

# BIOCONVERSION OF CORN STRAW AND SORGHUM STRAW WITH *Phanerochaete chrysosporium* AND ITS EFFECTS TOWARDS LOCAL SHEEP CARCASS WEIGHT AND THE CARCASS PERCENTAGE

Sirajuddin Abdullah<sup>1\*</sup>

<sup>1</sup> University Tadulako, Palu, Indonesia

## Abstract

Bioconversion of corn straw and sorghum straw by using *Phanerochaete chrysosporium* fungus was done to improve the nutrition quality as well as the influence of corn straw and sorghum straw towards the changes of fiber components, the quality of nutrition, rumen ecosystem, and the performance of local sheep. This research was done in two trials, which were the laboratory and in field trial, using Randomized Block Design (RBD) 2 X 4 factorial with three replications. The first factor was the types of straw (corn straw and sorghum straw), the second factor was the dosage of *Phanerochaete chrysosporium* fungus inoculums (0% v/w (Pc<sub>0</sub>), 2% v/w (Pc<sub>1</sub>), 4% v/w (Pc<sub>2</sub>) and 6% v/w (Pc<sub>3</sub>)). If there was significance, then it was continued with Real Honest Difference Test. The use of inoculums of *Phanerochaete chrysosporium* fungus in real could improved the carcass weight (11,30%), and the non-carcass weight component (3,82%), carcass percentage (5,71%) but in real decreased the non carcass component (1,60%) in local sheep. There was no interaction between the types of straw with the dosage of *Phanerochaete chrysosporium* fungus inoculum towards the carcass weight, carcass percentage, the non carcass components weight and the percentage as well as the weight of local sheep carcass. Based on the effect of fermentation of *Phanerochaete chrysosporium* fungus, 6% v/w (Pc<sub>3</sub>) dosage was better as the inoculums of corn straw and sorghum straw, which were able to improved the quality of straw as feed because have enough nutrition as ration replacement for local sheep. In addition, the value of digestibility of fiber and corn straw nutrition components was better than sorghum straw after fermentation using *Phanerochaete chrysosporium* fungus, and bioconversion straw was better compared to the non bioconversion, as well as able to give a better response towards the weight and carcass percentage of local sheep.

**Key words:** Straw, *Phanerochaete chrysosporium*, Carcass, Local sheep

## INTRODUCTION

Corn and sorghum was crop plants can at the moment becomes a favourite to be planted by the people in rural areas to be used as an alternative food and is equivalent to rice as the source of carbohydrate. Fruits in corn and sorghum plants can be picked as human food, whereas their stalks and leaves can be used as animal food. Yet, there is also the use of straw in corn and sorghum for animal food [1], [2]. The use of corn straw and sorghum straw can be done through the use fermentation technology ruminants. It seems that the

biological way by using microbe is more promising because besides the ability to decompose high fiber food, microbe can also improve the nutrition content and is not dangerous nor bring any loss [3]. However, up to now the fermentation of corn straw and sorghum straw as sheep food has not been done. This is related to the farmer's habit to give fresh grass to sheep, so the use of corn straw and sorghum straw still needs to be done through research to see the difference in nutrition quality and the palatability of corn straw and sorghum straw before and after fermentation. Bioconversion of corn straw and sorghum straw needs microorganism which include pro biotic to help the process of decomposing complex food substances to become simpler food. The use of microorganism not only can reduce the

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\*Corresponding author:

sirajuddin\_abdullah@yahoo.co.id

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content of lignin and other carbohydrate structural substances, such as cellulose and hemicellulose, but also can improve the food quality and palatability [3]. The improvement of corn straw and sorghum straw use as alternative food source of ruminants requires the corn straw and sorghum straw to be processed through fermentation technology by using microorganisms. Microbes that can be used for bioconversion of corn straw and sorghum straw was *Phanerochaete chrysosporium* fungus, functioned to decompose the structural carbohydrate to become simpler [4]. Yet, the optimal fungus growth needs enough nutrition. The source of energy for organisms can be fulfilled through carbohydrate (carbon), nitrogen as well as mineral, vitamin and certain number of available growth factors.

### MATERIAL AND METHODS

24 heads of local sheep were used in this research; using Randomized Block Design

(RBD) in a 2x4 factorial, with 3 replications. The sheep were grouped according to the body weight. Factors are (1) types of straw (corn straw – J, and sorghum straw – S); (2) the dosage of inoculums *Phanerochaete chrysosporium* fungus, each in 0% v/w (Pc<sub>0</sub>), 2% v/w (Pc<sub>1</sub>), 4% v/w (Pc<sub>2</sub>), and 6% v/w (Pc<sub>3</sub>) from the total weight of corn straw and sorghum straw substrate. Data were analyzed by using various test analysis (Test F). The variables are carcass weight and carcass percentage, also non-carcass weight and non-carcass percentage. Table 1, presents a summary of the ration formula. The ration, based on the body weight was 3% dry material, consisted of 2% dry material of fermented corn straw or sorghum straw and 1% dry matter concentrate. The ration concentrate consists of a mixture of coconut, milled corn, and rice bran. The composition and content of the ration (% dry matter) can be seen in Table 1.

