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EFFECTIVENESS OF TAJIN WATER (RICE-WATER) AS A COUPLING FOOD TO IMPROVE WEIGHT BOARD (*Mus musculus*)

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Abstrak. Malnutrition can occur on children of aged 6 to 24 months. During this period, there is generally a change in needs from exclusive breastfeeding to complementary foods and additional food can also be added. Starch water which is a springy white liquid obtained from rice that is cooked with the nutritional content of energy, protein, fat, carbohydrates, calcium, iron, vitamin B1. This study aims to test the effectiveness, determine the best concentration and determine the influence of the length time from using of starch water as an additional complementary food to increase body weight of male mice (Mus musculus) for 21 days by oral treatment. The experiment and method that used in this experiment is was pretest-posttest control group design. Starch water is obtained by means of rice being heated with 1200 mL of water for ± 30 minutes, filtering and extracting is obtained. Starch water concentrations commonly used empirically tested in this study are concentrations of 12.5%; 18.7%; 25%. The 25% concentration is the concentration that has an effective effect on body weight of mice with the results (21.87 ± 4.29) which differ 2.38% from the positive control results (24.25 ± 8.93).

Keywords: tajin water; mice; rice; body weight

I. INTRODUCTION

In infants when the baby's nutritional needs are not fulfilled by breast milk, additional foods are needed that complement breast milk complementary foods (MP-ASI) and must be given. Malnutrition can occur in children aged 6 to 24 months, and at this time there is generally a change in needs from exclusive breastfeeding to complementary foods and can also be added additional foods. However, additional foods added to complementary foods do not replace the role of breast milk. The influence of the development of the function of the Nervous System, Gastrointestinal Tract and Kidneys can be a success factor in complementary feeding (Soedibyo and Winda, 2007). WHO recommends that in infants aged 6 months the infant diet should be increasingly integrated with a healthy intake, Pediatric Gastroenterology Hepatology and Nutrition (ESPGHAN) recommends the consumption of complementary foods not consumed earlier (17 weeks) nor consumed more than 26 weeks (Carletti. et al., 2017).

The use of tajin water in the community is due to the high price of milk for some people, as well as the problematic production of breast milk in some women. In patients with lactose allergy (lactose intolerance) or cow's milk allergy sufferers, starch water can be used by infants because there is no lactose content or cow's milk protein (casein) (Hasanah and Yunita, 2018). The positive control used was Alpha-PSP (Polysaccaride-peptide). This finished product has various contents needed in body growth including protein, fat, carbohydrates, vitamin B1, minerals in the form of zinc, also there are amino acids (Macrofood, 2006). This study aimed to test effectiveness, determine the best concentration and determine the effect of the length of time from the use of starch water as an additional complementary food to increase body weight of male mice (Mus musculus) for 21 days with oral treatment

II. RESEARCH METHODS

Material Deception

Determination made on a plant aims to find out the fact that the plants used in research are true. Rice plant (Oryza sativa L.). The determination used for this research was carried out at Herbarium Bogoriense, in the field of Botany of the Biology Research Center-LIPI Cibinong. Form of experimental research design with the method used pretest-posttest control group design with selected designs that can be used by this research to evaluate manipulation or obtain and test hypotheses that have been proposed experimental research designs (Valente and Mackinnon, 2017)

Tajin Water Making Procedure

Making starch water using 1200 mL of water is put into a pot with a diameter of 17 cm. Rice weighed according to the concentration used, tajin with a concentration of 12.5% weighed 40 g of rice, tajin with a concentration of 18.7% weighed 60 g of rice, tajin with a concentration of 25% weighed 80 g of rice. 3 comparisons of rice use used for one experiment were used. Then, put in a pot of water, cooked rice to boil ± for 30 minutes then filtered. Thus, a filtrate is

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obtained in the form of starch water and is ready for use. From 1200 mL of starch water is brought to a boil until 320 mL of liquid is obtained. 5 g of boiled rice water is put in the kjeldahl flask, plus 0.5 g of Se and 35 H2SO4 are extracted for 2 hours. After 2 hours, it is cooled, diluted with aquadest to 250 mL and added 45% NaOH until the solution is alkaline and distilled. Distillate is accommodated in 25 mL H3BO3 3% which has been added mixed indicators (methyl blue and methyl red) and titrated with HCl 0.1 N. (Barus, 2005)

Testing of Moisture Content and Ash Content of Tajin Water

The calculation of water content is obtained from the difference in weight before and after heating by evaporating water from the material using heating to weight constant, until all volatile water is exhausted. Calculated using the formula (Kiay. et al., 2019): % Moisture content = ((cup+ fill before heating)-(cup+fill after heating))/(starting weight) x 100% The ash content is obtained by weighing 2 g of material in a platinum dish that has been dried using a bunsen heater until it no longer emits smoke. Platinum cups containing charcoal material are then put into a 600-temperature kiln°C until the ashing process is complete. Platinum dishes filled with ash are cooled in a desiccator and weighed until they reach a fixed weight. Calculated using the formula (Kiay. et al., 2019): % Ash content = (Cup+Ash - Empty cup)/(weight of material) x 100% .

