Research Article

Effect of Nitrogen and Phosphorus Fertilizer on Yield and Nutritional Quality of Jumbo Grass (Sorghum Grass × Sudan Grass)

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Abstract | An experiment was conducted to evaluate the effect of various levels of nitrogen and phosphorus fertilizer on the yield and nutritional value of Jumbo grass (Sorghum Grass × Sudan Grass). The experiment was conducted by using five different levels of nitrogen (N) fertilizer *viz.* 0(N_0), 40(N_1), 80(N_2), 120(N_3) and 160(N_5) kg N/ha in the form of urea and three levels of phosphorus (P) fertilizer *viz.* 0(P_0), 10(P_1) and 20(P_2) kg P/ha in the form of Triple Super Phosphate (TSP). The treatments were randomly assigned to each of three blocks in 5×3 factorial experiments in randomized complete block design (RCBD). A significant effect (P<0.01) was found on green biomass yield at 80 (N_2) and in case of P application for green biomass yield, statistically non-significant (P>0.05). Application of N fertilizer had a significant (P<0.01) effect on DM yield at the dose N_1 (40 kg/ha). DM content (g/100 g DM) decreased significantly (P<0.01) with increasing level of N fertilizer. P fertilizer had no significant effect on DM content. CP content increased significantly (P<0.01) with the increasing level of N fertilizer up to 80 kg N/ha and linearly decreased with increasing level of P fertilizer. N fertilizer application had a significant (P<0.01) effect on OM yield at N_1 (40 kg/ha) but further increase N application did not show any significant result of OM yield. A significant effect (P<0.01) was found on EE content up to N_2 (80 kg/ha) but ash content decreased significantly (P<0.01) with the increasing level of N fertilizer and P fertilizer had non-significant effect on EE and ash content. ADF content decreased with the increasing rate of N fertilizer. There was no significant effect (P>0.05) on NDF content of Jumbo grass. P content of Jumbo grass showed significant effect (P<0.05) by increasing levels of P. IVOMD content increased non significantly (P>0.05), where ME content increased significantly (P<0.01) as the level of N fertilizer application . P fertilizer application had no significant effect (P>0.05) both on IVOMD and ME. Based on the above findings, it may be suggested that Jumbo grass can be cultivated through the application of 80 kg N/ha and 10 kg P/ha for maximum production.

Keywords | Nitrogen, Phosphorus, Jumbo Grass, Chemical Composition, Metabolizable Energy

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INTRODUCTION

The major constrains to livestock production in Bangladesh is the acute shortage of feeds and fodder both in quality and quantity. Therefore, it is crying need for the growing animal population to satisfy the demand of animal feeds in the country. Bangladesh has 24.68 million cattle, 3.12 million sheep, 25.2 million goat and 0.64 million buffalo (DLS, 2013). The cost of producing milk and meat in Bangladesh is very high which is due to low yield and high feed cost. Since the high production cost occurs primarily due to shortage of feeds and fodder and seasonal fluctuation in the supply of quality green fodder, the farmers are advised for growing high yielding fodders in their field for

