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Productivity and Nutrient Digestibility of Sorghum Fodder at Different Urine Fertilizers Levels and Harvest Times

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Abstract. The present study aimed to determine the productivity and nutrient digestibility of sorghum (*Sorghum bicolor* (L.) Moench) fodder given different levels of urine fertilizer in various planting media and harvest times. The study was carried out in June - September 2020 and used numbu variety of sorghum planted hydroponically at fodder phase. This study used a 2x4 factorial completely randomized design with 4 replications. The first factor was the harvest time at 5 days (H1) and 10 days (H2). The second factor was the planting media that included water medium as an internal control (M1), 12.5 mL/L of urine fertilizer (M2) and 25 mL/L of water medium (M3), and urea 20 mg/L of water medium (M4) as the external control. The urine fertilizer was derived from Ongole crossbreed urine fermented for 21 days. The density of sorghum seeds in the planting medium was 2.5 kg/m^2. The observed variables included plant productivity and nutrient digestibility in vitro. Data analysis used ANOVA and continued with Duncan's Multiple Range Test to determine significance. The results showed that the addition of urine fertilizer and harvest time had a significant effect on plant height, length of fresh leaf production, dry matter, organic matter, and crude protein compared to those of the internal control. The H2M3 treatment provides a comparable productivity effect with H2M4. Meanwhile, harvest time affected dry matter and organic matter digestibility. It can be concluded that 25.0 mL/L of urine fertilizer in planting medium and harvest time in 10 days were able to increase productivity, dry matter digestibility, and organic matter digestibility of sorghum fodder.

Keywords: sorghum fodder, nutrient digestibility, productivity, urine fertilizer, harvest time

Abstrak. Penelitian bertujuan untuk mengetahui produktivitas dan kecernaan nutrien *in vitro* fodder sorgum (*Sorghum bicolor* (L.) Moench) dari pengaruh penambahan pupuk urin pada media tanam dan umur panen yang berbeda. Penelitian menggunakan sorgum varietas numbu, yang ditanam fase fodder secara hidroponik dan dilaksanakan pada bulan Juni – September 2020. Penelitian ini menggunakan rancangan acak lengkap faktorial 2x4 dengan 4 replikasi. Faktor pertama berupa umur panen 5 hari (H1) dan 10 hari (H2). Faktor kedua berupa media tanam yaitu air sebagai kontrol internal (M1), pupuk urin 12,5 mL/L (M2) dan 25 mL/L media air (M3), serta kontrol eksternal berupa urea 20 mg/L media air (M4). Pupuk urin berasal dari urin sapi peranakan ongole yang difermentasi selama 21 hari. Kerapatan benih sorgum dalam media tanam 2,5 kg/m^2. Variabel pengamatan meliputi produktivitas tanaman dan kecernaan nutrien secara *in vitro*. Analisis data menggunakan anova dan dilanjutkan *uji Duncan's Multiple Range Test* untuk mengetahui signifikansi. Hasil penelitian menunjukkan penambahan pupuk urin dan umur panen berpengaruh nyata ($P<0.05$) terhadap produktivitas tanaman berupa tinggi tanaman, panjang daun produksi segar, bahan kering, bahan organik, dan protein kasar dibandingkan dengan kontrol internal. Perlakuan H2M3 memberikan pengaruh produktivitas yang sebanding dengan H2M4. Umur panen berpengaruh terhadap kecernaan bahan kering dan organik. Berdasarkan hasil penelitian disimpulkan kombinasi pupuk urin pada media tanam sebanyak 25,0 mL/L dan umur panen 10 hari mampu meningkatkan produktivitas, kecernaan bahan kering, dan bahan organik fodder sorgum.

Kata kunci: fodder sorgum, kecernaan nutrien, produktivitas tanaman, pupuk urin, umur panen

Introduction

Hydroponics fodder is a plant cultivation by utilizing nutritious liquid medium to support germination and growth. Forage production through hydroponics is the potential alternative forage for ruminants. Wahyono et al. (2019) state that hydroponic plants take a relatively short time using a liquid medium in a controlled environment. Cereal crops such as maize, wheat, barley, and sorghum are widely cultivated as ruminant feed. Sorghum is a potentially developed green fodder because it thrives in tropical environments (Chrisdiana, 2018), is more resistant to dry environmental conditions, drought-tolerant, effective in absorbing water and nutrients in the growth process, and able to regrowth (Shakeri et al., 2017).

