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EFFECTS OF NITROGEN ON GROWTH, FODDER YIELD AND SILAGE OF MAIZE AND JUMBO FODDER WITH COWPEA AS INTER CROPPING

M. J. KHATUN[1], M. R. ISLAM[2], M. K. I. KHAN*[,3] AND M. EBRAHIMI[4]

Department of Animal Science,
Faculty of Agriculture, University Putra Malaysia, 43400 UPM,
Serdang, Selangor, Malaysia
**(e-mail : kik1775@yahoo.co.uk)*

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SUMMARY

Two field experiments were conducted to know the effect of different doses of nitrogen fertilizer on the growth, botanical parameters and yield of maize and jumbo fodder cultivated with cowpea as inter crop and evaluation of silage. The experimental plots for Jumbo with cowpea and maize with cowpea were applied to nitrogen (N_2) levels as urea 0, 100, 150kg ha-1 and 0, 150, 220 kg/ha, respectively. Significant differences were observed between treatments and control after applying N_2 fertilizer. In 75days, maximum plant length 146.85cm, stem length 126.99cm, dry matter (DM) yield 16.78t/ha, fresh yield 20.10t/ha, crude protein (CP)13%, acid detergent fiber (ADF) 59.50%, ash 12.5% and sundry matter (SDM) 88.5% were observed of Maize after applying 220kg urea/ha. In 75days, higher values of these parameters were obtained for jumbo after applying150kg urea/ha. Higher DM and CP content were found with Cowpea silage (95.18% vs 92.78% and 14.78% vs 6.35%) compared to Maize with Cowpea silage. To meet up the shortage of fodder for livestock priority should be given to cultivate of Maize with Cowpea and the recommended doses of nitrogen was 220 kg urea/ha for maize and 150 kg urea/ha for jumbo.

Key Words : Fodder, nitrogen fertilizer, silage quality, yield

Maize is one the multipurpose fodders which is rapidly expanding as a grain, green fodder and silage crop. Maize has potential for supplying larger amounts of energy-rich forage for animal diets, and its fodder can safely be fed at all stages of growth without any danger of oxalic acid or prussic acid toxity as in case of sorghum, *Sorghum bicolour* (Dahmardeh *et al.*, 2009). Hybrid sorghum has a significant role in livestock production, particularly in the tropical zone, where feedstuffs could not meet animal requirement due to many factors such as poor soil fertility, drought and others (Pholsen and Suksri, 2007). Jumbo fodder (*Sorghum sudanefe*) is also a promising and popular crop because of its high productivity and ultra-late flowering nature triggered by short day length. Cowpea (*Vigna sinensis*), an annual legume with high level of protein (about twice times more than maize), can be mixed with maize to improve forage protein content of diets and thus the costs of high quality forage production can be lowered.

In the tropical region including Bangladesh, low fodder yield and fodder scarcity periods, during summer and winter months aggravate the situation (Sarwar *et al.*, 2002). In rest of the year, fodder is abundantly available. Manipulating this surplus fodder can bridge the gap between supply and demand during scarcity periods. Preservation of surplus fodder by silage making when fodder is abundant can help to reduce its irregular supply pattern around the year.

Non-leguminous crops are having relatively low buffering capacity and low concentrations of fermentable carbohydrates and extensively being used worldwide for silage making (Bolsen *et al.*, 1996). Though, the most popular crop for silage making is maize, however, sorghum, maize and jumbo grass can also be used for silage making (Tauqir *et al.*, 2007). The plant yield and chemical composition of fodder vary due to many factors such as soil quality, plant density, fertilizer and growing seasons.

An adequate supply of nutrients is essential for optimum growth and development of maize (Cox *et al.*, 1993). The N levels applied to jumbo fodder vary widely under different soil and climatic conditions, but information on the optimum N level for maize and jumbo crop with cowpea fodder is very limited. Therefore, the study was designed with the objectives: (i) to compare

the growth and botanical fraction of maize with cowpea and jumbo crop with cowpea fodder using different nitrogen levels; (ii) to evaluate the nutritional composition of maize and jumbo with cowpea; and (iii) to evaluate the silage prepared from these fodders crops.

MATERIALS AND METHODS

The experiment was conducted from December 2009 to August 2010 at two locations at Subarnachar inside dike, Noakhali district of Bangladesh. The soil texture of the experiment site was sandy clay loam and the chemical characteristics of soil are given in Table 1.

