



Consumer Behavior Analysis as a Form of Pre-market Survey for the Black Pule (*Alstonia spectabilis*) Antimalarial Tablet Prototype

(Analisis Perilaku Konsumen Sebagai Bentuk Survei Pre-market Tablet Prototipe Antimalaria Pule Hitam (*Alstonia spectabilis*))

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ABSTRACT

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Malaria is a disease caused by the protozoan parasite Plasmodium with a high incidence of spread that is still found in remote tropical places, especially areas around gardens, swamps, forests, and mines such as eastern Indonesia. The commonly used antimalarial drug chloroquine has experienced resistance, encouraging researchers to look for effective alternative treatments. Formulation development of Standardized Herbal Medicine (OHT) from black pule was carried out as a potential new alternative treatment as an antimalarial. **Objectives:** The purpose of this study was to determine the level of liking and quality assessment or characteristics of the prototype of antimalarial OHT tablets. **Methods:** The method used in this research is descriptive quantitative which aims to describe 57 panelists' perspective on the product and to analyze product marketing. In this research method includes hedonic test and hedonic quality test which is a series of organoleptic tests and consumer acceptance tests by tasting and observing the product followed by filling out a form according to what is felt and observed. **Results:** The results obtained from this research, namely the preference test of the overall characteristics of the prototype of antimalarial black pule tablets (*Alstonia spectabilis*) showed a good sensory impression and characteristics. The positive results obtained from all aspects have illustrated that the panelists have considerable interest in the prototype sample and assess that the prototype tablets are suitable for dissemination to the public. **Conclusions:** Based on the research, it can be concluded that the prototype of black pule (*Alstonia spectabilis*) tablets tested through hedonic and hedonic quality tests produced overall good results, characterized by the tendency of panelists to choose "Like" in the hedonic test of sensory impressions and positive values in the hedonic quality test.



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INTRODUCTION

Malaria is an infectious disease that is still a global health problem. The disease is caused by protozoan parasites belonging to *Plasmodium* which can naturally infect humans in five species namely *P. falciparum*, *P. vivax*, *P. malariae*, *P. ovale* and *P. knowlesi*. In 2019, the disease has been widespread in about 85 countries in the world, with 229 million malaria cases worldwide with an estimated 409,000 malaria deaths (Lewinsca et al, 2021). Indonesia, which has a tropical climate, is very favorable for *Anopheles* sp. mosquitoes as their habitat. The increasing incidence of malaria in Indonesia is influenced by several factors related to climate change related to the environment such as weather, deforestation, excavation, neglected ponds, and mining because it is a breeding ground for mosquitoes that cause malaria (Dewi et al., 2022). Malaria can be found in all parts of Indonesia, but eastern Indonesia has a higher number of malaria cases due to its high endemicity and geographical factors. Most of the population in the area still has people living around gardens, swamps, and trees which are breeding grounds for mosquitoes, increasing the risk of malaria in eastern Indonesia (Malino et al., 2023).

Antimalarials are drugs used to prevent and treat *Plasmodium* sp. Antimalarial drugs that have been known for a long time by the wider community are chloroquine. However, in the 2019 Malaria Case Management Handbook, one of the obstacles in handling malaria cases in Indonesia is the decline in the efficacy of several antimalarial drugs, and there is even resistance to chloroquine. This can be due to the irrational use of anti-malarial drugs (Banne and Rintjap, 2020). Therefore, alternative treatments are needed to overcome the resistance of these antimalarial drugs that can provide more potent and effective results. In this study, the formulation of the development of Standardized Herbal Medicine (OHT) from black pule as an antimalarial drug was carried out. In previous research related to phytochemical screening or metabolite profiling, it was known that black pule (*Alstonia spectabilis*) contains many compounds such as alkaloids, triterpenoids, ethyl, alstomacrolone, and so on which are known to have plasmodium activity that causes malaria (Taek et al., 2021). This prototype will be needed to become a new antimalarial drug candidate used by the community in an effort to reduce mortality and morbidity due to malaria, dissemination of research results through counseling will be able to increase the level of community education, and the prototype raw material, which is an endemic plant of NTT, can be used as a livelihood for the community as collectors or black pule farmers. Black pule (*Alstonia spectabilis*) is one of the plants traditionally used as an antimalarial by the people of Java and Sumatra (Taek et al., 2019).