The nutrient composition of hydroponic plants is influenced by the harvest time. Akbag et al. (2014) stated that hydroponic barley fodder harvested at 10 days has a higher crude protein (CP) than the 7 days. Sorghum green fodder harvested after 9 days had a higher growth and chemical profile compared to the 7 and 8 days (Wahyono et al., 2019). Also, hydroponics maize on 10 days contained higher crude protein and lower crude fiber compared to conventionally grown forages (Kumalasari et al., 2017). While planting medium and fertilizers play a vital role in plant growth, nutrients in the medium specifically contribute to metabolism. Koten et al. (2012), Choudhary and Phrabu (2016), report that nitrogen is an element that can increase growth, production, and quality of forage, the formation of plant leaves, synthesis of amino acids, and proteins content. Lack of nitrogen can cause stunted plant growth, yellow plant leaves, and low nutrient quality.

Cow urine is one of the livestock wastes that contain nitrogen which is feasible for organic fertilizer. Mudhita et al. (2016) state that Bali cattle urine contains 0.03% of total nitrogen, 23.33 C/N ratio, 0.02 ppm phosphor available, and 1.21% of organic matter. The composition of animal urine is influenced by feed, activity, environmental temperature, water consumption, and season. Herul et al. (2015) report that 60 mL/L organic cow urine fertilizer showed a significant effect on tomato plant height, number of branches, faster flowering age, number of bunches, and number of tomatoes. The advantage of using fermented cow urine is more efficient and easier to apply by spraying or watering (Huda et al., 2013). Additionally, urine fertilizer as a nitrogen source to plants can optimize the growth and increase forage biomass when harvested at a certain age. Mudhita et al. (2016) mention that Balinese cow urine fertilizer significantly affect biomass production, germination, and growth of *Pueraria javanica* compared to the non-treated plants.

Although urine, at some dose, has been a common source of organic fertilizer in various plants with a relatively long harvest period, it has not been utilized on short-harvest plants, such as hydroponic green fodder. Accordingly, this study was conducted to determine the productivity and in vitro nutrient digestibility of sorghum (*Sorghum bicolor* (L.) Moench) fodder given different levels of urine fertilizer in various hydroponic media and harvest time.

Materials and Methods

The research was conducted in June - September 2020 at the Experimental Farm, Agrostology Laboratory and Animal Feed Science Laboratory, Faculty of Animal Science, Jenderal Soedirman University, Purwokerto.

Research Methods

This study used a factorial completely randomized design (2x4) using sorghum (*Sorghum bicolor* (L) Moench) numbu varieties grown hydroponically. The first factor was the harvest time of 5 days (H1) and 10 days (H2). The second factor was planting medium consisted of water as the internal control (M1), urine fertilizer as much as 12.5 mL/L (M2) and 25.0 mL/L (M3), and 20 mg/L urea (M4, as the external control) or equivalent to nitrogen concentration as much as 133.75, 265.50, and 200.00 ppm. Each treatment was replicated 4 times. The sorghum seeds contained 87.15% dry matter (DM), 98.51% organic matter (OM), 11.66% crude protein (CP) 4.93% ether extract (EE), and 4.18% crude fiber (CF). The urine fertilizer was derived from the urine of female Ongole Crossbreed cows aged 1.5–2 years. Cow urine was collected directly using a bucket before falling to the floor of the cage to avoid mixing with feces. Fermented urine fertilizer was made by mixing cow urine, microorganism culture from effective microorganisms 4 (EM-4) and molasses in a ratio 20:2:1 according to Huda et al. (2013), then fermented for 21 days. Upon analysis, the fermented urine fertilizer contained 1.07 ± 0.04% nitrogen (N), pH of 4.78 – 5.63, and had sour aroma. Urine treatment as a nutrient provider in plants in this study modified that by Lestari and Andrian (2017).

Hydroponic planting was carried out on 32 polyethylene trays according to the treatment and the environmental temperature was 27-30^oC. Sorghum seeds were sterilized in 5.25% sodium hypochlorite solution, the clean seeds were soaked for 24 hours then spread into each tray. The density of sorghum seeds in the planting medium was 2.5 kg/m^2. The watering period is carried out 3 times a day according to the treatment at 06.00 am, 12.00 am, and 05.00 pm. On the first two days, the polyethylene trays were covered with a black cloth to support seed germination.

