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EFFECT OF VARIOUS LEVELS OF NITROGEN AND PHOSPHORUS FERTILIZER WITH SHEEP AND GOAT MANURE ON MORPHOLOGY, YIELD AND CHEMICAL COMPOSITION OF JUMBO FODDER PRODUCTION

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An experiment was conducted to evaluate the effect of various levels of nitrogen and phosphorus fertilizer with sheep and goat manure on botanical parameters, yield and chemical composition of Jumbo fodder. The experiment was conducted by using 10 ton/hector sheep and goat manure as basal dose for all treatments. Treatment T_1 was control without any inorganic fertilizer, T_2 contain 50 kg/hector urea and 50 kg/hector triple super phosphate (TSP), T_3 applied 100kg/ hector urea and 60kg/hector TSP and T_4 applied 150kg/hector urea and 70 kg/hector TSP. Six plants were randomly collected from each plot and measured the length of every plant, stem length, leaf length, stem diameter and number of leaf in cm by using meter stick at 60 days and 75 days from planting and recorded. A significant effect of nitrogen and phosphorus fertilizer application on plant leaf and stem length was observed with 100kg/hector nitrogen and 60kg TSP/hector at 75 days of harvesting. Whole plant length was not significant but tallest plant was observed in T_3 treatment. Stem and leaf percentage was insignificant but highest percentage was found in T_3. Total yield of fodder was highly significant and highest in T_3 (55.22ton/ hector). Significant effect was observed on DM% of whole Jumbo fodder, leaf and stem of fodder. Highest DM was found about 27.29% in T_4. Average ash content for all treatments was significantly higher (11.69%) in 60 days than 75 days. The total Ash content was gradually reduced with increase in the nitrogen (N) and phosphorus (P) fertilizer doses it was lower with treatments having N-P 150-70 kg ha-1 than that was in lower dose and control. A significant effect was also found on CP% and it also observed that with higher doses of nitrogen fertilizer increased the CP % of Jumbo fodder. DM and CF percentage of whole Jumbo fodder increased with the maturity of fodder but the CP, ash and NFE content of fodder decreased with the age of fodder and CP decreased by around 3%, Ash 1 to 1.5% and NFE 2% when Jumbo was harvested at 60 days instead of 75 days. From this study it is suggested that 100kg/hector urea and 60kg/hector TSP can be used with sheep and goat manure for highest production of Jumbo fodder and its nutritive value.

Key Words: Jumbo fodder, fertilizers, manures, botanical parameters, chemical composition.

Livestock plays an important role in nutrition directly through the consumption of animal products by livestock owners and their families; and indirectly through the sale of animals and animal products as a source of income. However, traditional feeding system and shortage of quality fodders and feeds are the major constraint for dairy farming in Bangladesh during the lean season from January to May and also throughout the year for poultry, which leads to lower performance of animals. Therefore, cultivation of quick growing good quality perennial forages like Napier, Para, German and recently Jumbo (Hybrid sorghum) is needed to mitigate the chronic shortage of fodders for feeding ruminants in Bangladesh. Hybrid Sorghums are known for being drought resistant and tolerance to hot temperatures, diseases, pests and various soil types. They are more efficient in water absorption because they have twice as many secondary roots per unit of primary root as corn and have only half as much leaf area as corn for evaporation. Their water requirements are the same as corn but they

have the ability to go dormant during extended drought periods. After drought periods growth of hybrid Sorghums will begin when the rains come (Beth Wheeler, 1998). Also it has the potential of producing high green fodder yield. To boost the fodder Jumbo production, it is necessary to adapt proper production technology. The use of organic and inorganic fertilizers could enhance Jumbo production. Moreover, combined use of manure and inorganic fertilizer is an approach that seeks to reduce cost of external inputs, increase food production and safeguard the environment for future generation (Bodine *et al*., 2001). The success of combined nutrient management depends on several factors that include the types and quantities of organic materials available, and the rates and proportions at which the two nutrient sources are combined. The sheep and goat manure containing higher nutrient than farmyard manure and compost and it can be used as combined with inorganic manure.

