



HYDROGEL IN DIAPER WASTE AS FERTILIZER: BIBLIOMETRIC ANALYSIS USING GOOGLE SCHOLAR INDEXED VOS VIEWER

HIDROGEL PADA LIMBAH POPOK SEBAGAI PUPUK: ANALISIS BIBLIOMETRIK MENGGUNAKAN VOS VIEWER TERINDEKS GOOGLE SCHOLAR

Bilqis Aprilia Salima³

Program Studi Kimia, Fakultas Pendidikan Matematika dan Ilmu Pengetahuan Alam
Universitas Pendidikan Indonesia

E-mail: bilqis.aprilias@upi.edu

ARTICLE INFO

Correspondent:

Bilqis Aprilia Salima
bilqis.aprilias@upi.edu

Key words:

hydrogel, diapers waste, fertilizer.

Website:

<https://idm.or.id/JSCR/index.php/JSCR>

Page: 557 - 563

ABSTRACT

Data was collected from the Google Scholar scientific document database using the Harzing Publish or Perish 8 application. Journal articles containing the keywords "hydrogel", "diapers waste", and "fertilizer" that were published in the years 2018 through 2023 were used as the selection criteria for the data. The selection results in the form of journal articles were analyzed and mapped. The mapping process is done using VOSviewer. A total of 34 relevant articles were found the total number of research publications has increased from 2018-2021 with the highest number of publications being 49 articles (in 2022). Research publications related to the topic experienced a decline in 2019 and 2022-2023 due to the global COVID-19 pandemic. The items that are very closely related to the topic have the keywords hydrogel and diaper. This bibliometric analysis is expected to help researchers identify research trends and recommend future research prospects.

Copyright © 2023 JSCR. All rights reserved.

INFO ARTIKEL	ABSTRAK
Koresponden Bilqis Aprilia Salima <i>bilqis.aprilias@upi.edu</i> Kata kunci: hidrogel, limbah popok, pupuk Website: https://idm.or.id/JSCR/index.php/JSCR Hal: 557 - 563	Data dikumpulkan dari basis data dokumen ilmiah <i>Google Scholar</i> menggunakan aplikasi <i>Harzing Publish or Perish 8</i>. Artikel jurnal yang mengandung kata kunci "hidrogel", "limbah popok", dan "pupuk" yang diterbitkan pada tahun 2018 hingga 2023 digunakan sebagai kriteria seleksi data. Hasil seleksi dalam bentuk artikel jurnal dianalisis dan dipetakan. Proses pemetaan dilakukan menggunakan VOSviewer. Sebanyak 34 artikel yang relevan ditemukan. Jumlah total publikasi penelitian telah meningkat dari tahun 2018-2021 dengan jumlah publikasi tertinggi adalah 49 artikel (pada tahun 2022). Publikasi penelitian terkait topik mengalami penurunan pada tahun 2019 dan 2022-2023 akibat pandemi COVID-19 global. Item yang sangat terkait dengan topik memiliki kata kunci hidrogel dan popok. Analisis bibliometrik ini diharapkan dapat membantu para peneliti mengidentifikasi tren penelitian dan merekomendasikan prospek penelitian masa depan. <i>Copyright © 2023 JSCR. All rights reserved.</i>

INTRODUCTION

As time progresses, meeting human needs has become increasingly easy to obtain and affordable. Especially types of baby and child equipment. One of them is disposable baby diapers or called Disposable diapers. Disposable diapers or diapers are used from the age of a newborn to a child aged three years. Disposable diapers can make it easier for mothers to maintain the baby's cleanliness and comfort, especially when the baby is sleeping and traveling, so it doesn't take a long time and is efficient and easy to carry.

Disposable diapers are easy to get and relatively cheap so it is affordable for everyone. So almost every mother can buy diapers for her baby. Diapers are a type of disposable diaper material in the form of a highly absorbent material which has absorbent properties which are generally made from absorbent materials such as tissue, fluff, pulp and function to absorb fluids resulting from excretion in the baby's body such as urine and solid feces. Diapers phenologically have a very negative effect. Difficult to release absorbed water.

