboration of authorship by author and country.

The researchers decided to collect data from SJR within the same time period in order to analyze authorship and affiliation. 950 articles are indexed (1999-2021). According to Rogers, Szomszor and Adams (2020), who proposed that 200 articles is an acceptable as minimum for institutional data of bibliometric analysis. Therefore, the size of the data is above the minimum number. The exported data from the Scopus database will be used to identify the authors and collaborations on each article.

1.2 Criteria for choosing the best practice of Thai-owned science journals listed in Scopus

It is difficult to assert which journal one is the one. At present, points based on score and ranked order are used to define the performance of a journal. However, the current study also looks at the aspect of editorial management apart from the Scopus metric, e.g., citations, diversity of authorship, and number of publications. The additional criterion is if the journal spend less time to enter the Scopus. In addition, it has the competence ability in the Scopus database for many years.

A selection of best practice was:

1) The selected journal is based on SJR 2021. The rank includes only journals that belong to a particular field of discipline. Journals ranked by Scopus are divided into four quartiles (Q). Q1 is the highest rank while Q4 is the lowest rank. The SJR is a measure of the scientific impact of scholarly journals that accounts for the number of citations received by a journal and the prestige of the journals from which the citations originated.

**Data Analysis**

Bibliometric analysis and Statistical analysis

All Thai journals in the Scopus database's development were examined using timeline analysis (Lin, 2018) based on the information given in *The Scimago Journal & Country Rank* (SJR), which incorporates ranking information from the Scopus database (SCImago, 2022a).

For the best practice journal, some bibliometric indicators that are accepted by the scientific community were used to evaluate the journal productivity. We used total number of publications (TP) and total number of citations (TC). Visualization tools such as line charts, bar charts, and pie charts were used for science mapping analysis of bibliometric indicators from the journal. Descriptive statistics including mean, average, sum, were used. In addition, the Pearson correlation coefficient (r), the most common way of measuring a linear correlation, was also used to measure the correlation among data of SJR, citation, and international collaboration. Pearson correlation coefficient is a number between -1 and 1 that measures the strength and direction of the relationship between the two variables (Rodgers & Nicewander, 1988). The VOS viewer (Van Eck & Waltman, 2010) was used to map the clusters of co-occurrence of words and co-authorship network.

Co-occurrence analysis using VOSviewer in terms of titles, abstracts and keywords

The visualization approach for analyzing the journal bibliometric data is based on Jan & Ludo (2009). Articles were retrieved from the Scopus database. A literature search was conducted online in November 2022 with the source title "Asian Pacific Journal of Allergy and Immunology" The articles had been downloaded from Scopus database via institution access in CSV format to be processed using VOSviewer to visualize and analyze it in bibliometric form. In this research, data used in analysis include authorship, keywords, and citations.

**Findings**

**1. Overall historical bibliometric data**

The overview performance of Thai-owned journals can be explained by indexing of those journals. The TCI was used for evaluation of Thai-owned journals. Figure 1 shows indexing data since 2015. Most of Thai-owned journals were listed in Tier 2 of TCI while the small number of Thai-owned journals were listed in Scopus.

The result indicates that most of Thai-owned journal are unable to reach the highest TCI standard. More than 50% were below tier 1 of TCI. The remarkable of the chart is on 2020 when the TCI has announced new criteria. As a result, more than 200 journals were lowered in that year. In the same year, journals listed in Scopus had increased rapidly due to support from external factors

with the TCI-TSRI-Scopus Collaboration Project allowing more Thai journals to be listed in the Scopus (Thai Journal Citation Index Centre, 2022b).

