World Journal of Agricultural Sciences 15 (4): 206-214, 2019
ISSN 1817-3047
© IDOSI Publications, 2019
DOI: 10.5829/idosi.wjas.2019.206.214

Effect of Sowing Dates and Seeding Rates on Forage Crop Brown-Top Millet (*Panicum ramosum* L.) Under Calcareous Soil

Mofeeda Abd El-Kader Seiam, Fatma Sh. Ismail and Azza Kh. Salem

Forage Crops Research Department,
Field Crops Research Institute, Agriculture Research Center, Giza, Egypt

Abstract: Two field experiments were conducted at El-Nubaria Research Station farm of Agricultural Research Center, Egypt, during the summer seasons of 2016 and 2017 to study the effect of different sowing dates (15 April, 1 May and 15 May) and different seeding rates (10, 15 and 20 kg/fed) on quantity and quality of Brown top millet (*Panicum ramosum* (L.). The experiments were laid out in a split plot design in a randomized complete block arrangement with three replications. Sowing dates were allocated to main plots; while the different seeding rates were devoted to sub plots. The results showed that first sowing dates and first seeding rate A1 B1 (15 April and 10 kg/fed) significantly availability increased growth plant height (cm), fresh yield (ton/fed) and dry yield (ton/fed). In addition, the highest value in treatment A1B2 (15 April and 15 kg/fed) was recorded in leaf/stem ratio, crude protein (CP) content and digestible crude protein (DCP). Meanwhile, the interaction between treatments was insignificant. The lowest values were recorded with the treatments A3B3 (third sowing date with third seeding rates) for all characters except for leaf/stem ratio, crude protein and digestible crude protein. They gave the lowest value in A2B3 (1 May and 20 kg/fed). The study suggests the application of early sowing date and low seeding rate which recorded the highest values for growth stages, yield and quality under the saline soil of El-Nubaria in the two seasons.

Key words: Forage grass brown-top millet (*Panicum ramosum* (L.) · Growth traits · Fresh and dry yield · Quality sandy loam soil

INTRODUCTION

Brown-top millet is a plant that normally occurs in non-wetlands in the Atlantic and Gulf Coastal Plain, the Eastern Piedmont and Great Plains. It grows best in sandy loam soils with a pH 5-6.5 under full sun [1]. It grows best in full sun in light-textured, well-drained soils with an optimal pH of 7-7.5. Recommended seeding rates are 20-14 lb. / acre [2 - 3]. Brown-top millet (*Urochloa ramosa*) is an introduced, annual/perennial warm-season grass often used in forage/pasture management systems. The stem (culm) may be erect or prostrate along the ground. When growing erect, it may reach 3 ft at maturity. The lance-shaped, hairless leaf blades are ¾-10 inches long (2-25 cm) [4]. The inflorescence is indeterminate, open with stalked flowers, white flowers and it has fibrous roots that can grow to 2 ft deep. Also has the ability to accumulate significant amounts of lead and zinc in shoot and root tissues making it an important plant for remediation of contaminated soils Brown-top millet can be planted in late spring or early summer; May 1-June 15 in Tennessee Cold stratification is not required for seed germination. The optimal air temperature for germination is between 63-79°F [5 - 6].

Generally, brown-top millet and pearl millet (*Pennisetum glaucum* (are grown in the South/Southeast United States, while types of proso millet (*Panicum miliaceum*), foxtail millet (*Setari aitalica*) and Japanese millet) *Echinochloa frumentaceae*), are mainly grown in the Midwest and Central Plains [7]. Brown-top millet can yield 1,800-4,000 lb/acer dry matter and it can be accumulate toxic/lethal levels of nitrate and plantings in Minnesota have produced low yields and did not successfully compete with weeds and are used as a fast

Corresponding Author: Moffeda Abd El-Kader Siam, Forage Crops Research Department,
Field Crops Research Institute, Agriculture Research Center, Giza, Egypt.

growing cover for erosion control [8, 7, 1]. Compared to other warm season forage grasses, brown-top millet is relatively a low yielding crop. It's Strength in that it is a rapidly maturing grass, often used as a catch crop, cover crop, or nurse crop [9]. In addition, Atis *et al*. [10] revealed that effect of sowing date on forage yield and quality are directly related to its harvesting time. It is vigorous perennial having many branches with hairy stems up to 205 m high and long, it is grows in annual summer rainfall of 500- 800 mm. It grows on all types of soil especially sandy loam, while resistant to drought, fire and heavy grazing [11]. It is highly nutritious grass before flowering and crude protein is more in dry matter than fresh material.

Due to the limited agronomic information about its potential for growing in saline conditions and about their forage value, it has not received much attention as a fodder crop and is therefore, not grown widely across the world for forage purposes. Thus, its' growth stage for cutting has not been established. However, data decreasing growth, yield and feed value have been lacking so far. Crop growth and feed values are important considerations for adopting specific crop species as livestock forage [12, 13, 14]. Revealed that for determining the feed value of a crop are plant height, leaf/stem ratio, dry matter content; crude protein (CP), acid detergent fiber (ADF) and neutral detergent fiber (NDF) were considered as important parameters [15-16]. Salinity is a major environmental stress that drastically affects plants growth by creating low osmotic potential outside the plants [17]. Increasing salinity of agricultural land had a negative impact on food production. Enhancing tolerance to saline stress in crop plants is necessary in order to increase productivity with limited water supplies and high saline.

