

THE EFFECTIVENESS OF GIVING JATROPHA CURCAS L. SAP SOLUTION TO THE FREQUENCY OF TODDLER DIARRHEA

Alyxia Gita Stellata¹, Nispi Yulyana², Eliana³, Tonny Cortis Maigoda⁴

¹Department of Midwifery, Health Polytechnic of Health Ministry Padang, Indonesia

^{2,3}Department of Midwifery, Health Polytechnic of Health Ministry Bengkulu, Indonesia

⁴Department of Nutrition, Health Polytechnic of Health Ministry Bengkulu, Indonesia

*Email correspondence: alyxiastell@gmail.com

ABSTRAK : KEEFEKTIVITASAN PEMBERIAN LARUTAN GETAH JARAK PAGAR (JATROPHA CURCAS L.) TERHADAP FREKUENSI DIARE BALITA

Latar Belakang: Diare adalah penyebab kematian kedua (14%) terbanyak di Indonesia untuk anak di bawah 5 tahun. Pengobatan non-medis yang sering digunakan pada penderita diare adalah pemanfaatan zat "Tanin" pada getah jarak pagar.

Tujuan: penelitian ini adalah untuk menilai efektivitas larutan getah jarak pagar terhadap frekuensi diare balita tanpa dehidrasi dibandingkan dengan zink.

Metode: Metode penelitian quasi eksperimental, populasi balita usia 2-4 tahun dengan diare akut tanpa dehidrasi di wilayah kerja puskesmas sukamerindu. Sampel intervensi sebanyak 15 orang dan kontrol 15 orang yang diambil secara accidental sampling. Penelitian berlangsung ditanggal 2-28 Januari 2019 di Kota Bengkulu. Analisis penelitian menggunakan uji Wilcoxon dan Mann-Whitney.

Hasil: Perbedaan rata-rata frekuensi BAB yang mengkonsumsi larutan getah jarak pagar adalah 4 sedangkan pada kelompok zink perbedaan rata-rata frekuensi diare adalah 0.27. Sehingga perbedaan rata-rata frekuensi diare antarkedua kelompok adalah 4 dengan nilai $p=0.002$.

Kesimpulan: Larutan getah jarak pagar lebih efektif untuk mengurangi frekuensi buang air besar (BAB) balita dengan diare akut tanpa dehidrasi dibandingkan dengan zink.

Saran: Diharapkan getah dari tanaman Jathropha L. Curcas dapat dimanfaatkan untuk mengatasi diare pada balita karena sudah terbukti efektif untuk mengurangi frekuensi diare akut tanpa dehidrasi.

Kata kunci: Diare; getah jarak pagar; zink; frekuensi BAB; balita

ABSTRACT

Background: Diarrhea is the second leading cause of death (14%) in Indonesia for children under five years. Non-medical treatment often used in patients with diarrhea is using "tannin" substances in the sap of *Jatropha curcas*.

Purpose: This study aimed to assess the effectiveness of *Jatropha curcas* sap solution on the frequency of defecation diarrhea in toddler without dehydration compared with zinc.

Method: Quasi-experimental research method, the population of children aged 2-4 years with acute diarrhea without dehydration in the working area of Sukamerindu Public Health Center. The intervention sample was 15 people, and the control group of 15 people was taken by accidental sampling. The research conducted on January 2-28, 2019, in Bengkulu City—research analysis using Wilcoxon and Mann-Whitney test.

Results: The average frequency difference of defecation in the *Jatropha Curcas L.* sap solution group was 4, while the zinc group was 0.27. So the difference in the average frequency of diarrhea between the two groups was 4 with a $p\text{-value} = 0.002$.

Conclusion: *Jatropha Curcas L.* sap solution is more effective in reducing the frequency of defecation in toddlers with acute diarrhea without dehydration than zinc.

Suggestion: It is expected that the sap from the *Jathropha L. Curcas* plant can be used to treat diarrhea in toddlers because it has been proven effective in reducing the frequency of acute diarrhea without dehydration.