This diaper has unique properties, namely that it can absorb water and stores water up to several hundred times its mass. In fact, nowadays it's not only babies who wear diapers, but also the elderly. The diapers that are currently frequently used are shaped like pants, making it easier for users to wear them in daily activities. Many of the remaining diapers that have been used by local people are thrown away in vain, some are even thrown into rivers, in gardens, and around residential areas. So post-used diapers cause environmental pollution, including water pollution, soil pollution and air pollution. Apart from that, diapers can damage the aesthetic value of residential areas and cause unpleasant odors in the area.

Diapers that have been used by the public, especially babies and The elderly are difficult for nature to recycle. Besides that, the use of diapers can cause problems in the environment because the ingredients used are synthetic pulp, polychlorine, dibenzodioxins, super absorbing polyacrylic gel, acid and also plastic. (Nariko, 2013)

Lack of public knowledge regarding the use of diapers as a growing medium for plants, it can be seen that the contents of diapers support plant growth. One of them is the use of diaper waste in planting media. Baby diapers contain hydrogel, which is a gel that can absorb water and store water. Apart from the hydrogel in baby diapers or diapers, it contains other waste, namely human urine. Hydrogel is a hydrophilic polymer with a structure cross-linked tissue. Hydrogels have the ability to absorb a certain amount of water without any dissolution process and have the hydrodynamic properties of cells in many ways.

Hydrogel is a hydrophilic polymer material that has the ability to expand in water or biological fluids but is not soluble in water. When expanded in water, the hydrogel still maintains its original shape. The hydrophilic properties of this hydrogel are influenced by the presence of -OH, - COOH, - groups. CONH₂, and -SO₃H. Its insolubility in water and its ability to maintain shape are influenced by its three-dimensional structure from hydrogels. Generally hydrogels are made from hydrophilic polymers either in single form or in combination with other polymers using chemical or radiation techniques to form crosslinks.

The substance content in urine from baby diaper waste includes, among others nitrogen waste, hippuric acid, electrolyte ions, hormones, and so on. Therefore, the urine content in baby diaper waste can also be used as fertilizer after fermentation is carried out to break down the organic compounds. With the ingredients contained in baby diaper waste and with the right methods, baby diaper waste can be utilized as an alternative planting medium with the advantages of high humidity and also rich in nutrients and organic fertilizer. The hydrogel content in diapers can be used to store water when the dry season arrives, so that soil moisture will be maintained.

Apart from that, urine contains several ingredients including K. The K content in urine is five times more than in solid feces, while the N content is two to three times more. Nitrogen (N) and Phosphorus (P) are nutrients that are needed by plants in large quantities. Nitrogen is an important element in the formation of chlorophyll, protoplasm, proteins and nucleic acids. This element has an important role in the growth and development of all living tissue. Phosphorus is an important component of compounds for energy transfer (ATP and other nucleoproteins), for genetic information systems (DNA and RNA), for cell membranes (phospholipids) and phosphoproteins (Nawawi, 2015). People often use diapers every day, so it is easier for people to throw them away in any place. This will disrupt environmental cleanliness and can become environmental pollution as well. Discarded diapers will cause pollution to water, land and air.

RESEARCH METHOD

Bibliometric analysis was carried out in three stages: data collection, data screening, and data analysis and visualization.

Data collection

Analysis of research trends was carried out using Publish or Perish 8 Software. Google Scholar was used to search and collect documents related to the topic. Google Scholar

is used as a database for bibliometric analysis Due to the large user base of the free and openly available scientific article database. Google Scholar can be compared with two other expensive scientific article databases such as Web of Knowledge (edited by ISI/Thomson) and Scopus (developed by Elsevier) (Nandiyanto et al., 2023). Data was collected on September 15, 2023 with a publication period from 2018-2023 (5 years). The keywords used are 'hydrogel', 'diapers waste', 'fertilizer', with only journal articles are utilized as sources. The search results show a total of 34 relevant journal articles from 200 articles. The articles were then processed using Microsoft Excel software.

Data screening

Journal articles that has been collected was then selected based on article's title, topic relevance, and year of publication. Articles having titles and publication dates unrelated to the criteria were discarded and not used. The selected data was then further processed using Microsoft Excel and VOSViewer.