feeding animals. The total production of green roughage in Bangladesh is 51.16 million tons DM against the requirements of 73.8 million tons DM (Huque et al., 2014). As the result, the shortage of green fodder can be overcome by cultivated some potential high yielding fodder like Napier, Para, German, Maize, Oat, Jower and Cowpea following scientific methods and appropriate technology. Traditionally, crop residues, mainly rice straw, supplemented with some by products such as rice polish, wheat bran, oil cakes, and rice gruel are the main feed resources used for feeding cattle and buffaloes in Bangladesh. We need to feed ruminant's dry roughage (straw) in order to make a low-cost diet with quality green grass. Rice straw contains very low protein (3%), high crude fiber specially the very high neutral detergent fiber, low energy, extremely low non-fiber carbohydrates (soluble carbohydrates <5%) and low levels of calcium, phosphorous and sulphur. Meanwhile, green fodders are palatable, laxative in action and easily digestible resulting efficient utilization of the entire feed. Forages contain all the essential nutrients in order to maintain maximum production. Sorghum-Sudan Hybrids locally called "Jumbo" or "Sudax" resemble Sudan grass but are taller, have larger stems and leaves, and give higher yields. It is an adaptable, vigorous highly productive species and withstands considerable periods of drought. It can also be grown all over the year and be kept for re-growth after harvesting. It is palatable and could be fed fresh, as silage or directly grazed on the field. Jumbo grass is one of the most important forage producing high herbage yield per unit of land. The cultivation of this type of quick growing good quality forage is needed to cope up the chronic shortage of fodder for feeding ruminant in Bangladesh. It is well recognized that N and P fertilizer is very important component for production of not only Jumbo fodder but also of other fodder crops because of the facts that without protoplasm no living cell is possible and nitrogen is essential for production of protoplasm (Iqbal et al., 1992). Jumbo production can be augmented through manipulation of appropriated agricultural practices like application of fertilizer, water, pest, weed, sowing methods. Application of Nitrogen and Phosphorus fertilizer may improve yield and nutritive value of such fodder. Nitrogen from urea is an important nutrient in increasing productivity of forage biomass. The response of N fertilizer on green forage yield and protein content and also enhances the growth of shoot and makes the fodder juicy that is essential for fodder crop. It has been reported that N fertilizer increased both the biomass yield and quality of Jumbo grass (Khalid et al., 2003). Sarker (2000) carried out an experiment with Jumbo grass by applying fertilizer Nitrogen per hectare and reported that the yield characteristics (green biomass, CP, DM, OM) of Jumbo grass increased as the level of Nitrogen fertilizer increased in both 1st and 2nd cutting. Meanwhile, use of Phosphorus fertilizer has much effect both in quality and quantity on Jumbo grass (Vashishatha et al., 1997). Information on the optimum level of N and P and their effective combination of fertilizer on forage biomass and DM yield in Bangladesh are scanty. In our country, Nitrogen and Phosphorus fertilizer are normally used in the form of Urea and Triple Super Phosphate (TSP) respectively and excessive use of these fertilizers may increase the cultivation cost. So, the appropriate level of Urea and TSP application in Jumbo grass cultivation is needed to know. Keeping this view in mind, this research was done to evaluate the effect of different levels of Nitrogen and Phosphorus fertilizer on biomass yield, chemical composition and nutritive value of Jumbo grass and the effective combination of Nitrogen and Phosphorus fertilizer for Jumbo grass production.

MATERIALS AND METHODS

The experiment was carried out at the Animal Nutrition field laboratory, Department of Animal Nutrition, Bangladesh Agricultural University, Mymensingh during the period from December 25, 2007 to March 15, 2008. The experimental site was in the old Brahmaputra flood plain agro-ecological zone having non-calcareous dark-grey soil. The soil was silt loam textured, neutral in reaction (P^H 7.0). Nitrogen, phosphorus and potassium content of the soil samples were 0.098%, 16.0 ppm and 57.0 ppm, respectively. The investigation was carried out using five different levels of Nitrogen (N) fertilizer (0, 40, 80, 120 and 160 kg N/ha) in the form of urea as the quantity of 0, 87, 174, 261 and 348 kg/ha respectively and three levels of Phosphorous (P) fertilizer (0, 10 and 20 kg P/ha) in the form of Triple Super Phosphate (TSP). The fertilizer treatments were allocated randomly in each block. Potassium (K), Sulphur (S) and Zinc (Zn) were applied as basal doses in the form of muriate of potash (MP), Gypsum and $ZnSO_4 7H_2O$(Zinc Sulfate Heptahydrate) at the rate of 100, 111 and 8.7 kg/ha respectively. During land preparation, cow dung was applied at the rate of 18 MT/ha. All the basal doses, the required amount of TSP and half of the recommended amount of urea were applied during land preparation and rest half of urea was applied 5 weeks later as top dressing. The whole experiment area was divided into three blocks with the spacing at 40 cm border area between two blocks. Each block was subdivided into fifteen experimental plots having a plot size of 10 m^2 (2 m × 5 m). The treatments were randomly assigned to each of three blocks in a 5 × 3 factorial arrangement. After harvesting, the representative samples of Jumbo grass were collected from each plot. The samples were chopped and dried in the sun and then ground to pass through 40 mm mesh sieve. After grinding, the samples were kept in the polythene bags, labeled and stored for further analysis. The nutrient contents of Jumbo grass were determined according to the methods of AOAC (2003). Acid Detergent Fiber (ADF) and Neutral Detergent Fiber (NDF) were determined by fibertec sys-

