


Utilization of Pineapple (*Ananas comosus*) Skin Waste as an Antioxidant for Constipation Medicine

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Article Info	ABSTRACT
<p>Keywords: Antioxidants, Free radicals, Pineapple peel</p>	<p>Pineapple peel (<i>Ananas comosus</i> L. Merr), which has been considered as waste, actually contains various active compounds that have potential as herbal medicine ingredients. One of its main benefits is its ability as a natural antioxidant that can ward off free radicals, as well as support digestive function. This study aims to assess the potential of pineapple peel as a source of antioxidants and as a natural remedy for constipation. The content of bromelain, dietary fiber, vitamin C, and phenolic compounds in it is known to have biological activities that support smooth bowel movements. The research method used a quantitative descriptive approach by distributing questionnaires to respondents to determine public perceptions of pineapple peel utilization. The results showed that most respondents believed in the effectiveness of pineapple peel in overcoming constipation. The percentage of constipation sufferers was higher in women (40%) than men (30%), indicating a tendency for greater vulnerability in women. In conclusion, pineapple peels have the potential to be an effective alternative herbal treatment in reducing constipation symptoms while increasing the use value of organic waste.</p>
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INTRODUCTION

Pineapple (*Ananas comosus* (L.) Merr) based on information from the community and traditional medicine books, not only has important economic value, but also beneficial for health as a cure for constipation, urinary tract disorders, nausea, flu, hemorrhoids, lack of blood, skin diseases (Rahmat et al., 2016).

The fruit with the Latin name *Ananas comosus* L. Merr is one of the fruits that are in great demand in tropical areas such as Indonesia. In Indonesia there are many pineapple producing areas that have the potential if utilized optimally, for example Lampung, Kediri, Pematang, Riau and North Sumatra. The North Sumatra region occupies the second position after Lampung with the acquisition of a percentage of 12.78% including the top two from Sumatra. Based on data from the Central Bureau of Statistics, pineapple fruit production in 2021 reached 165,063 tons in North Sumatra Province, followed by North Tapanuli Regency with pineapple fruit production reaching 2,161,392 kilograms (BPS Provinsi Sumatera Utara, 2020).

Pineapple peels contain vitamins (A and C), carotenoids, flavonoids, tannins, alkaloids, calcium, phosphorus, magnesium, iron, sodium and Bromelin Bromelin is a Proteolytic Enzyme found in the stalk, stem, leaves, fruit, and skin in different amounts. Currently, a lot of waste is generated from the pineapple fruit industry, generally pineapple waste in the form of stems, skin, leaves and stumps has not been optimally utilized, even though the pineapple skin which is usually wasted when peeling pineapple contains the Bromelain enzyme which can inhibit bacteria (Manaroinsong, 2015).

Free radicals in the body are highly reactive and can interact destructively through oxidation reactions with various cell components, such as proteins, lipids, DNA, carbohydrates and cell membranes (Halliwell & Gutteridge, 2015). This interaction triggers oxidative stress, which is a condition of imbalance between the amount of free radicals and the body's ability to neutralize them. Oxidative stress can trigger various degenerative diseases, including coronary heart disease, cancer, and premature aging. One way to overcome the negative effects of free radicals is by consuming antioxidants, which are compounds that neutralize free radicals and inhibit the oxidation process in the body (Reynertson, 2007).

Antioxidants function as inhibitors of oxidation reactions and cannot completely stop the process of autooxidation in fats so that at the end of the process rancidity will always occur. The general mechanism of action of antioxidants is to inhibit fat oxidation. Fat oxidation consists of three main stages, namely initiation, propagation and termination. In the initiation stage, fatty acid radicals are formed, which are fatty acid-derived compounds that are unstable and highly reactive due to the loss of one hydrogen atom. The propagation stage of fatty acid radicals will react with oxygen to form peroxy radicals. Peroxy radicals will further attack fatty acids to produce hydroperoxides and new fatty acid radicals. The hydroperoxides formed are unstable and will degrade further to produce short-chain carbonyl compounds such as aldehydes and ketones that are responsible for the flavor of fatty foods (Kumalaningsih cited in Widiyanto & Ekanto, 2015).

Constipation is a condition characterized by changes in stool consistency to hard, large size, no bowel movements at all in a week, decreased frequency or difficulty of defecation (Parewasi et al., 2021). Constipation is an obstruction of defecation from normal habits where there is infrequent defecation, less feces, hard and dry consistency (Intan Octavia cited in Ula, 2020). Constipation is still often underestimated by the public. Constipation occurs due to diet such as lack of fiber intake and water intake that is less than the body's needs (Permadi & Ramadhani, 2024).