Although this plant is considered to have strong inhibitory activity against *P. falciparum* 3D7 strain which has been tested in vitro in preliminary research (Taek et al., 2021), this prototype needs to be market analyzed to develop marketing strategies and improvements to the product before being disseminated to the wider community. In this study, there are hedonic tests including shape, color,

aroma, taste and size, as well as hedonic quality tests including texture, taste, flavor, aroma, and color. These parameters are used to determine the level of liking and specific characteristics that can be accepted by consumers. The test conducted in the study is a series of organoleptic tests and consumer acceptance tests by presenting the assessment score of each parameter to trained panelists involving individuals represented from a special population so that the research results are more accurate. The purpose of the score results is to determine the right future strategy to be set in order to achieve the best results related to the development of the new drug (Kusbandono, 2019).

MATERIAL AND METHODS

Materials

The material used in this study were panelists as test subjects with a total of 57 panelists who had previously been accustomed to taking tablet medication in general, who have tasted the black pule extract antimalarial tablet prototype and filling out a hedonic quality questionnaire which contains likert scale from 1 to 4. This research was approved by the health research ethics committee of the Faculty of Health Sciences, Brawijaya University with number No. 8552/UN10.F17.10.4/TU/2023.



Figure 1. Sample's prototype of antimalarial OHT tablet "Malstonin"

METHODS

The research method used in this research is quantitative descriptive which aims to describe the panelists' perspective on the product and so that product marketing analysis can be carried out, so that it can be concluded whether the product is in accordance with market conditions and determine whether the marketing strategy is appropriate. This research method includes hedonic tests and hedonic quality tests which are a series of organoleptic tests and consumer acceptance tests. A group of somewhat trained panelists were used as test subjects with a total of 57 panelists who had previously been accustomed to taking tablet medication in general. The panelists gave quite varied assessments on the questionnaire sheets that had been given. This study has a criteria for required panelists that is panelists who are in

good health or have normal senses, and are willing to fill out the assessment form provided. Panelist acceptance refers to a series of four assessment scales to determine the level of panelists liking for the product being tested. The data obtained was taken by tasting 1 (one) prototype sample of the black pule antimalarial tablet (*Alstonia spectabilis*) provided that the panelists drank a little water to neutralize their sense of taste so that the resulting data matched the actual situation perceived by the panelists.

Hedonic Test

In the hedonic test, the aspects assessed as the level of panelists liking for the black pule extract (*Alstonia spectabilis*) tablet prototype included shape, color, taste, aroma and size. Consumer acceptance includes four hedonic scorings including the statements (hedonic scale) for acceptance including four scores, namely "Very like", "Likes", "Dislike", and "Really dislikes". The result distribution of panelist assessments based on a hedonic scale is a form of descriptive sensory assessment, where the hedonic assessment will then be converted into a numerical scale in the form of mean values for data analysis purposes (Wangiyana et al., 2022).

Hedonic Quality Test

In hedonic quality research, to support the sustainability of the panelist preference test, a hedonic quality test was also carried out as a form of quality characterization and complement to the hedonic test data that had been carried out. The hedonic quality test itself is used as a special assessment variable for a product. In contrast to the results of hedonic test assessments which state likes or dislikes, the results in hedonic quality tests give a value by stating the impression about the good or bad of a test sample more specifically (Fadhilillah et al., 2020). Several variables that need to be assessed in the hedonic quality test of the antimalarial black pule tablet prototype this time include the criteria for "Shape", "Color", "Taste", and "Aroma" as shown in Figure 2.

