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PROTEIN ANALYSIS OF SAGO GRUB BASED ON INSTAR LARVAL STAGES

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Abstract

Human protein needs could be obtained from animal or vegetable. Sago grub (sago worm), a larva stage of Sago Palm Weevil (*Rhyncophorus ferrigineus*), has been usually consumed by local communities in Luwu Raya as protein source. The weevil larva hatch from eggs, the turn into first, second, third, fourth, fifth and sixth instar larval stage, before continued to pupa stage and at last as adult palm weevil. The objective of this research were to determine the average length and weight of sago grub in various instar larval stage, and to determine total protein content in various instar larval stage by using kjeldahl method. The results showed that the highest levels of total protein obtained at the third instar larval stage (12.04%) and the lowest in the first instar larval stage (8.02%). Total protein will be decline after the third instar larval stage for the proteins used for pupation in the process of metamorphosis.

Keywords : *sago grub, total protein, instar larva stage, Rhynhcophorus ferrugineus*

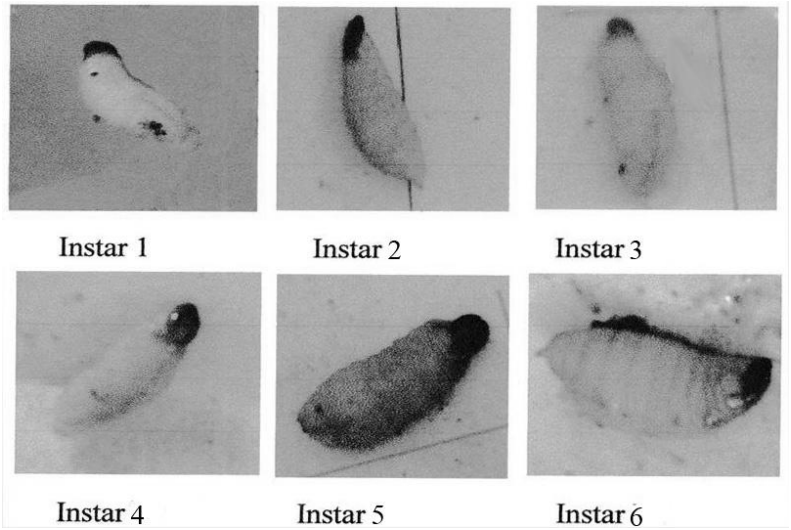
Background

Sago palm (*Metroxylon sago* Rottb.) is a tropical plant that are often found in Luwu Raya area. Traditional sago processing generally leaving waste such as sago trunk. In that decaying sago palm trunk, we could find sago grubs (sago worms) as they feed on starchy pith inside. These sago grubs were derived from eggs of sago palm weevil (*Rynchophoru ferrigineus*) which is hatch into larvae. In Indonesia, sago grub has not been commercially exploited, but the local people in Luwu Raya utilize sago grubs for consumption. Similar thing was done by the people of Papua and Maluku who seek sago processing as their main revenue.

Sago grubs contain high protein that could be used as feed. Based on proximate analysis, sago grubs contains of 13.80% protein, 18.09% fat and 64.21% water (Wikanta,2005). Purnamasari (2010) said that the crude protein content in Papua's sago grubs (*Rhynchophorus bilineatus*) depends on variety of sago and it' growth place.

Sago grubs were harvest 30-40 days after the trunk is cut. Harvesting period is closely related with sago palm weevil life cycle which is starting from the egg, then first, second, third, fourth, fifth and sixth instar larval stage, followed by a pupa stage until later becomes imago and adult weevil (Bustaman, 2008).

Masna (2014) mentioned that the development of first to sixth instar larval stage have a variety of shapes and morphological characteristic. At the first instar larval stage head is starting to appear and has segmented body texture. At the second instar larval stage the head is blackish brown, then turn into brown and also has downy feathers in the third instar larval stage. At the fourth instar larval stage the head become dark brown, then 0.2 cm antenna began to appear at the fifth stage. Finally at the sixth instar larval stage the body becomes oily and bigger (Picture 1.)