Keywords: Diarrhea; *Jatropha Curcas L.* sap; zinc; defecation frequency; toddler

INTRODUCTION

In 2012, the World Health Organization (WHO) and the World Bank reported that around 6.6 million children died before five. The under-five mortality rate in Indonesia is still relatively high at 29 per 1,000 KH compared to neighboring countries such as Malaysia and Singapore, which are already below ten deaths per 1,000 KH. The most common causes of death for children under five years of age are pneumonia morbidity (14%), diarrhea (14%), other infections (9%), malaria (8%), and non-communicable diseases (4%) (WHO, 2017).

Diarrhea became one of the causes of children's death. One way to deal with acute diarrhea without dehydration is with medical and non-medical therapy. Medical therapies often used to treat diarrhea are ORS, zinc, and intravenous therapy (Direktorat Jenderal Pengendalian Penyakit dan Penyehatan Lingkungan, 2011). While non-medical treatments often used by the community are tea, honey, ginger, guava, and *Jatropha* (Afrida & Sanova, 2020; Arranury, 2023; Putri et al., 2023; Suntara, 2022; Utshudi et al., 2022; Fajrina et al., 2016). Current non-medical treatment often used by the community to reduce the frequency of defecation in diarrhea sufferers is to utilize the substance "tannins" in certain plants. Tannins are compounds widely found in plants with astringent taste in fruits, leaves, and stems and their sap which can reduce gastrointestinal motility. One type of plant that contains tannins is *Jatropha* (*Jatropha Curcas* L.) (Purnomo, 2013). *Jatropha Curcas* L. sap contains 37% more tannin levels than tea's 5-15% tannin content (Fajrina et al., 2016). According to previous research, there are differences in the frequency of defecation before and after administration of *Jatropha Curcas* L. sap solution in patients with acute with a p-value of (0.000). Tannins in *Jatropha Curcas* L. sap have a unique compound and are very easily absorbed by the intestinal lumen to provide a fast reaction in the body (Purnomo, 2013).

Data from the Bengkulu City Health Profile 2018 from 20 Puskesmas located in Bengkulu City in January-August, Sukamerindu Health Center, is the Puskesmas with the most findings of diarrheal diseases under five, 122 (16.5%) of 778 cases. The determination of this diarrhea is also diarrhea with specifications without dehydration and mild/moderate dehydration. According to data obtained on 3-18 September 2018, there were 13 visits by sick toddlers with diarrhea at this health center, including eight children with diarrhea without dehydration (61.3%) and five toddlers (38.46%) had mild/moderate dehydration diarrhea and the treatment given was ORS and zinc; and zinc alone

for diarrhea without dehydration. The second highest incidence of diarrhea was in the Sawah Lebar Health Center area of 71 (9.13%) cases, the third highest was in the Anggut Atas Public Health Center area of 63 (8.1%) cases, and the lowest diarrhea case was found in the Beringin Raya Public Health Center with 0 (0%) cases (Profil Kesehatan Kota Bengkulu 2018, 2018). Therefore, based on the statement above, this study aimed to assess the effectiveness of *Jatropha curcas* sap solution on the frequency of defecation diarrhea in toddler without dehydration compared to zinc in Sukamerindu Public Health Center working area in Bengkulu City.

RESEARCH METHODS

This research method used a quasi-experiment with a pretest-posttest control group design. The study participants were 30, with 15 in the intervention group and 15 in the control group. The inclusion criteria in this study were toddlers willing to become respondents aged 2-5 years. The intervention was carried out on the second day of diarrhea, toddlers with diarrhea caused by food, diarrhea < 7 days, and living permanently at the study site. Samples were taken by accidental sampling method. The research occurred on January 2-28, 2019, in the Sukamerindu Public Health Center working area in Bengkulu City.

The intervention group in this study was treated using a solution of *Jatropha Curcas* L. sap added with a surplus of grapes at a dose of 1 time per day, as much as 100 ml, which was then assessed the next day directly. The control group used zinc following the standard guideline procedure for toddler diarrhea. The *Jatropha Curcas* L. sap solution is 100 ml with a composition of 0.1 *Jatropha Curcas* L. sap taken using a syringe and 100 ml of boiled water. Stir all the ingredients in the glass evenly until it becomes a homogeneous solution. The solution that has been made is then drunk on toddlers with acute diarrhea without dehydration. If the child does not want to drink it all at once, give it a little at a time using a spoon until the solution runs out. Use up as soon as the solution is finished. The administration of *Jatropha Curcas* L. sap and zinc solution was carried out on the second day of diarrhea and continued by measuring the difference in the frequency of diarrhea before being given the solution and after one day of consuming the solution as well as in the control group who were observed after one-day consuming zinc.