TABLE 1
Soil characteristics of experimental site

Characteristics	Values	
	Jumbo with cowpea	Maize with cowpea
pH (%)	7.40	5.60
Organic matter (%)	4.70	3.77
Ec (dl/m)	1.40	4.35
Nitrogen (%)	0.11	0.09
Potassium (meq/100g)	0.46	0.16
Phosphorus (ug/g soil)	20.0	6.00
Sodium (ug/g soil)	19.0	115
Boron (ug/g soil)	0.33	0.41
Zink (ug/g soil)	0.92	0.97

Land preparation, fertilizer application and experimental design

Land was prepared properly using power tiller twice and then by spade. After ploughing with power tiller, fertilizer was mixed with soil during second day of land preparation. The treatments were applied different nitrogen source from urea fertilizer. The dose of urea fertilizer was given in Table 2. The fertilizer application was done by broadcast method during seed sowing day. The urea fertilizer was divided into three doses where first dose was given at the day of sowing, second dose and third dose were applied 30 days and 55 days after sowing, respectively for both experimental plot.

At first four decimal (25 square meter) land was taken for each experimental plot at two locations. Of these two experimental plots, one was used for intercropping maize with cowpea cultivation and another plot was used for intercropping of jumbo (hybrid sorghum) with cowpea fodder cultivation. The experimental lay out was Randomized Completely Block Design (RCBD) with two replication of each treatment as given in Table 2.

Intercropping of maize with cowpea planting and agronomic practices

The intercropping of maize with cowpea was sown on 10th December 2009 with row to row distance 70 cm and seed to seed distance 30 cm and seed rate for maize, cowpea were 30kg/ha and 15kg/ha, respectively and cowpea were cultivated between the two rows. All other agronomic practices were kept normal and uniform in the treatments. The first weeding was done at 15 days after plantation, the second weeding at 42 days and the third at 60 days. These fodders were harvested on May 09, 2010 i.e.75 days after sowing.

Intercropping of jumbo grass with cowpea planting and agronomic practices

The intercropping of hybrid sorghum (Jumbo grass) with cowpea was sown on 6th January 2010 with row to row distance was 65cm and seed to seed distance was 25cm and the seed rate for jumbo, cowpea were 12kg/ha, 15kg/ha, respectively and cowpea were cultivated between the two rows. The first weeding was done at 15 days after plantation, the second at 42 days and the third at 60 days. All other agronomic practices were kept normal and uniform among the treatments. These fodders were harvested on May 09, 2010 i.e. 75 days after sowing.

Silage preparation

Plants (maize, jumbo) for silage making were allowed to mature till the dry matter content attains 30-45 %. The plant material was collected, chopped into pieces about an inch in length @ 3.5 to 4.0 % of the green weight was added to the chopped fodder. The pit type silo was rectangular in shaped and it was 1.3 to 2.0 m above ground level.

A polythene sheet was placed into the pit to make the pit for air tight. Then chopped fodder which was 30% dry matter evenly distributed throughout the pit, the fodder was filled upto 01 to 1.5 m above the ground level rapidly and pressed properly to remove air. The pit was covered in all sides with 04 inches thick

TABLE 2
Experimental design

Types of fodder	Treatment		
	Control (T_1)	Low dose of urea (T_2)	High dose of urea (T_3)
	ton/ha	ton/ha	ton/ha
Maize with cowpea	Without any fertilizer	0.15	0.22
Hybrid sorghum /Jumbo grass with cowpea	Without any fertilizer	0.10	0.15

layer of rice straw, followed by covering with a plastic sheet. The plastic sheet was then plastered with a blend of wheat straw and mud to avoid any cracking while drying. Then the silage was given at fermentation time at least 30 days.

Sample preparation for Chemical analysis

Maize, jumbo and cowpea fodder sample were collected from different location of plot at 45 days and 75 days during harvesting chemical analysis (DM, CP and ash) using methods of AOAC (1990), and ADF described by Van-Soest *et al.* (1971). The sample of silage were collected after 95 days of keeping fodder in silo pit.

Statistical analysis

Data on fodder growth, botanical fraction, leaf length and breadth of fodder were analyzed by RBD using PROC GLM of SAS (SAS, 2008). Treatment means were compared by using the least significant difference test at $P > 0.05$.