Fertilizer application is one of the principle factors that increase the forage yield. An adequate supply of nutrients at each stage essential for optimum growth and development of forage (Cox et al.,1993).The essential nutrients such as nitrogen and phosphorus are important for plant growth and yield (Marschner,1998). The efficiency of utilization of nutrients from fertilizer applied to soils depends on weather condition, biological characteristics of the crops and fertilizer rates.

Fertilizer is a major component of farm production costs, however, it's best to apply an optimum amount rather than leaning toward excess; moreover, nitrogen fertilizer can also cause soil acidification, although this effect is offset by adding lime. Sorghum is intolerant of soil acidity, so it's important to monitor the soil pH and add lime as needed. Phosphorus is one of the major essential plant nutrients after nitrogen and is the second most deficient plant nutrient (Munir et al., 2004). The optimum rate of phosphorus application is important in improving yields of most crops (Cisar et al., 1992). The yield and chemical composition of fodder varies due to many factors such as the soil quality, plant density, fertilizer dose, growing season and stage of maturity etc. Among the various factors, Phosphorus application is important which directly contributes to the quality and quantity of fodder production. Application of phosphorus fertilizer gradually increased plant height, stem diameter, number of leaves per plant, leaf area per plant and fodder yield (Khalid et al., 2003).

Sorghum has a significant role in livestock production, particularly in the tropical zone where feedstuffs could not meet animal and others (Pholsen and Suksri, 2007). And hence it can be potential fodder crops in Bangladesh observed that response of Sorghum to phosphorus (P) was strongly influenced by soil P status as well as applied P level and was similar at three physiological stages of crop growth viz. boot leaf initiation, 50 percent flowering and maturity. In our country phosphorus fertilizer is normally used in the form of Triple Super Phosphate (TSP) (Das et. al., 1996).

In plants, phosphorus is a common component of organic compounds. Phosphorus deficiency, however, significantly reduced plant growth (Marschner, 1998). Ayub et al. (2002) noticed that nitrogen and phosphorus application increased the green fodder yield of maize. The nitrogen and phosphorus fertilizer applied to Jumbo fodder vary widely under different soil and climate condition but information on the optimum N and P levels with sheep and goat manure is very limited. Therefore, the study was undertaken with the following objectives (i) to find out the morphology, yield and chemical composition of Jumbo fodder by applying different doses of nitrogen, phosphorus fertilizer with sheep and goat manure; (ii) to evaluate the nutritional value of Jumbo fodder in different stages; (iii) to identify optimum dose of nitrogen and phosphorus fertilizer with sheep and goat manure for Jumbo fodder production.

MATERIALS AND METHODS

The Experimental Site

The experiment was conducted during the period of January to April, 2012 in Jalabad at Chittagong, Bangladesh to study the effect of different levels of nitrogen and phosphorus fertilizer with sheep and goat manure on growth, forage yield and nutritive value of hybrid sorghum. The soil of the experiment site is sandy loam without water lodging condition. It is located at latitude 22°21″ north and longitude 91° 48″ east. The annual rainfall is about 2000 mm to 2250 mm and temperature 25.6°C and at an altitude 183 m above the sea level.

Soil Analyses

Composite soil samples were taken to a depth of 20 cm at the start of the study. Several core soil samples were taken randomly from different location of the plot, bulked and sub-sampled were sent to regional soil research centre at Hathazary, Chittagong, Bangladesh for laboratory analysis before manure application. The analysis value of soil is given in Table 1.

Land preparation and manure and fertilizer application

The experimental land was prepared properly using power tiller and there after using spade. Individual plot size was 4×4 square meters and eight plots were prepared for four treatment. After ploughing with power tiller sheep and goat manure were mixed with spade during 2nd day of land preparation. The treatments were applied three different dose of nitrogen and phosphorus fertilizer with basal dose of sheep and goat manure at 10 ton/hector according to (Vasanti and Kumarswamy 2000). The manure application was done by broadcast method and finally inorganic fertilizers were applied during seed sowing day. The inorganic fertilizer used was nitrogen from urea, phosphorus from single-super-phosphate and potassium from muriate of potash. Half the quantity of N and the full rate of P and K were mixed to the soil during final preparation of land for Jumbo planting. The remaining two doses of inorganic source of nitrogen applied through urea at 30 and 45 days of sowing.