tems (VELP Scientifica, EU) following the procedures of Georing and Van Soest (1970). Phosphorus concentration of samples was determined with according to the method of Page et al. (1982). The IVOMD and ME content of Jumbo grass was determined following the procedure of Menke et al. (1979) and the calculation was done according to Menke and Steingess (1988):

$$IVOMD = 16.49 + 0.9042\ GP + 0.0492\ CP + 0.0387\ TA$$
$$ME = 2.20 + 0.1357\ GP + 0.0057\ CP + 0.000286\ EE2$$

Where,
IVOMD= *In vitro* organic matter digestibility (%)
ME = Metabolizable energy (MJ/kg DM)
GP =Gas production expressed (ml per 200mg DM)
CP = Crude protein (g/kg DM)
TA = Total ash (g/kg DM)
EE = Ether extract (g/kg DM)

The data were analysed using 'MSTAT' statistical program to compute analysis of variance (ANOVA) for 5x3 factorial experiments in randomized complete block design (RCBD). Differences among the treatment means were determined by Duncan's Multiple Range Test (Gomez and Gomez, 1984).

RESULTS AND DISCUSSION

Yield

The yield of Jumbo grass cultivated at different levels of Nitrogen fertilizer (0, 40, 80, 120 and 160 kg N/ha) in the form of Urea and Phosphorus fertilizer (0, 10 and 20 kg P/ha) in the form triple supper phosphate (TSP) on the biomass, dry matter, crude protein and organic matter yields are shown in Table 1.

Green Biomass

Significantly (P<0.01) higher total green biomass yield was observed in application of 80, 120 and 160 kg N/ha when compared with 0 (N_0) and 40 (N_1). However, no significant difference was observed among the application of 80, 120 and 160 kg N/ha. The significantly (P<0.01) highest biomass yield of Jumbo grass due to application of 80, 120 and 160 N/ha compared to other two treatments might be due to its tremendous response of Nitrogen fertilizer on yield. The application of increased levels of Nitrogen fertilizer presumably increased the availability of soil N which might have enhanced the meristematic growth and resulted in higher forage yield. The present findings are in keeping with Zewdu et al. (2002b) who stated that the mean green matter yield was increased (P<0.05) when the level of N fertilizer application increased from 0 to 92 kg N/ha. It is apparent that Jumbo production in this present experiment was the highest (33.55 MT/ha) at the level of 10 kg P/ha as compared to the level of 0 kg P/ha (32.09 MT/ha) and 20 kg P/ha (29.85 MT/ha). These results are statistically non-significant (P>0.05). The results are in agreement with the findings of Roy and Khandakar (2010) indicated that the effect of P fertilizer on green biomass yield of Sorghum fodder at first cutting was statistically non-significant (P>0.05).

Dry Matter (DM)

Dry matter yield responded well due to fertilizer application which implies a positive effect with increasing level of Nitrogen application. The results of the present findings revealed that N fertilizer application had a significant (P<0.01) effect on DM yield of Jumbo grass up to the dose N_1 (40 kg/ha). But further increase N (80, 120 & 160 kg N/ha) did not show any significant improvement of DM yield. In the present experiment the vegetative growth of Jumbo grass could be optimum at 40 kg N/ha. On the other hand, Khaleduzzaman et al. (2007) reported that DM yield increased of Napier grass up to 160 kg N/ha because Napier grass had a higher vegetative growth having more tethering than Jumbo grass. The findings of Mbugua et al. (1999) and Tassema et al. (2003) are in keeping with the findings of Khaleduzzaman et al. (2007).