The study results were implemented with a univariate analysis of each independent and dependent variable. In the univariate analysis, homogeneity (equivalence) and normality tests were

carried out between the intervention and control groups. Because the data were not normally distributed, the Wilcoxon and Mann-Whitney tests were used. The presentation was continued with bivariate analysis, which aims to determine the difference in the frequency of defecation of toddlers before and after being given a solution of *Jatropha Curcas L. sap* and zinc using the Wilcoxon test. Also tested was the effectiveness of *Jatropha Curcas L. sap* solution on the frequency of defecation in acute diarrhea without dehydration which was analyzed using the Mann-Whitney test.

RESEARCH RESULTS

This study was conducted to determine the difference in effectiveness of *Jatropha curcas sap* solution on the frequency of defecation diarrhea in toddler without dehydration compared with zinc with 30 respondents.

Univariate Analysis

Distribution of respondent characteristics and frequency of defecation diarrhea in toddler without dehydration.

Table 1
Frequency Distribution of Characteristics of Age, Gender, Parents' Education, and Parents' Occupation

Responden Characteristic	Jathropa Curcas L. Sap	Zinc	P-value
	Frequency (n=15)	Frequency (n=15)	
Age (years)			
2	12(80%)	8(53%)	0.028
3	2(13 %)	4(27%)	
4	0(0%)	2(13%)	
5	1(7%)	1(7%)	
Gender			
Male	3(20%)	7(47%)	0.611
Female	12(80%)	8(53%)	
Parents's Education			
High: SHS-University	11(73.3%)	12(80%)	0.533
Low: ES-JHS	4(26.7%)	3(20%)	
Parents's occupation			
Working	5(33%)	4(27%)	0.875
Not working	10(67%)	11(73%)	

Note: SHS=Senior High School ES=Elementary School. JHS= Junior High School

Table 1 shows that In the two age groups, most research subjects were two years old, as many as 12 (80%) people in the intirvention group and 8 (53%) people in the control group. In both groups, most were female, 12 (80%) people in the intervention group and 8 (53%) people in the control group. Most of the parents in both groups had higher education (80%) but did not work (73%). The results of the univariate analysis describe the distribution of respondents based on the demographic characteristics of the respondents, age, gender, education, and mother's occupation. Characteristics of respondents according to age, most of the respondents are in the age group of 2 years (67%), so for further research, they can be grouped at the same age to obtain homogeneous results. According to gender, most respondents were women (67%; p=0.611). The age of the respondent contributes to the incidence of diarrhea as indicated by the results

of the frequency of defecation. Data processing regarding the age of the respondents showed that the age group that suffered the most from diarrhea was the age group of 2 years (67%; p=0.028).

Most of the respondents who experienced diarrhea had parents with higher education (Senior high school/university) which did not influence the incidence of diarrhea (77%; p=0.533). Respondents who experienced diarrhea mainly were mothers who did not work, and according to data analysis, the mother's occupation did not affect the frequency of diarrhea in children under five (67%; p=0.875).

Table 2
Frequency distribution of defecation before and after being given a solution of distance and zinc sap

Diarrhea Frequency	Jatropha Curcas L. Sap	Zinc
	n (%)	n (%)
Before		
Normal	0(0%)	0(0%)
Diarrhea	15(100%)	15(100%)
After		
Normal	15(100%)	11(73)
Diarrhea	0(0%)	4(27)

Table 2 shows that before being given treatment, both groups had diarrhea (100%), and after treatment in the intervention group, the frequency of bowel movements became normal (100%). In the control group, 4 (27%) children still suffered from diarrhea after a day of being given zinc.

Bivariate Analysis

The difference in the average in effectiveness of Jatropha curcas sap solution on the frequency of defecation diarrhea in toddler without dehydration compared with zinc .

