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Indigenous Knowledge in Reducing HCN Content in the Processing of Gadung Tubers *(Dioscorea hispida)* as Student Teaching Materials

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Abstract: The research aims to understand the indigenous knowledge of the community in processing gadung tubers (Discorea hispida) and to identify the most effective variations in reducing HCN content for educational purposes, specifically in the form of an Environmental Knowledge Module for students in the Biology Education program at FKIP Cordova University. The research methodology involves an experimental approach with four core stages: conducting surveys and interviews with the community in Beru Village, Jereweh District, West Sumbawa Regency; developing observation sheets for gadung tuber processing based on local knowledge; and engaging in practical activities with the research team, the community, and two biology education students. The research results, based on the module validation, show an average score of 77.5%, categorizing it as good. The conclusion of the study is that the most effective variation in reducing HCN content involves the addition of 300 grams of salt compared to other variations, along with the inclusion of squeezed castor leaves juice. The practical activities conducted in accordance with the local knowledge of Beru Village community in Jereweh District have progressed well, producing gadung sticks as safe-to-consume food products.

Keywords: Gadung tuber; Indigenous knowledge; Module

Introduction

Gadung tubers (*Dioscorea hispida*) are a tuber plant popular in various regions in Indonesia. This vegetation can be easily found in the shadows or near streams in Southeast Asia and its surrounding regions (Kumoro et al., 2020). Gadung tubers are a type of tuber that is high in carbohydrates and contains bioactive compounds such as Water Soluble Polysaccharides (PLA), dioscorin, and diosgenin (Harni et al., 2022; Siqhny et al., 2020). The total protein, fat, fiber, ash, carbohydrate, and metabolic energy of the studied species are found in gadung tubers (*Dioscorea* spp.) at levels of 5.05–8.79%, 0.33–1.01%, 3.53–14.15%, 3.30–5.31%, 62.60–78.26%, and 1241–149 kJ/100 g, respectively (Sahoo et al., 2023). Gadung tuber can help with food variety (Pusporini & Anggraini, 2016; Renate, 2018) because it includes 29.7 grams of carbohydrates per 100 grams of material (Renate, 2018). Starch and protein content from *Dioscorea* sp. make it as healthy food (Fauziah et al., 2016). The water content of *D. hipsida* is low so it is not easily contaminated by bacteria and is good for preservation (Valera et al., 2019).

The use of gadung tubers is still hampered because they contain cyanide acid (HCN), which can cause poisoning in humans and animals (Paramitha & Wulan, 2017). Before consuming gadung tubers, it is ensured that they undergo a processing process to reduce the cyanide acid content (Gunawan et al., 2019; Kumoro et al., 2011; Widiyanti & Kumoro, 2017; C. A. Wulandari et al., 2017). Consuming more than 1 ppm of gadung can cause nausea and drunkenness (Kresnadipayana & Waty, 2019). Cyanide levels in gadung can decrease due

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to the osmosis diffusion process using a salt solution (Drochioiu et al., 2016)

The detoxification test of gadung tubers (*Dioscorea hispida* Dennt) in a salt solution showed results on the fifth day with a change in color to pure white, loss of toxic properties such as HCN and Dioskorin, and a change in texture to become very soft (Erinda, 2021). Gadung can be prepared by slicing it thinly, washing it with clean water, boiling it several times in salt water, or soaking it in running water (Agustina, 2014).

The information obtained is based on observations in Beru Village, Jereweh District, West Sumbawa Regency (KSB), namely that the community still does not use local plants as alternative food ingredients. One of the local plants in the village is gadung tuber (Dioscorea hispida), a local food plant found in the Jantop Jereweh rice fields during the dry season. The processing of gadung tubers has been traditionally done and consumed only for personal use. The local wisdom of the Jereweh community is evident in the continued traditional processing of gadung tubers. However, further innovation is needed by introducing more effective processing variations to reduce the level of HCN (hydrogen cyanide), making it safe for consumption.