It is revealed from the results (Table 1) that the highest DM yield was found (5.76 MT/ha) in treatment P_1 (10 kg P/ha) than the other two treatments that were 5.22 MT/ha in treatment P_2 (20 kg P/ha) and 5.34 MT/ha in P_0 (0 kg P/ha). There was no significant difference in DM yield among the treatments P_0, P_1 and P_2. The results of DM yield are consistent with those reported by Bhagwan et al. (1997) who indicated that DM yield increased with the increasing level of Phosphorus rated up to 60 kg P/ha.

Crude Protein (CP)

The results showed that increasing level of N fertilizer resulted in significant (P<0.01) increase in the total CP yield up to 80 kg/ha but further increase of N (120 and 160 kg N/ha) fertilizer did not show any significant improvement of CP yield when compare with control and 40 kg N/ha. This might be due to rapid synthesis of carbohydrates into protein and protoplasm leaving relatively smaller portion for cell wall synthesis up to 80 kg N/ha level. Meanwhile, Kumar et al. (2001) observed a significant (P<0.05) increase in CP yield from 0.39 to 0.83 MT/ha as the level of N fertilizer increased from 0 to 160 kg/ha in oat forage. Other findings of Ruggieri et al. (1995) who found a similar trend of CP yield in *Brachiria brizantha cv.* Marandu forage with the findings of Kumar et al. (2001).

The CP yield of Jumbo grass at different P fertilizer treatments was 0.51, 0.51 and 0.45 MT/ha in response to P_0 (0 kg P/ha), P_1 (10 kg P/ha) and P_2 (20 kg P/ha) respectively. The effect of Phosphorus fertilization on CP yield of Jumbo grass was non-significant (P>0.05). Meanwhile, Vashishatha et al. (1997) found an increase CP yield at

the application of 40 kg P_20_5/ha in sorghum was due to the higher level of fertilizer application than the present experiment of highest dose (20 kg P/ha).

Organic Matter (OM)

The results of the present findings revealed that N fertilizer application had a significant (P<0.01) effect on OM yield of Jumbo grass up to the dose N_1 (40 kg/ha). But further increase N (80, 120 & 160 kg N/ha) fertilizer application did not show any significant improvement of OM yield. Saha et al. (2001) who found that OM yield of oat and maize significantly (P<0.05) increase with higher doses of N application (150 kg N/ha).

The organic matter yield per hectare was 4.77, 5.08 and 4.68 MT in response to the application of 0, 10 and 20 kg P/ha respectively. OM yield increase up to 10 kg P/ha but after that it decreases with the increase of Phosphorus fertilizer.

Chemical Composition

The chemical composition (g/100 g DM) of Jumbo grass as affected by different doses of Nitrogen and Phosphorus fertilizer are shown in Table 2. The DM content (g/100 g DM) of Jumbo grass decreased significantly (P<0.01) with the increasing level of N fertilizer from 0 (control) to 160 kg N/ha. The values for DM content of Jumbo grass were 17.36, 17.00, 17.17, 16.08 and 15.88 g/100 g in response to 0, 40, 80, 120 and 160 kg N/ha respectively. This might be due to rapid vegetative growth of plants as indicated from the rapid increase in water soluble portion of different parts of the forage plant with the increasing levels of N fertilizer. Similar results were observed in Napier by Khaleduzzaman et al. (2007) who observed a significant (P<0.01) decrease in DM content with the increasing level of N fertilizer from 0 to 160 kg/ha. The findings of the present experiment were in contrast with the observation in Jumbo Bajra hybrid (Singh et al., 1976) and oat fodder (Uddin et al., 2005a) where they found significant increase in DM content. Application of higher doses of Phosphorus fertilizer (20 kg P/ha) has a positive effect on dry matter content of the forage. The highest DM content (17.50 g/100 g) was observed from the application of 20 kg P/ha followed by 17.19 and 16.66 g/100 g by the application of 10 and 0 kg P/ha respectively. These results were not statistically significant. The findings were in keeping with the findings of Khaleduzzaman et al. (2007). They found that DM content had not increased significantly with the increasing levels of Phosphorus fertilizer application.