RESULTS AND DISCUSSION

Growth Parameters of Maize, Jumbo and Cowpea Fodder

The effect of different doses of nitrogen fertilizer on botanical parameter of Maize, Jumbo and Cowpea fodder is present in Table 3.

Plant height

The plant height increased with increasing nitrogen doses for all the fodders. Plant height at 75 days was greater than in 45 days of all treatments. At 45 days taller plant were observed T_3 (220 kg urea per hectare), and intermediate in T_2 but significantly different with control. At 75 days the maximum plant height was recorded in T_3 (higher dose of nitrogen) and minimum in control. The increased in the plant height due to nitrogen fertilizer may due to increased in number of nodes or inters nodes elongation or both. The similar results have been reported by Ayub *et al.* (1997) and Hassan *et al.* (2010) for maize, Abuswar and Mohammed (1997) and Eltelib (2004) for Jumbo and Younis *et al.* (2003) for Cowpea.

Stem length

At 75 days the maximum and minimum stem length (126.99cm and 113.8cm), respectively for maize and 193.36cm and 176.53cm for jumbo were found in T_3 and control, (Table 3). Stem length increased with maturity of the plant and application of nitrogen fertilizer. There were no statistical differences between T_2 and T_3 treatments in 75 days.

Leaf and stem percentage

In maize, at 45 days higher value of leaf percentage was found in T_1(45.07%) and lower value of leaf percentage was 41.95% in T_1 and T_3 (Table 3). In general, stem percentage was higher at 75 day than 45 days of plantation. At 75 day, higher stem percentage (73.54 ± 3) was obtained and lower stem percentage ($67.22\% \pm 0.799$) was found in control plot. There were no significant differences observed between T_1 and T_2 (Table 3). These findings was contradictory to Bilal *et al.* (2005), who reported that stem percentage decreased with the increasing of nitrogen doses.

In case of Jumbo, at 45 days, the nitrogen doses had no significant effect to the leaf percentage (Table 3). Leaf percentage was higher at 45 days than at 75 days. However, there was no significant differences observed in leaf and stem percentage at 45 days among the

TABLE 3
Effect of different doses of nitrogen fertilizer on botanical parameter of maize and Jumbo and cowpea fodder

Parameter	T_1 (without fertilizer)		T_2 (Low dose fertilizer)		T_3 (High dose fertilizer)	
	45 days	75 days	45 days	75 days	45days	75 days
Maize Fodder						
Plant length (cm)	76.7±1.76	135.1±6.59	74.3±1.76	143.5±6.50	86.1±9.30	146.8±5.44
Stem length (cm)	29±2.82	113.8±6.56	32.1±0.96	124.8±10.0	33.5±2.47	126.9±5.98
Stem (%)	53.5^{b}±0.50	67.2±0.79	52.3^{b}±1.01	68.8±3.08	57.9^{a}±1.18	73.5 ± 3.00
Leaf (%)	45.1±0.75	31.5±1.01	47.1 ±0.95	30.5±1.25	41.9±0.75	23.8±2.10
DM yield (t/ha)	-	13.4^{b}±0.90	-	14.8^{a}±1.00	-	16.8^{a}±1.37
Fresh yield(t/ha)	-	16.3^{b}±0.38	-	17.9^{a}±1.50	-	20.1^{a}+±1.27
Total fodder yield (t/ha)	-	15.9^{b}±0.68	-	17.5^{a}±0.69	-	18.8^{a}±0 .73
Jumbo Fodder						
Plant length (cm)	86.2±27.30	241.6±38.8	94.5±28.20	254.9 ±24.6	126.6±27.43	286.7 ±33.60
Stem length (cm)	24.3±10.20	176.5±37	37±2.12	181.2 ±30.50	48.5 ±20.50	193.9 ±7.62
Leaf %	47.1± 1.60	21.6 ±4.69	45.4±4.48	23.3± 2.4	39.8 ±9.21	18.8 ±1.69
Stem %	52.8±1.61	76.7^{c}±2.40	54.7±4.30	78.3^{b}± 4.66	60.1±9.21	81.2^{a} ±1.66
DM yield(t/ha)	-	16.2^{c}±0.33	-	19.9^{b} ±1.80	-	24.1^{a} ± 0.90
Fresh field(t/ha)	-	17.6^{b}±0.56	-	21.8^{b}±2.54	-	27^{a}±0.2 80
Total fodder yield (t/ha)	-	20.6^{b} ±2.36	-	25.2^{ab}±3.39	-	29^{a} ± 0.28
Cowpea						
Plant height (cm)	94.7^{c}±0.35	137^{b}±16.97	174.5^{b}±0.7	243.4^{a}±30.1	205^{a}± 7.07	311.1^{a}± 28.1
No.of leaf /plant	15.5±0.70	15.5±2.12	21.5±0.70	16± 1.41	24.8± .35	17.5±0.70
Leaf (%)	45.8±0.04	52.1^{b}±0.77	45.1±0.11	57.8^{a}± 7.29	46.7± .11	58.0^{a}± 7.14
Stem (%)	54.6± 0.54	48^{a}±0.89	54.9± 0.08	42.2^{b}± 7.30	53.9±0.07	41.5^{b}±6.27

