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MANUFACTURE OF ACTIVE CARBON TABLETS FROM SALACCA (*Salacca zalacca*) SEEDS AS ANTI-DIARY TREATMENT

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ABSTRACT
Salak seeds (Salacca zalacca) used to be considered as waste that is not useful and just thrown away. Now with advances in technology, some of the by-products of salak seeds can be processed into more economical products such as activated carbon which can be used as a treatment for diarrhea because it acts as an adsorbent. The method used to make activated carbon tablets is the wet granulation method with 2 kinds of formulas. The physical properties of the tablets were tested, including weight uniformity, hardness, friability and tablet disintegration time. Pharmacological testing on this activated carbon tablet which is used for the treatment of diarrhea will be tested on rats given orally and observed for 3 days. and the maximum result is the addition of 250 mg of activated carbon where the weight of the feces is reduced by up to 30%

Introduction

Salak (*Salacca zalacca* Gertn Voss) is a native Indonesian plant whose fruit is popular with the public because of its sweet, crunchy taste and high nutritional content. In Indonesia, the ripe fruit can be made into sweets and pickles. Unripe fruit can also be made like rujak or a kind of spicy salad consisting of a mixture of unripe fruits. However, the utilization of salak seeds is still getting less attention due to its rough and hard shape (Zamroni et al., 2018). Therefore, to increase the economic value and utilization of this plant, the salak seeds are used as the absorption of heavy metals from industrial waste by the carbonization method so that it is expected to reduce the concentration of heavy metals in industrial waste.

Almost all areas in Indonesia can be overgrown with salak, both those that have been cultivated or still growing wild. Currently, many industries zalacca processing which produces zalacca seed waste. The part of the salak fruit can be eaten about 56-65%, while the waste is 35-44%, so waste Salak can reach 35-44% of the amount of bark that is processed or consumed. Seed Salak is a waste from the fruit which has a larger portion than bark. The portion of salak seeds is 25-30% of the whole salak fruit, while the bark of bark 10-14%. Based on this comparison, salak seeds have greater potential to be exploited.

Diarrhea is a major public health problem in Indonesia (Zain et al., 2020). Especially in infants and toddlers (Rumaolat et al. 2019). Treatment of diarrhea is broadly divided into two, namely symptomatic and

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causative treatment (Okada et al., 2020). Symptomatic treatment, one of which is intended as an adsorbent, for example carbon adsorbents which on the surface can absorb toxic substances (toxins) produced by bacteria. Examples of tablets of activated carbon or activated charcoal. Diarrhea is one of the most common types of gastrointestinal infections and a leading cause of death worldwide. Viruses, bacteria (*Salmonella enterica, Shigella flexneri, Escherichia coli*), and parasites cause diarrhea, which can be acute or chronic (Weil et al., 2020). There are many researchers who have conducted research related to diarrhea by using natural ingredients such as leaves, roots or fruits of various medicinal plants .

In this research, the charcoal activation process is carried out by flowing hot gas from the decomposition of H_3PO_4 solution, so that it can further improve the quality of activated carbon. From the results of a previous study entitled Making Activated Carbon from Salak Seeds for Absorption of Industrial Metals where the Activated Carbon was tested on Industrial Heavy Metals (Lestari et al. 2016). The researcher will develop a method, namely the manufacture of Activated Carbon Tablets from Salak Seeds (Sallaca zallaca) as an Antidiarrheal Treatment. The research purpose is to formulate and test the physical properties of tablets activated carbon from salak seeds (*Salacca zallaca*) and to determinte the effectiveness of activated carbon tablets from the seeds of salak (*Sallaca zallaca*) as an anti diarrhea medicine. The potential possessed by salak seeds is a good alternative that can be used as a way to reduce diarrhea.

Materials and Methods

This type of research is experimental research, namely research conducted to determine the conssequences of a treatment given intentionally by the reseracher. The basuc for using the method and the sampling design was completely randomized. Where rhe researcer took samples of salak seeds and made tablets of activated carbon from salak seed as an anti diarrhea treatment to be tested on experimental animals. Preparation of test materials used in this study was salak seeds.

Which were separated from the fruit, washed with water and drained, then the leaves were dried, the salak seeds are gound into powder, then it is burned and activated with phospohoric acid so that is becomes charcoal/ activated carbon.

Research Methods

Salak seeds (sallaca zallaca) used in the study were determined at the researcher laboratoy Of lipi bogor

Sampling and processing seeds of salak (Sallaca zallaca) 10 kg are cleaned and washed with running water then dried in direct sunligt untul completly dry.

Actiated carbon production where the dried salak seeds are then carbonized in a 500’C furnace for 30 minutes until they turn into charcoal. Carbonized charcoal was ground using Ball Milling Los Angeles (LA). Then it was filtered thorugh a 200 mesg sieve to get the same grain size and the final result was charcoal/ carbon powder. Carbon powder is then immersed in a solution with a concentration of 2,5 % for 24 hours the mineral elemnts from the added H_3PO_4 compound will seep into tje carbon an d can cause the hydrocarbon residue to be pushed, thereby increasing the formation of the active carbon pore surface. Carbon powder that has beeb soaked is then activated by heating using a furnace for 2 hours and producing activated carbon. Activated carbon is washed with distilled water until it reaches a nutral pH. Activated carbon that has been washed is then dried in a furnace for 1 hour at a temperature of 120’C and the activated carbon is ready to use.