Sample Preparation

The observed growth data were plant height (cm), leaf length (cm), and fresh production (kg) based on Sriagtula and Sowmen (2018). A measuring tape was used to scale the leaf length as well as the plant height (from the base of the stem up to the highest tip of the plant). Fresh production was weighed with digital scales when the plants were harvested from each treatment. The fresh sorghum fodder samples were dried in an oven at 60^{0}C for 48 hours. Dry samples were finely ground to a size of ± 1 mm for testing the nutrient content by proximate analysis. The nutrient content of the samples observed included dry matter, organic matter, and crude protein based on the AOAC method (2005). The results of the proximate analysis were used to calculate the production based on nutrient content per unit area (kg/m^2).

Nutrient Digestibility by *In Vitro*

Dry matter digestibility (DMD) and organic matter digestibility (OMD) were carried out according to Tilley and Terry's (1963) stage I method. The samples were analyzed according to the treatment of sorghum fodder by incubation of the digestibility test for 48 hours. The rumen fluid sample for *in vitro* used the sheep rumen fluid. The fermentation medium was made of a mixed rumen fluid and saliva solution (McDougall) at 1:4 ratio. One liter of buffer solution consisted of 9.8 g $NaHCO_3$, 9.3 g Na_2HPO_4, 0.47 g NaCl, 0.57 g KCl, 0.12 g $MgSO_4.7H_2O$, and 0.0529 g $CaCl_2.2H_2O$. All these ingredients were dissolved in one liter of distilled water. The rumen fluid and saliva were mixed and put into a water bath while CO_2 gas was flowing. Then, 50 mL of the mixture was taken and put into a 100-mL in vitro tube pre-filled with 500 mg of sample and covered with a rubber stopper. The tube was incubated at 39^oC in a water bath for 48 hours and shaken every 8 hours. Blanks were made for digestibility correction but no additional feed samples were added.

Data analysis

The resulting data were analyzed using variance analysis with completely randomized 2x4-factorial design. The significantly different results were further analyzed using Duncan multiple range test (DMRT).

Results and Discussion

Biomass Production of Sorghum Fodder

The effect of planting media and harvesting time on the biomass production of sorghum fodder is shown in Table 1. The addition of urine fertilizer had a significant effect ($P <0.05$) on plant height, leaf length, fresh biomass, and fresh biomass conversion at each harvest time compared to internal controls. There was a correlation of increasing fodder growth between the planting medium and the harvest time. H1M4 produced the highest growth of all H1M1, H1M2, and H1M3 on 5 days. H2M3 produced a significant growth compared to the addition of urine fertilizer and harvest time of other treatments and was comparable to H2M4 treatment.

Tabel 1. Biomass production of sorghum fodder at different urine fertilizer and harvest time

Variables	Harvest time	Planting medium M1	M2	M3	M4	Mean
Plant Height (cm)	H1	$5.23^{a} \pm 0.11$	$6.64^{b} \pm 0.20$	$6.44^{b} \pm 0.22$	$9.36^{c} \pm 0.45$	$6.92^{p} \pm 1.58$
	H2	$11.24^{d} \pm 0.59$	$15.16^{e} \pm 0.31$	$14.60^{e} \pm 0.40$	$16.86^{f} \pm 0.42$	$14.46^{q} \pm 2.14$
	Mean	$8.23^{a} \pm 3.23$	$10.90^{ab} \pm 4.56$	$10.52^{ab} \pm 4.37$	$13.11^{b} \pm 4.03$	(+)
Leaf length (cm)	H1	$4.17^{a} \pm 0.40$	$5.00^{b} \pm 0.27$	$4.98^{b} \pm 0.31$	$6.67^{c} \pm 0.30$	$5.21^{p} \pm 0.99$
	H2	$8.91^{d} \pm 0.42$	$12.21^{e} \pm 0.52$	$11.63^{e} \pm 0.42$	$11.41^{e} \pm 0.55$	$11.03^{q} \pm 1.38$
	Mean	6.54 ± 2.56	8.60 ± 3.87	8.31 ± 3.57	9.04 ± 2.56	(–)
Fresh Biomass (kg/m^2)	H1	$10.66^{a} \pm 0.11$	$11.31^{b} \pm 0.18$	$11.68^{b} \pm 0.20$	$13.91^{c} \pm 0.43$	$11.89^{p} \pm 1.28$
	H2	$12.36^{c} \pm 0.30$	$15.11^{d} \pm 0.53$	$16.02^{e} \pm 0.48$	$16.30^{e} \pm 0.31$	$14.95^{q} \pm 1.66$
	Mean	$11.51^{a} \pm 0.93$	$13.21^{ab} \pm 2.06$	$13.85^{b} \pm 2.35$	$15.11^{b} \pm 1.33$	(+)
Fresh biomass conversion	H1	$4.24^{a} \pm 0.08$	$4.46^{ab} \pm 0.09$	$4.58^{b} \pm 0.15$	$5.42^{d} \pm 0.20$	$4.67^{p} \pm 0.48$
	H2	$4.93^{c} \pm 0.14$	$6.03^{d} \pm 0.22$	$6.42^{e} \pm 0.19$	$6.44^{e} \pm 0.21$	$5.95^{q} \pm 0.66$
	Mean	$4.58^{a} \pm 0.38$	$5.24^{ab} \pm 0.86$	$5.50^{b} \pm 1.00$	$5.93^{b} \pm 0.58$	(+)