Table 3
The average frequency of defecation before and after being given a solution of Jatropha Curcas L. sap and zinc

Treatment	Jathropha Curcas L. Sap			Zinc			P
	N	Mean	CI	N	Mean	CI	
Before	15	5	4.04-5.96	15	5.27	4.56-5.98	0.0002
After	15	1	0.41-1.59	15	5.00	1.19-7.48	
Differences		4			0.027		

Table 3 shows that, in the intervention group, the average frequency of defecation after treatment was 1, with an average difference of 4. In the control group, the average frequency of defecation after treatment was 5, with an average difference of 0.27. This significant difference can be seen from the data obtained that all toddlers (100%) had normal bowel movements after a day of giving Jatropha Curcas L. sap solution, with details of 7 toddlers (47%) who consumed the Jatropha resin solution, the frequency was 0 times in one day. Consumption, as many as two toddlers (27%) the frequency of their bowel movements became one time in one day of consumption, as many as 5 toddlers (33%) the frequency of their bowel movements became 2 times in one day of consumption, and as many as 1 toddler (7 %) the frequency of his bowel movements becomes 3 times in one day of consumption. Diarrhea completely stopped on the second day in respondents whose frequency was > 0 on one day of consumption, and the consistency and frequency of bowel movements returned to normal the next day so that the average difference in the frequency of defecation was greatly reduced from 5 to 1.

The data obtained based on this study showed that there were 4 (27%) toddlers who still had diarrhea after one day of consuming zinc, with details of 1 toddler (7%) who consumed zinc, the frequency of defecation became 1 time in one day of consumption, as many as 6 toddlers (40%) had their bowel movements 2 times in one day of consumption. For as many as 8 toddlers (53%), the frequency of their

bowel movements became 3 times in one day of consumption. Diarrhea did not wholly stop on the following day because most respondents took 2-3 days for the frequency of bowel movements to return to normal. Some even increased the frequency on the second day and were hospitalized so that the average difference in the frequency of defecation was not much reduced at first 5.27 to 5.00.

DISCUSSIONS

Based on the bivariate analysis results, of 15 children under five with diarrhea who were given the intervention of Jatropha Curcas L. sap before the intervention, the average frequency of diarrhea was 4. After the intervention, the average frequency of diarrhea was 1. It can also be traced from analyzing the defecation frequency difference average before and after the intervention. There was an average decrease from 5 to 1 with an average difference of 4. There is a significant difference between the scores before and after the intervention. Its statistical test results showed that the p-value = 0.002 was smaller than the value of = 0.05. Jatropha Curcas L. sap contains tannins, often used as a non-medical treatment to reduce the frequency of bowel movements in people with diarrhea (Purnomo, 2013; Sarabia et al., 2022). Tannins are compounds widely found in plants with an astringent taste in fruit, leaves, and stems and their sap, reducing gastrointestinal motility (Purnomo, 2013).

In this study, the authors mixed a solution of Jatropha Curcas L. sap with fruit-flavored syrup so

that children were interested in drinking it. Toddlers tend to find it difficult to take medicine, especially if it tastes bitter. Sirplus is an over-the-counter drug that contains natural sugars and fruit-flavored syrups such as strawberry, grape, and orange. Sirplus contains natural sugar, so it does not damage or affect the drug's efficacy. The Food and Drug Administration (FDA) categorizes syrup into category A. Researchers used grape-flavored syrup as the sweetening compounds in order to cover the taste and smell of bitter medications and components, commonly used as a drug solvent for children who cannot take bitter medicine. Sirplus hides the bitter taste of the medication, making it easier for children to take medication because it has a grape taste that children like (Klikdokter, 2016). Researchers also package this solution using cups and straws to make it look more attractive, and children think the solution is an ordinary drink, so they like to drink it and run out quickly.