Treatments and Design

The treatments in this study consisted of three levels of Nitrogen and Phosphorus fertilizer with sheep & goat manure and designated as T_1, T_2, T_3 & T_4 respectively with two replications as followed:

Treatment	Replication	Fertilizer dose (Kg/ hectare)	Sheep and goat manure
T_1	R_1 R_2	0	10 ton/hector
T_2	R_1 R_2	Urea - 50kg/ h TSP – 50 kg/ h MP – 30 Kg/ h	
T_3	R_1 R_2	Urea - 100kg/ h TSP – 60 kg/ h MP – 30 Kg/ h	
T_4	R_1 R_2	Urea - 150kg/ h TSP – 70 kg/ h MP – 30 Kg/ h	

Jumbo planting and agronomic practices

The hybrid sorghum (Jumbo) was sown on 24th January 2012 using seed rate of 5 kg ha-1 in 70 cm apart rows and 30 cm intra- row with the help of a single row drill. After emergence, the interplant distance was maintained at least 30 cm by thinning the surplus plants at the time of four leaves stage resulting in a plant population of 50,000 plants ha^{-1} for Jumbo fodder cultivation. All other agronomic practices were kept normal and uniform in the treatments. When the plant height attains 15-20 cm then the weed were controlled using khurpy. Weeding was done twice first one at 30 days and second one at 60 days after plantation. All other agronomic practices were kept normal and uniform in the treatment. Fodders were harvested on 10th April and measured the total biomass weight as well as stem and leaf

weight. Fodder was used for silage preparation.

Data Collection

Six plants were randomly collected from each replication and measured the length of every plants, stem length, leaf length, stem diameter and number of leaf in cm by using meter stick and this data were collected at 60 days and 75 days from planting .The total biomass yield and dry matter yield was also recorded. The green forage was left to dry in an oven until a constant weight was reached then final dry matter yield was calculated in tons per hectare.

Table 1. Characteristics of experimental site

Characteristics	Unit	Value
Organic matter	%	1.8
Total Nitrogen	%	.06
Phosphorus	Ppm	76.74
Sulpher	Ppm	7.5
K	(meq/100g)	0.32
P^H	--	5.46
Ec	(ds/m)	0.10
Soil textural class	Sandy clay loam	

Sample preparation for chemical analysis

Jumbo fodder were collected from different location of plot at 60 days of plantation and after final cutting and chopped (1-2cm) the sample and mixed well and 500-1000 gm were taken separately for leaves, stem and whole plant. The sample were dried into the sunlight about 2-3 days and milled and grind using grinder and filled in polythene bag and label the sample for chemical analysis (DM, CP, CF and ash) by the methods of AOAC (1990).

Statistical analyses

The data on fodder growth, botanical fraction, leaf length and breath and chemical composition of fodder were recorded at 60 days and after final cutting during 75 days of plantation and analyzed by using Proc GLM of SAS (2008) in considering of Completely Randomized Design (CRD). Treatment means were compared by using the least significant difference test at 0.05-probability level (Steel et al., 1997).

RESULT AND DISCUSSION

Effect of various level of nitrogen and phosphorus fertilizer with sheep & goat manure on botanical parameter of Jumbo fodder

Plant height

Plant height plays an important role in the final yield of fodder crops. Table 2, represents the data concerning plant height. Total length of whole plant was increased by higher dose of nitrogen fertilizer. In 60 days the plant height affect significantly with the N and P fertilizer. But in 75 days the plant height was statistically insignificant. Length of whole plant in different treatment ranges 265 to 292 cm in 60 days and 304 to 339 cm in 75days .The mean values of plant length indicated that taller plant were attained by those plots which received nitrogen and phosphorus at rate 100 kg ha-1 and 60 kg ha-1 in both 60 and 75 days compare to control and very high dose of N and P fertilizer. The probable reason could be the balance nutrient supply by 100-60 NP kg ha-I combinations. The results are in agreement with Arain et al. (1989), who concluded that plant height of Maize increased with increase in N, P up to 100, 60 kg ha-1 further increased in nitrogen had adverse effects on plant height. This finding is similar with Eltelib (2004).