Data analysis and visualization

Using Microsoft Excel, the chosen data is prepared and sorted by year and Google Scholar Ranking (GSRank). Additionally, bibliometric analysis of the data was performed using VOSViewer. Article data was mapped and visualized based on network and density. More detailed information about the data analysis and visualization using VOSViewer and Publish or Perish has been described in our previous work (Fitria et al., 2021).

RESULT AND DISCUSSION

Research Development on the Topic of Hydrogel in Diaper Waste as Fertilizer

Figure 1 shows the quantity of relevant articles over the previous five years (2018-2023) was shown in **Figure 1**. The total number of research publications related to the topic has increased from 2021 to 2022. The rise in research publication number demonstrates the interest among scientists hydrogel in diaper waste as fertilizer. The highest number of publications was obtained in 2022 with a total of 49 journal articles.

The number of research publications on the subject declined 2019 and between 2022 and 2023. The worldwide COVID-19 epidemic is the root reason of this drop in publications. The COVID-19 pandemic has had a considerable impact on laboratory access, raw material distribution for synthesis, and the implementation of strict regulations for physical distancing (Durant et al., 2020).

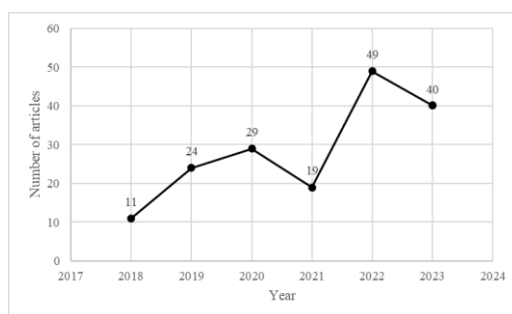


Figure 1. Research development of Hydrogel in Diaper Waste as Fertilizer

1. VOSViewer Visualization on the Topic of Hydrogel in Diaper Waste as Fertilizer

Based on the VOSViewer mapping analysis, the studies relevant to the topic can be divided into 4 clusters:

- 1) Cluster 1 is marked by a blue color containing 5 items, cellulose, characterization, diaper, hydrogel, synthesis.
- 2) Cluster 2 is marked by a yellow color containing 4 items, ccellulose hydrogel, disposable diaper, sap, super absorbent polymer.
- 3) Cluster 3 is marked by a green color containing 4 items, baby diaper, preparation, sanitary napkin, superabsorbent polymer.
- 4) Cluster 4 is marked by a purple color containing 3 items, diaper waste, organic fertilizer, use.

2. VOSViewerNetwork Visualization on the Topic of Hydrogel in Diaper Waste as Fertilizer

The relationship between items in the four clusters is illustrated in the network visualization shown in Figure 2. The lines that link one item to another depict their connection and proximity. Table 1. displays the total strength of the association between the items and the frequency of occurrence of the items.

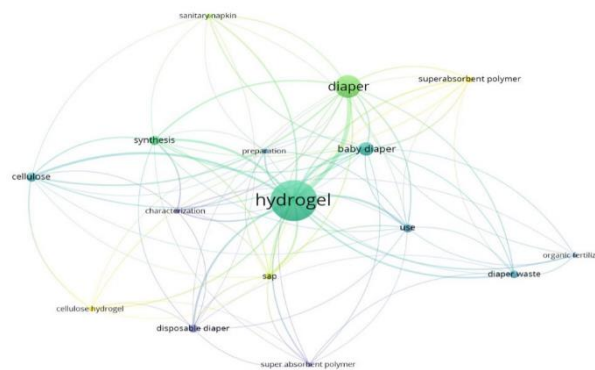


Figure 2. Network Visualization on The Topic of Hydrogel in Diaper Waste as Fertilizer

Table 1. The Strength and Frequency Of Occurrence Of The Term.

Cluster	Total Strength	Occurrence
1	486	274
2	109	47
3	134	62
4	89	45

Figure 2 shows the clusters in each of the researched topic areas. The hydrogel keyword is most closely related to other terms. The keywords of this hydrogel are in cluster 1 which consists of 5 items. Keyword hydrogel has 15 links.