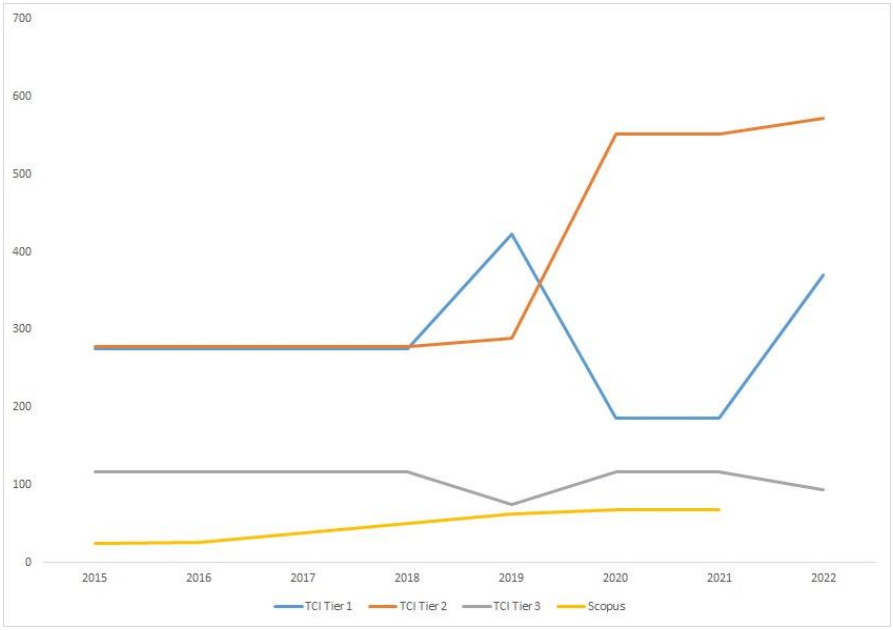


**Fig. 1** Thai journals listed in TCI and Scopus since 2015.

The timeline shows some of the journals have been listed in Scopus since 1999 when the SJR started to collect bibliometric data. Several journals have been listed in Scopus in recent years. The current study focusses on this point. The charts (see Figure 2 and Figure 3) indicate that most journals have been listed since 2017.

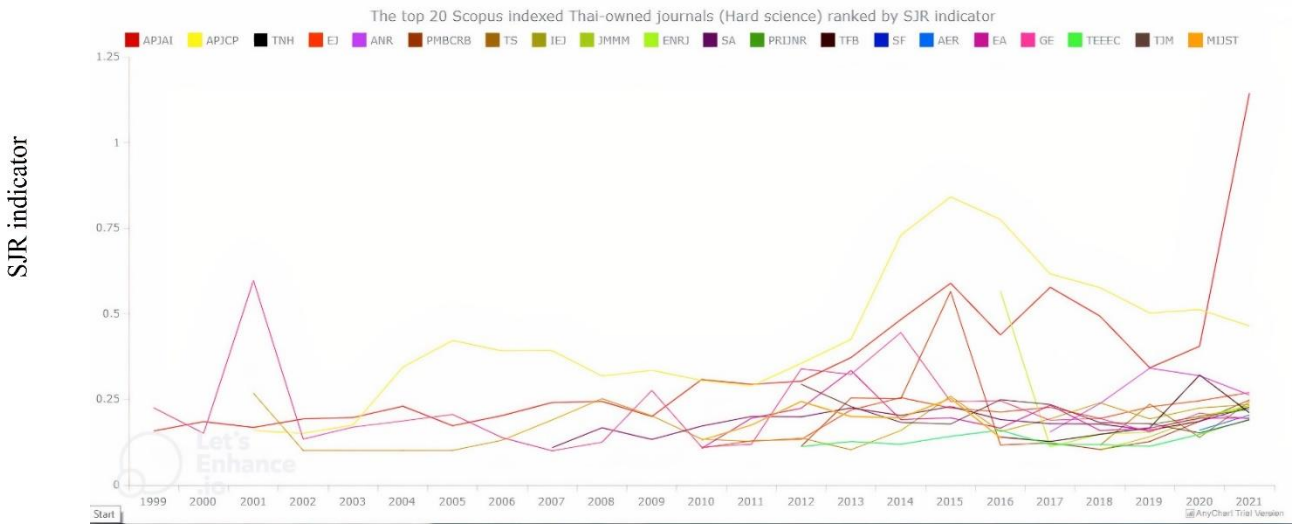


**Fig. 2** The top 20 scientific Thai-owned journals ranked in 2021 by SJR indicator.

The distribution of top 20 Scopus-Indexed Thai-owned journals shows that environmental sciences journals include the greatest number indexed in the top rank, followed by agricultural sciences journal. Even though only two medical science journals were included in the list, they are included, one in the 1st rank and another in the 2nd rank. It can be interpreted that Thai-owned medical journal also performed well in Scopus.

