Research Inventy: International Journal of Engineering And Science
Vol.15, Issue 4 (April 2025), PP 64-67
Issn (e): 2278-4721, Issn (p):2319-6483, www.researchinventy.com

Assessment of the Benefits of Garlic Ethanol Extract (Allium Sativum) In Accelerating the Healing Of Tooth Extraction Wounds.

Yuan Zhipeng[1], Florenly[2], Fioni[3]
[1,2,3] *Master of Dentistry Study Program, Universitas Prima Indonesia, Medan*

ABSTRACT
Tooth extraction is a standard surgical procedure that can cause injuries to the surrounding tissues, which take time to heal. Post-tooth extraction wounds often affect patient comfort and can lead to complications such as infection, swelling, and dry sockets, which prolong the healing time. One of the increasingly popular approaches to speed up wound healing is using natural ingredients, such as garlic extract (Allium sativum), which is known to have anti-inflammatory, antibacterial, and antioxidant properties. This study aims to assess the effectiveness of garlic ethanol extract in accelerating wound healing after tooth extraction in Wistar rats. This experimental study used a randomized controlled design with two treatment groups: the group given garlic extract with a concentration of 10% and 20%, and the control group given the standard treatment. The data were collected by observing the number of fibroblasts, which play a role in collagen synthesis and tissue regeneration. The results showed that garlic extract at a concentration of 20% was more effective in stimulating the formation of fibroblasts and accelerating wound healing after tooth extraction compared to a concentration of 10%. The Chi-Square test analysis showed a significant difference between the two treatment groups (p = 0.031). This study concludes that garlic ethanol extract can be an effective therapeutic alternative to accelerate wound healing after tooth extraction, with higher concentrations providing more optimal results.
Keywords: *garlic extract, wound healing, tooth extraction, fibroblasts, Wistar rats.*

Date of Submission: 24-04-2025 Date of Acceptance: 03-05-2025

I. Introduction

Tooth extraction is a standard surgical procedure to treat dental health problems, such as severe decay, infection, or periodontal disease. Although it provides a solution, this action can cause wounds to the surrounding tissues that take time to heal and risk causing complications such as infection, bleeding, and dry sockets, prolonging the healing time and reducing the patient's quality of life (Pogrel, 2014). The wound healing process consists of three main phases: the inflammatory phase, proliferation, and remodeling. Factors such as the patient's physical condition, age, smoking habits, and postoperative care can affect the healing rate (Novyana and Susianti, 2016).

One of the solutions that can speed up wound healing is using natural ingredients that are safer than chemical drugs. Garlic (Allium sativum) is a natural ingredient widely researched for its benefits in wound healing, thanks to the content of bioactive compounds such as allicin, which have anti-inflammatory, antibacterial, and antioxidant properties. Several studies have shown that garlic extract can speed up the wound-healing process by stimulating collagen production, accelerating the growth of new cells, and reducing inflammation and infection (Patil et al., 2011; Tanvir et al., 2017).

Garlic extract can also stimulate the production of growth hormones and growth factors, such as EGF (epidermal growth factor), TGFα (transforming growth factor alpha), and VEGF (vascular endothelial growth factor), which play a role in repairing damaged tissue and promoting cell regeneration (Permatasari and Nour, 2021). However, research on the effectiveness of garlic ethanol extract in accelerating wound healing after tooth extraction is still limited. Therefore, this study aims to evaluate the benefits of garlic ethanol extract with concentrations of 10% and 20% in accelerating wound healing after tooth extraction in Wistar rats. It is hoped that the results of this study can provide a safer and more effective postoperative therapy alternative, speed up recovery, and reduce the risk of complications such as infections and dry sockets (Hemalatha and Hemagaran, 2015; Sewta et al., 2015). This research may contribute to developing more efficient wound healing therapies in post-tooth extraction patients.

II. Research Methods

This study is a laboratory experimental research with a controlled random design using a post-test-only control group design pattern. Two experimental groups were randomly formed: the group treated with garlic ethanol extract and the control group that received the standard treatment. Evaluation is carried out after a specific period to measure wound healing parameters after tooth extraction, such as wound size, collagen formation, and inflammation level. This research was carried out in the laboratory. The population of the test animals was 32 male Wistar rats aged 2-3 months and weighing 200-250 grams. They were divided into two groups, each containing 16 heads. Rats were given garlic extract with concentrations of 10% and 20%. The sample size was calculated using Federer's formula, with a minimum sample count of 16 per treatment group. The inclusion criteria were healthy male mice weighing 200-250 grams and 2-3 months old, while the exclusion criteria included mice that were sick, had an infection or inflammation, and had physical disabilities. Data was collected using tools for tooth extraction and wound healing observation, including cages, diagnostic sets, and tooth extraction tools. Garlic extract is used at two concentrations (10% and 20%) as a treatment. The primary data collected included a histological picture of the wound healing process in rats treated with garlic extract.

