Handling and Using Waste Cabbage as Feed Additive on Pellet of Calf Starter and It’s Effect to Microbiology Quality

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Waste cabbage is by product of cabbage’s outer shells that have been sorted with number about 5–10% wet basis from produce of cabbage. Therefore, if the waste cabbage is not handled optimally, it can cause environmental pollution. Waste cabbage naturally content Lactobacillus sp. The fermentation is one method that can increase number of Lactobacillus sp in the waste cabbage. Lactobacillus sp is a probiotic bacterium as lactic acid bacteria that can suppress gram negative bacteria populations and it can replace antibiotics. On the other hand, the reticulo-rumen completely develops both physically and metabolically at birth, which is optimal in 2–6 weeks age. Feeding calf starter (CS) after birth can promote rumen development. However, young calves tend to easily diarrhea caused by Escherichia coli from environment and cause death. Giving antibiotic can suppress Escherichia coli, but it has negative effect. For this, the aim of this research was to examine microbiology quality pellets calf starter that added fermented waste cabbage (FWC). The research used completely randomized design with 4 treatments and 5 replications (T0: 100% calf starter + 0% FWC, T1: 100% calf starter + 2% FWC, T2: 100% calf starter + 4% FFWC, T3: 100% calf starter + 6% FWC). The materials of calf starter were corn, soybean meal, rice bran, molasses, mineral mix and materials in fermented waste cabbage were cabbage waste, sugar and salt. The parameters measured were total bacteria and lactic acid bacteria. The data were analyzed with descriptive analyze. The results showed that the more addition of fermented waste cabbage, the higher the count of total bacteria and lactic acid bacteria (T0: 0\times 10^6 cfu/g; T1: 0.8 \times 10^6 cfu/g; T2: 0.63 \times 10^6 cfu/g; T3: 0.8 \times 10^7 cfu/g).

Keywords: Calf Starter, Fermented Waste Cabbage, Total Bacteria and Lactic Acid Bacteria.

1. INTRODUCTION

Cabbage is produced in Indonesia about 1.363.741 ton per year. Waste cabbage is by product of cabbage’s outer shells that have been sorted with number about 5–10% wet basis from produce of cabbage. Therefore, if the waste cabbage is not handled optimally, it can cause environmental pollution. On the cabbage leave, naturally there are bacteria especially Lactobacillus sp (Lactobacillus plantarum, Lactobacillus delbrukil, Lactobacillus fermentum and Lactobacillus brevis), but in small quantity. Fermentation process can be used to increase the number of lactic acid bacteria.

On the other hand, new born calf’s rumen is still sterile and undeveloped since there are no bacteria present.6 Feeding calf starter can stimulate rumen development and is best given to 2-6 week-old calves.5 It will accelerate the process of weaning calves as well. Another problematic the young calves tend to catch diarrhea easily. Newborn calves’ (aged 2–10 days) mortality rate caused by diarrhea is 10–50% (Subronto, 2004). Diarrhea is generally caused by Escherichia coli.3 Dairy farmers often use antibiotics for diarrhea treatment. However, based on the patterns of resistance, antibiotics can be rendered ineffective.

Probiotic can be used alternatively as natural antibiotics. Probiotics are living non-pathogenic organisms capable of maintaining the balance of intestinal micro flora in the digestive tract.11 Feeding calves with probiotic-rich pellets can optimize calves growth by reducing their potential to catch diarrhea. Fermented waste cabbage is selected as the source of probiotics. The addition of microbial lactic acid bacteria from fermented waste cabbage can enhance calf starter’s benefits.

The research aimed was to examine the microbiology quality of pellets calf starter with added fermented waste cabbage.

2. EXPERIMENTAL DETAILS

The research used completely randomized design with 4 treatments and 5 replications. The treatment were T0 (100% calf starter + 0% fermented waste cabbage, T1: 2% fermented wastecabbage + 100% calf starter, T2: 4% fermented waste...
cabbage + 100% calf starter, T3: 6% fermented waste cabbage +
100% calf starter).

The materials of this research were waste cabbage, corn mill,
rice bran, soybean meal, molasses, mineral mix, sugar, salt, NA
medium and de Man Rogosa Sharpe (MRS) medium. Equipment
used were knives, digital scales, trays, plastic, tape, labels paper,
pelletier machine, stove, boiler, digital pH meter, plastic wrap-
ing, oven, incubator, autoclave, measuring cups, sterile petri
dish, pipette 1 ml, tube test, spatula, Erlenmeyer and Quebec
colony counter.