Based on the results of bivariate analysis, from 15 children under five with diarrhea who were given the intervention of *Jatropha Curcas L.* sap before the intervention, the average frequency of diarrhea was 5.27. After being given the intervention, the average frequency of diarrhea was 4.33. From these data, it can be seen that there is no significant change in the frequency of diarrhea. It can also be seen from the analysis of the difference in the mean frequency of defecation before and after the intervention, an average decrease from 5.27 to 5.00 with an average difference of 0.27. Statistical test results obtained a p -value = 0.072, more incredible than the value = 0.05 means no significant difference between the scores before and after the intervention.

The results of the two-group difference test found a significant difference between the mean frequency of diarrhea in the intervention group and the comparison group, with a p -value=0.002 smaller than the value =0.05. It means there is a significant difference in the frequency of bowel movements when the toddler is given treatment using *Jatropha* sap and zinc. Treatment of diarrhea using *Jatropha Curcas L.* sap solution healed faster on the first day; as much as 46.7% of the frequency of diarrhea had stopped (0) than the use of zinc. The results of this study follow previous research conducted by Purnomo (2013), which found that all respondents experienced differences in the frequency of diarrhea in the form of defecation before and after consuming 100 mL *Jatropha Curcas L.* sap solution (Purnomo, 2013). The paired t -test showed that the p -value = 0.000 ($p < 0.05$). The sap of *Jatropha Curcas L.* is very effective against all test organisms. The presence of tannins, saponins, alkaloids, and

steroids in the raw sap of *J. curcas* supports the traditional medicinal use of this plant in the treatment of different ailments (Abubakar et al., 2016). Leaves and stems of *Jatropha* contain saponins, flavonoids 3,959 mg/L, and polyphenols (Nezriyetti & Novita, 2012). The leaves and sap contain tannins in a reasonably high content, which causes the sap and leaves of *Jatropha curcas* to taste astringent (Kesumasari et al., 2018).

In general, the properties of tannins can be stated as follows: 1) All types of tannins are soluble in water; the solubility is significant and will be greater when dissolved in hot water; 2) Tannin particles begin to break down at a temperature of 98.8°C; 3) Tannins have bacteriostatic and fungistatic properties (Sujarnoko, 2012). Tannins in *Jatropha Curcas L.* sap have a unique compound and are very easily absorbed by the intestinal lumen to provide a fast reaction in the body. In contrast, the tannin content in salak fruit is relatively high. It is 29 units per milliliter but requires a long digestive process to be absorbed. The sap and leaves of *Jatropha curcas* also contain substances and compounds of amalinin, alkaloids, fatty oils, serpentine, and lipolytic enzymes, which are efficacious for treating fever, canker sores, and burns (Sudirga, 2012). *Jatropha Curcas L.* sap can be used as constipation and laxative drug. Local sweets given a few drops of *Jatropha Curcas L.* sap can be drunk to treat diarrhea (Biswakarma et al., 2017). Meanwhile, according to another research, as much as 5 ml of *Jatropha Curcas L.* sap mixed with 125 ml of goat's milk and given orally on an empty stomach for 3 days can cure dysentery (Bora et al., 2016).

Seeds, bark, and leaves of *Jatropha curcas*, when boiled and the stagnant water boiled, can be used for external therapy for rheumatism and as an anti-inflammatory. Thick water decoction of the roots is drunk to fight pneumonia and syphilis, abortion (abortifacient), deworming, and laxative. The methanol extract of *jatropha* bark (100, 300 mg/kg) decreased the frequency of feces until there were no more wet feces, and mileage with charcoal plug showed anti-diarrheal activity in rats (K. et al., 2012). Researchers have isolated and characterized many biologically active compounds from all parts of this plant. In addition, the mechanism of action of this active compound has been studied concerning its application in traditional medicine (D. M. Reddy Prasad, 2012). *Jatropha* leaf extract was effective in inhibiting the growth of *Escherichia coli* bacteria in vitro covering an area of 24.55 mm with a concentration of 80% (Agnita et al., 2014). *Jatropha* leaves smeared with eucalyptus oil are very effective in relieving flatulence in toddler 0-2 years old (Riani,

2018). The sap of the *Jatropha* plant also contains Curcayline A and Curcayline B. Giving 10% *Jatropha Curcas* L. sap ointment has been proven effective in accelerating the healing process of mice skin cuts in the epithelialization phase (Fauzi et al., 2017; Murti et al., 2017). Histopathological observations showed that the administration of 10% *Jatropha curcas* Linn sap in an ointment preparation for 10 days could shorten the time for the formation of the distribution of collagen tissue in the wound area, thereby accelerating the healing process of mice (*Mus musculus*) skin incisions in the remodeling phase (Nanda et al., 2017).