$^{a, b, c, d}$ Means within rows with different superscripts differ (P<0.05); M1: Water medium as an internal control; M2: Urine fertilizer at 12.5 mL/L; M3: Urine fertilizer at 25.0 mL/L; M4: urea 20 mg/L as an external control; H1: Harvest time at 5 days, H2: Harvest time at 10 days

H2M3 treatment increased the fresh biomass by 29.61% compared to H2M1 and resulted in a biomass conversion of 6.42%. Harvesting on day-10 produced a higher growth performance than the 5 days, probably due to urine fertilizer as the source of nitrogen on planting media for the growth process. According to Ramteke et al. (2019), planting media and nutrients were needed for the germination and growth process. The conversion of nutrients from the media is used for the metabolism of plant nutrient content. Germination will produce primary shoots and roots that can be consumed by livestock. Sodiq et al. (2019) added that urine contains natural phytohormones in the form of auxins, gibberellins and cytokinins. Auxin accelerates the germination process, root and stem growth, gibberellins regulates the germination process and the development of secondary meristems, an cytokinins contributes to the development of meristem tissue, cell growth, and differentiation in the germination process.

While the height of samurai sorghum varieties planted at the 8 days on hydroponic was 14.42 cm (Wahyono et al. 2019), Zahera et al. (2015) reported 19.00-19.67-cm-tall mungbean greenhouse fodder. This difference is based on the type, plant variety, harvest times, and nutrients in the planting media. According to Mudhita et al. (2016), the addition of urine fertilizer on the media increased Pueraria javanica fresh biomass. Increasing fresh production in this research was in line with Zahera et al. (2015) on 10.68 kg/m2 greenhouse fodder and 4.27-5.27 fresh biomass conversion planted up to 8 days. Akbag et al. (2014) added that biomass and fodder quality were also influenced by soaking time, seed quality, treatment, temperature, moisture content, and nutrient media availability. The germination process may increase protein, fiber, and fat but reduce starch and dry matter. Fermented urine as a source of nitrogen in the media could be a contributing factor to sorghum fodder growth. Hao et al. (2014) reported that increasing levels of nitrogen into cultivated plants promoted the photosynthesis process because plant leaves are the vital component of photosynthesis.

Nutrient Production of Sorghum Fodder

The effect of planting media and harvesting time on nutrient production of sorghum fodder is shown in Table 2. The addition of urine fertilizer had a significant effect (P <0.05) on the production of DM, OM, CP, and DM-biomass conversion compared to internal controls. Different harvest time has a positive correlation with planting media to increase the nutrient production.

Tabel 2. Nutrient production of sorghum fodder at different urine fertilizer and harvest time