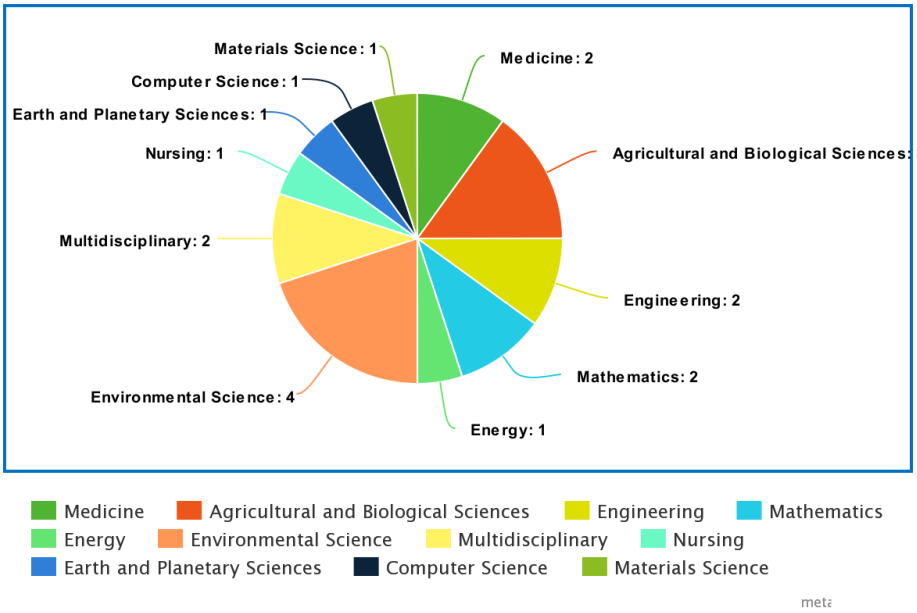


**Fig. 3** Discipline of the top 20 scientific Thai-owned journals.

**Table 1.** The top 20 science Thai-owned journals ranked in 2021 and year of its first publications (Scimago, 2022b).

| SJR rank 2021 | Journal Title | First issue | years coverage in Scopus | Avg. No. of Articles | Avg. No. of Citations | Avg. SJR |
|---|---|---|---|---|---|---|
| 1 | Asian Pacific Journal of Allergy and Immunology | 1983 | 1983 - 2021 | 40.70 | 138.91 | 0.35 |
| 2 | Asian Pacific Journal of Cancer Prevention | 2000 | 2000-2021 | 518.36 | 2,789.50 | 0.43 |
| 3 | Tropical Natural History | 2001 | 2017-2021 | 17.80 | 22.5 | 0.30 |
| 4 | Engineering Journal | 1997 | 2009-2021 | 73.62 | 142.58 | 0.20 |
| 5 | Agriculture and Natural Resources | 1967 | 2016-2021 | 91.83 | 271.60 | 0.26 |

| SJR rank 2021 | Journal Title | First issue | years coverage in Scopus | Avg. No. of Articles | Avg. No. of Citations | Avg. SJR |
|---|---|---|---|---|---|---|
| 6 | Phuket Marine Biological Center Research Bulletin | 1973 | 2011-2013, 2016-2021 | 8.17 | 8.7 | 0.21 |
| 7 | Thailand Statistician | 2003 | 2017-2021 | 28.20 | 28.25 | 0.18 |
| 8 | International Energy Journal | 2001 | 2000-2012, 2014-2021 | 24.77 | 22.71 | 0.17 |
| 9 | Journal of Metals, Materials and Minerals | 1991 | 2017-2021 | 46.80 | 67.75 | 0.17 |
| 10 | Environment and Natural Resources Journal | 2003 | 2017-2021 | 30.40 | 37.00 | 0.23 |
| 11 | ScienceAsia | 1975 | 2006-2021 | 72.50 | 116.33 | 0.18 |
| 12 | Pacific Rim International Journal of Nursing Research | 1997 | 2019-2021 | 37.75 | 49.33 | 0.20 |
| 13 | Thai Forest Bulletin (Botany) | 1973 | 2015-2021 | 24.29 | 20.17 | 0.19 |
| 14 | Studies in Fungi | 2016 | 2020-2021 | 38.50 | 16.00 | 0.20 |
| 15 | Applied Environmental Research | 1979 | 2019-2021 | 27.33 | 26.50 | 0.18 |
| 16 | EnvironmentAsia | 2008 | 2009-2021 | 35.69 | 53.17 | 0.20 |
| 17 | Geotechnical Engineering | 1970 | 1978-2021 | 35.43 | 30.43 | 0.22 |
| 18 | ECTI Transactions on Electrical Engineering, Electronics, and Communications | 2003 | 2011-2021 | 19.00 | 21.30 | 0.13 |
| 19 | Thai Journal of Mathematics | 2003 | 2011-2021 | 84.45 | 66.00 | 0.21 |
| 20 | Maejo International Journal of Science and Technology | 2007 | 2009-2021 | 27.00 | 47.42 | 0.18 |

*Data are calculated since the year that the SJR has provided data for each journal.