The increase in the frequency of bowel movements, accompanied by large volumes during diarrhea, is caused by an increase in water content due to an imbalance in intestinal function in the absorption process of organic substances and water. If it occurs continuously, the diarrhea child can become dehydrated. Thus, diarrhea must be stopped immediately by replacing lost fluids and improving the condition of the intestinal wall. *Jatropha Curcas* L. sap solution will coat the intestinal lumen because *Jatropha Curcas* L. sap also contains saponin compounds that can intensify collagen growth and stimulate the formation of new cells (Ar, 2014). Previous research also obtained significant differences in results, which showed the duration and frequency of defecation in cases of diarrhea in the intervention group (additional sprinkles). When compared between the two groups, there was a 10.45-hour shorter duration of diarrhea and 1.4 times less frequent diarrhea in the intervention group (Sopiyandi et al., 2013). Another research that showed a difference between giving honey and zinc therapy for treating diarrhea in toddlers is, $p = 0.000$. For those who were given honey, the frequency of diarrhea decreased from an average of 7.30 to 1.52 (Purnawati et al., 2015). It shows that zinc is effective in reducing diarrhea frequency. Still, using traditional medicines such as *Jatropha Curcas* L. sap and honey is more effective and faster in reducing the frequency and duration of diarrhea.

Acute diarrhea that occurs in children in developing countries is primarily infectious. Zinc affects several immune cells and enterocytes, interacting with contagious agents, and causing diarrhea. Zinc is also effective in modifying membrane function through interaction with oxygen, nitrogen, and hydrophilic macromolecular sulfur ligands, as well as organ antioxidant activity and stabilizing membrane structure. Zinc is also able to inhibit the release of histamine by mast cells and the contraction and secretory response to histamine and serotonin in the intestine so that this can inhibit the

increase in endothelial permeability initiated by TNF- α , which can also stimulate damage to the permeability of the endothelial lining in the intestine (Ulfah et al., 2012).

CONCLUSION

In conclusion, by comparing the effectiveness of *Jatropha Curcas* L. sap solution which is only consumed once and can directly reduce the frequency of diarrhea and the duration of diarrhea only lasts 1-2 days, it can be concluded that *Jatropha Curcas* L. sap solution is more capable in reducing the frequency of defecation of toddlers without having to be consumed continuously. Thus, the solution of *Jatropha Curcas* L. sap is more effective in reducing the frequency of defecation in toddlers with acute diarrhea without dehydration than zinc.

SUGGESTION

Although this study gave good results, research with a sample of 30 cannot be recommended to be applied, and further research needs to be carried out with a larger sample to be able to carry out socialization immediately regarding the use of *Jatropha Curcas* L. sap solution for the treatment of diarrhea without dehydration in the community. It is expected to be able to develop for the prevention of diarrhea with dehydration that not only measures the frequency of bowel movements but also the duration of diarrhea that occurs.

REFERENCES

- Abubakar, S., Akanbi, B. O., Osuji, C., Olajide, O. O., & Phillip, E. A. (2016). Evaluation of pharmacological potentials of *Jatropha curcas* Linn sap Euphorbiaceae family. 3(3), 334–342.
- Afrida, & Sanova, A. (2020). Teh Herbal Antibakteri dari Ekstrak Tumbuhan Patikan Cina, (*Euphorbia thymifolia* Linn.). *Journal of The Indonesian Society of Integrated Chemistry*, 12(1), 1–8. <https://doi.org/https://doi.org/10.22437/jisic.v12i1.8689>
- Agnita, P., Waluyo, J., & Wahyuni, D. (2014). Perbedaan daya hambat ekstrak dan rebusan daun jarak pagar (*Jatropha curcas* L.) terhadap pertumbuhan *Candida albicans* (Robin) Berkhout. *Jurnal Pendidikan Biologi, FKIP. Universitas Jember*.
- Ar, A. B. S. (2014). Pengaruh Getah Tanaman Jarak Pagar (*Jatropha Curcas* L) terhadap Daya Hambat Bakteri *Staphylococcus Aureus* Secara In Vitro [Universitas Hasanuddin].