The experiment consisted of two stages. The first stage was
fermenting waste cabbage. Waste cabbage was cut into small
pieces, blended and added 6% salt and 6.4% sugar and then fer-
mented in anaerobic condition for 6 days. The second stage was
making the pellets calf starter. The calf starter was formulated
with crude protein 19.62% and TDN 79/41%. The ingredients
for calf starter (corn mill, rice bran, soybean meal, molasses,
mineral mix) were mixed, then it was conditioned with tem-
perature at 70 °C during 20 minutes. Before extruding process,
the temperature of calf starter should be decreased at 30 °C and
then fermented waste cabbage was added as a treatment. Pellets
were extruded with diameter sized 5 mm. Then, pellets were dried
in oven at 34–39 °C temperature to reach 13% water content.

The parameters observed were total bacteria and lactic acid
bacteria, the data of total bacteria and lactic acid bacteria were
analyzed using descriptive analysis.1

3. RESULTS AND DISCUSSION

3.1. The Effect of Treatment on the Amount of
Total Bacteria on Pelleted Calf Starter

Mean of total bacteria and lactic acid bacteria contained on calf
starter pellets during research were shown in Table I.

The results from the research showed that the average of total
bacteria increased with level of addition of fermented waste cab-
bage. Moreover, the increasing addition of the fermented cabbage
up to 6% was more reducing the bacterial population. The
bacterial population was reduced due to the acidic conditions of
the pellet. The addition of the fermented cabbage waste increases,
the pellet. The addition of the fermented cabbage waste increases,
the degree of acidity pellets tend to be increase then the pH value
decreasing (T0 = 5.71; T1 = 5.76; T2 = 5.65 and T3 = 5.50).
This is in accordance with the opinion Utama and Sumarsih,13
that the addition of sauerkraut extract can accelerate the creation
of the acidic conditions. The bacteria are not resistant to acidic
conditions and it will die, causing bacterial population reduced.

Table I. Mean of total bacteria and lactic acid bacteria on calf
starter pellets in addition with microbial source from fermented waste
cabbage.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Total bacteria</th>
<th>Total lactic acid bacteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>T0 (0%)</td>
<td>3.3 × 10^10</td>
<td>0.3 × 10^6</td>
</tr>
<tr>
<td>T1 (2%)</td>
<td>8.1 × 10^10</td>
<td>0.6 × 10^6</td>
</tr>
<tr>
<td>T2 (4%)</td>
<td>5.3 × 10^10</td>
<td>0.6 × 10^6</td>
</tr>
<tr>
<td>T3 (6%)</td>
<td>1.5 × 10^10</td>
<td>0.8 × 10^7</td>
</tr>
</tbody>
</table>

3.2. The Effect of Treatment on the Amount of Total
Lactic Acid Bacteria on Pelleted Calf Starter

The effect of added microbial source from fermented waste cab-
bage in calf starter pellets showed that the increase of fermented
waste cabbage addition had consequently increased total lactic
acid bacteria (Table I). It showed that lactic acid bacteria could
grow and developed properly since the environmental conditions
were favorable for them. Lactic acid bacteria’s growth was influ-
enced by several factors including: temperature, pH, and nutrient
sources especially the amount of readily available carbohydrate
(RAC) or sugars. The addition of molasses in calf starter and
sugar in fermented waste cabbage was adequate for lactic acid
bacteria’s nutrient requirement. Molasses as RAC contained glu-
cose, carbohydrate and organic acid. Molasses and sugar func-
tioned as carbon sources that were used as energy for bacteria.10

Microorganism especially lactic acid bacteria required nutrients
such as carbohydrates for survival. Regarding its acidity, calf
starter pellets’s pH ranged from 5.50 to 5.76. The temperature
in drying oven was 34–39 °C. These conditions are optimal
conditions for the growth of lactic acid bacteria. The optimal
temperature for lactic acid bacteria was 25–37 °C (Supardi and
Soekamto, 1999). Lactic acid bacteria can grow in pH ranged
from 3 to 10.5, but the optimal pH range was 5.5–6.0.4

4. CONCLUSIONS

In conclusions, the higher addition of fermented waste cabbage
can be decrease total bacteria, but increasing to total lactic acid
bacteria. Extra fermented waste cabbage on a pelleted calf starter
as much as 6%, producing lactic acid bacteria highest. Biological
quality needed to be held to determine the effect of pellets calf
starter enrich with lactic acid bacteria against calves diarrhea.

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