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Article

Prototype: "INSEKTA" (Innovation of Temulawak Extract Capsules) as the Main Material of Powder Medicine Capsule Shell for Sustainable Health

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ABSTRACT

Health problems are one of the special concerns around the world. This is stated in the 17 SDGs goals, namely a healthy and prosperous life. What is of concern is the existence of capsule shells made of gelatin from animal materials such as cows and pigs. INSEKTA comes with an innovation in the shell of medicinal capsules from temulawak starch, glycerol, water and gelatin. INSEKTA also has advantages in the form of adding nutritional value to the human body. The purpose of this study is to determine a suitable method for making medicinal capsules from temulawak starch and its physical characteristics. The method used is descriptive experimental with a qualitative approach. Data collection is in the form of results from the time of destruction test, and organoleptic test. The techniques used in making capsule shells are divided into three stages, namely the temulawak extraction stage, mixing of ingredients, and shaping. Data analysis was carried out with descriptive statistical tests to describe the general characteristics of the data such as time of destruction, and organoleptic. The results of the time test of disintegration using hot water showed that the shell of the drug capsule could dissolve and the organoleptic test by giving a questionnaire to the panelists showed positive interest.

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INTRODUCTION

The state of Indonesia is working with the global realm to continue to improve the welfare of the community. This commitment is contained in the goal or goal to achieve a sustainable life. One of these goals is a healthy and prosperous life. The steps taken by the government in realizing its goals include reducing diseases and deaths due to hazardous chemicals and pollution and supporting research, development, and universal access to vaccines and affordable medicines. To realize the goal of sustainable development is not only the task of the

government, but there needs to be synergy between all existing communities. As a good society, efforts that can be made to help achieve the goal of sustainable development are by channeling all forms of skills or abilities in the form of creativity that they have. In the context of realizing a healthy and prosperous life, currently an innovation has been developed to prepare medicinal capsule shells from natural ingredients.

The shell of a commercial drug capsule is a small-sized container that serves as a protector and cover for the drug to keep the drug in a sterile condition. Capsule shells are usually produced by the pharmaceutical industry. The capsule shell consists of two parts, namely the capsule head and the capsule body. The size of the capsule head is shorter than the capsule body, so the two parts if put together will cover the capsule body precisely and tightly. Shells are generally made of gelatin, but there are also those who use gelatin substitutes from starch or other ingredients that have the same characteristics as gelatin. The capsule shell has eight size variations namely a volume of 1.37 ml; 0.95 ml; 0.68 ml; 0.50 ml;0.37 ml;0.30 ml;0.21 ml;0.23 ml. With a capacity of 1096 mg; 728 mg; 544 mg; 400 mg; 296 ml; 240 ml; 168 ml; 104 ml (Huda & Sari, 2021).

Commercial capsule shells are generally made of gelatin material. Gelatin has *excellent* gelling properties and is usually made from pigs or cows. For the purpose of making capsule shells, Indonesia still imports gelatin from Thailand, Bangladesh, and India, because it does not have its own gelatin manufacturing industry (Unair News, 2021). This results in the price of gelatin depending on the dollar value which is relatively expensive. The price of 1 kg of gelatin on the market ranges from Rp.195,000 to Rp.326,000,-. The source of ingredients, safety and halalness of commercial capsule shells from imported gelatin are also problems that the community is worried about. Public concerns about mad cow disease are also one of the problems with the use of gelatin from cows as capsule shells. In addition, some religions also prohibit the consumption of products derived from pigs and cows.

In general, gelatin is made from the extraction of skin, bones, and connective tissue of animals, especially cows and pigs. According to the Journal Homepage, cows and animal bones pose significant health risks to gelatin ingested, such as mouth and hoof bites. *bovine spongiform encephalopathy (BSE)* or mad cow disease. Along with the increasing consumer awareness of the origins of gelatin, concerns have arisen over the use of gelatin. In terms of religion, especially Islam and Judaism, gelatin derived from non-halal or non-halal animals is a prohibited material, so there is a need for gelatin-free products. One alternative to replace gelatin is gelatin(Alipal dkk., 2021).

Along with the development of the times, many innovations have developed natural-based medicinal capsule shells, especially plant-based. The use of natural ingredients in the process of making medicinal capsules is not new, as research has been conducted by Rosiana Rizal, et al., 2023 Capsule Shell Formulation from Jackfruit Peel Pectin (*Artocarpus heterophyllus* Lam) and Capsule Crushing Time Test, showing that capsules produced from jackfruit peel are considered to meet capsule industry standards. This can prove that the use of natural plant-based ingredients is feasible to be used in the manufacture of capsule shells as a substitute for gelatin. Based on the description above, the author was inspired to make a prototype of a capsule shell based on temulawak named "INSEKTA" (Innovation of Temulawak Extract Capsule).