- <http://repository.radenintan.ac.id/4147/1/pdf.pdf>
- Arranury, Z. (2023). Pembuatan Produk Minuman Jahe untuk Pencegahan Penyakit Diare. *Sociality: Journal of Public Health Service*, 2(1), 25–29.
- Biswakarma, S., Pala, N. A., Shukla, G., Vineeta, & Chakravarty, S. (2017). Ethnomedicinal plants used to cure stomach disorders in forest fringe communities in Northern part of West Bengal. *Indian Journal of Natural Products and Resources*, 8(4), 370–380.
- Bora, D., Mehmud, S., Das, K. K., & Medhi, H. (2016). Report on medicinal plant practices for dysentery, diarrhoea and cholera in different parts of Assam, India. *Journal of Medicinal Plants Studies*, 4(6), 208–212.
- D. M. Reddy Prasad. (2012). *Jatropha curcas*: Plant of medical benefits. *Journal of Medicinal Plants Research*, 6(14). <https://doi.org/10.1046/j.1471-4159.2001.00377.x>
- Direktorat Jenderal Pengendalian Penyakit dan Penyehatan Lingkungan. (2011). *Panduan Sosialisasi Tatalaksana Diare Balita*. Kementerian Kesehatan Republik Indonesia.
- Fajrina, A., Junuary, J., & Sabirin, S. (2016). Penetapan kadar tanin pada teh celup yang beredar dipasaran secara spektrofotometri UV-VIS. *Jurnal Farmasi Higea*, 8(2), 133–142. <https://doi.org/0.4103/0973-1482.148700>
- Fauzi, Salim, M. N., & Nazaruddin. (2017). Efektifitas Salep Getah Jarak Pagar (*Jatropha curcas*, Linn) Pada Fase Epitelisasi Penyembuhan Luka Sayat Mencit (*Mus musculus*). *Jurnal Ilmiah Mahasiswa Veteriner*, 1(3)(3), 1–6.
- K., S., P., G., M., S., & B., S. (2012). Pharmacological evaluation of *Jatropha curcas* L. extract for antidiarrhoeal activity. *Indian Journal of Novel Drug Delivery*, 4(2), 157–162. <http://www.embase.com/>
- Kesumasari, N. M., Napitupulu, M., & Jura, M. R. (2018). Analisis Kadar Flavonoid pada Batang Jarak Pagar (*Jatropha curcas* L.), Jarak Merah (*Jatropha gossypifolia* L.), dan Jarak Kepyar (*Ricinus communis* L.). *Jurnal Akademika Kimia*, 7(1), 28–31. <https://doi.org/10.22487/j24775185.2018.v7.i1.10387>
- Klikdokter. (2016). Sirplus. <https://www.klikdokter.com/obat/sirplus>
- Murti, D. A., Salim, M. N., Sabri, M. (2017). Efektifitas salep getah jarak pagar (*Jatropha curcas* L) pada fase epitelisasi penyembuhan luka sayat kulit mencit (*mus musculus*) dengan pewarnaan Masson trichrome. *Jimvet*, 01(3), 465–472.
- Nanda, Y., Salim, N. M., & Iskandar, C. D. (2017). Hispatologi Kulit Mencit (*Mus musculus*) Fase Remodeling Pada Penyembuhan Luka Sayat Dengan Salep Getah Jarak Pagar (*Jatropha curcas* Linn). *Jurnal Ilmiah Mahasiswa Veteriner*, 01(4), 780–787.
- Nezriyetti, & Novita, T. (2012). Efektivitas Ekstrak Daun Jarak Pagar (*Jatropha curcas* L.) dalam Menghambat Perkembangan Nematoda Puru Akar *Meloidogyne* spp. pada Tanaman Tomat. *Biospecies*, 5(2), 35–39.
- Bengkulu city health office. (2018). *Profil Kesehatan Kota Bengkulu 2018*. Bengkulu: Bengkulu city health office .
- Purnawati, T., Nurhaeni, N., & Agustini, N. (2015). Terapi Madu Efektif untuk Menurunkan Frekuensi Diare dan Bising Usus pada Anak Usia Balita. *Jurnal Ilmiah Keperawatan*, 7(3), 1004–1010. <https://docplayer.info/66810222-Terapi-madu-efektif-untuk-menurunkan-frekuensi-diare-dan-bising-usus-pada-anak-usia-balita.html>
- Purnomo, S. (2013). Perbedaan Frekuensi Buang Air Besar Sebelum dan Sesudah Pemberian Larutan Getah Jarak Pagar pada Penderita Diare Akut di Dusun Sumuran Desa Sekarbagus Kecamatan Sugio Kabupaten Lamongan. *Sekolah Tinggi Ilmu Kesehatan Muhammadiyah Lamongan*.
- Putri, M. E., Sari, M. T., Katriani, I., Anggita, D., & Suryenti, V. (2023). Edukasi Pencegahan dan Penanganan Diare dengan Pemanfaatan Teh Daun Jambu Biji (*Psidium Guava*). *Jurnal Abdimas Kesehatan (JAK)*, 5(1), 38–43. <https://doi.org/10.36565/jak.v5i1.417>
- Riani. (2018). Perbandingan Efektivitas Daun Jarak+Minyak Kayu Putih Dengan Daun Jarak Tanpa Minyak Kayu Putih Terhadap Kesembuhan Perut Kembang Pada Bayi 0-2 Tahun Di Wilayah Kerha Puskesmas Bangkinang Kota Tahun 2017/2018. *Jurnal Ners*, 2(23), 71–81.
- Sarabia, M., F., J. B., Calalas, M., S., A. G., Gregorio, M., P., J., Maceren, M., G., J. I., Padayhag, M., L., W. R., Faller, M., & M, E. (2022). a Review on the Medicinal Uses and Toxicological Effects of Herbal Plant *Jatropha Curcas* L. *International Journal of Research Publication and Reviews*, June, 3389–3408. <https://doi.org/10.55248/gengpi.2022.3.5.24>
- Sopiyandi, S., Juffrie, M., & Susetyowati, S. (2013). Pemberian taburia (sprinkle) berpengaruh