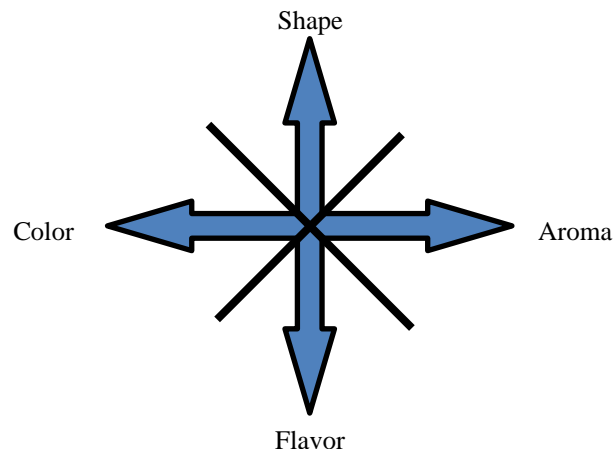


Figure 2. Hedonic quality variables of the black pule tablet prototype.

RESULTS AND DISCUSSION

The instrument used in this research on hedonics and hedonic quality is a questionnaire whose validity and reliability have been tested by ethics committee. The results obtained in this research are based on the organoleptic preferences of each individual panelist as a big picture of the hedonic and hedonic quality of the black pule (*Alstonia spectabilis*) antimalarial tablet prototype in general in society. The combination of tests simultaneously between hedonic tests and hedonic quality carried out in this consumer behavior research aims to produce a knowledge base for a sensory test system that functions as input and predicts the level of public liking for the products before they are marketed (Permadi *et al.*, 2019).



Figure 3. Process of filling out research instruments for hedonic and hedonic quality test

Hedonic Test

In this research after the prototype product of antimalarial tablet black pule extract had been made and tested in the laboratory, the preference test research was continued. That research namely hedonic test (preference test) or what can also be called an organoleptic test. The hedonic test is a test in organoleptic sensory analysis with the function of determining differences in the quality of several similar products or giving a certain score scale to the special characteristics of a sample so that the level of liking of a product is known (Qamariah *et al.*, 2022). However, the aim of this study was to determine the level of panelist preference for black pule antimalarial tablet products based on original organoleptics characteristics about this product.