Pineapple peels are known to contain various bioactive compounds such as bromelain, dietary fiber, vitamin C, and phenolic compounds that have high antioxidant activity. These compounds not only play a role in neutralizing free radicals, but can also help improve bowel movements, so they have the potential to be used as an alternative natural treatment for constipation. Based on this potential, this study aims to explore the utilization of pineapple peel as a source of antioxidants as well as a natural remedy for constipation.

METHODS

This research method uses a questionnaire with descriptive quantitative which aims to determine people's perceptions of the use of pineapple peel as a remedy for constipation. The instrument used in this study is a closed and open questionnaire containing questions about: Respondents' knowledge about the benefits of pineapple peel Experience using pineapple peel as a remedy for constipation, Processing methods used, and sources of information about the use of pineapple peel. Data was collected by distributing questionnaires directly or through online media (Google Form/WhatsApp). Respondents were asked to fill in the questionnaire honestly according to their experience and knowledge. The data obtained were analyzed descriptively quantitatively using percentages. The results of the answers from respondents will be classified and presented in the form of tables or diagrams to facilitate interpretation.

RESULTS AND DISCUSSION

Design Of Constitution Medicine Product

The processing of pineapple peel organic waste as a remedy for constipation can be done with traditional technology.

- a. Drying by drying the pineapple skin under the sun for 3-4 hours, so that the pineapple skin is dry with a moisture content of 13%.
- b. Grinding the dried pineapple peel to produce powder.
- c. Packaging of pineapple peels with disposable tea bags (tea bags)

The results of distributing questionnaires to respondents

Based on the results of distributing questionnaires to respondents, it was found that the majority of the community had a positive view of the use of pineapple peel as an alternative medicine for constipation. The data collected shows the level of knowledge, attitudes, and perceptions of respondents towards the effectiveness and safety of using pineapple peels. The results of distributing questionnaires to respondents can be shown in table 1. below.

Table 1. The results of Distributing Questionnaires

No	Respondent	Age/year	Respondent Answer			
			Benefits of pineapple peel for health (Yes/No)	History of constipation (Yes/No)	Frequency of constipation (Rarely/Often)	Herbal medicine; nature is worthy of health
1	B	25	Yes	No	Rarely	Yes
2	C	17	Yes	Yes	Rarely	Yes
3	D	28	Yes	No	Rarely	Yes
4	E	37	Yes	Yes	Rarely	Yes
5	A	18	Yes	Yes	Often	Yes
6	C	30	Yes	No	Often	Yes
7	A	40	Yes	Yes	Rarely	Yes

No	Respondent	Age/year	Respondent Answer			
			Benefits of pineapple peel for health (Yes/No)	History of constipation (Yes/No)	Frequency of constipation (Rarely/Often)	Herbal medicine; nature is worthy of health
8	B	33	Yes	No	Rarely	Yes
9	C	16	Yes	Yes	Often	Yes
10	A	19	Yes	Yes	Rarely	Yes

Based on the results of Table 1 regarding the distribution of questionnaires given to respondents regarding the use of pineapple peel as an alternative medicine for constipation, it was found that the majority of respondents stated that pineapple peel has the potential to be used as a natural herbal medicine to treat constipation. This potential is supported by the content of active substances in pineapple peel such as vitamins A and C, carotenoids, flavonoids, tannins, alkaloids, and minerals such as calcium, phosphorus, magnesium, iron, and sodium. In addition, the bromelain enzyme found in pineapple peel also plays a role in its effectiveness as a digestive agent.

Pineapple peel is known to contain various secondary metabolite compounds, such as flavonoids, alkaloids, tannins, and steroids. This is in line with the results of research by Setiawan et al. (2016) which showed that the results of the phytochemical test of pineapple peel showed the content of flavonoids, alkaloids, steroids, tannins, and saponins. Flavonoids, which are included in the phenolic compound group, have various pharmacological activities, including as antioxidants, anti-inflammatory, antiallergic, antiviral, anticancer, and antibacterial (Sandhar et al., 2011).

Other findings show that the prevalence of constipation in adolescents is high, which is significantly related to disordered eating. An unbalanced and low-fiber diet is the main trigger for this digestive disorder. According to Dalimartha (2008), Pineapple fruit has a variety of properties, including reducing excess gastric acid secretion, helping the process of digesting food in the stomach, being anti-inflammatory, diuretic, clearing dead skin tissue, and inhibiting cancer cell growth. In addition, pineapple also has fibrinolytic activity, inhibits platelet aggregation, reduces joint pain, and is anti-aging. The fiber content in pineapple also helps facilitate the process of defecation, making it effective for people with constipation.