From the Table 1, the result shows that the top two journals have high average SJR score among this group. The majority of the group's journals achieved SJR scores between 0.15 and 0.25. Moreover, the data also demonstrate that journals with a good average record were placed at the top of the table in 2021.

**2. Best Practice of Thai-owned journals listed in Scopus in 2021**

1) Journal overview

From the criteria, the *Asian Pacific Journal of Allergy and Immunology* was selected for bibliometric analysis. It has been ranked as the 1st journal in Thailand according to SJR. The SJR of the journal was 1.143 in 2021. The journal published its first issue in 1983 and the Scopus database has covered its data since the year of the first issue. Therefore, it is considered that the journal contained sufficient performance articles to define it as the Thai journal with best practice.

Figure 4 shows that APJAI had an outstanding performance in 2021 with over 700 citations while the journal published 40 articles in the same year. According to the bibliometric data, it can be interpreted that the journal that has been indexed in Scopus must receive citation at higher number of publications in each year.

2) Descriptive statistics of the dataset

Descriptive statistics have been used to analyze the dataset. The results are shown in Table 2.

Table 2. Descriptive statistics of The *Asian Pacific Journal of Allergy and Immunology* in 1999-2021.

| Indicators | SJR | No. of Citation | %Collaboration |
|---|---|---|---|
| **Minimum** | 0.158 | 35 | 0 |
| **Maximun** | 1.143 | 706 | 29.730 |
| **n** | 23 | 23 | 23 |
| **Sum** | 7.939 | 3195 | - |
| **Mean** | 0.345 | 138.913 | 11.190 |
| **Standard Deviation** | 0.219 | 141.127 | 6.385 |

Table 3. Pearson correlation coefficient

| **Pearson correlation coefficient calculation on descriptive statistics of The *Asian Pacific Journal of Allergy and Immunology* in 1999-2021.** | |
|---|---|
| | **SJR** |
| **No. of Citations** | 0.9678*** |
| **% of collaboration** | 0.1452 |

Note: * p< .10,**p< .05, ***p< .01

The *Asian Pacific Journal of Allergy and Immunology* has published 936 articles since 1999 (41 articles per year in average). The highest number of publications was 60 articles in 2012 and the lowest number of publications was 31 articles in 2009. The number of journal citations since 1991 is 3,195 articles (139 articles per year in average). The highest number of citations was 706 in 2021 and the lowest number of citations was 35 in 1999. Table 3 reports that the SJR indicator and citation were correlated at the significance level of 0.01 while the collaboration was not significantly correlated with SJR. It shows that between these two factors, journals should focus more on citations, although contributors diversity is one of Scopus's assessment criteria.

3) Articles, citations, and contents of the journal

This subtopic focuses on analyzing the characteristics of the most cited articles, the number of citations they have received, and the content of the journal through keyword analysis.

Table 4. Top 10 cited articles in the *Asian Pacific Journal of Allergy and Immunology* since 1991-2021 (Elsevier, 2023).

| **Rank** | **Title** | **Year** | **No. of citations** |
|---|---|---|---|
| 1 | Immune responses in COVID-19 and potential vaccines: Lessons learned from SARS and MERS epidemic | 2020 | 975 |
| 2 | Perspectives on monoclonal antibody therapy as potential therapeutic intervention for Coronavirus disease-19 (COVID-19) | 2020 | 312 |
| 3 | Geography of house dust mite allergens | 2010 | 90 |
| 4 | Frequency of the HLA-B*1502 allele contributing to carbamazepine-induced hypersensitivity reactions in a cohort of Malaysian epilepsy patients | 2011 | 87 |
| 5 | Epidemiology and current status of allergic rhinitis and asthma in Thailand-ARIA Asia-Pacific workshop report | 2009 | 75 |
| 6 | High prevalence of hepatitis C virus genotype 6 in Vietnam | 2009 | 62 |
| 7 | Airway remodelling in asthma and novel therapy | 2013 | 60 |
| 8 | Impact of domestic air pollution from cooking fuel on respiratory allergies in children in India | 2008 | 59 |
| 9 | The potential impact of gut microbiota on your health: Current status and future challenges | 2016 | 58 |
| 10 | The pleiotropic role of vitamin A in regulating mucosal immunity | 2015 | 58 |

The impact of the research article and the reputation of the journal are typically account for the citations. In this case, the journal has published two outstanding research articles in 2020.