Activated carbon adsorption test

Weight 500 mg of activated carbon then put aquadest into a glass beaker as much as 100 mk, then add 5 drop of methylene blue, the carbon is put into a beaker glass containing methylene blue solution and then observed the color change occurs from light blue changes to colorless, this indicates that activaetd carbon has adsorbent power formula design

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Tabel 1. Formula Design

Formulas	F1	F2
Activated carbon	250 mg	125 mg
Avicel PH 101	100 mg	100 mg
Muvilago Amyli	15%	15%
Magnesium Stearat	1 mg	2 mg
Talkum	5 mg	10 mg
Amprotab	15 mg	30 mg

Granule and Tablet Manufacturing

500 tablets were made by making 10% Mucilago Amyli first by weighing 10 grams of amylum mannihot dissolved in 100 mg of distilled water and then heated in a water bath until the solution was clear and thick.

Then weighed 62.5 grams of activated carbon and 125 grams were put into a mortar and crushed homogeneously. Then carefully weighed as much as 50 grams mixed so that it is homogeneous. Mucilago amyli is added to the mixture little by little until it forms a compressible mass. The wet granules obtained were weighed and then dried in a drying cabinet at 50'C for 24 hours. After drying, it was sieved through a 14/30 mesh sieve. The dry granules were weighed. The granules are then tested for their physical properties

The granules to be printed are first mixed with 15 grams of manihot starch, 5 grams of talc and 1 gram of magnesium stearate and printed on tablets using a tablet printing machine. The tablets were then tested for the physical properties of the granules

Evaluation of granules

Evaluation of the granules carried out on each activated carbon tablet formula was the moisture content, the average diameter of the granules, the friability of the granules, the angle of repose and the flow time.

Evaluation of tablets

The evaluation of tablets carried out on each tablet formula of activated carbon was uniformity of weight and size of hardness, friability and disintegration time of tablets.

Results and Discussion

The results of measuring blood glucose levels in rabbits before and after induction can be seen in the table below

Table 2. Design of Formula

Name of Material	Formula I	Formula II
Active Carbon Avicel PH 101	250 mg 100 mg	125 mg 100 mg
Mucilago Amyli	15 %	15 %
Magnesium Stearat	1 mg	2 mg
Talkum	5 mg	10 mg
Amprotab	15 mg	30 mg

Table 3. Evaluation Tablet can be seen in

Samples	Range	Results	Conclusion
No added Added Activated Carbon 259 mg	80 – 120 % 80 – 120 %	90 – 110 % 93 – 100 %	qualify qualify
Added activated carbon 125 mg	80 – 120 %	87 – 114 %	qualify

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Table 4. Test Results of Salak Seed Activated Carbon Tablets on test animals

Samples	Stool weight before being given	Stool weight after being given	Presentation
No added	100 gram	100 gram	0 %
Added Activated Carbon 259 mg	100 gram	69,275 gram	30,725 %
Added activated carbon 125 mg	100 gram	89,275 gram	10,725 %

This study uses Salak Seeds (*Salacca zalacca*) which are used to make activated carbon tablets and will be tested as antidiarrheal drugs in test animals. Salak seeds were chosen because they are waste that is often thrown away by the general public without knowing the efficacy of the seeds, which can actually cure diarrheal diseases.

In this study, a formula was designed to make the activated carbon tablets, namely: Salak seeds, avicel and musilago and talcum as a tablet filler, amprotab as a tablet coating material. The results of the manufacture of activated carbon tablets were evaluated and all the formulas used met the requirements, both granules and tablets. The results of making these tablets were tested for anti-diarrhea where feces were measured on rats for a span of 3 days, and the maximum result was the addition of 250 mg of activated carbon where the weight of the feces was reduced by 30% (Rahimzadeh et al., 2021).

Salak seeds as active carbon have cellulose and active compounds contained in this salak seed so that it can be used as a as a bioadsorbent (Jain et al., 2016). Activated carbon is a porous solid made from raw materials that contain carbon (Lestari et al. 2020). When activated carbon is heated at a temperature of 250-400oC Its function is to remove the water content in the charcoal active, and we can use it as a gas or liquid absorber. So that Activated carbon is expected to be able to absorb free fatty acids, impurities and colloids in used cooking oil. To increase ability activated carbon absorption it is necessary to do the activation. Activated carbon tablets from salak seeds contain anti-diarrhea properties because in the salak seeds there is a cellulose network that can be used as activated carbon (Oktarianti et al., 2021). And the activated carbon is activated using organic compounds.

Conclusions

Salak seeds (*Salacca zalacca*) can be made into activated carbon tablets because in the seeds there is a cellulose network. The activated carbon tablet can be used as an anti-diarrheal treatment that has been tested on test animals

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