Productivity and Quality of Corn Straw (Zea mays L) and Mung Bean (Vigna radiata L.) with Intercropping System

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Abstract- This study aims to determine the production and quality of corn straw (Zea mays L.) and Mung Bean (Vigna radiate L.) from the intercropping system. This study used a completely randomized design (CRD). P1 Single corn crop (8 corn: 0 mung beans), P2 Mix corn and mung beans (6 corn: 2 mung beans), P3 Mix corn and mung beans (4 corn: 4 mung beans), P4 Mix corn and mung beans (2 corn: 6 mung beans), P5 Single crop mung beans (0 corn: 8 mung beans). Parameters observed were the production of DM and OM, contents CP, CF, and DMDg and OMDg. The results of the variance analysis showed that the effect of treatment withintercropping planting system had a significant effect (P> 0.05) on the production of DM, OM, content of CF, CP and DMDg and OMDg.

Index Terms- Intercropping system, in vitro digestibility, forage production and quality,

I. Introduction

Good quality feed needs have increased with increasing livestock populations. The business of providing forage is still has a number of problems, including fluctuations in the number of production throughout the year, where the availability of forage in the dry season is less than in the rainy season and limited land in the use of forage.

One effort in increasing land productivity is through multiple cropping systems such as intercropping. In this model, more than one plant species are planted in the same time and land. In general, intercropping planting patterns are more profitable than monocultures because land productivity is high, the types of commodities produced are varied, saving in the use of production facilities and the risk of failure can be minimized (Beets, 1982).
The selection of constituent plants in intercropping is based on differences in morphological and physiological characteristics of plants, including depth and root system, canopy shape, photosynthesis rate, nutrient uptake patterns so as to obtain a synergistic characteristic of growth, development and intercropping (Gomez and Gomez, 1983; Palaniappan, 1985). In intercropping planting patterns there are interactions between plants that planted together. These interactions can be beneficial because they support each other, or can also be detrimental because of the nature of mutual competitiveness (Koten et. Al., 2013).

a intercropping system of corn with mung beans, symbiosis will occur between the two, namely an increase in the supply of nitrogen from mung beans to corn instead of corn plants able to protect mung beans from direct exposure to excessive solar radiation (Morgano and Willey, 2008).

The other side of the use of corn is by the waste, namely corn straw, skin and corn cobs which can be used as animal feed but corn straw is classified as a low-quality feed because it contains low protein content and high crude fiber. Thus, it is expected that planting between corn and mung beans can increase production and the quality of forage produced.

II. Material and Methode

A. Time and Place

Research about Productivity and Quality of Corn Straw and Mung Beans from the Intercropping Planting System was held on July - December 2018 which was divided into 2 stages. The first stage was planting and maintaining the plants was held in the Hasanuddin University Faculty of Animal Husbandry second stage of quality analysis forage was held in the Livestock Feed Chemistry Laboratory, Faculty of Animal Husbandry, Hasanuddin University, Makassar.

B. Research Material

The tools used in this study were hoes, machetes, measuring tape, analytical scales, sitting scales, knives / scissors, and plastic.
The materials used are corn seeds, mung bean seeds, fertilizers, water and materials used in the laboratory for analysis of feed ingredients.

C. Research Design

This study used a Completely Randomized Design (CRD) consisting of 5 treatments and 3 repetition. The treatment consists of:

P1: Single corn crop (8 corn: 0 mung beans)
P2: Intercropping corn and mung beans (6 corn: 2 mung beans)
P3: Intercropping corn and mung beans (4 corns: 4 mung beans)
P4: Intercropping corn and mung beans (2 corn: 6 mung beans)
P5: Single planting mung beans (0 corn: 8 mung beans)

E. The Parameters Measured

The parameters measured in the production and quality of corn straw and mung bean from the intercropping system are dry matter (DM) production, organic matter (OM) production, crude protein content (CP), crude fiber content (CF), dry matter digestibility (DMDg) and organic matter digestibility (OMDg).

III. RESULT AND DISCUSSION

A. Forage Production of Corn and Mung Bean

The intercropping system is one of the plant systems where there are two or more different types of plants planted together in the same time. The total production of maize and mung beans grown with intercropping systems is presented in Table 1.

Table 1. Forage production of maize and Mung Beans from intercropping planting systems

Treatment	DM Production (gr/plot)	OM Production (gr/plot)
P1	368,66^{b}	341,50^{b}
P2	245,33^{b}	224,63^{b}
P3	362,00^{b}	334,25^{b}
P4	284,33^{b}	259,68^{b}
P5	36,33^{a}	33,19^{a}

Note: Different supercripts ^{ab} in the same column show significant differences (P <0.05)

Variety examination (Table 1) shows that intercropping of corn and mung beans grown with the intercropping system had a significant effect (P> 0.05) on the production of dry matter and forage organic matter.

