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The Regional Distribution Map of Carbohydrate Producer and the Feed Material Quality of *Vannamei* Shrimp in South Sulawesi

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Keywords: fructose, glucose, carbohydrates, feed, starch, *vannamei* shrimp

Abstract. Shrimp needs a high protein of feed to get a maximum growth. Generally, the optimal growth of shrimp will be reached when protein content up to 40 – 50%. But in other side, when the protein substance in a feed is too high, it may decrease the water quality of cultivation media. One of ways that can be done is minimize a feed protein content and change it with carbohydrates in high protein so that, the energy from protein sources can be used to maximize a growth but the energy just for metabolism and the activity is gotten from carbohydrates. It is needed to know the production of potential area for providing carbohydrate material source of shrimp feed in South Sulawesi. Based on the research result, there are five regencies which the highest producer of carbohydrates that takes from paddy field, paddy of unirrigated field, sweet potato, and cassava. They are Bone, Wajo, Gowa, Pinrang and Sidrap, while for corn carbohydrates comes from Jeneponto, Gowa, and Bantaeng. Luwu regency, North Luwu, East Luwu and Palopo are sago producer in South Sulawesi. The result of laboratory testing shows that sweet potato flour has a highest glucose and fructose content about 4.49% and 4.23%. The highest starch content can be gotten at soft corn flour about 59.81% then followed by pulverize rice about 57.58%, and also the tapioca flour about 57.06%.

Introduction

Feed is one of the strategic component that can determine the success of business in *vannamei* shrimp cultivation intensively at a fishpond. It almost 60 – 70% of the total cost of production uses for buying feed [10,11]. But recently, the cultivation activity of this commodity got failure. There are many causal factors of it. One of its factors is unsupported cultivation media and the cultivation technology is not suitable with waters sources including the less of feeding technology. The decrease of cultivation quality is because of the high organic material that comes from unconsume feed or high protein content of feses then it will cause massal death [3,13,20,21].

The accumulation of material organic-N is about 4.47 g/m²/day in shrimp cultivation intensively but the accumulation of material organic -N which far from embankment cultivation is about 0.025 g/m²/day [5,15]. One of the ways to solve the problem above is making a safe environment cultivation activity. It means that feeding feed with lower protein.

Protein is the highest component and the most expensive of shrimps feed than the other feed supplement. It is needed for *vannamei* shrimps growth about 40 – 50% [16,17,18]. Some of feeds which its content about 28 – 41% are sold in South Sulawesi [8,14]. But the using of it that is too high will cause the high production cost of feed and waste and also decrease the water quality. Therefore, its content in a feed must be limited, it is optimized only for the growth of shrimp, while the energy necessity includes carbohydrates is fulfilled from the less expensive another source [6,19].

Nowadays, it is not much the research which talking about the regional distribution map of carbohydrate producer as the feed material of shrimp and so does the research about carbohydrate material quality in South Sulawesi although it is an important information for choosing the right material in making the feed. Based on the explanation above, then this research is needed to do.

Methodology

Time and Place. The research held on April till October 2015. It divides on two steps. The first step is the regional survey of carbohydrate material producer and the next step is the analysis and chemical test at Feed Chemical Laboratory of Animal Husbandry Faculty, Hasanuddin University.

Instrument and Material. The instrument and material that were used in the research are as follows:

Table 1. The instrument and material and theirs function

No.	Instrument/Material	Function
	<i>Instrument</i>	
1.	Digital Camera	As the media for taking pictures
2.	Digital map of earth in the scale about 1:250.000	For making map
3.	Digital weights	For weighing the material of chemical testing
4.	Laboratory	For chemical testing of feed material
	<i>Material</i>	
1.	Carbohydrate	Material testing to be analyzed
2.	Chemical substance	Chemical testing media of feed

Procedure. The survey was done for collecting date of carbohydrate material production in South Sulawesi. The data was collected then it was compiled and arranged based on statistic data from South Sulawesi book in Numeral [4]. The researcher used digital map of earth in scale about 1:2.500.000 for making the regional distribution map of Carbohydrate producer.