METHODS

This research is a descriptive experimental research with a qualitative approach. Data was obtained by conducting a series of tests on the product and observations.

Tools and Materials

The tools and materials used in this study include containers, graters, filter cloths, baking sheets, blenders, pots, digital scales, spatula, spoons, temulawak, glycerin, water, and gelatin powder.

Research Methods

The research conducted was experimental in nature carried out at home by modifying the materials used from the research conducted by Indah Tri Lestari et al. (2021). The method used includes the stages of starch extraction and the preparation of capsule shell preparations.

Capsule Shell Preparation Characteristic Test

To determine the quality of the capsule shell made, tests are carried out in the form of:

1. Organoleptic test: Organoleptic evaluation is a physical test of preparations that includes color, odor and texture (Suparman, 2019; Rizal, et al., 2023).
2. Crush time test: The capsule shell is inserted into a crush time tester filled with water at a temperature of 370C±10C, then the crush time tester containing the sample is raised and lowered until the capsule shell is crushed. It is recorded the time it takes for the capsule shell to be destroyed (Mahardika, et al., 2023).

RESULTS AND DISCUSSION

Natural capsule shells are capsule shells made from natural ingredients, such as gelatin and starch. Gelatin usually comes from the hydrolysis process of skin and bone collagen which is a derivative of collagen fibers physically and chemically, so it can be said that gelatin is the result of collagen denaturation. There are two methods used in making gelatin, namely type A and type B. Type A gelatin is generally made from animal skin, so the softening process can be done quickly, namely by soaking in an acid solution. Type B gelatin is gelatin that is processed from hard raw materials such as bones, so the soaking process needs to be long and the solution used is an alkaline solution. Gelatin contains very high protein and low in fat content. Dry gelatin with a moisture content of 8-12 contains about 84-86% protein, almost no fat and 2-4% minerals. The source of gelatin can be obtained from the skin and bones of cows, pigs, chickens, ducks, fish (N, 2021).

Temulawak is the main basic ingredient in making capsule shells. The nutritional content in curcumin or curcuminoids, and flavonoids. Curcuminoids can help the metabolic process. Flavonoids are effective in curing inflammation and inhibiting cell division. Flavonoids not only inhibit lipid peroxidase, but also affect the stabilization process of cell membranes and improve metabolic processes.

Glycerol has the characteristic of being a *plasticizer* , namely the ability to make bioplastics flexible by stretching the bonds between molecules. The addition of glycerol in the manufacture of capsule shells has a smoother surface. The addition of gelatin in the manufacture of capsule shells is used as an additive to smooth the surface of bioplastics. Water has a function in the process of dissolving the ingredients for making capsule shells.

Making INSEKTA Capsule Shells

The manufacture of INSEKTA capsule shell preparations is carried out through several stages that are carried out, namely:

a. Extraction of temulawak starch

The extraction process begins with smoothing temulawak which aims to make it easier to take starch. After being mashed, water is added to dissolve the starch in the temulawak. Then it is filtered and squeezed until the water runs out. The results of the filtration are stored and deposited for one day until starch deposits are obtained. The result of the sediment is separated from the water which is then put in clean water again and left

for one hour. After an hour has passed, the settled starch is separated with water and dried for one day in the heat of the sun. The last process, the dried starch is mashed using a blender.

b. Manufacture of capsule shell preparations

The manufacturing process goes through the stages of mixing materials, cooling, shaping and drying materials. The stages are explained as follows, the ingredients are done by including all ingredients including water, starch and glycerol are heated and stirred until homogeneous. After that, it is placed in a baking dish to cool and dry. Once cooled, the dough is molded into capsules and re-dried.

Organoleptic Test Results

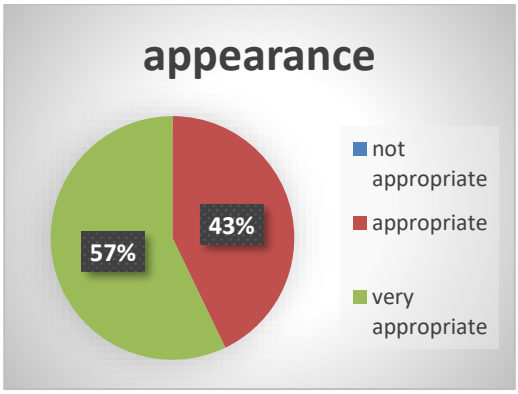

Figure 1. Organoleptic test result diagram shown.