T_1= without fertilizer; T_2 = Low dose of nitrogen (urea) fertilizer; T_3 = Higher dose of nitrogen (urea) fertilizer

^{a,b,c}Mean values for same day with different superscripts in the same row differ significantly ($p< 0.05$).

treatments but at 75 days these value differed significantly. At 75 day, higher stem percentage (81.17%±1.66) was found with high doses of nitrogen (T_3) and lower stem percentage (76.74%± 2.40) was found in control plots (T_1). At 75 days, significantly higher leaf percentage (60.18) were found (T_3) than in control (52.8 %), however there were no significant differences between T_2 and T_3 (Table 3). These findings was similar to Bilal *et al.* (2005), who reported that stem percentage decreased with increasing nitrogen doses in Maize.

Number of leaves per plant in cowpea differed significantly between 45 and 75 days and significantly higher number of leaves per plant was produced in treatment T_3 than control (Table 3). In 45 days the maximum (17.5) number of leaves per plant was in treatments T_3, and the minimum in control (15.50).

Dry matter yield

Nitrogen fertilization had significant effect on dry matter yield on different fodders. The maximum DM yield (16.78 t/ha) for maize was recorded in T_3 (Table 3). The control produced lowest DM yield (13.41 t/ha) than all other treatments. The low dose of nitrogen (T_2) produced DM yield closed to control. For jumbo, DM yield per hector was significantly higher (24.11 t/ha) for T_3 followed by T_2 and T_1. Increased in DM yield with nitrogen application was also reported by Iftikhar *et al.* (2001). However, these results coincide with the findings of Keskin *et al.* (2005).

Fresh Biomass yield

With nitrogen levels produced significantly higher fresh fodder yield than control in maize fodder (Table 3). The maximum fresh maize fodder yield (20.10 t/ha) was recorded in T_3. There were no significant differences found between the treatments T_1 and T_2.These finding were similar with Hassan *et al.* (2010). In case of Jumbo, the plots receiving urea @ 150 kg/ha (T_3) gave significantly higher green fodder yield (27t/ha) than others. The increase in green fodder yield was due to greater plant height and stem diameter. Sarkar *et al.* (2004) also reported similar response jambo fodder to nitrogen.

Total fodder yield

Maximum total fodder yield of maize+cowpea (18.80t/ha) and jambo+cowpea (29.0 t.ha) in the treatment T_3 and minimum in control (15.9 and 20.9t/ha, respectively). The difference between T_3 and T_2 were found non-significant in both the intercropping systems, where T_1 and T_2 were also at par in jumbo + cowpea fodder yield (Table 3).

Chemical Compositions of Maize fodder

Sundry matter (SDM)

Dry matter (DM) of whole plant, stem, and leaf significantly affected with rate of nitrogen for both stages

TABLE 4
Effect of different doses of nitrogen fertilizer on chemical composition of maize fodder at different stage of production