The locally produced food items on a small scale at home are still questionable in terms of safety for public consumption. Therefore, this research suggests the need for laboratory tests to determine the HCN levels in gadung tubers found in the mountainous areas of Beru Village, Jereweh District. Additionally, the Biology Education study program at FKIP Cordova University lacks teaching materials in the form of modules related to the processing of gadung tubers, originating from the local potential of the West Sumbawa district. The hope is that these materials can be utilized in the learning process in the future. Based on these considerations, the research team is interested in conducting a study on the indigenous knowledge of the Jereweh community in reducing HCN during the processing of gadung tubers (Discorea hispida) as teaching materials for students.

Based on the above background, the objectives of this research are firstly to find out the community's indigenous knowledge in processing gadung tubers (Dioscorea hispida) and to look for processing variations that effectively reduce HCN levels. Secondly as teaching materials in the form of environmental knowledge modules for Biology Education students at FKIP Cordova University.

Method

The research used in this research uses experimental methods. This research used four core stages, namely surveys and interviews with the people of Beru village, Jereweh District, West Sumbawa Regency, compiling an observation sheet on the processing of gadung tubers, carrying out practical activities with the Besi Sora Jereweh women's group and with two students from the Biology Education Study Program, FKIP, Cordova University.

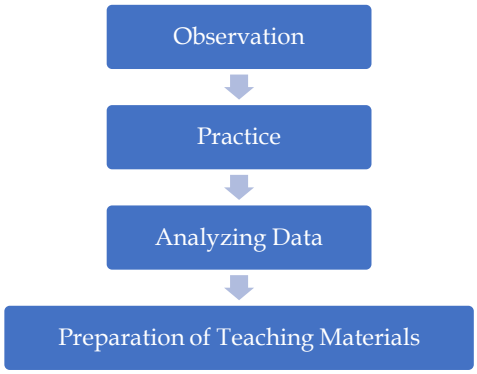

Figure 1. Research flow

The stages of processing gadung tubers in reducing the HCN content are that the tubers are peeled, washed with clean water, sliced according to stick size, and then soaked in salt water for 24 hours without stirring to remove HCN. There are two treatments for soaking gadung tubers by adding 100 grams and 300 grams of salt for 2 kg of gadung tubers.

Next, the tubers are drained, sprinkled with ± 30ml and 60ml of Jatropha juice, rewashed with clean water, dried in the sun until completely dry, then fried and made into a food product, namely local village gadung sticks. Beru, Jereweh District. From the steps that were carried out, it was found that the most effective variation in reducing the HCN content was administering 300 grams of salt and ± 60 ml of jatropha juice for 2 kg of sliced yam tubers. The research data is used as a basis for compiling modules that the Biology Education Study Program students will use at FKIP University of Cordova after the validation stage.

Result and Discussion

Validation data for the assessment of module preparation obtained from validators 1 and 2 used two criteria, namely the module's construct or design and the module's content or material, as described in Figure 1.

The validation results carried out by two validators were in the sufficient category, with an average value of 67.5%. However, the data has been revised or revised. Aspects that need to be improved are that the accuracy of the reference description is still lacking, and the size displayed on the module is not proportional. There are still parts in the gadung tuber processing module that

give rise to double interpretations; the rules for using the module need to be further supplemented to be appropriate, and the sentences in the module still need to be clarified.

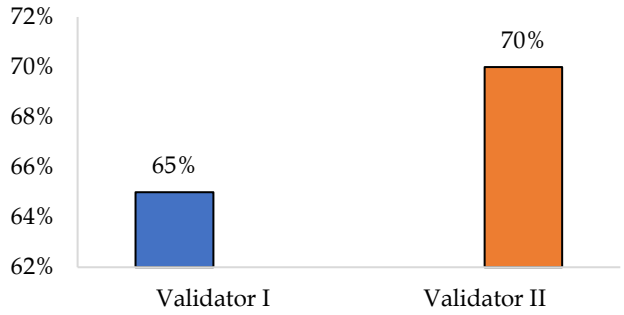

Figure 2. Results of validation I of module preparation

The results of the two validators after revision are explained in Figure 3.