Stem diameter

Stem diameter, which directly influence the yield potential of fodder crops was influenced significantly by different dose of P and N fertilizer application. The stem diameter in 75 days was higher than in 60 days but there were no significant difference within the treatments in 60 days. However, the stem diameter in T_3 (6.22±0.02 cm) were significantly higher than in T_1 (5.15±0.025 cm) in 75 days (Table 2). The plot produced significantly thicker stem which receives nitrogen and phosphorus at rate 100 kg ha-1 and 60 kg ha-1 than NP 150-70, 50-50 and control. The minimum (5.03± 0.025 cm) stem diameter was recorded in control treatments (T0) that is plot without inorganic fertilizer. The significant effect of nitrogen and phosphorus (different manure) application also has been reported by Ayub et.al. (1997, 1999); Safder (1997).

Stem length

Stem length was increased with maturity of the plant and application of nitrogen and phosphorus fertilizer. The result shows highly significant variation. Stem length of Jumbo fodder was increased with dose levels of nitrogen fertilizer. Result of this study is similar to Eltelib (2004).

Leaf length

Leaf length of fodder in different treatment is highly significant. But leaf length was increased with higher doses of nitrogen and phosphorus fertilizer. In T_1 treatment, leaf length is lower than other treatment. The highest leaf length (94.92 cm) were found treatment receiving nitrogen fertilizer at dose rate 100kg/ha and phosphorus 60kg/ha in 75 days (Table 2). Leaf length was increased with increased dose of N and P fertilizer (Sarker et al., 2004).

Number of Leaf

Number of leaf is increased with maturity of plant. There was no significant difference in leaf length among the treatments both 60 and 75 days. Leaf number was found higher in treatmentT_3.The lower number leaf was 8 and higher number was 10.

Leaf and Stem percentage

Table 2 shows data regarding the Leaf and stem percentage. The leaf and stem proportion did not significantly vary among four treatment however, leaf percentage was higher in T_3 (16.05%) and lower in T_1 and stem percentage was higher in T_1 (86.56%) than the other treatment. Nitrogen and phosphorus fertilizer had positive effect on leaf percentage. This result is similar to (Ali, 2000).

Effect of various level of nitrogen, phosphorus fertilizer with sheep & goat manure on yield of Jumbo fodder

Green fodder yield

The total Green Jumbo fodder yield was ranging from 29.71 to 40.17 ton ha-1 in 60 days and 42.39 to 55.22 ton ha-1 in 75 days (Table 3). Maximum green fodder yield obtained in T_3 with an average of 40.16 t ha-1 in 60 and 55.22 t ha-1 in 75 days and it was significantly higher than those of other treatments. The green fodder yield increases with increases of N and P fertilizer up to certain limit but excess fertilizer affect the yield of fodder. The P fertilizer helps faster growth of plant .These findings are in conjunction with those of Hussain et al. (1991) and Zahid and Bhatti (1994) reported remarkable increases in forage yield of elephant grass with nitrogen application Sarker et al. (2004) also found increase in Jumbo fodder yield in increase of nitrogen fertilizer.

The higher number leaf and leaf area, an important yield component, plays a vital role in increase the green fodder yield due to more assimilation of photosynthesis and higher number of tillers can extract more nutrients from soil and result in maximum fodder production (Muchow,1988).

Dry matter yield

Dry matter yield was higher in 75 days than 60 days .In 60 days dry matter yield was significantly vary among the treatments whereas in 75 days the dry matter yield found to be highest (15.05 t ha-1) for treatment using 100 kg and 60 kg P followed by fertilizer doses NP 150-70,50-50 and control (Table 3). The increase in DM yields due to the higher number of leaves plant-1, plant height and leaf area of plant. This result are in close agreement with those of Hussain et al. (1991) and Zahid and Bhatti (1994). Patel et al. (1994) reported increase in dry matter yield with the increase in application of nitrogen fertilizer in sorghum.

Leaf and stem yield

Average leaf yield of four treatments was slightly higher at 75 days than at60days however stem yield was 1.5 times higher at 75 days compare to 60 days (Table 3). In 75 days the maximum amount of leaf were obtained 8.79 t/ha in treatment applied 100-60 N-P kg ha-1 and lower amount (5.73 t/ha) in control without any inorganic fertilizer. Similar trend production was found in case of stem yield and higher production was 46.42 t/ha in T_3 treatment at 75 days and 32.89 t/ha at 60 days.