Laboratory research was done for testing the chemical substance of the materials which consists of glucose, fructose and starch testing. The chemical observation of carbohydrate used Luff method.

Material preparation. In this research, the researcher provided flour from many of carbohydrate's sources such as corn, cassava, sago, and sweet potato flour which used for chemical testing of feed. There are many preparation steps in making the flour. It began from cleaning step, peeled, slicing, drying, till the process of making flour.

The flouring production from the material was separated based on its variety then it was tested in the laboratory for the glucose, fructose and starch testing.

a. Determine the glucose content.

Weigh more or less 5 ml of sample in a retort 100 ml. Put 50 ml of aquadest, Concentrated HCl 5 ml, then heat into 68 – 70° for 10 minutes. Cool it down and neutralize with 30% of NaOH solution (with litmus or phenolphthalein). Squeeze till reach the dash of 100 ml. Drip 10 ml of filter into 500ml of Erlenmeyer, put 25 ml of luff solution (by using pipette), some of igneous rocks and 15 ml of distilled water. Heat the mixture with the fire constantly. Boiled in three minutes (Using the stopwatch, counted from the time it starts to boil and using the stopwatch) then cool it down in a place which full of ice quickly. After it is cold, put 15 ml of KI solution 20% and 25 ml of H₂SO₄ 25% slowly. Move it quickly back and forth with 0,1 N to solution (Using the directory of 0,5% starch solution). Fill in the proof sheet. The pattern using calculation is:

$$\% \text{ glucose} = \frac{\text{dilution} \times \text{titrasi volume} \times \text{mg of glucose}}{\text{mg of sample}} \times 100\%$$

b. Determine the fructose content

Weigh the solid material which has been refined or 2,5-25 of liquid material which depends on reduction in its glucose content. Move it into the retort 100ml. Put 50 ml of aquadest then put the mush of Al(OH)₃ or Pb-Acetate solution. The purifier material is put drip by drip till the drip of reagent does not cause muddy yet. After that, put the aquadest till the dash and filter it. Filtrate was collected on flask content about 200 ml to relieve overwhelming Pb and added anhydrous Na₂CO₃, K, Na-oxalate anhydrous and 8% of Na-Phosphate solution. After that add some aquadest till the mark is suit to be strain. Filtrate will pure of Pb if its add with K, Na-oxalate, Na-Phosphate or Na₂CO₃ to keep it clear. Take 25 ml of free filtrate that has about 15-60 mg of reduction sugar and then add about 25 ml of Luff-Schoorl solution in Erlenmeyer. Creating a treatment form about 25ml of Luff-Schoorl and 25 ml aquadest. After that add a few of boiling stone, then the Erlenmeyer contact to freezer before its heat again. It must be takes 2 minutes to boil it up. Maintenance the

solution boiling till 10 minutes. Next step is make it cold quickly and add 20% KI about 15 ml then we must be carefully to add H_2SO_4 26,5% about 25 ml. A clear iodine was titrated with Na-thiosulfate 0,1N solution which is uses about 2-3 ml starch indicator. For making clear of colour exchange at a last titration, we have to give a starch at the end of titration.

c. Determine the starch content

Weigh 2-5 gr exemplar of solid material that has flouring or in liquid about 250ml on the glass, and then add some of aquadest about 50 ml then stir it for 1 hour. The suspension is strained with a strain paper and washed by aquadest till 250 ml filtrate volume. The filtrate contents a late corbihydrate. When the material that containing fat, the starch that have as residue in strain paper must be clean up for five times with 10 ml ether. And then let the ether vapor from the residue, then wash it again by using 10% of alcohol about 150 ml for making carbohydrate clear. In quantitative, Residue removed from strain paper into the Erlenmeyer with 200 ml aquadest washing and add 20ml of HCl in 25%, after that shut it up by the freezer and start to heat in boiling water for 2,5hour. After the residue come cold, so the next is netralized it with 45% NaOH salution and make it become a liquid till 500 ml then strain it. Determaine the sugar content as a glucose that come from filtrate. Glucose determining seem like sugar reduction determining where it divided 0,9 weight of glucose which is mean a weight of starch.