Tajin Water Content Testing

Carbohydrate levels are obtained by calculating not done carbohydrate analysis, carbohydrate levels are calculated by the formula: % Carbohydrate = 100 % - % (water + ash + lipid + protein). Carbohydrate levels obtained in a way without analysis are called " carbohydrate by difference", calculation of carbohydrate levels with this method is already quite adequate and acceptable (Kiay. et al., 2019). Fat content was obtained by means of 2g of water-free material extracted with hexane organic solvent in a soxlet device for 6 hours. Examples of extraction results are evaporated by aerating and dried in an oven at 105°C. The material is cooled in a desiccator and weighed until a fixed weight is obtained. Calculated by formula (Santi. et al., 2012): % Fat Content = ((Fat Cup + Fat Extract)-Empty Cup)/(Material weight) x 100%. Determination of Ca and Fe mineral levels. 344 mL 65% w/v HNO3 solution was diluted with 1000 mL of distilled water. Then, 50 g of boiled rice water is put into a porcelain dish and dried in the oven at 100 – 105°C. Then, it is cooled in a desiccator for 30 minutes. The dry sample was put into the furnace at 450°C for 5 hours and the ashes were added with 10 mL HNO3, heated on a hot plate for 15 minutes and filtered. The filtrate was diluted in a 50 mL measuring flask, pH 2 – 3 regulated with NH4OH and analyzed with an Atomic Absorption Spectrophotometer (SAA). (Barus, 2005).

Determination of vitamin B1. Carefully weighed ± 5 g of rice cooking water, put in a 100 mL erlenmeyer. Added 50 mL HCl 0.1 N, then shaken. Heat on a water bath at 95-100°C for ± 60 minutes. Then, it is cooled at room temperature. Then, the pH of the sample solution is adjusted to 4.5 with the addition of 2M sodium acetate. A sample solution was inserted in a 100 mL measuring flask quantitatively and diluted to the tera mark with distilled water. Whipped until homogeneous. Then, it is filtered with Whatman No. 42 filter paper and the solution is ready to be injected into HPLC. Before injection, base line inspection is carried out by injecting a blank solution. Then, a standard solution is injected and a sample solution is injected (Sims & Shoemaker, 1993).

Treatment of Test Animals

After testing the material, the treatment was carried out with 5 treatments and 5 repeats on test animals. Exposure to test animals was given for 21 days. The treatment group consisted of negative control (K-) in the form of treatment with test material (aquadest), positive control (K +) in the form of treatment with alphameta preparations on the market and clinically proven to affect body growth, dose orientation using starch water was carried out with 3 doses based on empirical doses. The table of treatment groups can be seen in Table 1.

Table 1. Treatment Group

Treatment	Concentration and Control
Positive Control	Alphameta 0,8 mL
Control Negative	Aquadest 0,8 mL
Concentration 12,5%	Rice 40 g tajin water 0,8 mL
Concentration 18,7%	Rice 60 g tajin water 0,8 mL
Concentration 25%	Rice 80 g tajin water 0,8 mL

After oral tajin water treatment was carried out for 21 days with 3 different concentrations, A1 was the treatment group with the same 40 g rice weight with a concentration of 12.5%, A2 was the second treatment with the same 60 g rice weight with a concentration of 18.7%, and A3 was the third treatment with the same 80 g rice weight with a concentration of 25%. The test animal used was a 4-week-old male Mus musculus mouse, without anatomical defects, obtained from the IPB Pathology Laboratory. Test animals were kept with a density of 4 heads/cage. The experimental animal treatment was acclimatized under laboratory conditions for 5 days to adapt the test animals to environmental conditions. Feeding is given as much as 3-4 g (Tolistiawaty. et al., 2014) and drinking is carried out ad libitum. The feed given is standard feed BR 594 (Mardiati and Sitasiwi, 2016). Body weight can also be used as a parameter of body growth in experimental animals and weighing is carried out to determine the development of experimental animals in this study. Animal weighing is carried out every 7 days for 21 days. On day 0; 7; 14; 21 Weighing was carried out at the time of tajin water sampling treatment, before treatment and after acclimatization, during tajin water sampling and after tajin water sampling treatment.