The application of N fertilizer has marked effect on CP content of Jumbo grass. The CP content of this present findings increased significantly (P<0.01) with the increasing level of N fertilizer up to 80 kg N/ha. This might be due to rapid synthesis of carbohydrates into protein and protoplasm leaving relatively smaller portion for cell wall synthesis up to 80 kg N/ha level. Khandaker and Islam (1988) observed similar response who found highest value of CP (8.85%) at the application of 63 kg N/ha. Similar results were also obtained in Napier Bajra hybrid (Singh et al., 2000). The CP values were 9.72, 9.43 and 8.76 g/100 g DM with the level of 0, 10 and 20 kg P/ha respectively. These results indicate that CP content linearly decreases with increasing level of P fertilizer. The results are in contrast with the findings of Keshwa et al. (1992) who reported that crude protein content of summer pearl millet increased significantly with the increasing level of P fertilizer application.

The ADF content of forages decreased non-significantly due to increased doses of Nitrogen fertilizer. In Jumbo forage, ADF content decrease at 40, 80, 120 and 160 kg N/ha than control (0 kg N/ha). The results are in keeping with the findings of Lee and Lee (2000) who found that ADF content decreased with the increasing rate of Nitrogen fertilizer.

The result showed (Table 2) that the effect of Phosphorus fertilization on ADF content was statistically non-significant (P>0.05). Similar results were observed by Khaleduzzaman et al. (2007) who found that ADF content decreased in Napier grass with increasing levels of P fertilizer. The results are contrasted with the findings of Virender et al. (2001) who reported that ADF content increased significantly with the increasing levels of P fertilizer application.

The mean values for neutral detergent fiber (NDF) of Jumbo grass were shown in (Table 2). The values were statistically non-significant (P>0.05). Similarly, Khaleduzzaman et al. (2007) did not find any significant effect on the NDF content in Napier grass with the increasing level of N fertilizer. The difference among the NDF content 81.43 (P_0), 80.75 (P_1) and 81.24 (P_2) g/100g DM at different doses (0, 10 and 20 kg P/ha) of Phosphorus fertilizer in this present experiment were statistically non-significant. The highest NDF content was found at 0 kg P/ha than those of other two treatments groups (10 and 20 kg P/ha).

The highest value of EE was found at N_4 (160 kg/ha) (Table 2). The results of EE content of Jumbo grass showed that there was significantly (P<0.01) increased with the increase of fertilizer up to N_2 (80 kg/ha). Earlier investigation by Uddin et al. (2005 a) who reported that EE content of oat forage increased significantly (P<0.01) with the increasing level of N fertilizer from 0 to 115 kg N/ha. The EE content at different doses of Phosphorus fertilizer (0, 10 and 20 kg P/ha) was 2.48, 2.48 and 2.59 g/l00g DM respectively. These results showed that the effect of Phosphorus fertilization on EE percent was statistically non-significant. Similar result was found by Khaleduzzaman et al. (2007) in Napier grass. He observed that the EE content increased non-significantly due to application of P fertilizer.

Table 1: Yield of green biomass, DM, OM and CP (MT/ha) of Jumbo grass at different doses of Nitrogen and Phosphorus fertilizer

Yields (MT/ha)	Levels of Nitrogen (kg/ha)					Levels of Phosphorus (kg/ha)			Significance of contrast #		
	N_0	N_1	N_2	N_3	N_4	P_0	P_1	P_2	A	B	AB
Green biomass	20.53^{c}	29.22^{b}	36.10^{a}	34.54^{a}	38.76^{a}	32.09	33.55	29.85	**	NS	NS
DM	3.56^{b}	4.96^{a}	6.19^{a}	5.55^{a}	6.15^{a}	5.34	5.76	5.22	**	NS	NS
CP	0.28^{c}	0.45^{b}	0.67^{a}	0.55^{ab}	0.57^{ab}	0.51	0.51	0.45	**	NS	NS
OM	3.13^{b}	4.41^{a}	5.54^{a}	5.01^{a}	5.54^{a}	4.77	5.08	4.68	**	NS	NS