Parameter	T_1 (without fertilizer)		T_2 (Low dose fertilizer)		T_3 (High dose fertilizer)	
	45 days	75 days	45 days	75 days	45days	75 days
			Maize Fodder			
Whole plant						
ADF %	38.5^{b}±0. 70	40^{b}± 0.07	30.2^{c}±3.70	41.9^{a} ± 0.77	43.50±2.10	49.5^{a}± 0.70
Ash %	14.4^{a}± 0.28	12.2^{b}±0.35	12.4^{b}±1.40	12.5^{a}± 0.40	14.95^{a}± 0.70	13.12^{a}± 0.16
CP %	11.9^{b}±0.07	7.5 ^{b}±0.007	12^{a}±0.07	8.04^{a}± 0.06	12.5^{a} ± 0.14	9.05^{a}± 0.07
SDM %	75.0^{c} ± 0.13	79.6^{b}±0.21	75.7^{c}± 0.30	84.2^{a}± 0.10	76.3^{b} ± 0.14	84.3^{a}±0.04
Leaf						
ADF %	-	38.8^{b}±1.60	-	40^{a}± .07	-	40.2^{a}± 0.35
Ash %	.-	12 ^{b}± 2.82	-	12.1^{b}±0.16	-	13^{a}± 1.41
CP %	-	9.6^{b}± 0.21	-	13^{a}± 1.41	-	12.6^{a}±0.19
SDM %	-	80.91^{c}± 0.80	-	82.6^{b}±0.88	-	88.5 ^{a} ±0.07
Stem						
ADF %	-	58.02^{a}±0.03	-	48.6^{b} ±0.14	-	59.50^{a}±0.70
Ash %	-	10.9^{b}±1.34	-	11.90^{b}±0.9	-	12.51^{a}±0.40
CP %	-	4.3^{b}±0.23	-	4.73^{b}±0.18	-	6.23^{a}± 2.20
SDM %	-	80.7^{b}±1.06	-	81.6^{b}±2.30	-	82.2^{a} ±1.06
			Jumbo Fodder			
Whole plant						
ADF %	30.25^{b}±0.30	49.5^{b}± 0.70	40.1^{a}±0.14	57.7^{a}±3.20	40.6^{a}±0.86	58.5^{a}±0.70
Ash %	13.17 ^{c}±0.30	11.25^{a}±0.07	15.54^{b}±0.60	13.3^{b}±0.91	19.0^{a} ±0.03	11.7^{a}± 0.40
CP %	13.34^{b}±0.06	7.99^{b}±0.007	14.72^{b}	11.80^{a} ±0.24	16.02^{a}±0.60	10^{a}± 2.82
SDM %	77.1^{b}±0.17	87.79^{b} ±1.20	76.25 ±0.30	87.7 ±0.297	78.17^{b}±0.10	91^{a}± 1.97
Leaf						
ADF %	-	39.50 ± 0.70	-	40	-	41.5 ±2.10
Ash %	-	9.85 ±0.77	-	11.1± 1.50	-	10.75 ±0.30
CP %	-	11.9 ± 0.04	-	13.8 ± 0.02	-	14.0 ±2.50
SDM %	-	90.9 ± 0.19	-	89.79±1.80	-	94.6 ± 0.45
Stem						
ADF %	-	59.5 ± 0.70	-	59.5 ± 0.70	-	60.05±3.50
Ash %	-	11.2 ± 0.98	-	11.1 ± 0.84	-	12.4 ± 0.77
CP %	-	3.76 ± 0.07	-	3.48 ±0 .32	-	4.79 ± 1.30
SDM %	-	90.6 ± 1.60	-	90 ± 0.04	-	91.6 ±3.10
			Cowpea Fodder			
Whole plant						
ADF%	41 ±0.54	39.50^{b}± 0.70	40±0.32	44.5^{a}±0 .70	40.61 ± 0.70	44.5^{a}±0 .70
Ash %	13.15^{b}±0.20	14.2 ±4.50	16^{a} ± 0.14	14.5 ± 3.50	15.9^{a}±0.07	13 ±2.80
CP %	21.4^{a}±0.31	10.64^{b}±0.20	19.9^{b}±0.10	11.82^{b}±0.40	21.8^{a} ± 0.05	14.4^{a} ±1.40
SDM %	65.7^{b}±0.31	89 ±0.88	87^{a}± 2.30	89.16 ± 0.10	88.30^{a}±0.40	89.6 ± 0.12

Treatment descriptions are in footnote on Table 4
ADF= Acid detergent fiber, CP=crude protein, SDM=sundry matter
^{a,b,c} Mean values for same day with different superscripts in the same row differ significantly ($p< 0.05$).

(Table 4). At 45 days, the higher DM (76.39%) was recorded from the T_3 for whole plant in maize and 78.1% in jumbo and crop receiving no nitrogen produced lower DM values for maize and jumbo. In cowpea the maximum and minimum SDM for whole plant was recorded in T_3 and T_1, respectively. At 75 days also, the maximum SDM for whole plant was recorded in T_3. The maximum DM percentage of leaf and whole plant was observed 88.50 and 94.31% for maize and jumbo, respectively in T_3 plot at 75 days. The results are confirmatory with Ahmed *et al.* (1999) who reported that significant increase in DM with application of increase in nitrogen.