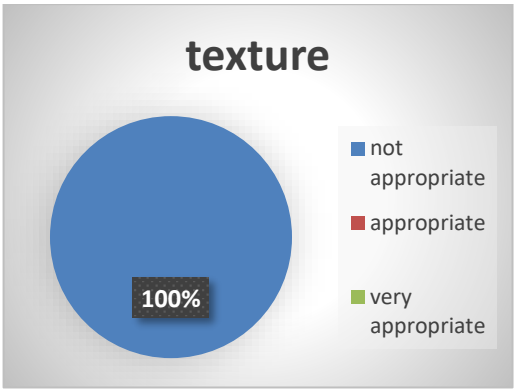

Figure 2. Texture organoleptic test result diagram

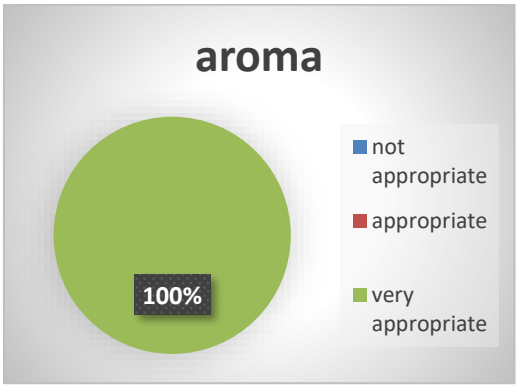

Figure 3. Diagram of the results of the organoleptic test of aroma.

Organoleptic test is a way to assess the quality of a product by prioritizing the sensitivity of human sensory devices such as sight with eyes, smell with nose, and taste with tongue. The organoleptic test on the prototype of the curcuma capsule shell or *Insekta* was carried out by providing samples in the form of products to the panelists to be assessed. The characteristics assessed in the organoleptic testing of the prototype product of the temulawak capsule shell are in terms of appearance, texture, and aroma.

Based on the data obtained in the organoleptic test, the results were obtained where 57% of panelists thought that the product appearance was very appropriate, while another 43% thought that the product appearance was appropriate. This shows that in terms of color, the prototype of the capsule shell of temulawak or *insekta* is appropriate and well accepted by the panelists. The results of the organoleptic test in terms of texture obtained results where 100% of the panelists were of the opinion that the texture of the product prototype was still not

suitable when used as a capsule shell. This is because the product still has a soft texture and is less rigid. Therefore, it is necessary for the product to be further developed in terms of texture. The results of the organoleptic test in terms of aroma obtained results where 100% of the panelists thought that the aroma of the product was very suitable for use as a capsule shell. This is because the product has a weak aroma and even has almost no smell. From the overall test results, it can be concluded that the product can be accepted by the panelists but needs to be improved in the texture of the product

Crushed Time Test Results

The test results show that most of the products are water-soluble but still leave a small amount of product deposits. Products that are not completely destroyed/dissolved in water can be caused by the source of the basic ingredients of the product. Temulawak has a starch content of 41.45%, fiber 12.62%, essential oil 3.81% and curcumin 2.29% (Khamidah, et al., 2017). The content of essential oils in curcuma can affect the product's ability to dissolve in water because of its hydrophobic content (Atmaka, et al., 2016). Likewise, the curcumin content in curcumin in curcumin is hydrophobic (Abriyani, et al., 2022), so it can affect the solubility of the product.

Product Value

Capsule shells made from temulawak contain flavonoids that function as antioxidants, anti-microbes. According to the journal *Proceedings of the STIKES Syedza Saintika National Seminar* Several researchers have researched that flavonoids exhibit biological activity, including anti-allergic, anti-inflammatory, and vasodilating actions (Fitri & Putra, 2021). Another advantage in curcumin is curcumin or curcuminoid. Curcumin is a part of the yellow pigment found in the rhizome of temulawak. Curcumin is a class of polyphenol compounds with a chemical structure similar to ferulic acid that is widely used as a flavor enhancer in the food industry. Curcumin in the body plays a role in spurring the apocation process, which is a natural process of cell death in order to maintain the integrity of the cell as a whole. Curcumin can inhibit cell proliferation and induce cell cycle changes in adenocarcinoma candidates without the prostagiandio pathway. In addition, curcumin content is also able to inhibit cancer growth (Safitri, 2020).

CONCLUSION

The use of temulawak extract can be one of the alternative ingredients in making capsule shells. The method of making capsule shells can be done by extracting starch and mixing ingredients such as water, glycerol, temulawak starch and gelatin powder. The results of organoleptic testing by giving questionnaires to the panelists showed positive interest and solubility testing using hot water showed that the shell of the drug capsule could dissolve by leaving a small amount of precipitate. Based on the results of the tests that have been carried out, it is concluded that the use of capsule shells from temulawak starch can be well tolerated by the community. In addition, the use of natural ingredients from temulawak starch is a solution to replace the use of gelatin which is still a concern for the wider community.

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