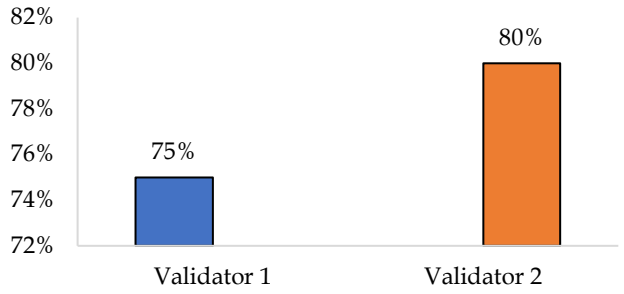

Figure 3. Results of validation II of module preparation

After two validators carried out the revision process, the validation data increased by 77.5%. This data has improved compared to the validation results in Figure I. The validation results in this category show a good category.

Documentation of data collection activities in the field by research teams, students, and groups of women processing gadung based on indigenous knowledge in Besi Sora Hamlet, Beru Village, Jereweh District, as follows:

Figure 4. Observations and Interviews

Figure 5. Collecting Gadung tubers on Mount Jantop

Figure 6. Gadung tuber processing practices

Figure 7. Slicing Gadung tubers

Figure 8. Watering jatropha leaf juice with water

Figure 9. Drying gadung tubers

Figure 10. Frying gadung tubers

Figure 11. Packaging of gadung sticks

The environmental knowledge module in the processing of gadung tubers (*Dioscorea hispida*) that was developed has gone through the assessment and revision stages of the validator and meets all the requirements to be used effectively. Comments and suggestions from Environmental Knowledge material experts when validating can help expand the material, clarify the material, and clarify learning objectives (Irmawati et al., 2016). Module revisions from expert validation are also carried out so that the module is ready for use by students (Septianita et al., 2023).

Aspects of the appropriateness of content learning modules have been checked to ensure that the material presented is by the material that has been determined and achieves the learning objectives (Wahyudi et al., 2022). The opinion Purwanto (2022) is that developing teaching modules requires minimum components such as general information, core components, and attachments. Language aspects, correct and practical sentence structures, and the information conveyed are straightforward and easy for users of the teaching module (Wulandari et al., 2023). This means that this module not only contains relevant material but also ensures that the material meets all curriculum criteria. Learning modules ideally contain lesson material and also work activities carried out by students (Nora et al., 2023), so that they are useful for independent learning (Hasbie et al., 2023; Matsun & Saputri, 2020), improving science process skill and student learning outcome (Yusra et al., 2021), creativity (Eurika et al., 2023; Susanti et al., 2020), and decision-making skills (Fadha et al., 2023; Saputra et al., 2023).

Gadung tubers, which are often overlooked, have great potential to be processed into delicious foods such as chips and gadung sticks. Gadung sticks are a savory snack made from thinly sliced gadung tubers that are then fried until crispy. Making sticks from gadung tubers can be an economically valuable product (Putri et al., 2020). High-yielding wild yam species (*Dioscorea* spp.) are essential to the tribe's diet, nutrition, and financial security (Sahoo et al., 2023).

Making gadung sticks begins by mixing gadung with wheat flour according to the treatment, tapioca flour, salt, margarine, and eggs until homogeneous (Putri & Hersoelistyorini, 2019). Low levels of amylose in flour have high levels of amylopectin, which have the property of stimulating the puffing process so that the food products produced are crunchy, light, porous, and crunchy (Hersoelistyorini et al., 2015). Additionally, *D. hispida* tuber starch was employed as a food ingredient. By processing it into glucose syrup and oligosaccharides prebiotic, it can be further valued (Ahmad, 2021).

Conclusion

The conclusion of this research is that the validation results of the environmental knowledge module are an average of 77.5%, categorized as good. The most effective variation in reducing HCN content is through the addition of 300 grams of salt and the use of squeezed castor leaves juice, resulting in safe-to-consume gadung sticks.

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Author Contributions

Supervision of the research process, F.R.; Observation, F.R.; Data Analysis, F.R.; Drafting module, F.R.; Seminar on research results, F.R.; Creating research instruments, A.A.; Interviews, A.A.; Documentation of research activities, A.A.; Drafting articles, A.A. This research is funded by the Ministry of Education, Culture, Research, Technology, and Higher Education in the fiscal year 2023.

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Conflicts of Interest

The author declares that there is no conflict of interest regarding the publication of this article.

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