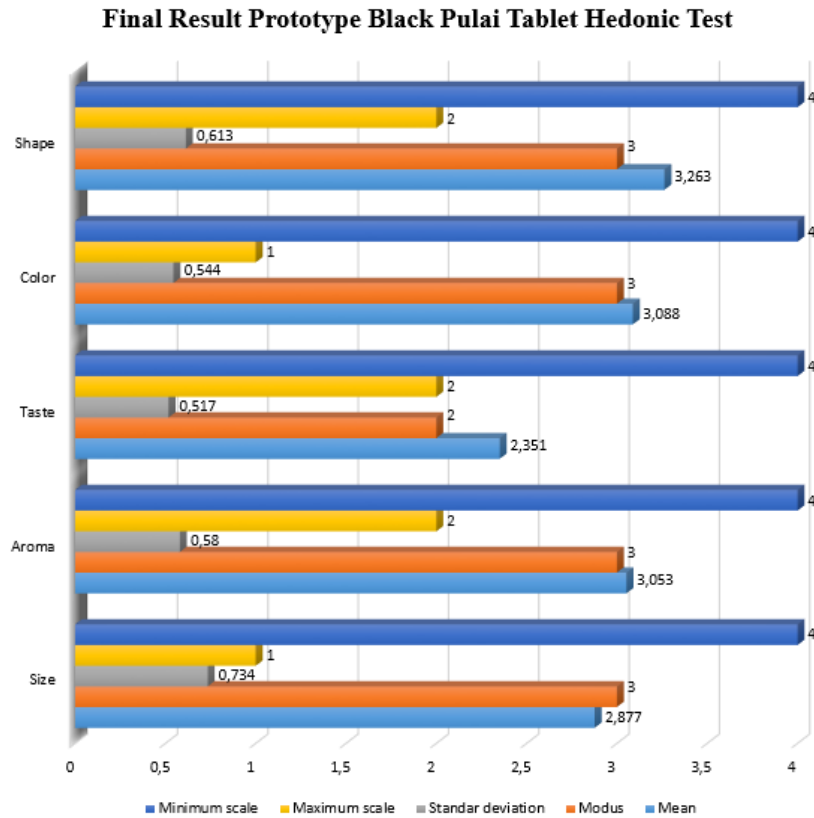


Figure 4. Graph of final assessment aspects of the hedonic test

Based on the results of the hedonic data analysis from the panelists which are summarized in Figure 4 , it can be indicated that the panelists' liking test answers averaged close to a value of 3 on the hedonic scale of "Like" the tablet samples tested. The value that appears most often in the organoleptic aspect which is tested as a hedonic test produces a value of 3 which also shows the measuring scale of "Like" towards the antimalarial herbal tablet product black pule (*Alstonia spectabilis*) marked in the aspects of shape, color, aroma and size. The taste aspect of the product was assessed by the panelists as more likely to be in mode 2 which states the "Dislike" measuring scale.

After calculating the result from the panelists, descriptive analysis was carried out with the results in every aspects. Shape aspect of the black pule antimalarial tablet prototype sample has a value of 3.263 which is known to be closer to the "Like" hedonic scale with a variance distribution of 0.613 which is indicated by a fairly large comparable standard deviation. This means that the shape value is relatively large with the average value being closer to the maximum value of 4 (the "Very Like" scale) than the minimum value of 2 (the "Dislike" scale).

The color aspect of herbal tablets from black pule extract (*Alstonia spectabilis*) produces an average value of 3,088 which is more towards the hedonic scale of "Like". The variance distribution value of 0.544 has a standard deviation value that is quite far from the mean value, thus indicating that the

variance value of the hedonic data for the color aspect is relatively large. So the result can be said that many of the panelists have a fairly high liking for the color of the black pule herbal tablet prototype product that was tested.

Hedonic test scores for the taste aspect show a significant average that tends towards measuring scale 2, the "Dislike" parameter. This is indicated by the calculated mean value of 2.351 with a variance distribution value of 0.517. It can be seen that the comparison is quite far between the mean and the variance values, but the mean value has a relatively small value because the magnitude is closer to the minimum value marked on hedonic scale "Dislike" compared to the maximum value on scale 4 which indicates the feeling "Very Like". Most of the panelists did not like the taste of the prototype herbal tablet from black pulp extract (*Alstonia spectabilis*). The panelists dislike of the taste aspect of this tablet prototype was due to the use of natural ingredients such as black pule extract, which is basically the bark of the pule plant which has a quite bitter taste (Mayor & Lanny, 2022). This bitter taste may not be suitable for some people. However, several panelists considered that the taste felt in these tablets matched the taste of medicinal tablets in general.

About the aroma aspect, it is clear that it has an average value of 3,053 with a score closest to the number scale "Like. The average value when compared with the standard deviation value of 0.580 has a relatively large amount of data variance with a number that is close to the maximum number for the scale selection, namely a score of 4 which states that the panelists "Very Like" the related product compared to the minimum number that refers to the scale. Many people chose the "Like" scale in the hedonic test carried out, so it can be indicated panelists had a fairly high level of interest in the aroma of the prototype.

Descriptively, the numerical values about the prototype size can be analyzed using the statistical calculations. Average rating result of 2,877 is shown, which if rounded up would be close to the value of the hedonic measuring scale "Like" in terms of measurement aspects. The comparison between the average value and the standard deviation of 0.734 is quite far apart so that from the mean value it can be said that the panelists gave a relatively large assessment in terms of positivity because many panelists "Like" the size of the prototype of the black pule (*Alstonia spectabilis*) antimalarial herbal tablet.