Crude protein yield

Crude protein yield was higher in 75 days compare to 60days of harvesting of Jumbo fodder. Data regarding crude protein yield exhibited a significant ($P<0.05$) differences among different treatments. It increased l with the in N fertilizer. Maximum crude protein yield (1.45 t ha-1) was observed in the treatments having100-60 N-P kg ha-1that was followed by the treatments having

50-50,150-70 and control N-P kg ha-1(Table 3).The positive effect of increase in nitrogen fertilizer on CP yield. Similar results were found by Khan et. al. (1996) in oat grass and Singh et al. (1976). They observed that the higher levels of nitrogen increase the CP yield of the grasses.

Effect of various level of Nitrogen, Phosphorus fertilizer with Sheep & Goat manure on chemical composition of Jumbo fodder

Fresh dry matter (DM) and sundry dry matter (SDM)

Table 2. Effect of various level of Nitrogen, Phosphorus fertilizer with Sheep & Goat manure on Botanical parameter of Jumbo fodder

Parameter	Cutting Days	Treatments				Level of significance
		T_1	T_2	T_3	T_4	
Plant height(cm)	60days	265^{b}±15	291.52^{a}±6.08	292.52^{a}±10.19	287.07^{a}±0.32	*
	75days	304±37	319.67±36.34	339.17±12.5	325.94±10.04	NS
Stem Length(cm)	60days	177.5^{a}±2.50	207.29^{a}±2.71	210^{a}±27.5	189.25^{a}±6.5	*
	75days	243^{b}±47.00	281.83^{a}±33.17	296.88^{a}±8.88	290.14^{a}±8.54	*
Leaf length(cm)	60days	87.33^{b}±1.17	92.78^{a}±3.97	94.92^{a}±1.76	92.63^{a}±1.13	*
	75days	84.75^{b}±2.24	90.45^{a}±1.45	93.86^{a}±.36	86.54^{b}±0.10	*
Stem diameter (cm)	60days	5.05±0.05	5.10±0	5.22±0.08	5.21±0.21	NS
	75days	5.03^{a}±0.025	5.84^{b}±0.51	6.22^{c}±0.02	5.04^{a}±0.035	*
Stem %	60 days	79.25±1.25	83.52±1.66	81.65±4.10	79.04±0.48	NS
	75 days	86.56±0.25	84.06±2.54	83.95±1.045	85.56±2.83	NS
Leaf p %	60 days	19.75±0.75	16.48±1.66	20.90±1.60	21.21±0.23	NS
	75 days	13.44^{a}±0.25	15.94^{ab}±2.54	16.05^{b}±1.045	14.44^{a}±2.84	*
No of leaf	60 days	8.25±0.25	8.22±0.215	8.05±0.45	9.25±0.25	NS
	75 days	9.5±0.83	8.50±0.50	9.03±0.73	9.8±0.80	NS

* $P < 0.05$, ** $P < 0.01$ a, b, c, Super script with different letters are significant different

NS = Non significant

* = Significant, **= Highly significant

T1 = Sheep & Goat manure without fertilizer

T2= Low doses of nitrogen & phosphorus fertilizer

T3=High doses of nitrogen & phosphorus fertilizer

T4= Very higher doses of nitrogen & phosphorus fertilizer

Table 3: Effect of various level of Nitrogen, Phosphorus fertilizer with Sheep & Goat manure on Yield of Jumbo fodder