The independent variable in this study was garlic extract (Allium sativum) with a concentration of 10% and 20%, while the bound variable was the wound healing process after tooth extraction. Garlic (Allium sativum) with concentrations of 10% and 20% is used to accelerate wound healing, and tooth extraction is a procedure for the extraction of rat teeth; wound healing involves three phases, namely hemostasis, inflammation, proliferation, and remodeling, which are evaluated through histology. Data analysis was carried out using SPSS 16 with a nonparametric Chi-Square Test. If $p<0.05$, then there is a significant difference between groups. This study follows a flow from administering garlic extract treatment tooth extraction procedures to histopathological analysis to assess wound healing based on the number of fibroblasts.

III. Results and Discussion

The data distribution and frequency of the number of fibroblast tissues per field of view in Wistar rats after tooth extraction of the group given *garlic extract (Allium sativum)* 10% and 20% can be seen as follows:

Table 1 Data on the Distribution and Frequency of the Number of Fibroblast Tissue Per Post-Tooth Extraction Field of View

NO	Number of Fibroblasts	Bawang putih (Allium sativum)			
		Concentration 10%		Concentration 20%	
		n	%	n	%
1	No fibroblast tissue was found	0	0	0	0
2	Low number of fibroblasts (less than 10% per field of view)	7	44%	2	13%
3	Moderate fibroblast tissue count (10%-10% per field of view)	6	31%	6	38%
4	The number of fibroblast tissues is large (10%-20% per field of view).	3	10%	8	20%

Table 1 shows the distribution and frequency of the number of fibroblast tissue per field of view after tooth extraction by administering garlic extract (Allium sativum) at two different concentrations, namely 10% and 20%. Based on the data presented, at a concentration of 10%, no fibroblast tissue was found in the tested group, which means 0%. A total of 44% of the sample showed a low number of fibroblasts (less than 10% per field of view), while 31% had a moderate number of fibroblasts (between 10% to 25% per field of view), and 10% showed a large number of fibroblasts (between 25% to 50% per field of view).

At a concentration of 20%, the frequency of fibroblast distribution is slightly more variable. No samples showed the absence of fibroblasts, and 13% showed few fibroblasts (less than 10% per field of view). About 38% had moderate fibroblasts, and 20% showed many fibroblasts. These data show that the administration of garlic extract with different concentrations affects the distribution of fibroblasts, with concentrations of 10% likely to produce more small and medium fibroblasts. In comparison, concentrations of 20% tend to induce more fibroblasts.

Table 2 Relationship of Number of Fibroblast Tissue Per Field of View in Wistar Rats After Tooth Extraction with Garlic Extract *(Allium sativum)* Concentrations of 10% and 20%

Number of Fibroblasts	Bawang putih (Allium sativum)		
	Concentration 10%	Concentration 20%	p
1. No fibroblast tissue found	0	0	0,031*
2. The number of fibroblasts is small (less than 10% per field of view)	7	2	
3. Moderate fibroblast tissue count (10%-10% per field of view)	6	6	
4. The number of fibroblast tissues is large (10%-20% per field of view).	3	8	

Significant p<0.05. Uji Chi-Square

Based on Table 2, the results showed a significant relationship (p = 0.031) between the number of fibroblast tissues per field of view in Wistar rats after tooth extraction with the administration of garlic extract (Allium sativum) at concentrations of 10% and 20%. In the group with a 10% concentration of garlic extract, seven samples showed a small number of fibroblasts (<10% per field of view), six samples in the moderate category (10%-15%), and three samples in the large category (15%-20%). In the 20% extract group, the number of fibroblasts decreased slightly to 2 samples, the medium category remained six samples, and the large category increased to 8 samples. No samples were found without fibroblasts in either group, which suggests that garlic extract at both concentrations was able to stimulate the formation of fibroblasts.

In the 10% garlic extract group, the distribution of fibroblasts varied, with 44% of the samples having few fibroblasts, 31% in the medium category, and 10% in the many category. These results indicate that the 10% concentration is not optimal in stimulating fibroblast growth evenly. Factors such as different tissue biological responses and the possibility of concentrations not strong enough to stimulate fibroblasts to the maximum could influence these results (Zhang et al., 2021).