Picture 1. Sago grub instar larval stage development (Masna, 2014)

Instar larval stage plays an important role for harvesting sago grubs. According to Edrus & Bustaman (2007), the right time to harvest sago grubs was at fifth or sixth instar larval stage, which at that stage the size of sago grubs were large enough. But so far, there is no data that reveals protein content in each instar larval stage. This study aims to determine average weight and length of sago grubs on each instar larval stage following their crude protein content. Hopefully, through this study can provide an overview of instar larval stage with the highest protein content in sago grubs.

Method

Sample Measurement of Sago Grubs

Sample of sago grubs were taken from the harvested sago trunk. Each sample was separated into instar larval stage refers to research conducted by Masna (2014). Each instar larval stage consist of 5 sago grubs. We then measured the weight and length of sago grubs, and calculated the average weight and length for each instar larval stage.

Analysis of Protein Content of Sago Grubs

Samples to be analyzed were dried in an oven at 27°C for 24 hours. Further analysis of protein content was using Kjeldahl method (Sudarmadji *et al.*, 1984). Difference in number of samples and blank titration is the equivalent amount of nitrogen. Then percentage of nitrogen were calculated by this following formula

$$\%N = \frac{(ml\ HCl\ Sample\ -ml\ Hcl\ blank\ )x100\ x\ 14{,}007}{sample\ \ weig\,ht\ (mg)x\ 1000}$$

Furthermore, protein percentage were calculated with formula:

% protein = %N x 6,25 (conversion factor)

Result and Discussion

Average size of sago grubs at different instar larval stage was presented in Table 1. The average length and weight of sago grubs in each instar larval stage were increased in accordance with the stages of growth. In first until the sixth instar larval stage only experiences no significant increase in length. Similarly, the average of weight of sago grubs also not significant.

Table 1. Length and weight of sago grubs at each instar larval stage.

Instar stage.	Average length (cm)	Average weight (gram)	Crude protein (%)
1	2.5	1.0	8.02
2	3.2	2.0	8.34
3	3.3	2.3	12.04
4	3.4	3.0	9.60
5	3.9	5.0	6.54
6	4.4	6.0	7.16

Crude protein content on sago grubs has increased from first instar larval stage through third instar larval stage, but then decreased in the fourth instar larval stage. Results of analysis of variance showed no significant difference in crude protein content. In this research, data showed that the highest protein content was found in third instar larval stage, amounting to 12.04%. This is in line with research conducted by Istalaksana (1994), in which the protein content of wet sago grubs reached 11.47%, while Wikanta (2005) mentions the protein on sago grubs approximately 13.80%. Protein in the larval body was used in the growth process (Bustaman, 2008). That was a structural protein that was needed in the formation of body tissues of larvae. The protein will also be used to form hormones and catalytic enzymes needed in the process if metamorphosis (Purnamasari, 2010).

Based on this research, to get a high protein it recommended taking sago grubs in third instar larval stage, where size is approximately 3.4 cm with a weight of 2.3 grams. Bustaman (2008) suggested harvesting sago grubs in fifth or sixth instar larval stage, where in that stage the sago grubs have greater weight. In addition to protein, the sago grubs also found to contain high fat and carbohydrate nutrients such as fiber (Omotoso & Adedire, 2007).

Sago grubs prospective as a source of animal protein is large enough, either for direct consumption by humans or used as animal feed. Utilization of sago grubs as feed cal also help to reduce pests in sago palms and other plam tree (Hastuty, 2016). Although entomophagy (the consumption of insects by human for food) already being done in some areas (especially in tropical and sub-tropical region where there is a diversity of large insects that are suitable for eating) (van Huis, 2013), it takes effort to provide knowledge to the general public about the nutritional content of sago grubs, and also to commercialize it. Cooking sago grubs in creative ways, and perhaps developing a catchy marketing name, may enhance marketability and acceptance as food.

Conclusion

Protein level in sago grub varies according to instar stages. The highest levels of total protein obtained at the third instar larval stage (12.04%) and the lowest in the first instar larval stage (8.02%). Total protein will be decline after the third instar larval stage for the proteins used for pupation in the process of metamorphosis.

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