Looking at the overall value of the aspects tested, the "Like" scale was chosen more often by panelists than other hedonic scales. So it can be said that the prototype of the black pule (*Alstonia spectabilis*) antimalarial herbal tablet has a good assessment and is suitable when compared with other herbal tablet products. Nowadays it is generally liked by consumers because the prototype had a positive level of acceptance.

Hedonic Quality Test

According to the literature on liking tests conducted by Permadi *et al.* (2019), it is explained that hedonic quality tests are generally produced in the form of descriptions to identify and measure important sensory product characteristics. The information is known about the degree or intensity of the characteristics of the particular product being tested. The information is used as data for development, improvement, manufacturing processes and functions as quality control for a product. The evaluation is done by calculating percentage variable values which are then linked to the description of the product quality attributes.

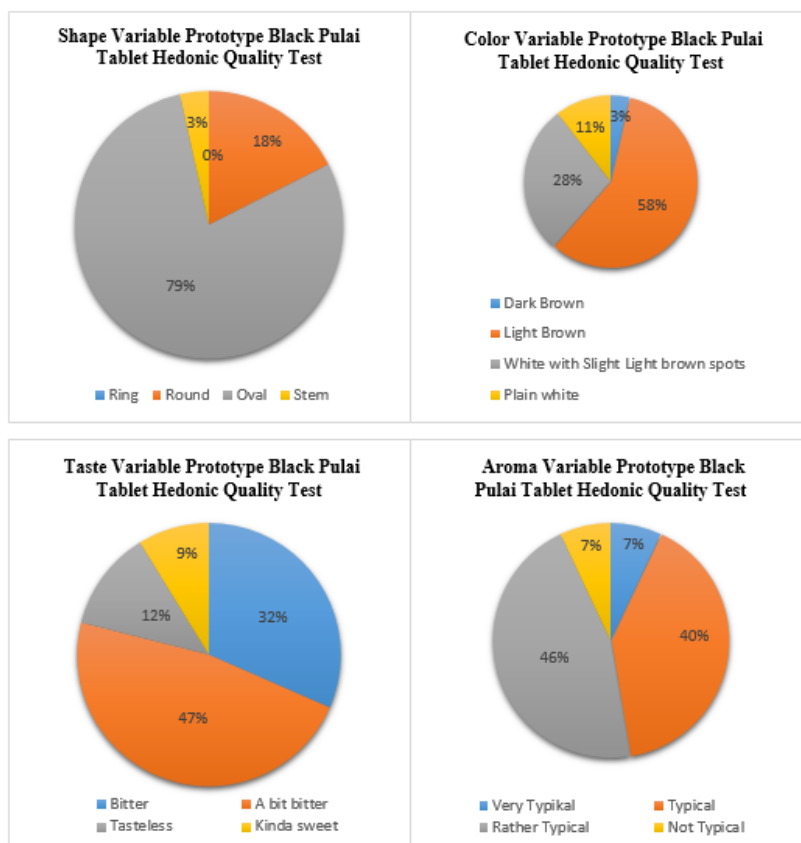


Figure 5. Graph of percentage assessment of the overall variable of hedonic quality test

Based on the analysis of hedonic quality test data in Figure 5 regarding the variable form of the black pule antimalarial prototype tablet this time, it shows the percentage of numerical results that can be described. A total of 79% panelists indicated a preference for an “Oval” shape. Judging from the characteristics of the actual black pule tablet, most of the panelists' preferences were in accordance with the shape of the tablet itself, namely oval. The choice of round and rod shapes is thought to be due to the oval shape which is a combination of round and rod shapes. In general, commercial tablet medicines are sold not in stick form but in round form. However, because the prototype black pule antimalarial tablet tested this time has a fairly large weight, reaching 700 mg, the desired shape is oval for certain purposes and purposes. The oval shape or capsule shape of large tablets will make it easier for consumers to swallow and reduce the transit time of the drug in the esophagus, which is why the product is made

in an oval shape (Yohannes and Admassu, 2021). Several panelists considered that tablets with an oval shape visually look elegant.