The parameter measured was the increase in mouse body weight during the treatment period. The test was carried out using a "gavage or sonde" needle because the treatment was given orally with a volume according to the empirical dose orientation in test animals. The treatment is carried out in the morning for 21 days in a row. Measurement of mouse weight is carried out every 7 days. Data analysis was

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performed to compare the best concentrations that can be used as growth in male mice (Mus musculus). The data obtained were analyzed by fingerprint analysis to obtain a conclusion about the effect of tajin water on the body weight of male white mice. Thus, the data obtained were analyzed with a 5x4 Factorial Group Random Design (RAK) fingerprint analysis pattern, with 5 dose level factors and 4 treatment factors. The treatment design carried out in this study consisted of two treatment factors, namely the tajin water comparison group consisting of 3 levels, namely 12.5%; 18,7%; 25% starch water concentration and duration of administration. Factorial Group Random Design (RAK) fingerprint analysis data.

III. RESULTS AND DISCUSSION

The results of the examination of starch water produced organoleptically showed that the starch water produced from 1200 mL of starch water was boiled until a filtrate of 320 mL was obtained from each concentration. The resulting starch water has a texture according to the concentration of rice used at a concentration of 12.5% liquid texture; 18.7% slightly viscous texture; 25% has a slightly viscous texture. The color of the resulting tajin water is white, has no taste and has a distinctive aromatic smell.

Figure 1. Tajin Water

Determination of Tajin Water Content

Determination of starch water content shows different results at each concentration, where all tests show positive presence of protein, carbohydrates, vitamin B1, and minerals (Ca and Fe). This biochemical test provides the same results, in the form of a picture of the existence of these contents with research conducted by Barus, (2005). Determination of starch water content. Carried out includes water content, ash content, determination of the presence of proteins, fats, carbohydrates. Determination of the ash content of tajin water is carried out by direct method graying. The principle of this method is to oxidize all organic substances at a high temperature of 600 ° C and then weigh the substances left behind after the ashing process (Rahmawati., et al. 2015).

The percentage of ash content in tajin water obtained at a rice concentration of 12.5% g is 0.1%; 18.7% at 0.2%; 25% by 0.3%. So that the average percentage of tajin water ash content obtained is 0.2%. Ash measurement is the residue of the combustion of organic matter in the form of inorganic substances. Ash content testing is carried out, because the ash content results can provide an idea of the mineral content in this starch water, with the principle that the sample is heated. So that organic compounds and derivatives evaporate and only mineral and inorganic elements are left behind (Irsyad, 2013).

The percentage of ash content in tajin water obtained at a rice concentration of 12.5% g of 0.1%; 18.7% of 0.2%; 25% of 0.3%. So that the average percentage of tajin water ash content obtained is 0.2%. Ash content testing is carried out, because the ash content results can provide an idea of the mineral content in this starch water, with the principle that the sample is heated. So that organic compounds and derivatives evaporate and only mineral and inorganic elements are left behind (Irsyad, 2013). Determination of the ash content of tajin water is carried out by direct method graying. The principle of this method is by oxidizing all organic substances at a high temperature of 600°C, then the substance is weighed. Determination of the moisture content of tajin is carried out in a direct way. The calculation uses the weight of fresh material with the cup before heating minus the weight of the material and the cup after heating divided by the initial weight of the material multiplied by 100% to get the percentage of moisture content tested. The percentage of water content in starch water obtained at a concentration of 12.5% is 97.0%; 18.7% at 96.8%; 25% by 96.5%. So that the average percentage of tajin water ash content obtained is 96.7%. In a material measuring water content is very necessary, high water content can show the potential growth of fungi on a material that has an adverse impact on health so that a decision can be made to be required to do the addition of additional ingredients such as preservatives in these materials to extend the resistance time in materials or products (Irsyad, 2013). The protein yield of starch water with a concentration of 12.5%; 18,7%; The 25% obtained is low enough to meet the protein needs in toddlers >6 months by 9-14% (Hardinsyah et al., 2013). Proteins have elements C, H, O, and N that fats or carbohydrates do not have. Fat content in starch water at a concentration of 12.5%; 18,7%; The 25% obtained is 0%. Because the presence of fat in rice is around 1.74% (Kiay. et al., 2019). The results obtained are very far from the recommended proportion of fat in toddlers >6 months, which is 45% (Hardinsyah et al., 2013). Calcium is the main element of bones that is useful as an important element and is needed for blood clotting, sensors, transmission sensors, bone formation and muscle. In animals, even low calcium can lose weight caused by energy restriction (Ismail and Qahiz. 2016). The calcium content contained in tajin water concentration is 12.5% which is 1.24%, the concentration is 18.7% which is 1.33% and at a concentration of 25% which is 1.35%. The results of calcium levels obtained are proven to be quite small compared to the number of calcium adequacy in toddlers >6 months, namely 3% or 200 mg / 6KgBB (Ministry of Health RI, 2013).