Parameter (Yield Ton/hector)	Cutting Days	Treatments				Level of significance
		T_1	T_2	T_3	T_4	
Total Yield (Green basis)	60 days	29.71^{b}±0.205	36.05^{a}±0.67	40.165^{a}±2.775	33.92^{a}±2.265	*
	75 days	42.39b±3.62	51.77a±1.89	55.22a±6.405	47.67b±0.74	*
Dry matter yield	60 days	6.47c±0.071	8.13b±.133	9.69a±0.52	8.88b±1.21	*
	75 days	11.15b±.95	13.89a±.494	15.05a±1.75	13.01a±0.15	*
Leaf yield(t/ha)	60 days	5.87b±.26	5.95b±0.71	8.35a±.062	7.82a±.82	*
	75 days	5.73b±.38	8.29a±1.61	8.79a±.45	6.86b±1.27	*
Stem yield(t/ha)	60 days	23.54b±.21	30.09a±.038	32.89a±3.91	29.22b± 3.56	*
	75 days	36.99b± 3.24	43.47a± .27	46.42a± 5.95	40.80b ±1.80	*
CP yield(t/ha)	60 days	.82b± .014	.90a ±.045	1.21a± 0.17	1.14a± .20	*
	75 days	1.02b± .035	1.32a± .088	1.45a± .19	1.40a± .023	*

* P < 0.05 , ** P < 0.01 a, b, c, Super script with different letters are significant different

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T1 = Sheep & Goat manure without fertilizer

T2= Low doses of nitrogen & phosphorus fertilizer

T3=High doses of nitrogen & phosphorus fertilizer

T4= Very higher doses of nitrogen & phosphorus fertilizer

Fresh dry matter (DM) and sundry DM (FDM and SDM) of whole plant increased significantly (P<0.05) with increase age of plant for all treatments (Table 4). The FDM and SDM percentage were superior in the treatments receiving 100-60 N-P kg ha-1that was followed by the treatments having 50-50,150-70 and control N-P kg ha-1(Table 4). The maximum FDM recorded for whole plant 24.15% at 60 days with T3 treatments and 27.29 % with T_4 treatments in later stage(75 days) and SDM was highest(86.88%) with treatment T_4 at advanced stage for whole plant (Table 4). The FDM and SDM increased with increased nitrogen and phosphorus fertilizer. Significance in dry matter with application increase nitrogen and phosphorus has also been reported by Ahmad (1999).

Crude protein percentage (CP %)

Crude protein (CP) content of whole plant decreased with maturity for all treatments (Table 4) with CP content of Jumbo fodder at 60 days (11.13-12.75) was higher than at 75days (9.16-10.85%) for all treatments. The reduced Cp content of plant matured was mainly due to rapid accumulation of fibrous components(Table 4).Maturity has a large influence on the CP content of plant and its reduction may be explained in two factors (i) fodder mature increase proportionally in the stem and (ii) CP content fall in all fractions

with maturity advanced (Minson,1990). Protein contents were influenced also by Nitrogen fertilizer application and higher percentage of protein content observed treatments with higher dose of nitrogen fertilizer. CP percentage of whole plant of treatment with high dose fertilizer N-P 150-70 kg ha-1 was higher (10.85%) at 75 days and this value was statistically superior to other treatments and control. There was no significant difference among T_1, T_2 and T_3.The increase in crude protein concentration with higher dose nitrogen and Phosphorus fertilizer due to the reason that more nitrogen available to soil from nitrogen fertilizer enhanced the amino acid formation. The increase in CP with nitrogen and phosphorus application has also been reported by (Husnain (2001) and Cheema (2000).

Total ash content (ash %)

Total ash content decreased significantly with maturity of whole plant for all treatments. Average ash content for all treatments was significantly higher (11.69%) in 60 days than 75 days (Table 4).The total Ash content was gradually reduced with increase in the N and P fertilizer doses it was lower with treatments having N-P 150-70 kg ha-1 than that in lower dose and control (Table 3).The result was in agreement findings of Sarkar et al (2004).They reported that there was a lower ash content of fodder with increasing N fertilizer doses.

Crude fiber (CF %)

Crude fiber of whole plant of Jumbo fodder increased with increasing maturity stage (Table 4). Average Crude fiber content at 75 days was higher (41.80%) than at 60 days (35.40%).CF content was lower treatments receiving nitrogen and phosphorus fertilizer at different doses compare to control the crude fiber content was higher in control treatments which was 42.0% at 75 days .However, there was no significant difference of CF content among the all treatments at 60 days.