Treatments: N_0 = 0 kg N/ha; N_1 = 40 kg N/ha; N_2 = 80 kg N/ha; N_3 = 120 kg N/ha; N_4 =160 kg N/ha; P_0 = 0 kg P/ha; P_1 = 10 kg P/ha; P_2 = 20 kg P/ha
Contrast: **A** = Main effect of Nitrogen fertilizer; **B**= Main effect of Phosphorus fertilizer; **AB**= Interaction between Nitrogen and Phosphorus fertilizer; **NS**= Non-significant; *P<0.05; **P<0.01; ^{a,b,c} Mean values with different superscripts differ significantly

Table 2: Mean chemical composition and phosphorus content (g/100 g DM) of Jumbo grass at different doses of Nitrogen and Phosphorus fertilizer

Parameters	Levels of Nitrogen (kg/ha)					Levels of Phosphorus (kg/ha)			Significance of contrast #		
	N_0	N_1	N_2	N_3	N_4	P_0	P_1	P_2	A	B	AB
DM (g/100 fresh sample)	17.36^{a}	17.0^{b}	17.17^{b}	16.08^{c}	15.88^{c}	16.66	17.19	17.50	**	NS	S
Chemical composition (g/100 g DM)											
CP	7.86^{c}	9.08^{b}	10.90^{a}	9.93^{b}	9.55^{b}	9.72	9.43	8.76	**	NS	NS
ADF	48.37	46.80	46.60	45.34	46.26	47.19	46.70	46.15	NS	NS	NS
NDF	81.17	82.09	80.27	80.37	81.26	81.43	80.75	81.24	NS	NS	NS
EE	2.08^{c}	2.46^{b}	2.60^{ab}	2.68^{ab}	2.75^{a}	2.48	2.48	2.59	**	NS	NS
Ash	12.42^{a}	11.13^{b}	10.10^{c}	9.75^{c}	9.93^{c}	10.73	10.70	10.58	**	NS	NS
Phosphorus	0.24	0.23	0.28	0.25	0.26	0.25^{b}	0.34^{a}	0.37^{a}	NS	*	NS

Treatments: N_0 = 0 kg N/ha; N_1 = 40 kg N/ha; N_2 = 80 kg N/ha; N_3 = 120 kg N/ha; N_4 =160 kg N/ha; P_0 = 0 kg P/ha; P_1 = 10 kg P/ha; P_2 = 20 kg P/ha
Contrast: **A** = Main effect of Nitrogen fertilizer; **B**= Main effect of Phosphorus fertilizer; **AB**= Interaction between Nitrogen and Phosphorus fertilizer; **NS**= Non-significant; *P<0.05; **P<0.01; ^{a,b,c} Mean values with different superscripts differ significantly

Table 3: Mean *in vitro* organic matter digestibility (%) and metabolic energy (MJ/kg DM of Jumbo grass at different doses of Nitrogen and Phosphorus fertilizer

Parameters	Levels of Nitrogen (kg/ha)					Levels of Phosphorus (kg/ha)			Significance of contrast #		
	N_0	N_1	N_2	N_3	N_4	P_0	P_1	P_2	A	B	AB
IVOMD (%)	55.42	57.76	58.28	59.44	59.86	56.10	58.45	57.71	NS	NS	NS
ME	6.54^{c}	6.81^{bc}	7.38^{a}	7.25^{ab}	7.43^{a}	6.91	7.03	7.29	**	NS	NS

Treatments: N_0 = 0 kg N/ha; N_1 = 40 kg N/ha; N_2 = 80 kg N/ha; N_3 = 120 kg N/ha; N_4 =160 kg N/ha; P_0 = 0 kg P/ha; P_1 = 10 kg P/ha; P_2 = 20 kg P/ha
Contrast: **A** = Main effect of Nitrogen fertilizer; **B**= Main effect of Phosphorus fertilizer; **AB**= Interaction between Nitrogen and Phosphorus fertilizer; **NS**= Non-significant; *P<0.05; **P<0.01; ^{a,b,c} Mean values with different superscripts differ significantly