3. VOSViewer Density Mapping on the Topic of Hydrogel in Diaper Waste as Fertilizer

Figure 3. shows density mapping of the topic. The items closest to the topic are those with a strong yellow background. Items in green, meanwhile, show that they are not closely related to one another. The topics of hydrogel and diaper had the strongest correlations.

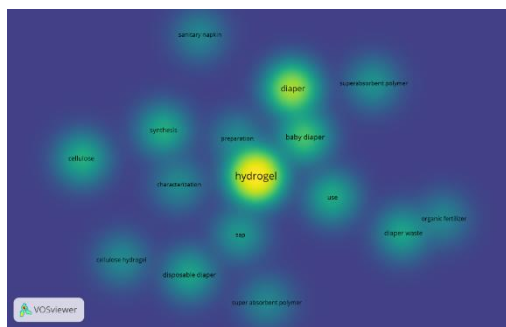


Figure 3. Density map of hydrogel in diaper waste as fertilizer

CONCLUSION

Disposable diapers provide convenient and affordable baby care solutions. While efficient for maintaining cleanliness and comfort, their extensive usage leads to environmental challenges. Improper disposal practices cause water, soil, and air pollution, impacting aesthetics and emitting unpleasant odors.

However, these diapers possess a remarkable ability to absorb water due to their hydrogel content, which supports plant growth. Moreover, the urine in diaper waste can serve as fertilizer post-fermentation, enriching it with essential nutrients like nitrogen and phosphorus for plants.

In essence, despite their convenience, the irresponsible disposal of diapers contributes significantly to environmental pollution, emphasizing the need for better waste management practices.

DAFTAR PUSTAKA

- Chen, D., Shi, F., Xu, W., Shen, H., & Zhu, Y. (2021). A simultaneous extraction and enrichment method for rapid detection of polar chlorophenoxy acid and non-steroidal anti-inflammatory drugs from wastewater based on low-generation dendrimer poly (propylene imine). *Microchemical Journal*, 168, 106454.
- Durant, T. J. S., Peaper, D. R., Ferguson, D., & Schulz, W. L. (2020). Impact of COVID-19 pandemic on laboratory utilization. *The Journal of Applied Laboratory Medicine*, 5(6), 1194–1205.
- El-Rehim, H. A. A., Hegazy, E. A., & El-Mohdy, H. L. A. (2004). Radiation synthesis of hydrogels to enhance sandy soils water retention and increase plant performance. *Journal of Applied Polymer Science*, 93(3), 1360–1371.
- Nandiyanto, A. B. D., Biddinika, M. K., & Triawan, F. (2020). How bibliographic dataset portrays decreasing number of scientific publication from Indonesia. *Indonesian Journal of Science and Technology*, 5(1), 154–175.
- Nandiyanto, A. B. D., Al Husaeni, D. N., & Al Husaeni, D. F. (2021). A bibliometric analysis of chemical engineering research using vosviewer and its correlation with covid-19 pandemic condition. *Journal of Engineering Science and Technology*, 16(6), 4414–4422.
- Nandiyanto, A. B. D., & Al Husaeni, D. F. (2022). Bibliometric analysis of engineering research using vosviewer indexed by google scholar. *Journal of Engineering Science and Technology*, 17(2), 883–894.

- Nandiyanto, A. B. D., Ragadhita, R., Al Husaeni, D. N., & Nugraha, W. C. (2023). Research trend on the use of mercury in gold mining: Literature review and bibliometric analysis. *Moroccan Journal of Chemistry*, 11(1), 11.
- Nawawi, M. I. (2019). Pemanfaatan limbah popok bayi sebagai alternatif media tanam.
- Noriko, N. (2013). Diapers Bagi Kesehatan Bayi Dan Lingkungan. *Proceeding Biology Education Conference: Biology, Science, Enviromental, and Learning*, 10(2), 141–145.
- Ragadhita, R., & Nandiyanto, A. B. D. (2022). Computational bibliometric analysis on publication of techno-economic education. *Indonesian Journal of Multidiciplinary Research*, 2(1), 213–222.
- Rizky, P. (2019). Pembuatan Hidrogel Semi Interpenetrating Polymer Network dari Selulosa Bakteri dan Asam Akrilat Menggunakan Pengikat Silang N, N'-Metilenbis Akrilamida. Universitas Sumatera Utara.