Ether extract (EE %)

Ether extract content of Jumbo fodder at different doses of N fertilizer are shown in Table 4. It was found that with the increasing doses of N fertilizer increase the

Table 4. Effect of various level of Nitrogen, Phosphorus fertilizer with Sheep & Goat manure on Chemical composition of Jumbo fodder (whole plant)

Traits	Days	Treatments				Treatment Average	Level of significance
		T1	T2	T3	T4		
DM Fresh	60	21.79^{ab}±0.09	22.55^{b}±0.05	24.15^{a}±0.55	24.00^{a}±0.50	23.13^{b}±0.392	*
	75	26.10^{b}±0	26.83^{a}±0.025	27.26^{a}±0.005	27.29^{a}±0.01	26.87^{a}±0.181	*
Dry matter	60	87.87^{a}±0.210	87.50^{b}±0.035	86.75^{b}±0.845	86.88^{b}±0.505	87.25^{b}±0.257	*
	75	90.13^{b}±0.525	91.50^{a}±0.27	92.32^{a}±0.48	92.39^{a}±0.86	91.58^{a}±0.407	*
Ash	60	14.50^{a}±0.24	13.63^{b}±0.375	9.9^{c}±0.10	8.75^{c}±0.75	11.69^{a}±0.931	*
	75	12.75^{a}±0.55	12.67^{a}±0.47	7.69^{b}±0.32	8.94^{b}±0.06	10.51^{b}±0.863	*
Nitrogen Free Extract	60	36.80^{c}±0.44	38.98^{bc}±1.175	40.82^{b}±0.515	41.95^{a}±0.15	39.64^{a}±0.781	*
	75	35.14^{c}±0.96	35.98^{a}±0.02	40.13^{a}±0.12	37.92^{b}±0.715	37.29^{b}±0.762	*
Ether Extract	60	1.00±0	1.00±0.10	1.03±0.05	1.05±0.05	1.025±0.025	NS
	75	0.95±0.05	1.10±0	1.05±0.05	1.10±0.10	1.05±0.327	NS
Crude Fiber	60	35.98±0.075	35.28±0.275	35.75±0.25	35.50±0	35.40 ±0.119	NS
	75	42.00^{a}±0	40.75^{b}±0.75	41.50^{ab}±0	41.25^{ab}±0.25	41.38^{a}±0.226	*
Crude Protein	60	12.10^{a}±0.125	11.13^{b}±0.425	12.49^{a}±0.415	12.75^{a}±0.55	12.25^{a}±0.292	*
	75	9.16^{b}±0.46	9.50^{b}±0.30	9.65^{b}±0.15	10.85^{a}±0.23	9.78^{b}±0.263	*

* $P < 0.05$, ** $P < 0.01$ a, b, c, Super script with different letters are significant different

* = Significant, **= Highly significant

T1 = Sheep & Goat manure without fertilizer

T2= Low doses of nitrogen & phosphorus fertilizer

T3=High doses of nitrogen & phosphorus fertilizer

T4= Very higher doses of nitrogen & phosphorus fertilizer

EE content in both 60 and 75 days.

Nitrogen free extract (NFE %)

Nitrogen free extract is higher at 60 days than in 75 days for all treatments and the average NFE at 60 days was 39.64% which was statistically higher than 75 days (37.29%). NFE content were influenced also by Nitrogen and phosphorus fertilizer application and higher percentage of NFE observed treatments with higher dose of nitrogen fertilizer. NFE percentage of whole plant of treatment with high dose fertilizer N-P 150-70 kg ha-1 was higher (40.13%) at 75 days and this value was statistically superior to T_3 and control Table 4).

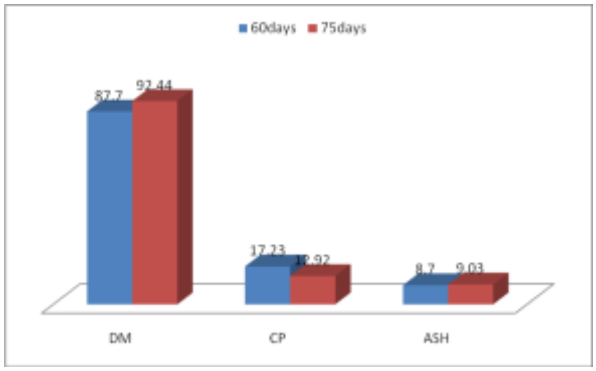

Figure 1. Chemical composition of leaf at two stages

According to figure 1 it is observed that the average DM and ash percentage of leaf increased with age of Jumbo fodder and it was approximate 87.7 and 92.96%, 8.7 and 9.02% at 60 days and 75 days respectively. However, the crude protein percentage decreased with the age of maturity of fodder.