Results And Discussion

1. The distribution map regional of carbohydrate material producer

Based on survey finding and the investigation [11] data from BPS of South Sulawesi (2014), the carbohydrate production in South Sulawesi which can be seen in the Figure 1.

Figure 1 shows carbohydrate production in South Sulawesi respectively are Wajo, Bone, and Pinrang. The three regencies distribute paddy field in South Sulawesi about 37%. The high production of their paddy field was supported by the width of production area and the technology intensification of agriculture sector. It is appropriate with [2] statement about the significant difference of the intensive, semi-intensive, and cistern of paddy field.

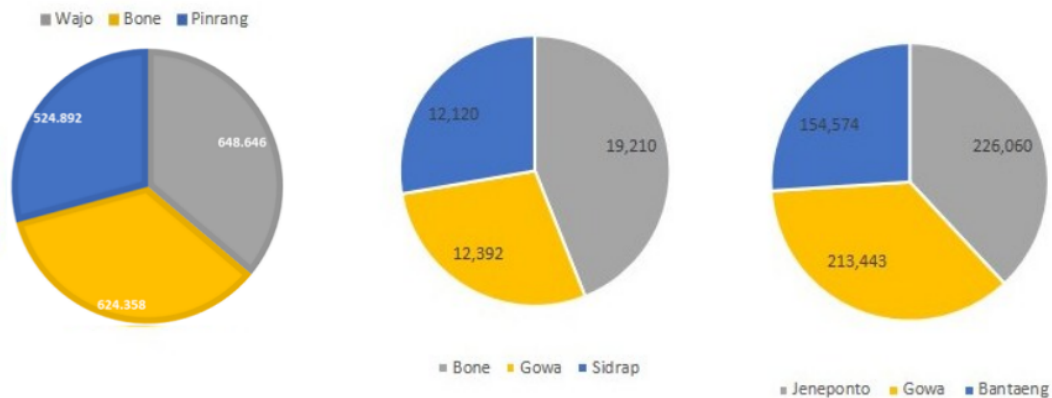


Figure 1. Carbohydrate Production (ton) in the top three regencies in Wajo, Bone & Pinrang (left)
 Figure 2. Carbohydrate Production (ton) in the top three regencies in Bone, Gowa & Sidrap (middle)
 Figure 3. The highest distribution of carbohydrate producer of corn (ton) in South Sulawesi (right)

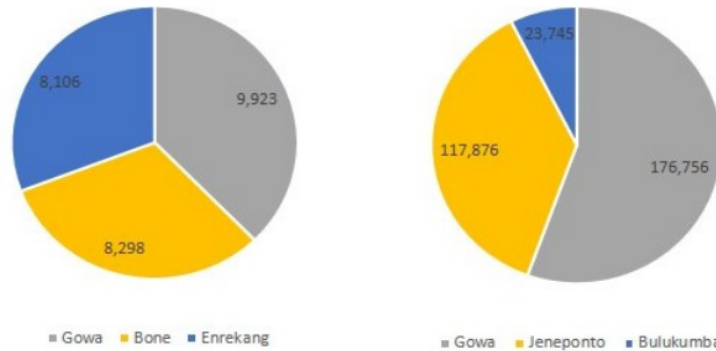


Figure 4. The highest distribution of carbohydrate producer from sweet potato (left)

Figure 5. The top three regencies which have the highest distribution of carbohydrate producer from cassava in South Sulawesi (right)

Furthermore, the regency distribution of carbohydrate producers of unirrigated field paddy are Bone, Gowa and Sidrap is shown in Figure 2 [4]. They have different characteristic in the case of area. The six regencies distribute paddy of unirrigated field about 37% in South Sulawesi.

While in South Sulawesi, the top three regencies which have the highest distribution of carbohydrate producer of corn are Jeneponto, Gowa, and Bantaeng as shown in Figure 3. They distribute corn in South Sulawesi about 47,5%. If it is looked from the growth of the corn crop area in Sulawesi where South Sulawesi is the centre of corn production so it can be concluded that in the future, it will face an obstacle in increase the crop area. It is caused by the limitation of area and the competition with another commodity especially cotton [2,12].