Table 1 The Ration Formula [Composition and Content of Food Ration Substances (% Dry Matter)]

Treatment	Substances	Portion	Food Substances (%)						
			BK	PK	LK	SK	ABU	BETN	TDN
JPc0	Concentrate	1	29,66	4,78	3,29	3,78	3,8	17,68	24,17
	Straw	2	60,95	6,2	3,45	18,56	6,54	31,92	43,62
<b>Total</b>			<b>90,61</b>	<b>10,98</b>	<b>6,74</b>	<b>22,34</b>	<b>10,34</b>	<b>49,6</b>	<b>67,79</b>
JPc1	Concentrate	1	29,66	4,78	3,29	3,78	3,80	17,68	24,17
	Straw	2	61,33	6,81	3,31	18,19	6,81	31,54	43,58
<b>Total</b>			<b>90,99</b>	<b>11,59</b>	<b>6,6</b>	<b>21,97</b>	<b>10,61</b>	<b>49,22</b>	<b>67,75</b>
JPc2	Concentrate	1	29,66	4,78	3,29	3,78	3,80	17,68	24,17
	Straw	2	62,24	6,76	3,19	17,67	6,86	32,18	43,68
<b>Total</b>			<b>91,9</b>	<b>11,54</b>	<b>6,48</b>	<b>21,45</b>	<b>10,66</b>	<b>49,86</b>	<b>67,85</b>
JPc3	Concentrate	1	29,66	4,78	3,29	3,78	3,80	17,68	24,17
	Straw	2	61,9	7,04	3,12	16,9	6,93	32,67	44,17
<b>Total</b>			<b>91,56</b>	<b>11,82</b>	<b>6,41</b>	<b>20,68</b>	<b>10,73</b>	<b>50,35</b>	<b>68,34</b>
SPc0	Concentrate	1	29,66	4,78	3,29	3,78	3,80	17,68	24,17
	Straw	2	60,72	5,53	3,96	19,77	7,76	29,64	41,86
<b>Total</b>			<b>90,38</b>	<b>10,31</b>	<b>7,25</b>	<b>23,55</b>	<b>11,56</b>	<b>47,32</b>	<b>66,03</b>
SPc1	Concentrate	1	29,66	4,78	3,29	3,78	3,80	17,68	24,17
	Straw	2	61,36	5,51	3,86	19,46	7,87	29,96	41,91
<b>Total</b>			<b>91,02</b>	<b>10,29</b>	<b>7,15</b>	<b>23,24</b>	<b>11,67</b>	<b>47,64</b>	<b>66,08</b>
SPc2	Concentrate	1	29,66	4,78	3,29	3,78	3,80	17,68	24,17
	Straw	2	58,93	6,22	3,91	19,31	7,91	29,32	42,25
<b>Total</b>			<b>88,59</b>	<b>11</b>	<b>7,2</b>	<b>23,09</b>	<b>11,71</b>	<b>47</b>	<b>66,42</b>
SPc3	Concentrate	1	29,66	4,78	3,29	3,78	3,80	17,68	24,17
	Straw	2	59,09	6,54	3,92	19,28	8,16	28,78	42,10
<b>Total</b>			<b>88,75</b>	<b>11,32</b>	<b>7,21</b>	<b>23,06</b>	<b>11,96</b>	<b>46,46</b>	<b>66,27</b>

## RESULTS AND DISCUSSIONS

### 1. The Influence of Treatment towards the Weight of Carcass of a Local Sheep

The observation result on the influence of several dosages of *Phanerochaete*

*chrysosporium* of corn straw and sorghum straw towards the weight and percentage of carcass as well as non carcass in a local sheep can be seen in Table 2.

Table 2 The Average Influence of Treatment towards a Local Sheep Performance

Component	Treatment					
	<i>Phanerochaete chrysosporium</i> Dosage				Types of straw	
	PC <sub>0</sub>	PC <sub>1</sub>	PC <sub>2</sub>	PC <sub>3</sub>	Corn	Sorghum
BK (kg)	10,00a	10,63ab	11,23bc	11,67c	11,19a	10,58b
PK (%)	47,53a	49,40ab	50,22ab	51,09b	51,25a	47,88b
BKNK (kg)	3,80a	3,88ab	3,95bc	4,01c	3,95a	3,87b
PKNK (%)	18,08a	18,00ab	17,71ab	17,58b	18,14a	17,55b

Notes: -Different letter towards the row, shows significant difference (P<0.05)

BK = carcass weight; PK = carcass percentage; BKNK = non-carcass weight; and PKNK = Percentage component of non carcass

The various analysis shows that there was no interaction between the types of straw and the dosage of *Phanerochaete chrysosporium* inoculums, but the type of straw has significance (P<0.05). The dosage of *Phanerochaete chrysosporium* inoculums also has significance (P<0.05) to the local sheep carcass weight. The differences of sheep carcass weight that feeding treatment ration, because the dosage of *Phanerochaete chrysosporium* fungus, the differences of the food substances content [6] stated that the weight of carcass is really influenced by body weight, in which the high body weight, the higher carcass weight results. The high body weight is caused by adequate food substances for growing. The rate of growing is varied, so the level of growing is one of the important criteria, because the level of growing rate has related directly to the maximum production of meat [5]. Therefore, the higher dosage of *Phanerochaete chrysosporium* fungus, get better adequate of food substances, so the growing of an animal will be better and resulted in a better carcass as well.