Nutrient Production	Harvest time	Planting medium				Mean
		M1	M2	M3	M4	
DM (Kg/m^2)	H1	$1.94^a \pm 0.05$	$2.13^b \pm 0.10$	$2.19^b \pm 0.08$	$2.62^{cd} \pm 0.22$	$2.22^p \pm 0.28$
	H2	$1.94^a \pm 0.04$	$2.43^c \pm 0.17$	$2.57^{cd} \pm 0.14$	$2.67^d \pm 0.09$	$2.40^q \pm 0.31$
	Mean	$1.94^a \pm 0.04$	$2.28^b \pm 0.20$	$2.38^b \pm 0.23$	$2.64^c \pm 0.16$	(+)
OM (Kg/m^2)	H1	$1.89^a \pm 0.04$	$2.08^{ab} \pm 0.10$	$2.13^b \pm 0.08$	$2.54^c \pm 0.24$	$2.16^p \pm 0.27$
	H2	$1.90^a \pm 0.04$	$2.36^c \pm 0.15$	$2.49^c \pm 0.13$	$2.52^c \pm 0.11$	$2.31^q \pm 0.28$
	Mean	$1.90^a \pm 0.04$	$2.22^b \pm 0.19$	$2.31^b \pm 0.21$	$2.53^c \pm 0.17$	(+)
CP (Kg/m^2)	H1	$0.24^a \pm 0.01$	$0.27^b \pm 0.02$	$0.28^b \pm 0.01$	$0.34^c \pm 0.03$	$0.28^p \pm 0.04$
	H2	$0.27^b \pm 0.01$	$0.35^c \pm 0.02$	$0.38^d \pm 0.02$	$0.40^d \pm 0.01$	$0.35^q \pm 0.05$
	Mean	$0.25^a \pm 0.02$	$0.31^b \pm 0.05$	$0.33^{bc} \pm 0.06$	$0.37^c \pm 0.04$	(+)
DM biomass conversion	H1	$0.90^a \pm 0.03$	$0.98^a \pm 0.05$	$1.00^a \pm 0.04$	$1.15^b \pm 0.14$	1.01 ± 0.11
	H2	$0.91^a \pm 0.03$	$1.14^b \pm 0.08$	$1.17^b \pm 0.07$	$1.20^b \pm 0.07$	1.10 ± 0.13
	Mean	$0.91^a \pm 0.03$	$1.06^b \pm 0.10$	$1.09^{bc} \pm 0.1$	$1.17^c \pm 0.10$	(–)

a, b, c, d Means within rows with different superscripts show differences (P<0.05); M1: Water medium as an internal control; M2: Urine fertilizer at 12.5 mL/L; M3: Urine fertilizer at 25.0 mL/L; M4: urea 20 mg/L as an external control; H1: Harvest time at 5 days, H2: Harvest time at 10 days

The highest DM production (2.67 kg/m2) was achieved by H2M4 followed by H2M3 (2.57 kg/m2). The harvest time at 5 days gave the highest OM production on H1M4 (2.54 kg/m2) followed by H2M3 (2.49 kg/m2) which was comparable to H2M4. Additionally, crude protein in H2M3 increased significantly (P <0.05) by 40.74% and the biomass conversion of dry matter increased by 28.51% compared to H2M1.

The dry matter of sorghum fodder in this study was comparable to mungbean fodder harvested on the 8th day (Zahera et al., 2015) and higher than sorghum fodder samurai-2 varieties grown hydroponically and harvested on the 10th day (Wahyono et al., 2019). However, it was lower than the KD4 variety of sorghum fodder cutting age at 8, 12, 16 days (Chrisdiana, 2018). The difference in nutritional composition is influenced by the type, plant variety, harvest time, and fodder variety. Ramteke et al. (2019) reported the advantages of hydroponic fodder technique including the palatability, digestibility, and high nutrient quality. Hydroponic green fodder has a protein content of 13.6% vs 10.7% when compared to forages other than fodder. Fodder can be harvested at the age of 7-8 days with a height of 20-30 cm. The hydroponic fodder system does not require a large location. Biomass conversion from 1-1.25 kg of seeds, capable of producing 5.5-7.5 kg of a fresh production. Nitrogen elements are nutrients that can stimulate overall plant growth such as for the formation of plant leaves, synthesis of amino acids and protein. According to Al Karaki et al. (2012), hydroponic fodder can provide forage in a fast period through a germination process that contains high-quality nutrients such as protein, fiber, vitamins, and minerals.

Kattering et al. (2005) described quantity and forage quality as determined by the harvest phase, genotype, maintenance management, and cutting frequency. Nitrogen fertilization play a role in increasing plant productivity early in the growth phase because the starter fertilizer can promote early growth that enables plants to capture radiation and other soil nutrient nutrients overall during the growing season (Subedi and Ma, 2009). Increasing CP value and biomass is the result of the availability of nitrogen from urine fertilizers from the planting medium.

The resulting protein value was comparable to Chrisdiana (2018) on KD4 varieties but lower than Super-1 varieties. Ramteke et al. (2019) stated that media and nutrients are needed for the germination and growth process. The conversion of nutrients from the media and cotyledons is used for the metabolism of plant nutrient content components.