The bromelain enzyme found in pineapple peel is a sulfhydryl protease enzyme composed of components such as trypsin, chymotrypsin, and other enzymes that play a role in breaking down proteins into polypeptides and amino acids (Olivia cited in Lupita et al., 2015). The activity of these enzymes supports the digestive process and speeds up gastric emptying, which indirectly helps to alleviate the symptoms of constipation.

Percentage Results of the Occurrence of Constipation in Both Male and Female

Constipation is one of the most common digestive disorders in various age groups and genders. Based on the data obtained from the research respondents, it was noted that the

percentage of male who experienced constipation was 40%, while in female it reached 30%. This shows that there is a difference in the tendency of constipation.

Calculation of the percentage of the number experiencing constipation for both male and female using the formula below.

$$\text{Percentage of constipation} = \frac{\text{Number of respondents with constipation}}{\text{Total number of respondent}} \times 100\% \quad (1)$$

The percentage of the number who experienced constipation in both male was found to be 40% while in female as much as 30%, this is not much significant. Although the percentage difference between males and females is not very large, this result indicates that males in this study tend to experience constipation more than females. However, this result is in contrast to a study by Budianto & Novendy (2018) who found that in Indonesia the estimated prevalence of constipation in women ranges from 15-23%, while in men it is 11%. In fact, the prevalence in adolescents reached a higher rate, around 24%, compared to the adult age group.

This difference in data can be caused by several factors, such as variations in diet, physical activity levels, daily fiber consumption, as well as differences in the social and cultural background of respondents. These findings indicate that constipation is a significant problem among adolescents, and needs to be addressed or alternative solutions, one of which is through herbal approaches such as the use of pineapple peels. Pineapple peel, which contains bromelain, fiber, and antioxidant compounds, has the potential to help smoothen the digestive system and reduce symptoms of constipation (Mehraj et al., 2024). Thus, the results of this study support the importance of preventive efforts and the utilization of natural resources as a safer and more sustainable alternative to constipation.

Percentage Chart of the Occurrence of Constipation in Both Male and Female

Figure 1 shows a comparison of the percentage incidence of constipation between men and women before and after the pineapple peel treatment. The purpose of this graph is to provide a visual representation of the prevalence of constipation and the effectiveness of pineapple peel in reducing the symptoms in each group.

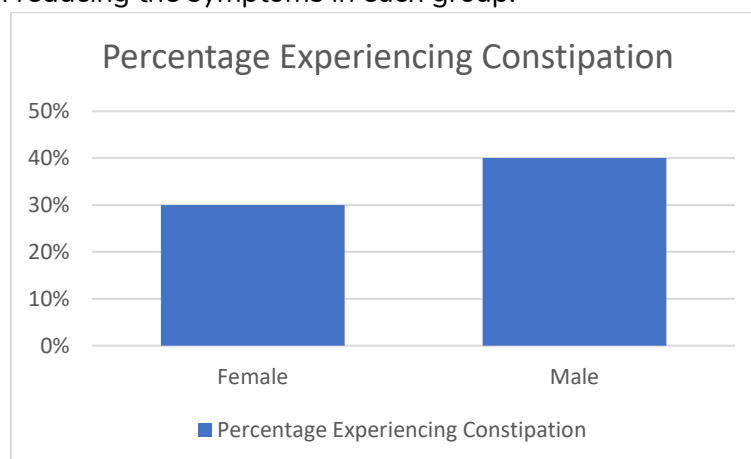


Figure 1. Percentage Experiencing Constipation

Based on the graph, it can be seen that both the male and female groups experienced a decrease in constipation rates after treatment. However, a more significant decrease was seen in the female group. This suggests that pineapple peel has greater potential in reducing constipation symptoms in women than men.

This difference in effectiveness could be due to various physiological and hormonal factors that affect the digestive system, where women tend to be more prone to digestive disorders such as constipation. Nonetheless, both groups showed a positive response to the treatment, which reinforces the potential of pineapple peel as an alternative herbal treatment for constipation in general. Thus, the utilization of pineapple peels is not only beneficial from a health perspective, but also supports sustainable organic waste management.

CONCLUSION

Based on research, pineapple peels have been shown to have potential as a natural remedy for constipation. The use of pineapple peel can reduce constipation symptoms in both male and female. The percentage of constipation sufferers showed that female experienced constipation by 30%, while male by 40%. This shows that female tend to be more prone to constipation than male. Overall, pineapple peel can be an effective alternative herbal treatment to reduce constipation.

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