### 2. The Influence of Treatment towards the Local Sheep Carcass Percentage

The result of various analysis shows that there was no interaction (P>0.05) between the types of straw and the dosage of *Phanerochaete chrysosporium* inoculums, but the type of straw gave significance

(P<0.05); and also to the local sheep carcass percentage.

The local sheep carcass percentage differences from each dosage, is caused by the differences in ration quality and the weight of carcass gained. The differences in the feed substances for growing in which the higher dosage of *Phanerochaete chrysosporium* fungus, the better food substances contains, especially the protein and energy content. Therefore, it will give different carcass percentage.

The quality or nutrition value in the ration can influence the total consumed by a livestock. The quality of food consumed by a livestock influenced the percentage of carcass. [11], stated that the protein and energy are very important substances in the growing process, so with the ration of high protein and energy can increase the body weight. The high body weight will result in higher percentage of carcass [13].

### 3. The Influence of Treatment towards the Local Sheep Edible Offal Weight

The result of various analysis shows that there was no interaction between the types of straw with the dosage of *Phanerochaete chrysosporium* inoculums, but the types of straw gave a real influence (P<0.05). The dosage of *Phanerochaete chrysosporium* inoculums also gave real influence (P<0.05) towards the weight of local sheep edible non carcass. The treatment can influence the non-

carcass weight component, according to Jones et al., 1983 cited by [7]. Further, it was stated that the sheep non-carcass weight component which was given *ad-libitum*; was no differences with the sheep that given 0% treatment ration. According to Murray et al. (1977), cited by [12] that the treatment of giving extra food has no influence towards the edible non-carcass weight except the heart and liver. This difference was caused by the age of the livestock, in which younger ones will grow faster when supported by high nutritious food. Also, [12] cited from Murray and Slezacek, 1978; stated that the relative growth in several parts of non carcass is equal with the rate of livestock body growth. There were no real differences in the  $Pc_2$  and  $Pc_3$  treatments caused by the balance of amino acid and are still in the good range for the growth of sheep and its non carcass.

The straw fermented with *Phanerochaete chrysosporium* fungus affected by the microorganism during the fermentation. The enzyme activities during fermentation process will cause the chemical changes, including the changes of complex molecules or organic compound like protein, carbohydrate, and fat to become simple molecules and easier digested [Jay, 1975 in [9]. Furthermore Parakkasi (1975) stated that the content of food protein can stimulate the consumption of protein which later can increased the absorption of protein in the organ or in the body tissues of a livestock, so there was an improvement in the meat of a sheep, and will influence the non carcass parts of the body.

#### 4. The Influence of Treatment towards the Edible Offal of Local Sheep Percentage

The result of various analysis shows that there was no interaction ( $P > 0.05$ ) between the types of straw and the dosage of *Phanerochaete chrysosporium* inoculums, but the types of straw gave significance ( $P < 0.05$ ). Also, the dosage of *Phanerochaete chrysosporium* inoculums gave a real influence ( $P < 0.05$ ) towards the percentage of edible non-carcass component in a local sheep. This was caused by the differences in the nutrition content of corn straw and sorghum straw such as the protein and energy

contents which were very important substances in the growing process. The differences in the nutrition content caused the percentage of edible non carcass to be different, too. [10], cited Allen and Kilkenny, 1980 stated that growth was supported by the environment factors; reflected as a linear relationship towards the weight and percentage of carcass, except the non edible non carcass components like *tractus digestivus*, skin as well as legs, will reduce its proportion towards the empty body weight as the increase in body weight. Hence, the growth of edible non-carcass components from a sheep is higher when compared to its life weight. Protein and energy are two important substances in the growing process, so ration with high protein and energy will give higher addition in the body weight [11]. Higher body weight will give higher percentage of carcass [13].

#### CONCLUSIONS

1. The used of *Phanerochaete chrysosporium* fungus as inoculums, increased the carcass weight (11.30%), and the weight of non carcass components (3.82%), the carcass percentage (5.71%), but reduced the percentage of non carcass component of local sheep (1.60%).

2. There was no interaction between the types of straw and the dosage of inoculums of *Phanerochaete chrysosporium* fungus towards the local sheep carcass weight, carcass percentage, the non carcass component weight, and the non carcass percentage.

3. Corn straw had higher influence on the local sheep carcass weight, carcass percentage, non-carcass weight, and the percentage of non carcass weight.

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