

Evaluation of organoleptic characteristics and pH of silage *Indigofera* sp. combined with green *Zea mays* and *Pennisetum purpureum* cv. *mott* grass with additional lactic acid bacteria for ruminant feed

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Abstract

This study aims to obtain quality preserved forage derived from silage *Indigofera* (*Indigofera* sp.) and combined with forage corn (*Zea mays*) or grass odot (*Pennisetum purpureum* cv. *Mott*) with the addition of lactic acid bacteria from cabbage waste. The materials used were starter of lactic acid bacteria from fermentation of cabbage waste and table salt, *Indigofera* (*Indigofera* sp.) which was harvested at a tree height of 1.5 m with a cutting interval of 60 days, forage maize (*Zea Mays*) which was harvested at the age of 8 weeks, odot grass (*Pennisetum Purpureum* Cv. *Mott*) harvested at the age of 6 weeks and molasses. The tools used are chopper, jar, duct tape and pH meter. The experimental design used in this study was a completely randomized design (CRD) with 5 treatments and 4 replications. The treatments given consisted of T1 (control), T2 (50% *Indigofera*+50% grass odot), T3 (30% *Indigofera*+70% grass odot), T4 (50% *Indigofera*+50% forage corn), T5 (30% *Indigofera*+70% forage corn). Based on the organoleptic test, it was found that the combination of forage corn and grass had a significant effect on the organoleptic characteristics ($P<0.05$). pH 6 at T1 has not been able to produce preserved *Indigofera* in the form of silage. The conclusion of this study is that *Indigofera* silage should be combined with grasses.

Keywords: *Indigofera* silage, organoleptic, pH

Introduction

The problem often faced by farmers is the low quality of feed, especially the nutrient content in it. One method to maintain the quality of feed is by preserving it such as silage. Silage is a form of preserved forage forage produced through the ensilage process by lactic acid bacteria (LAB) [1]. Silage quality can be determined by organoleptic test which includes color, aroma, texture and presence of fungus. The characteristics of good silage are not clumping, texture does not change, taste and smell are sour and not slimy and moldy. The process of making silage will run optimally if it is given the addition of an accelerator which can be in the form of an inoculum

of lactic acid bacteria which has the function of creating an acidic atmosphere in silage, accelerating the ensilage process, inhibiting the growth of spoilage bacteria and fungi. The basic principle of making silage is forage fermentation by microbes which produce a lot of lactic acid bacteria (LAB). Lactic acid bacteria can be obtained from cabbage waste which is used as a starter for fermentation because it contains acids and beneficial microbes.

Indigofera is a plant for livestock belonging to tree legumes that has high potential and productivity as well as good nutrient content and is resistant to dry soil, puddles, soils with high salt content and acid soils [2]. *Indigofera* plants can survive and produce at the level of severe drought stress which can be developed in dry climate areas to overcome the problem of food shortages, especially during the dry season. *Indigofera* has a high alkaline protein content and low fiber will cause problems regarding buffering capacity where the pH of silage is difficult to decrease due to the alkaline nature of N [3]. Corn (*Zea mays*) is one of the animal feed ingredients that can be used as silage so that it is easy to preserve. Odor grass (*Pennisetum purpureum* cv. *Mott*) is one of the superior types of grass that has high productivity and nutritional content which can be used as animal feed in the form of silage. The addition of forage corn or grass odor on *Indigofera* silage is expected to improve the quality and continuity of supply of ruminants [4].

Materials and Methods

The material used is starter in the form of lactic acid bacteria from the fermentation of cabbage waste and table salt, *Indigofera* (*Indigofera* sp.) which was harvested at a tree height of 1.5 m with a cutting interval of 60 days, forage corn (*Zea Mays*) which was harvested at the age of 8 weeks, odor grass (*Pennisetum Purpureum* Cv. *Mott*) harvested at the age of 6 weeks and molasses. The equipment used are chopper, analytical scale, jar container, duct tape, blender, stationery, pH paper and organoleptic assessment questionnaire. Organoleptic testing, data entry was carried out using 20 semi-trained panelists.

Research Procedure

The first stage is making a starter from cabbage waste. The raw material for making starter from cabbage waste is obtained in the market, then cabbage waste is washed and cleaned and then cut into pieces, 10% starter is added and 2.5% salt is added. After adding the starter and salt, it is put into a jar, then it is soaked for 5 days and filtered to separate the dregs. The starter solution from cabbage waste is ready to use.

The second stage is making silage, starting with *Indigofera* (*Indigofera* sp.), forage corn (*Zea mays*) and odor grass (*Pennisetum Purpureum* Cv. *Mott*) which are cut into pieces, approximately 3-5 cm then withered for approximately 24 hours to reduce the water content so that the ensilation process can be carried out. Mixing the ingredients with the starter from cabbage fermentation waste is carried out according to the predetermined treatment until the ingredients are mixed homogeneously. The ensilage process is carried out by placing the material that has been mixed

with the starter into a jar container (silo), then compacted to minimize the air inside, then the jar container (silo) is given duct tape. Silage is stored in a storage room to avoid direct sunlight for 21 days.

Methods

Data collection stage which is carried out with previously marked samples in each treatment and replications for each sample. Furthermore, organoleptic analysis in the form of odor, texture, color, organoleptic data collection was carried out by panel test and measuring pH using pH paper. There were 20 organoleptic test panelists from the Faculty of Animal Science, UNDIP. Observation of color, texture, aroma and appearance is done by making a score as shown in table 1.