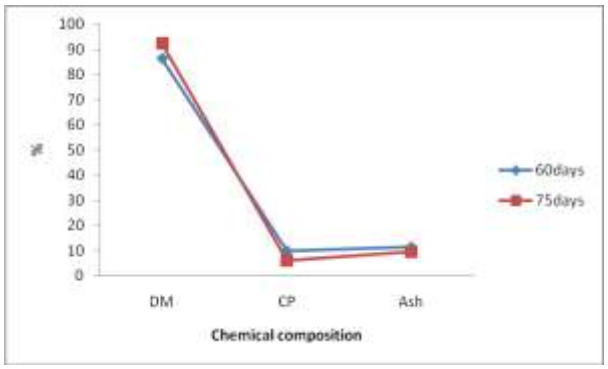

Figure 2. Chemical composition of stem at two stages

From figure 2 CP and Ash percentage of stem decreased with the increased the age of fodder whereas, DM increased with increased of fodder age which ultimately increase the yield of fodder but nutritive value also important matter that need to consider. For this reason it is essential to indicate the suitable time of harvest fodder.

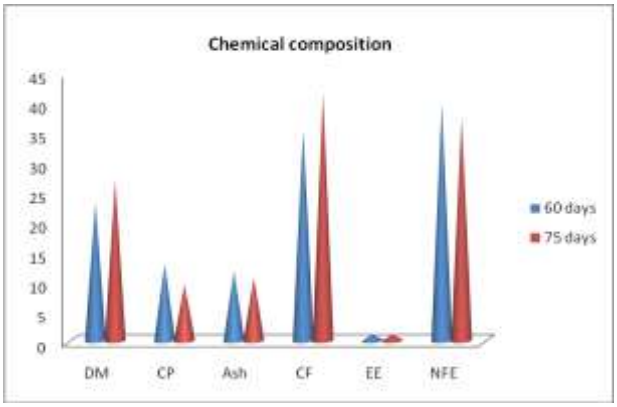

Figure 3. Nutritive value of whole Jumbo fodder at 60 and 75 days

Figure 3 indicated that DM and CF percentage of whole Jumbo fodder increased with the maturity of fodder but the CP , ash and NFE content of fodder decreased with the age of fodder and Cp decreased by around 3% ,Ash 1 to 1.5% and NFE 2% when Jumbo harvest at 60 days and 75 days. So it is better to harvest hybrid sorghum or Jumbo fodder at the age of 60 days if the growth is optimum.

CONCLUSION

From the study it may be concluded that higher doses of nitrogen and phosphorus fertilizer increase the performance on botanical parameters, yield and chemical composition of Jumbo fodder. The amount may vary according to soil characteristics and environment of study area. It can also be observed that total yield, DM, leaf, stem and CP (crude protein) yield was higher in 75 days compared to 60 days however, stem yield was 1.5 times more at 75 days than 60 days which decrease the nutritive value and digestibility of fodder as stem contain less CP and High CF at advanced stage of maturity and there was little variation in leaf yield and Cp yield between two stage of Maturity. Moreover, DM and CF percentage of whole Jumbo fodder increased with the maturity of fodder but the CP, ash and NFE content of fodder decreased with the age of fodder when Jumbo harvest at 75 days . So

in terms of nutritive value and digestibility, it is better to harvest Hybrid sorghum fodder at 60 days if the growth is optimum. It can be recommended that sheep and goat manure can be used as organic source as a rate 10 ton per hectare land and urea 100kg/ha and TSP 60kg/ha can be used with sheep and goat manure for optimum Jumbo fodder production. However, more research required to identify the accurate dose of nitrogen and phosphorus fertilizer for better performance of Jumbo fodder in different soil and different climate and also need animal trail to know the effect of Jumbo fodder on Animal production performance and digestibility.

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