Total ash content (Table 2) was decreased significantly (P<0.01) with the increasing doses of N application up to N_2 (80 kg/ha). The results are in with the findings of Khan et al. (1996) who reported that application of N fertilizer decreased ash percentage of oat fodder. The effects of P fertilization on ash content (Table 2) was decreased non-significantly (P>0.05). Meanwhile, Uddin et al. (2005a) found that ash content decreased significantly (P<0.01) with the increasing levels of P fertilization in oat fodder.

The phosphorus content (Table 2) of Jumbo grass were increased non-significantly (P>0.05). On the other hand, Babnic et al. (2000) who found that P concentration increased with increasing levels of N fertilizer. Phosphorus fertilization had a significant (P<0.05) positive effect on P concentration of Jumbo grass. It can be seen from the results that over the control (0 kg P/ha) due to application of 10 and 20 kg P/ha Phosphorus concentration increase significantly (P<0.05). Similar results were found by Awan and Abbasi (2000) who found that with increasing levels of P fertilizer, Phosphorus uptake increased.

In vitro Organic Matter Digestibility (IVOMD) and Metabolizable Energy (ME) Content of Jumbo Grass

In vitro organic matter digestibility (IVOMD) and me-

tabolizable energy (ME) contents of Jumbo grass as affected by different levels of N and P fertilizers are presented in Table 3. *In vitro* organic matter digestibility (IVOMD) of Jumbo grass differs non-significantly with different levels of N fertilizer application. The highest value (59.86%) for IVOMD was observed at 160 kg N/ha while the lowest value (55.42%) was observed at 0 kg N/ha. This result indicated that IVOMD increased as the level of N fertilizer increased from 0 to 160 kg N/ha. Similar results were also reported by Johnson et al. (2001) who conducted experiment on Star grass and Bermuda grass by applying different doses of Nitrogen fertilizer and found a linear increase in IVOMD of Star grass and Bermuda grass with the increasing level of N fertilization. Zewdu et al. (2002a) reported similar results on Napier grass. The highest value (7.43 MJ/kg DM) for ME was observed at 160 kg N/ha level while the lowest value (6.54 MJ/kg DM) at 0 kg N/ha. This results indicated that ME content increased significantly ($P<0.01$) with the increase of N fertilization. The present findings of increased ME value due to increased N fertilization is in agreement with the results of Uddin et al. (2005b) in oat fodder. He found higher ME content with higher doses of N fertilization. Effect of different levels of P fertilizer on IVOMD of Jumbo grass was observed which was statistically non-significant ($P>0.05$) and ME value increased with the increased level of P fertilizer which was also statistically non-significant ($P>0.05$). The results are in agreement with the findings of Roy et al. (2010) who indicated that the effect of P fertilizer on IVOMD and ME content of Sorghum fodder was statistically non-significant ($P>0.05$) at first cutting.

CONCLUSION

This above research findings, it may be suggested that Jumbo grass can be cultivated through the application of 80 kg N/ha and 10 kg P/ha for maximum production. Chemical analysis is time consuming and accurate estimation of chemical composition is not possible because destruction of feed components occur during chemical analysis by chemicals. Further latest technique can be applied to overcome this erroneous situation. Meanwhile, further research trial will be conducted by using different levels of Nitrogen fertilizer *viz.* 55(N_0), 65(N_1), 75(N_2), 85(N_3) and 95(N_5) kg N/ha in the form of Urea and three levels of Phosphorus (P) fertilizer *viz.* 4(P_0), 8(P_1) and 12(P_2) kg P/ha in the form of Triple Super Phosphate (TSP) to evaluate accurate yield and nutritional quality of Jumbo grass. If the constrains could be overcome properly it would have accurate result. However, this study indicates important indication. The findings of this study can be used by the farmers and researchers for fulfilling the production demand from green roughage in Bangladesh.

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CONFLICT OF INTEREST

No competing financial or other interest exists.

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