Table 4 reports that the most cited journal is “Immune responses in COVID-19 and potential vaccines: Lesson learned from SARS and MERS epidemic”, which was published in 2020 received high citations within one year. The two articles that were published in 2020 contribute the most to the journal's performance in 2021. The research is likely to focus on immune response to COVID-19. The article compares the immune responses to COVID-19 to SARS and MERS outbreaks with the purpose of gaining better understanding to COVID-19 and the potential process for vaccines development.

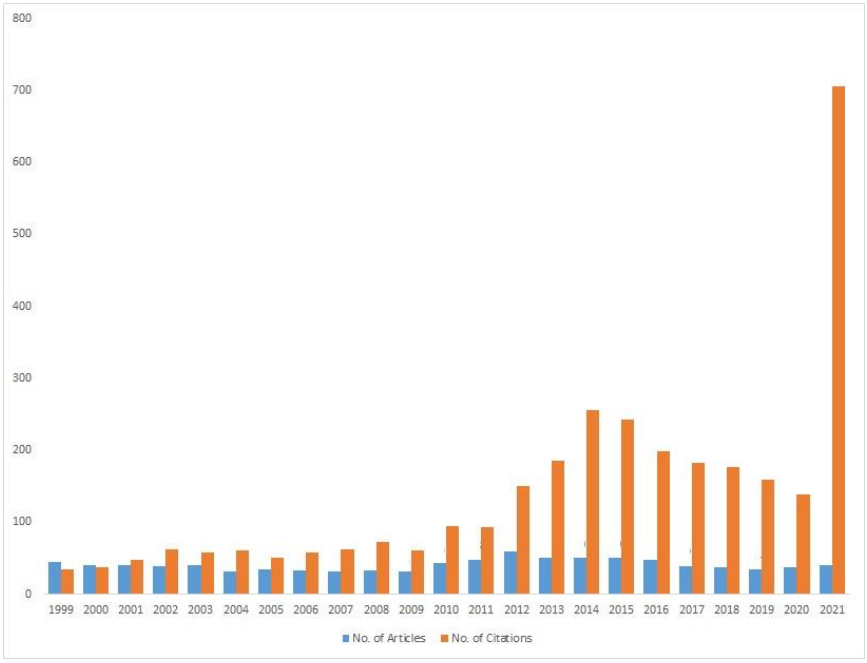


**Fig. 5** The number of publications and citations of the *Asian Pacific Journal of Allergy and Immunology.*

Content of the journal

The term "keyword co-occurrence" implies how two or more keywords occur together in a text or document. Co-occurrence analysis of keywords provides a perspective of the knowledge structure and research trend, which helps readers identify the research topic of an article in a journal.

There are 8,837 keywords used in articles in the journal, and 1,314 of these reach the threshold with a minimum occurrences of a keyword as 5. The data displays a network of

publications' co-occurrences of keywords. A node represents a word; a larger node indicates a greater number of frequency of word. A link between two nodes indicates the co-occurrences of words. The thicker edge (link) means more frequently they co-occur. As shown in Figure 5, there are six meaningful clusters were generated. To be specific 'nonhuman' 'immunology' are prominent in red cluster; 'controlled study', 'human' are prominent in purple cluster; 'human', 'female'are prominent in blue cluster; 'major clinical study', 'adolescent' are prominent in yellow cluster. The keyword 'Human' are included in all cluster according to the data.