The highest dry matter production in P1 compared with P2, P3, P4 and P5. This is because corn can absorb solar energy for better use in photosynthesis and are able to use it more efficiently so that the dry matter produced will also be higher. According to Gardner et al (1991), dry matter is the accumulation of net carbon dioxide throughout growth. The assimilation of carbon dioxide is the result of absorption of solar energy and due to solar radiation that is distributed throughout the earth's surface, the main factor influencing the total dry matter of the crop is absorbed solar radiation and the efficiency of the utilization of energy to fix carbon dioxide.

B. Quality of Corn Forage and Mung Bean

Forage quality includes the content of nutrients in a forage, including crude protein (CP) and crude fiber (CF). In addition, the quality of forages can also be seen from the DMDg andOMDg values produced. The higher the DMDg and OMDg values then better the quality of the forage. Digestion is closely related to chemical composition, forage CF and CP content (Tillman et al., 1998). The forage quality of the nutrient content is presented in table 2.

Table 2. The quality of forage of maize and Mung Beans from intercropping Planting systems

Note: Different superscripts^{abcde} in the same column show significant differences (P <0.05)

Variety examination (Table 2) shows that intercropping of corn and mung beans has a significant effect (P <0.05) on the content of CP, CF, DM digestibility and OM.

Treatment	CP (%)	CF (%)	DMDg	OMDg
P1	5,36^{a}	37,82^{d}	47,52^{a}	47,23^{a}
P2	5,88^{b}	36,35^{c}	49,80^{b}	47,77^{a}
P3	7,02^{c}	35,73^{c}	53.42^{c}	51,99^{b}
P4	7,77^{d}	34,11^{b}	55,09^{d}	52,92^{b}
P5	8.5^{e}	33,08^{a}	57,95^{e}	56,00^{c}

Duncan's test showed that each treatment was significantly different from other treatments. Treatment of P5 is higher than treatment P1, P2, P3 and P4 towards the forage content of CP. This is because the protein content in each plant is different. The more proportion of mung beans has the higher protein content. This is in line with the opinion of Yulianto (2010) which states that mung bean waste has a high crude protein (CP) content of 13.67% while for protein content of corn is 8.2% (Sukria and Krinan, 2009) .So, this shows that the protein content in mungbean plants is higher when compared to the protein content in corn.

The Duncan test showed that each treatment was significantly different from the other treatments. Where P1 was higher than P2, P3, P4 and P5 for the CF content from forage. This indicated that the treatment with more proportions of corn produced a high CF value but the DMDg value was produced low. Maize is thought to have the highest proportion of stems compared to mung beans, so the CF content is higher but the DMDg produced is low. The high CF content in forages causes DMDg to be low (Anggorodi, 1998), further explained by Anggorodi (1979) that the more crude fiber found in forages, the thicker the cell wall is due to the lower digestibility of the forage.

Duncan's test showed that each treatment was significantly different from the other treatments for forage DMDg. Treatment of P5 was higher and the lowest treatment was P1 against DMDg. DMDg is one indicator to determine the quality of forages. Increasing the quality of forages, especially proteins, causes forage to be easily digested by livestock so that it is beneficial for growth and development. This is supported by Afriyanti (2008) that the higher the DMDg value, the higher of nutrition that livestock can use for their growth. According to Anggorodi (1979) that the digestibility value of dry matter is related to chemical composition, where fibrous parts, lignin and growing silica content are due to species differences in genotypes including growth rates, environmental conditions, growing areas and processing systems that will increase digestibility .

The Duncan test showed that treatment P5 was higher than treatment P1, P2, P3 and P4 against forage OMDg. Organic matter is a component of dry matter so that the factors that influence the high and low DMDg will affect the high and low OMDg of forage. The low digestibility of organic materials may be due to several factors including the location of planting, availability of water and climate from the location of planting. According to Sutardi (1980), degradation of organic matter is closely related to the degradation of dry matter, because some dry ingredients consist of organic matter. Dervish (1988) said that the decrease in dry matter digestibility results in decreased digestibility of organic matter or the other side.

Based on the results obtained in Table 2, the DMDg value is higher than the value generated by OMDg. According to Soewardi (1974) who was cited by Hapsari (2007), DMDg is higher than OMDg because the degradation of ash in DM components is low and the ability of microbes to degrade components in DM is higher than OM

IV. CLOSING

Conclusiom

From the results of the discussion, it can be concluded that forage production and the quality of corn and mung beans from the results of intercropping have increased both in terms of forage production and forage quality.

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