Vitamin B1 in starch water concentration 12.5%; 18,7%; The 25% obtained is <0.25%. Low levels of vitamin B1 due to the ratio of the concentration of rice used with water is large enough to affect the amount of vitamin B1 in the starch water used. Meanwhile, Vitamin B1 is essential for all organisms where vitamin B1 is a coenzyme that has a broad

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impact on energy metabolism (Hsieh. et al., 2017). Iron levels produced from tajin water concentration of 12.5% which is 0.14%, concentration of 18.7% which is 0.20% and at a concentration of 25% which is 0.60%. Meanwhile, iron needs in infants >6 months amounted to 0.5 mg / 6KgBB used per day (KEMENKES RI, 2013).

Treatment of Test Animals

The experimental animals used were mice with a male Deutschland Denken Yoken (DDY) strain aged 3-4 weeks. Test animals were kept with a density of 4 heads/cage. The acclimatized first in laboratory conditions for 5 days. Feeding is given as much as 3-4 g (Tolistiawaty. et al., 2014) and drinking is carried out ad libitum. The mice used were given BR594 type feed as previously conducted by Mardiati and Sitasiwi, (2016). Then, a body weight measurement was carried out on day 7; 14; 21 to determine the development of body weight in mice. The test results showed a significant change ($p<0.05$) in the body weight parameter as seen from the results of the wallis crucial test. In this study, the fingerprint analysis used was a factorial group random design (RAK) on the grounds that there were 2 treatment factors in the study and among the 2 treatment factors it was suspected that there was interaction, as well as the time of the study conducted for more than 1 day. The following is a table of the average body weight values of male white mice for 21 days.

Description: Average values followed by different superscript letters in the same column and row showed a markedly different effect ($p<0.05$). From the average body weight measurement of the group, it showed that the average body weight measurement for 21 days was highest in the positive control at 24.25±8.93 g, the concentration of the test group was 2.38% different from the positive control results was found at a concentration of 25%, which was 21.87±4.29 g. This can happen because the difference in the amount of content contained in the positive control is better with the manufacturing process that has been well arranged by experts so that a greater increase in body weight occurs and from the test group from the average positive control results get a weight on the last day of 35.77±1.16 while at a concentration of 25% the results on the last day show a body weight figure of 26.03±0.84 g. The weight on the last day of mice showed a normal number of weight increases for positive control where the normal weight of mice aged 5-7 weeks was 30-50 g (Susanna, et al. 2017). However, at a concentration of 25% it has a number that is still below the normal weight of mice.

In the results of data analysis using SPSS with the wallis crucial test, the results of the analysis on the treatment of the resulting value at a concentration of 25% were not significantly different from the positive control on the influence of the group. Weight gain runs normally if the intake used contains food substances in good quality and quantity (Muliani, 2011). The increase in body weight that occurs is also influenced by the age of the test animal and the process of converting intake into meat goes well which makes the growth rate (weight gain) will be better (Maeda et al., 2019).

The results of statistical analysis using the kruskal wallis test effect on treatment time showed significantly different results from body weight between treatment times. Day 21 was the last day of weight gain measurements and showed the results of weight gain in positive controls that were significantly different from other groups. The results of statistical tests of influence between treatment groups with treatment time showed that the concentration was 12.5%; 18.75% and 25% showed significantly different results at each time. Then data analysis of the effect of body weight differences between treatment groups with treatment time using SPSS was carried out.

Description: Average values followed by different superscript letters in the same column and row showed a markedly different effect ($p<0.05$). The results of the crucial wallis statistical test using SPSS were carried out to draw conclusions from data analysis that showed the effect of the difference between treatment groups and the time of treatment with the result that the difference in positive control body weight was significantly different from the increase in body weight in the difference in negative control body weight and did not differ significantly from the three test concentrations (12.5; 18.75; 25%). Meanwhile, the difference in body weight growth at each time of treatment is different, growth will run normally if the food substances used are of good quality and quantity, because if the test animal lacks nutrients then. The growth rate will also be hampered (Muliani, 2011). Here is a graph of the increase in body weight in mice during the treatment process: The graph shows that the positive control experienced a significant increase in body weight at week 3, followed by a concentration of 25% below which experienced an increase in body weight that was not much different from the positive control.

IV. CONCLUSION

It can be concluded that the provision of starch water with a concentration of 25% can be used as complementary food to increase body weight in male mice

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