The percentage results in terms of color of the antimalarial black pule tablet product are listed in Figure 5 above. In the graph, it is known that on average the largest percentage of panelists stated that the sample tablets had a "Light Brown Color" 58%. In the review carried out before the test, the black pule tablet product had a characteristic light brown color with an uneven color that looked like spots. The presence of spots on the tablets is caused by the use of natural ingredients in the product manufacturing process, where natural ingredients have the weakness of causing spots on the tablets produced (Fadhilah *et al.*, 2019). The color variable has a big impact on product acceptance assessments because it is the first impression of interest in a product. Based on the results, it can be said that most of the panelists agreed that the color for the black pule prototype tablet was "Light Brown".

The percentage results seen in terms of taste of herbal tablet products from black pule extract (*Alstonia spectabilis*) show that the largest percentage is that the panelists stated that the product had a slightly bitter taste with a value of 47.37%. As for the bitter taste assessment, there were 18 panelists who voted to obtain a percentage of 31.58%. This shows that the majority of the panelists think that the taste of this product is slightly bitter to bitter. The bitter taste in this product is inherited from the black pule plant as the main ingredient for making the prototype of this product which has a very bitter taste. Medications that have a bitter taste are usually a problem related to patient compliance, resulting in frequent incidents of ineffective therapy in several cases of disease (Mahdiyyah *et al.*, 2020). However, the taste aspect of the product in the form of a tablet is not a serious problem because the prototype of this drug is not a lozenge but a tablet that is used by swallowing. The panelists also stated that the bitter taste in the antimalarial black pule tablet prototype is something that is common in the taste of medicines in general. So even though the majority of panelists think that this product has a bitter taste, this is not a problem in its use.

The largest percentage of the aroma aspect in this hedonic quality assessment was "Rather Typical" at 45.61%, followed by "Typical" as the second most selected by panelists with a percentage of 40.35%. The aroma preference test is greatly influenced by the distinctive smell of the active ingredient of the prototype antimalarial tablet made from herbal ingredients, namely black pule extract. which may not necessarily be well received by the panelists. Many of the panelists agreed that the prototype sample of black pule antimalarial tablets had a rather distinctive aroma. The pule tree has a special aroma characteristic that is not strong (Khoiri *et al.*, 2023). Therefore, the light distinctive aroma of the antimalarial tablet prototype content is in accordance with consumer preferences, as can be seen from

the overall notes from the panelists, where there are panelists who assess that the tablet's aroma is not disturbing when consumed orally.

The average preference test for the overall characteristics of the antimalarial black pule tablet prototype (*Alstonia spectabilis*) as seen from the panelists' statements showed a fairly good sensory impression on each variable tested. The overall aspect is the panelists assessment of the product in all aspects tested (Tisa et al., 2022). The result characterized by the panelists' tendency to "Like" as a representative that will become a benchmark for people's level of liking for each aspect of the hedonic test. The overall hedonic quality test of the antimalarial black pule tablet prototype (*Alstonia spectabilis*) also resulted in a good characteristic assessment based on the results of the panelists' agreement on each variable tested.

CONCLUSION

Based on the analysis of the data in the research, it can be concluded that the prototype black pule tablet (*Alstonia spectabilis*) which was tested through the sensory impression hedonic test and hedonic quality produced good overall results, characterized by the panelists tendency to "Like" in hedonic resulted in a good characteristic assessment and positive values in hedonic quality test have shown that the panelists have quite an interest in the prototype.

CONFLICT OF INTEREST

The authors declare no conflict of interest

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