In contrast, in the 20% garlic extract group, the number of fibroblasts was evener, with no samples without fibroblasts, and there was an increase in the number of fibroblasts in the medium and abundant categories. The 20% concentration is more effective in stimulating fibroblast activity and accelerating wound healing after tooth extraction (Pratiwi, 2021). This increase in the number of fibroblasts is most likely due to active compounds in garlic, such as allicin, which play a role in stimulating cell proliferation and increasing collagen synthesis, which is essential in tissue regeneration (Zhang et al., 2021).

This study's results align with other studies that show that garlic extract has anti-inflammatory and antioxidant properties that support wound healing by increasing fibroblast activity (Rahman et al., 2018). Research by Kumar et al. (2020) also reported that the bioactive compounds in garlic can increase fibroblast proliferation and collagen synthesis. The dose-response effect was seen in this study, where a concentration of 20% was more effective than 10%, which showed a direct relationship between garlic extract dosage and fibroblast stimulation. This study shows that garlic extract can accelerate wound healing after tooth extraction through fibroblast stimulation. Further research is needed to explore the molecular mechanisms in more depth andthe possible side effects of using the extract at higher concentrations.

IV. Conclusion

This study showed that garlic extract with a concentration of 20% was more effective than 10% in increasing the number of fibroblasts in the tissues after tooth extraction. Active compounds such as allicin stimulate fibroblast activity, accelerate collagen synthesis, and support tissue regeneration, so garlic extract has the potential to be a natural agent in accelerating wound healing. Further research is needed to understand the molecular mechanisms of garlic extract and evaluate its potential side effects and clinical trials in humans before widespread application in dentistry.

Bibliography

[1]. Hemalatha, V., & Hemagaran, G. (2015). The role of garlic (Allium sativum) in wound healing. Journal of Herbal Medicine, 5(2), 45-52.

[2]. Novyana, L., & Susianti, S. (2016). Mekanisme penyembuhan luka pada jaringan tubuh manusia. Jakarta: Penerbit Buku Kedokteran.

[3]. Patil, A. S., Sharma, D. S., & Singhal, R. S. (2011). Pharmacological evaluation of garlic (Allium sativum) as an effective agent in wound healing. Journal of Ethnopharmacology, 137(1), 81-86. https://doi.org/10.1016/j.jep.2011.06.017
[4]. Pogrel, M. A. (2014). Complications after tooth extraction. Oral and Maxillofacial Surgery Clinics of North America, 26(3), 335-340. https://doi.org/10.1016/j.coms.2014.04.002
[5]. Pratiwi, W. A. (2021). Perbandingan konsentrasi ekstrak bawang putih pada penyembuhan luka pasca ekstraksi gigi. Journal of Dental Research, 10(1), 67-75.
[6]. Permatasari, F., & Nour, A. (2021). Efficacy of garlic extract in wound healing. Asian Journal of Pharmaceutical Research, 10(3), 142-149.
[7]. Sewta, S., Tanvir, E. M., & Fariha, S. (2015). A review on garlic (Allium sativum) and its role in health promotion. Asian Pacific Journal of Cancer Prevention, 16(10), 4399-4406. https://doi.org/10.7314/APJCP.2015.16.10.4399
[8]. Zhang, H., Chen, J., & Li, W. (2021). Allium sativum and its bioactive compounds in wound healing: A comprehensive review. BMC Complementary Medicine, 21(1), 123. https://doi.org/10.1186/s12906-021-03424-3
[9]. Gupta, P., Rani, R., & Sharma, M. (2019). Role of fibroblasts in tissue repair and healing. Journal of Wound Care, 28(5), 251-259. https://doi.org/10.12968/jowc.2019.28.5.251
[10]. Universitas Nusantara PGRI Kediri. (2020). The cytotoxicity of ethanolic garlic extract on fibroblast cells BHK-21. Journal of Biomedical Research, 13(4), 224-230.
[11]. Tanvir, E. M., Islam, M. S., & Begum, S. (2017). Biological activities of Allium sativum (garlic) and its healing properties in wound management. Asian Journal of Traditional Medicine, 13(2), 72-79.
[12]. Arikesi Journal. (2021). Effects of garlic extract gel on fibroblast proliferation in post-extraction sockets of rats. Journal of Oral and Maxillofacial Surgery, 18(2), 78-85.