Tabel 3. Nutrient digestibility of sorghum fodder at different urine fertilizer and harvest time

Digestibility variables	Harvest time	Planting medium				Mean
		M1	M2	M3	M4	
DMD	H1	$54.55^{ab} \pm 1.35$	$55.36^{b} \pm 1.51$	$55.58^{b} \pm 1.10$	$56.16^{b} \pm 1.57$	$55.41^{p} \pm 1.43$
	H2	$51.68^{a} \pm 4.67$	$53.01^{ab} \pm 2.99$	$53.27^{ab} \pm 2.08$	$53.69^{ab} \pm 2.00$	$52.71^{q} \pm 3.96$
	Mean	53.37 ± 4.03	54.19 ± 2.58	54.43 ± 1.99	54.93 ± 2.15	
OMD	H1	$55.11^{ab} \pm 1.34$	$55.78^{ab} \pm 1.74$	$56.10^{ab} \pm 2{,}23$	$58.41^{b} \pm 2.67$	$56.35^{p} \pm 2.30$
	H2	$53.14^{a} \pm 4.40$	$53.79^{a} \pm 1.35$	$54.72^{ab} \pm 3.21$	$54.72^{ab} \pm 4.54$	$53.71^{q} \pm 4.26$
	Mean	54.29 ± 3.53	54.79 ± 1.81	55.41 ± 2.73	56.56 ± 4.03	

$^{a, b}$ Means within rows with different superscripts show difference (P<0.05); M1: Water medium as an internal control; M2: Urine fertilizer at 12.5 mL/L; M3: Urine fertilizer at 25.0 mL/L; M4: urea 20 mg/L as an external control; H1: Harvest time at 5 days, H2: Harvest time at 10 days

Dung et al. (2010) added that enzyme activation in the seeds occurs during the germination process which causes the hydrolysis of protein, carbohydrates, and fats to become simpler components. The provision of fermented urine as a source of nitrogen in the media is one of the factors in increasing the growth of sorghum fodder. Leghari et al. (2016) added that nitrogen is an essential component that plays a role in protein metabolism, increased photosynthesis and plant biomass.

Nutrient Digestibility of Sorghum Fodder

The effect of planting media and harvesting time on nutrient digestibility is shown in Table 3. The addition of urine fertilizer had a significant effect (P <0.05) on dry matter digestibility and organic matter digestibility compared to internal controls. Sorghum Fodder harvesting time at 5 days had DMD and OMD higher than 10 days. The results showed that H1M3 produced DMD comparable to H1M4, but OMD of H1M3 was lower than H1M4. H1M3 increased DMD by 1.89% compared to H1M1, but H2M3 was comparable to that of H2M4. H2M3 treatment increased DMD by 3.08% and OMD by 2.97% compared to H2M1.

The DMD results in this research were lower than corn fodder harvested after 8-10 days producing 61.15% of DMD and 64.20% of OMD (Ramteke et al., 2019), Differences in nutrient digestibility may be due to the fodder type, harvest age, nutrient content, and digestibility analyzing method. Zahera et al. (2015) added that nutrient digestibility *in vitro* is an indicator of feed degradation by rumen microbes and digested by the digestive enzyme in post rumen. Hydroponic fodder is high-quality and highly digestible forage. The DMD of this study was greater than 51.11-52.71% in *Pueraria javanica* by Mudhita et al. (2016) and 40.2-50.50% in *Sorghum plumosum* var by Keraf et al (2015). According to Sondakh et al. (2018) a higher DMD of a feed ingredient is proportional to the quality of the feed material. Organic matter digestibility is higher than the dry matter digestibility feed ingredient. The OMD sorghum fodder in this study was comparable with 47.96-53.85% in Sorghum Mutant Lines by Puteri et al. (2015). Increasing OMD is proportional to the CP and decreases in CF content as an organic component. According to Tillman et al. (1998), feed organic matter that is easily digested is the result of soluble OM such as protein, dissolved carbohydrates, and fat. Increasing CF would decrease nutrient degradation because CF has cellulose and hemicellulose components which often bind to lignin so it is difficult to degrade by digestive enzymes.

Conclusions

Incorporating 25.0 mL/L urine fertilizer on a planting medium and harvest time in 10-day could increase productivity, dry matter digestibility and organic matter digestibility of sorghum fodder.

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