Table 1. Physical Analysis of Silage on The Criteria of Color, Texture, Aroma and Appearance

Score	Silage color	Silage texture	Silage smell	Mushroom sighting
4	Brownish Yellow	Very mushy	Fresh sour	No mushrooms
3	Chocolate	Currently	Slightly sour	There are a few mushrooms
2	Dark chocolate	Rough	Rotten	There are many on the surface
1	Black	Very rough	So rotten	There are many at all points

Experimental Design

The experimental design used in this study was a completely randomized design (CRD) with 5 treatments and 4 replications. The treatments given are as follows.

- T1 : *Indigofera* disilage without being combined with other forages or control treatments
- T2 : 50% *Indigofera* disilage + 50% odot grass
- T3 : 30% *Indigofera* disilage + 70% odot grass
- T4 : 50% *Indigofera* disilage + 50% forage corn
- T5 : 30% *Indigofera* disilage + 70% forage corn

Results and Discussion

Silage color indicates a determinant of the physical quality of silage. A good silage color is in accordance with the original color. According to Kurniawan [5] stated that good silage quality can be known from its original color. Based on the color organoleptic test on *Indigofera* silage combined with forage corn and grass odot with the addition of lactic acid bacteria has a score of 35.5-73.75. The color of the silage changes from the original color, which is green to brownish yellow. Each treatment, namely T1, T2, T3, T4 and T5 had a brownish yellow color which indicated good silage quality and had a significant effect ($P < 0.05$) on the silage color. In green leaves there is chlorophyll which is destroyed during the ensilation process, causing a brown color [1].

Table 2. Effect of Adding Forage Corn (*Zea mays*) and Odor Grass (*Pennisetum purpureum* cv. *Mott*) on Silage of *Indigofera* (*Indigofera* sp.)

Variable	Treatment				
	T1	T2	T3	T4	T5
Color	35.5±1.73 ^d	73.75±2.87 ^a	62.75±2.22 ^c	69.25±2.06 ^b	71.25±3.59 ^{ab}
Texture	65.5±3.11 ^a	53.75±2.63 ^c	57.25±2.22 ^{bc}	56.25±2.87 ^{bc}	61±4.08 ^{ab}
Odor	69.3±6.13 ^{ab}	63±3.16 ^c	63±1.83 ^c	65.25±0.96 ^{bc}	72.25±1.89 ^a
Fungus	80±0.00	80±0.00	80±0.00	80±0.00	80±0.00
pH	4.5±1.00	4.5±1.00	4.5±1.00	4.5±1.00	4.5±1.00

Different superscripts in the row showed significant differences $P < 0.005$

Based on the organoleptic test of *Indigofera* silage texture combined with forage corn and odor grass with the addition of lactic acid bacteria, it has a score of 53.75-65.5 for each treatment, namely T1, T2, T3, T4 and T5 with a moderately acidic texture and has an effect on significantly ($P < 0.05$) on silage texture. Silage texture that has good quality is fresh, not slimy and does not lump [6].

Based on the organoleptic test, the aroma of *Indigofera* silage combined with forage corn and odor grass with the addition of lactic acid bacteria had a score of 63-72.25, each treatment, namely T1, T2, T3, T4 and T5 had a slightly acidic aroma and gave a significant effect ($P < 0.05$) on silage aroma. This is because when the ensilage is in progress, the ensilation process occurs. The sour aroma comes from reacting lactic acid bacteria [7].

Based on the organoleptic test, the appearance of *Indigofera* silage combined with forage corn and odor grass with the addition of lactic acid bacteria had a score of 80, each treatment, namely T1, T2, T3, T4 and T5 there was no fungus in the silage and did not give a significant effect ($P > 0.05$) on fungal capture on silage. The silage making process, silage storage, preparation and quality of raw materials are factors that influence the silage process [8]. There was no fungus in the silage because during the ensilage process it took place under anaerobic conditions and lactic acid bacteria developed well. The addition of an accelerator to silage makes it difficult for fungi to grow [9].

Based on the pH of *Indigofera* silage combined with forage corn and odor grass with the addition of lactic acid bacteria has a score of 4.5-1.00 which each treatment, namely T1, T2, T3, T4 and T5 did not have a significant effect ($P > 0.05$) to silage pH. At T1 (control) it produces a pH of 6 because *Indigofera* cannot silage itself so it must be combined with other forages. *Indigofera* is a legume that can be processed into silage using lactic acid bacteria (LAB) which has a high crude protein content which is low in fiber base however, will cause problems in buffering capacity where the pH of silage difficult to decrease due to the basic nature of N [3]. In treatment T2, T3, T4, and T5 has a pH of 4, which means a low pH indicates that the ensilation process is running well. The high content of lactic acid causes the pH of the silage to be low and will inhibit the growth of fungi, bacteria and yeast which can cause rot in the silage [10].

Conclusion

Based on the results of the study, it can be concluded that the color, texture and aroma of *Indigofera* silage (*Indigofera sp.*) combined with forage corn (*Zea mays*) and odot grass (*Pennisetum purpureum cv. Mott*) had a significant effect, while the appearance of mushrooms had no significant effect. Suggestions that can be given are *Indigofera* silage should be combined with grasses.

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