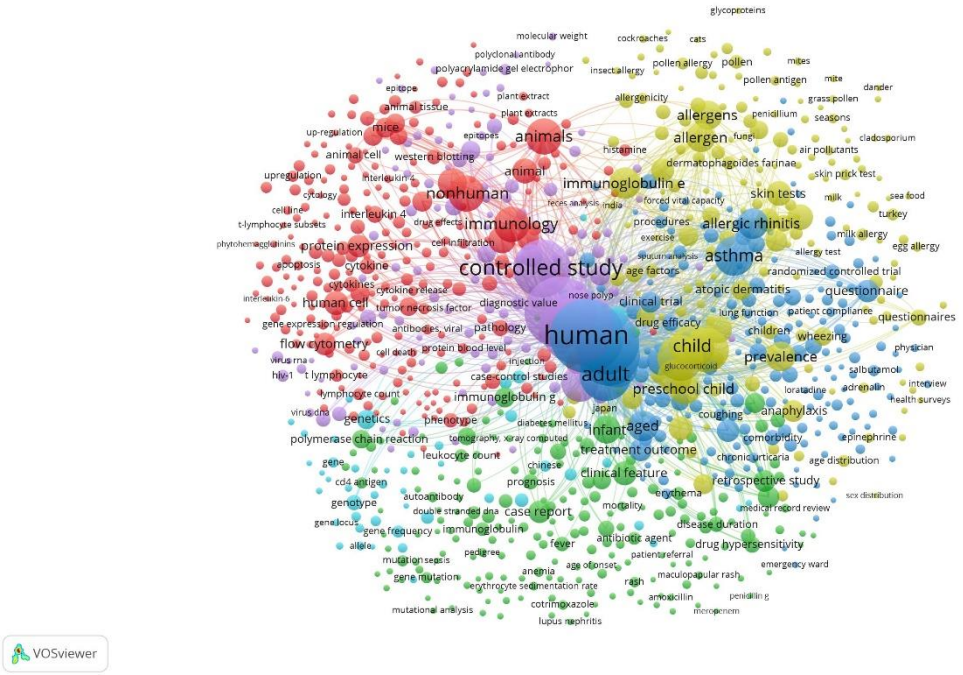


**Fig.4** Keywords co-occurrence of the journal

4) Contributors, funding, and collaboration

This section displays statistics on journal contributors, the funding source for research published in the journal, and a collaboration map at the level of authors and countries.

**Table 5.** Top 5 of affiliations regarding to the affiliation of author (n=950).

| No. | Affiliation | Country | Number articles | Percentage |
|---|---|---|---|---|
| 1 | Mahidol University | Thailand | 380 | 40.00% |

| No. | Affiliation | Country | Number articles | Percentage |
|---|---|---|---|---|
| 2 | Chulalongkorn University | Thailand | 129 | 13.58% |
| 3 | Siriraj Hospital | Thailand | 87 | 9.16% |
| 4 | Chiang Mai University | Thailand | 45 | 4.74% |
| 5 | Khon Kaen University | Thailand | 40 | 4.21% |

The data of recent publications 1999-2021 in the diversity of authorship shows that Mahidol University had the highest number of organizations publishing in this journal (40%), followed by Chulalongkorn University. The country that contributed the most articles to this journal was Thailand with more than 50% of the collected data.

International collaboration is when published articles have been produced by cooperation among several researchers from different countries. Figure 6 shows the percentage of a journal's published articles involving researchers from more than a single country. The average value was 11.19%. The highest rate of collaboration was 29.37% in 2020 while the lowest rate was 0.00% in 2001.

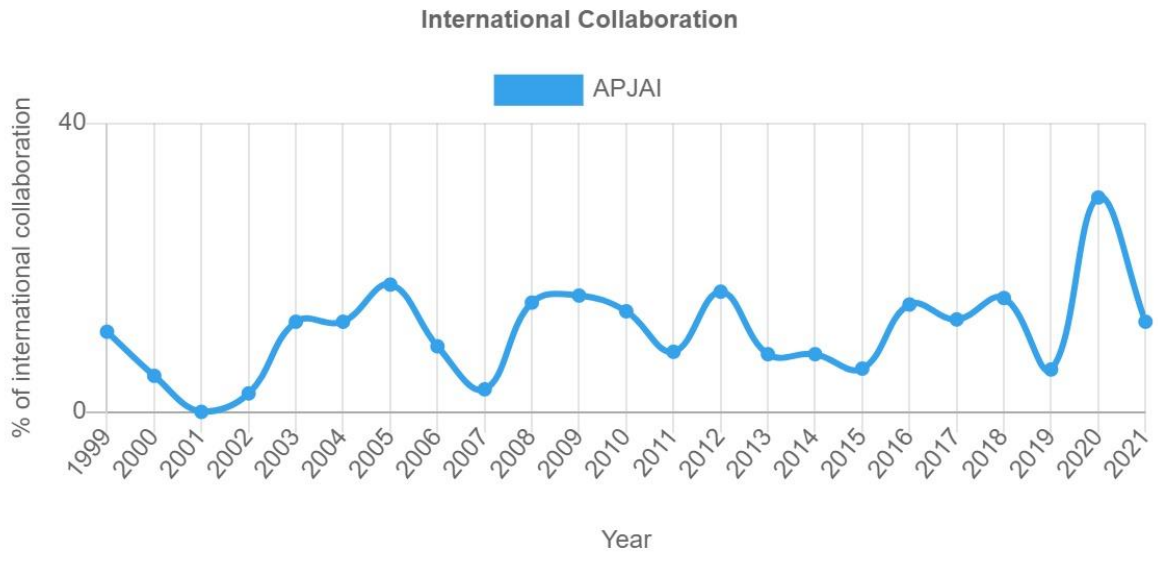


**Fig. 6** International collaboration of APJAI.

To describe the collaboration relationship of publications in *Asian Pacific Journal of Allergy and Immunology* from 1999 – 2021, the co-authorship analysis by VOS viewer at the level of author and country are made. The threshold settings are set to the following default parameters from VOS. Maximum number of authors per document was set at 25, minimum number of authors per document was set at 5, and there were no minimum requirements for citations. The outcome reveals that 115 authors met the threshold.