Crude protein percentage

In maize, the significant increased in the crude protein (CP) contents of whole plant was observed with increased level of nitrogen both at 45 days and 75 days (Table 4) and that in leaf decreased at 75 days as compared to that at 45 days for all treatments. At 75 days, CP content of leaf (13%) was higher with treatments T_3 than the control. At 75 days, CP of leaf was higher than whole plant and stem for all treatments. CP of treatment T_2 and T_3 were not statistically significantly different at both maize fodder. The results are similar to Ayub *et al.* (1997) and Husnain (2001) who reported increases in CP with increase in nitrogen.

In jambo fodder, the maximum and minimum CP was recorded when urea was applied @ 150 kg (T_3) and control (T_1), respectively. CP content of whole plant, stem and leaf was higher at 75 days than at 45 days for all treatments (Table 4). CP content in whole plant (16.02%) was higher than in stem and leaf with treatments T_3 at 45 days and at 75 days CP content of leaf (11.95-14.02%) was higher than in stem with treatments T_3. The reduced CP content of stem as plant matured was mainly due to rapid accumulation of fibrous components. Nitrogen being a basal component of amino acid might have enhanced the protein content. Increase in protein content with the N application has also been reported by Ahmed (1999) and Ali *et al.* (2002).

Acid detergent fiber

The maximum values of ADF content of whole plant, stem and leaf were observed with treatment T_3 at 75 days and the minimum values were found in T_1 (Table 4). ADF content of whole plant, stem and leaf were similar T_2 and T_3. At 45 days, whole plant ADF of higher dose of nitrogen (T_3) was superior compared to control (T_1).

The highest value of ADF was observed in stem (59.50%) with T_3 treatments (Table 4). Moreover, higher ADF content was obtained with T_3 as compare to T_1 and T_2 at 75 days. These results were contradictory with Ayub

TABLE 5
Compare to Effect of different doses of nitrogen fertilizer on botanical parameter of Maize with cowpea and Jumbo with Cowpea

Parameter	T_1 (without fertilizer)		T_2(low dose fertilizer)		T_3(Higher dose of fertilizer)	
	Maize with cowpea	Jumbo with cowpea	Maize with cowpea	Jumbo with cowpea	Maize with cowpea	Jumbo with cowpea
Plant length (cm)	135.04±6.59	241.6 ±38.80	143.5±6.50	254.9±24.0	146.85±5.44	286.7±33.60
Stem length (cm)	113.8±6.50	176.5±37.20	124.88±10.0	181.2±30.50	126.99±5.98	193.9±7.62
Leaf (%)		21.6±4.69		23.25 ± 2.40		18.80±1.69
Stem (%)	67.22±0.90	76.74±2.46	68.84±3.08	78.30± 4.66	73.54 ±3.00	81.17±1.66
DM yield (t/ha)	13.41±0.90	16.2 ± 0.33	14.86±1.01	19.90 ±1.80	16.78 ± 1.37	24.1 ± 0.90
Fresh yield of only maize or jumbo (t/ha)	16.25±0.38	17.6 ±0.56	17.9±1.50	21.80 ±2.54	20.10±1.27	27 ±0 .28
Yield of maize or jumbo with cowpea (t/ha)	15.95±.68	20.6 ± 2.36	17.55±.69	25.20 ±3.39	18.80 ±0.73	29 ±0.28
ADF (%)	40^{b}± .07	49.5^{b}± 0.70	41.9^{a}±0.77	57.7^{a}±3.20	49.5^{a}± 0.70	58.5^{a}± 0.70
Ash (%)	12.2^{b}±.35	11.25^{a}±0.07	12.5^{a}±0.40	13.3^{b}±0.91	13.12^{a}±0.16	11.7^{a}±0.40
CP (%)	8.04^{b}±.06	7.99^{b}±0.007	7.5^{a}±0.007	11.80±0.24	9.05^{a}±0.07	10^{a}± 2.82
DM (%)	79.6^{b}±0.21	87.79^{b}±1.2	84.2^{a}± 0.1	87.7±0.29	84.3^{a}±0.04	91^{a}± 1.97

Treatment descriptions are in footnote on Table 4

[a,b,c] Mean values with different superscripts in the same row differ significantly ($p< 0.05$).

et al., (2002), who reported that ADF concentration of Jumbo fodder decreased significantly with the increased level of N. These results might differ due to the differences in genetic makeup of the varieties or differences in the fertility status of the soil. The highest ADF of cowpea whole plant was 41 and 44.50% in 45 days and 75 days, respectively. Similar values were reported by Ashraf (1996) and Patel *et al.* (1977).