- terhadap lama dan frekuensi diare akut anak.
Jurnal Gizi Klinik Indonesia, 9(3), 117.
<https://doi.org/10.22146/ijcn.15444>
- Sudirga, S. K. (2012). Pemanfaatan Tumbuhan Sebagai Obat Tradisional Di Desa Trunyan Kecamatan Kintamani Kabupaten Bangli. *Electronic Jurnal Bumi-Lestari*, 12, 7–18.
- Sujarnoko, T. U. (2012). Studi Meta-Analisis Efek Senyawa Metabolit Sekunder Tanin Terhadap Kualitas Silase. Skripsi, Departemen Ilmu Nutrisi Teknologi Pakan Fakultas P.
- Suntara, D. A. (2022). Pemberian Therapy Pemberian Madu Untuk Mengatasi Diare Di Wilayah Kerja Puskesmas Tanjung Uncang Kota Batam. Zahra : *Journal of Health and Medical Research*, 2(1), 15–23.
<https://adisampublisher.org/index.php/aisha>
- Ulfah, M., Rustina, Y., & Wanda, D. (2012). Zink efektif mengatasi diare akut pada balita. *Jurnal Keperawatan Indonesia*, 15, 137–142.
<https://doi.org/10.7454/jki.v15i2.39>
- Utshudi, A. L., Oleko, R. O., Kayembe, C. T., Onautshu, D. O., Kitete, E. M., Mbala, B. M., & Mpiana, P. T. (2022). Antiviral Activities of *Jatropha curcas*: A Review. *International Journal of Pathogen Research*, 9(3), 33–46.
<https://doi.org/10.9734/ijpr/2022/v9i330228>
- WHO. (2017). Diarrhoeal disease. WHO.
<https://doi.org/10.7861/clinmedicine.11-5-488>