According to the visualization tool of Figure 7 and Figure 8, the node shows co-authorship network. The size of node means total number of contributions. A link between two nodes represent co- author relationship, the thicker of the link shows strong relationship between nodes.

There are total 10 clusters. The most prominent countries in each cluster are from Thailand such as Vichyanond, P. (Thailand), Poovorawan, Y. (Thailand), Chaicumpa, W. (Thailand), and Pattanapanyasak, K. (Thailand). In addition, the analysis from countries level shows there are total 5 clusters. The most prominent country is Thailand. Thai researchers prefer to connect with all five cluster according to the data.

In conclusion, the study demonstrates that more than half of the prominent authors are from Thailand, supporting the claim that Thai scholars significantly contributed to the *Asian Pacific Journal of Allergy and Immunology*.

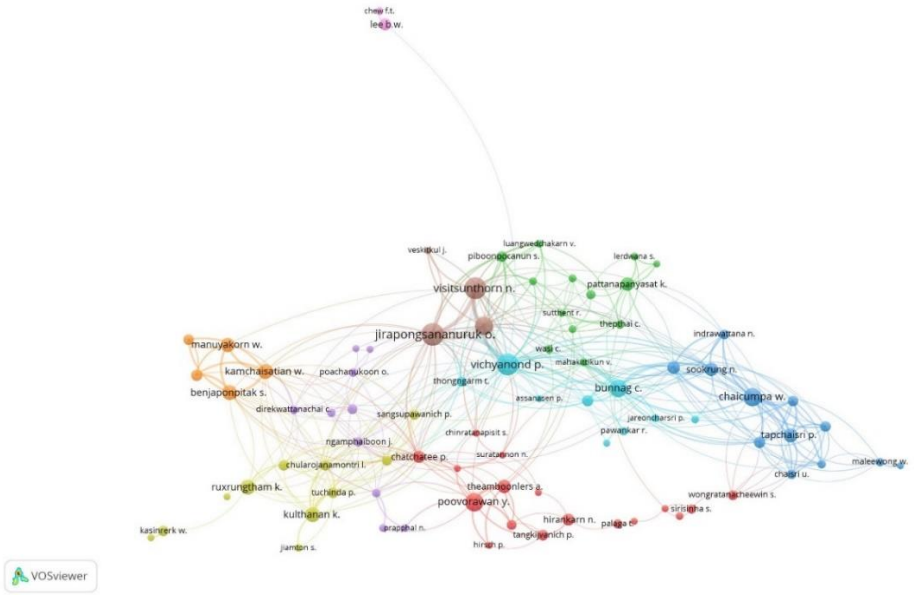


**Fig 7.** Co-authorship network of authors.

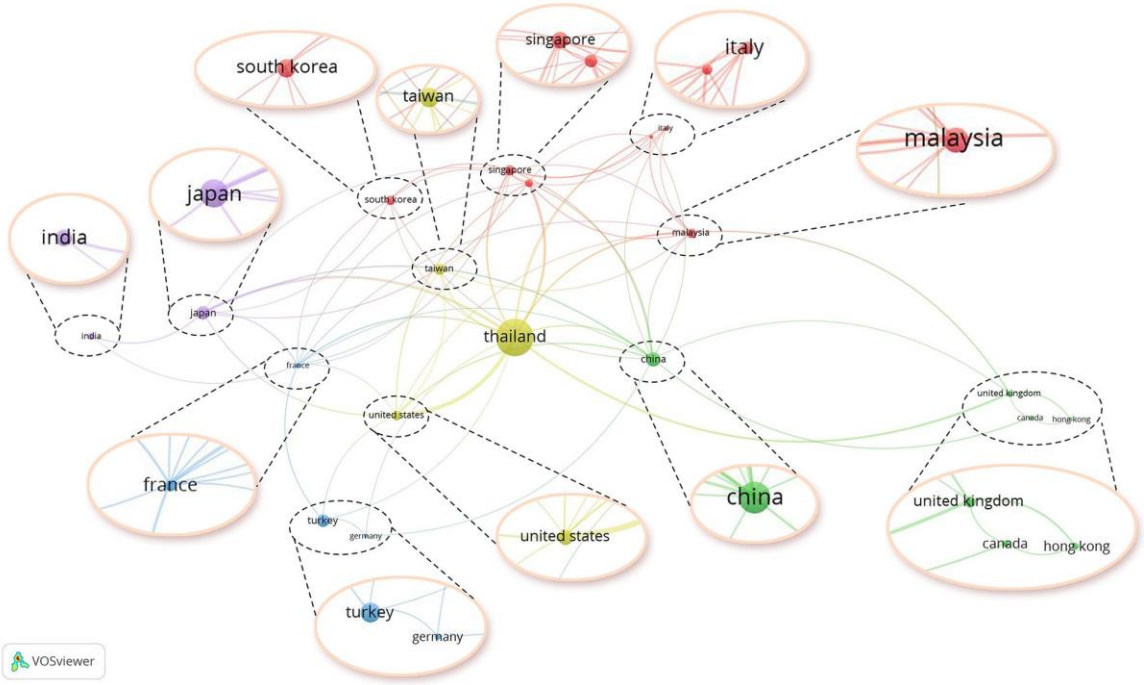


**Fig. 8** Co-authorship network of countries.

**Table 6.** Funding organization (N=950)

| No. | Funding | Country | No. of articles | Percentage |
|---|---|---|---|---|
| 1 | Mahidol University | Thailand | 32 | 3.37% |
| 2 | Thailand Research Fund | Thailand | 18 | 1.89% |
| 3 | National Natural Science Foundation of China | China | 15 | 1.58% |
| 4 | Japan Society for the Promotion of Science | Japan | 14 | 1.47% |
| 5 | National Research Council of Thailand | Thailand | 14 | 1.47% |

The most significant source of funding is Mahidol University at 3.37%. Three of the five funding sources have their headquarters in Thailand. It is not surprising that government organizations and academic institutions in Thailand commonly provide research funding to the authors from Thailand.

**Discussion**

The statistical data of top rank science journals is comprised of the main disciplines, such as environmental sciences, engineering and agricultural sciences. The journals analyzed here are considered as the top tier of journals in Thailand according to their performance data as listed in the Scopus database. It can be concluded that some of the journals have been listed in the recent years due to external factors such as the TCI-Scopus collaboration project in 2017. However, these journals must strive to maintain their performance to increase competitiveness. It can be seen that the number of citations has a huge impact on the SJR indicator. Therefore, the journals in this group are required to publish high quality articles as Malvi**Ć** et al. (2022) stated in that high-quality editorial screening plays an important role to improve citation. It can help small journals successfully participate