Total ash content

In maize, the ash content of whole plant in T_3 at 45 days was higher (14.95%) than whole plant, leaf and stem at 75 days. At 75 days, the least value of ash percentage was obtained in stem of control plots. The results are similar to the findings of Ayub *et al.* (1999), Cheema *et al.* (2000) and Husnain (2001) who reported the increased in ash content with nitrogen fertilizer application.

The Ash content was increased with increased of nitrogen (urea) level for all parameters of plant (Table 4). Total ash content of whole plant and leaf decreased significantly with maturity for all treatments. The minimum ash content of leaf was recorded in control for jumbo (9.85%) and cowpea (13%). The results coincide with the findings of Patel *et al.* (1977), Ayub *et al.* (1997) and Husnain (2001) who reported that the increase in ash content with nitrogen fertilizer application.

Effect of intercropping of non legume (Maize, Jumbo) with legume (cowpea) fodder

Significantly higher values of plant length of Jumbo with Cowpea (286.7cm) was obtained with 150 kg urea per hectare (T_3) whereas, higher values of plant length of maize with cowpea (146.8cm) was with higher doses of nitrogen fertilizer (Table 5). There was significant difference of plant height between jumbo with cowpea and maize with cowpea. The higher stem length and stem percentage were observed in jumbo as compared to maize when intercropped with cowpea fodder. In case of DM yield, T_1 and T_2 of jumbo and maize with cowpea, differences were not significant but among these treatments the DM yield of jumbo with cowpea was more than maize with cowpea. The higher values of DM yield of jumbo-cowpea (24.1t/ha) and maize-cowpea (16.78t/ha) were recorded with T_3. There was a significant difference of DM yield between T_3 of jumbo-cowpea and maize-cowpea. The maximum fresh yield was observed in T_3 27t/ha and 29t/ha, respectively in jumbo-cowpea and maize-cowpea. This results are similar with Ibrahim *et al.* (2006) who reported that green fodder yield of sorghum was higher than maize.

All parameter of chemical composition of jumbo with cowpea was higher than maize with cowpea except ash content for all treatments (Table 5). The higher value of ash content of maize (13.12%) was with treatments $T_{3,}$ where as, the higher values of jumbo with cowpea (13.3%) with treatments T_2. However, there was no significant difference of the chemical parameter of jumbo with cowpea and maize with cowpea.

Effect of Intercropping on Silage Quality

The physical colour of jumbo with cowpea silage was greenish, and silage quality of jumbo with cowpea was very good whereas silage colour of maize with cowpea was brownish and silage quality of maize with cowpea was good.

It was observed that higher values of DM of silage of jumbo-cowpea (95.18%) than maize-cowpea (92.78%) (Table 6). There was non-significant difference in DM and ash content of both type of silage. The CP content of silage was higher in jumbo-cowpea (14.78%) than maize-cowpea (6.35%).

TABLE 6
Comparative evaluation the silage of Maize with cowpea and Jumbo with cowpea

Parameter	Type of silage	
	Maize with cowpea fodder	Jumbo with cowpea fodder
p^H	4.30	4.20
Colour	Brownish	Greenish
Dry matter (%)	92.78	95.18
Crude protein (%)	6.35	14.78
Ash (%)	11.54	8.3
Acid detergent fiber (%)	60	60

CONCLUSION

Higher doses of Nitrogen (urea) used for jumbo with cowpea and maize with cowpea cultivation showed improved performance in respect of yield, botanical parameter of both combination of fodder compared to control. Non legume fodder cultivated with legume fodder will increased CP content of the non legume fodder. However, there were non- significant differences found

in performance of fodder yield and chemical composition between the lower and higher doses of nitrogen fertilizer. Jumbo fodder was not only exhibited better performance on all botanical parameter and chemical composition as compared to maize, but also produced better quality silage compared to maize with cowpea. Cultivate of maize with cowpea and jumbo with cowpea with recommended doses of nitrogen (150kg urea/ha for jumbo and 220 kg urea/ha for maize) was better.

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