Figure 4 shows the top three regencies which have the highest distribution of carbohydrate producer from sweet potato are Gowa, Bone, and Enrekang. They distribute sweet potato in South Sulawesi about 37,2%. They have width of area which correlates linear with sweet potato production in South Sulawesi. According to [2] that the nutrient substance in sweet potato is the best one especially as the carbohydrate source, vitamin and mineral. A fresh sweet potato contents of much water (71,1%) and starch (22,4%) while another nutrient contents relatively are low such as protein (1,4%), fat (0,2%), and grease (0,7%) but it is also rich of vitamin A (0,01-0,69mg/100g).

Then the top three regencies which have the highest distribution of carbohydrate producer from cassava in South Sulawesi are Gowa, Jeneponto, and Bulukumba as shown in Figure 5. They have the widest crop area than other regency in South Sulawesi. They produce cassava about 73,5% from the total production of cassava in South Sulawesi. Cassava (*Manihot esculenta Crantz*) is one of local carbohydrate sources from Indonesia. A fresh cassava contents of water 60%, starch 35%, crude fibrous 2,5%, protein 1%, fat 0,5% and grease 1%. Therefore it is a carbohydrate and food fibrous although it has less nutrient content like protein.

2. Chemical testing of carbohydrate material

The chemical analysis result of carbohydrate material can be seen on the Table 2.

Table 2. Chemical testing result of carbohydrate material*

No	Material	Composition (%)		
		Glucose	Fructose	Starch
1	Pulverize rice	0,12	0,82	57,58
2	Smooth corn flour	0,12	0,35	59,81
3	Common corn flour	0,25	0,75	48,35
4	Tapioca flour	0,12	0,80	57,06
5	Sweet potato flour	4,49	4,23	47,64
6	Cassava flour	0,20	2,24	54,22
7	Wheat flour	1,32	2,34	45,25
8	Rice and bran flour	0,22	0,23	22,57
9	Sago flour	0,20	0,22	37,92

Note: *Analysis result of Chemical Laboratory of Animal Feed in animal husbandry of Hasanuddin University, August, 2015

Table 2 shows that sweet potato flour has the highest glucose content about 4,49%. Glucose is an important monosaccharides. It is used by living cell as the source of energy [9]. It is one of the photosynthesis processes on the green plant. A green plant can mould glucose of carbon dioxide and water molecule by the helping of sunray and its chlorophyll pigment [1]. It is a main component to make starch. It is a unit of polysaccharides in wheat, rice, potato, and sago. Commonly, they are the staple food in the many parts of earth [2].

The research shows that cassava flour has the highest fructose content than other materials. It is commonly sugar which can be found in vegetables and fruits. Therefore, the society considers it is safe to be consumed. Fructose itself is monosaccharides (*simple sugar*) which can be used by body as the source of energy without giving the development on the sugar content of blood by having the low glycemic index [7,9]. Most of the foods that are consumed every day have high fructose content such as softdrinks, juice, sport drinks, corn flakes, candy, jam, ice cream, crackers, milk, and also liquid cough medicine.

Table 2 also shows that pulverize rice, corn flour, and cassava flour have the high starch content up to 50%, while sweet potato flour about 48%. The high starch content of it shows that it is really appropriate as the material of feed. Starch consists of amylose and amylopectine. Amylose is a linear polisakarida and amilopektin which is split. Every starch consists of two fractions in the different comparison. The starch of Yangga (addesif) has amylose content about 20-30% [2].

Conclusion

Based on the research, there are five regencies as the highest of carbohydrate producers from paddy field, paddy of unirrigated field, sweet potato, and cassava are Bone, Wajo, Gowa, Pinrang and Sidrap and the highest corn producers are Jenepono, Gowa dan Bantaeng while Luwu regency, North Luwu, East Luwu and Palopo are the producers of sago in South Sulawesi. Chemical testing result of carbohydrate material shows that sweet potato flour has the highest glucose and fructose content than others materials while pulverize rice, corn flour, and cassava flour have the highest starch content.

It is needed to do the continuous research to formulate the shrimp feed from many of carbohydrate sources. It is used in maintaining testing of vannamei shrimp in South Sulawesi.

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