in the ranking procedures and also maintain indexing in databases. Among the top rank journals, the *Asian Pacific Journal of Allergy and Immunology* as a representative, is one of the best practice journals due to the high ranking of journals in Thailand in 2021. The characteristics of the journal shows that research article impact and journal reputation significantly seen through citations in Scopus database. The two outstanding articles published in 2020, related to study on immune responses in COVID-19 and potential vaccines, receiving high citation rates. Keyword co-occurrence analysis identified six meaningful clusters, highlighting research topics such as nonhuman immunology, controlled studies with humans, and major clinical studies with adolescents. Mahidol University and Chulalongkorn University emerged as prominent contributors of the journal, emphasizing the significant role of Thai scholars. Co-authorship analysis identified ten clusters, with Thai researchers prominently involved, and demonstrated broad engagement across various clusters. Funding predominantly originated from Mahidol University and other Thai organizations, reflecting the support provided by local government and academic institutions. Moreover, the 23 years bibliometric analysis shows that the *Asian Pacific Journal of Allergy and Immunology* is strongly positioned and leads the publications with its high productivity and citation score in 2021.

Considering the similarities and differences of the previous researches, the results were similar to other studies such as an academic journal in Croatia (Malvi**Ć**, et al., 2022; Wang &

Skare, 2020 ) or Thailand (Sirirak, 2021). Most authors are from the country where the journal is located. In addition, the research fund also plays roles in contribution of the journal. It shows that even though diversity is actually a part of the evaluation criteria in Scopus, yet quality of the publications plays a major role in surviving competition.

Limitations and Suggestion

The current study is limited by the time period of data. The selected journals are the top 20 scientific journals out of total 70 journals in Thailand. There are 18 Thai-owned humanities journals in the database that are available for further research. Another point that research should focus on is the details of the bibliometric data such as rate of citation per article. An interesting point, in our opinion, is the time to publication. Does the faster time from submission to publication impact citation and ranking? There are a lot more questions in this area that could be researched and would be useful as information for the development of academic journals of the country.

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