Thus, the main objectives of the present study are to explore the feeding value of brown-top millet and identify the effects of different seeding rates (kg/ fed) and sowing dates to increase productivity and quality brown - top millet under calcareous soil.

MATERIAL AND METHODS

Experimental Site and Plant Materials: Two field experiments were conducted in El-Nubaria Research Station farm of Agricultural Research Center, Egypt, during the summer of 2016 and 2017 to study the effect of different sowing dates and seeding rates on quantity and quality of the forage crop *Brachiaria ramosa* (L.) Stapf (*Panicum ramosum* L.) General name: Brown-top millet (*Urochloa ramosa*).

Layout and Experimental Design: The experiments were laid out in a split plot design, where the main plots arranged in randomized complete block design with three replications. Sowing dates (A1) 15 April, (A2) 1May and (A3) 15 May were allotted to main plots, while the different seeding rates (B1) 10, (B2) 15 and (B3) 20 kg fed^{-1} were allocated to sub plot. The plot size was 12 m^2 (4.0 x 3.0 m). Seeds were sown in rows, 30 cm apart followed by three times in sowing and three treatments for seeding rates.

Cultural Practices: Nitrogen fertilizer as urea (46.5% N) was added at the rate of 15 kg N fed^{-1} after 15 days from seeding and after each cut prior to irrigation. All plots received 150 kg calcium superphosphate (15.5 P_2O_5) at seedbed preparation and potassium as potassium sulphate at a rate of 100 kg /fed (48% K_2O) were applied just after land preparation.

The first cut was taken after 55 days from sowing, while the second cut was taken after 42 days from the first. The third cut was after 38 days from the second cut. The same intervals of cutting were followed with shift of additional 6 days in the second season. The preceding crop was wheat (*Triticum aestivum*) in both seasons. Normal agricultural practices were done, i.e. plugging and harrowing twice then ridging to the suitable plots in the first and second seasons, respectively.

Soil Analysis: Data of weather at Alexandria region during 2016 and 2017 growing seasons are presented in Table (1) according to Egyptian Meteorological Authority general management for scientific Research, research management of lower layers of the atmosphere. Chemical Soil characteristics of the soil characteristics of experimental location are shown in Table (2). Particle size distribution and moisture of the soil sample was determined as described by Blackmore [18]. Soil organic matter, $CaCo_3$, EC and pH were determined according to Black *et al*. [19] under investigation region of Nubaria, Alexandria Governorate.

Recording of Observations:

- Plant height (cm): A sample of ten plants was taken from each plot at harvesting time to measure height from the ground level to the highest leaf tip.
- Leaf/stem ratio.
- Fresh forage yield of each cut was calculated by harvesting the complete plot (kg) and yield was converted to ton fed^{-1} (one ton = 1000 kg and one Fadden = 4200 m^2). Total fresh yield was calculated by sum of cut's yields.

Table 1: Mean monthly temperature (°C) and precipitation at experimental sites

Months	Min T.°C First season	Min T.°C Second season	Long term min. T °C	Max T.°C (2016)	Max T.°C (2017)	Long term max. T °C	Rainfall (mm) 2016	Rainfall (mm) 2017	Long term Rainfall (mm)	R.H. (%)	Snowy day	Possible sunshine duration (hr)
April	21.5	21.4	21.0	33.0	32.6	32.8	-	-	0.5	60.3	242.1	60
May	22.9	23.5	23.2	35.1	34.8	35.0	-	-	-	60.4	295.2	64
Jun	24.8	25.0	24.0	36.4	36.0	36.0	-	-	-	63.8	321.9	69
Jul	26.1	26.3	26.1	37.0	36.9	37.1	-	-	-	64.8	350.5	74
Aug	27.4	27.5	27.0	37.5	37.2	37.5	-	-	-	67.9	307.2	71
Sep	25.2	25.4	25.2	35.8	36.0	36.2	-	-	-	70.7	233.2	62

*T max = Maximum temperature; T. min = Minimum temperature; D.T. = Day temperature, RH = Relative humidity

Table 2: Soil characteristics of the experimental site 0 - 30 cm depth (mean across 2016 and 2017)

Soil characteristics	Means of both seasons	Available macronutriments (ppm)	Means of both seasons
Particle size distribution %			
Sand	55.86	N	15.66
Silt	23.43	P	14.00
Clay	20.71	K	21.13
Textural class	Sandy loam		
Chemical properties			
pH (suspension 1:2.5)	8.27	---	---
EC dSm^{-1} (saturated paste extract)	1.14		
Organic matter (%)	0.23		
$CaCo_3$ (%)	24.73		

- Dry forage yield was calculated from dry matter % multiplied by fresh yield (the green plants were chopped manually and were weighed on digital weight balance then placed in shade for drying and shifted to electric oven at 70 °C for the period till a constant weight was achieved).

The sub sample (10 g) dry matters was well grind and passed through 0.5 mm sieve and was preserved of each cut in both years to determine:

- Crude protein (CP %), the nitrogen contents of feed sample was determined by Kjeldahl N A.O.A.C, [20] and the value recorded for nitrogen was then multiplied by 6.25 to determine CP of the sample.
- Digestible crude protein (DCP): was calculated according to the equation of Mc-Donald *et al.* [21]. DCP = CP X 0.9115 - 3.67.

Statistical Analysis: Data were statistically analyzed according to Snedecor and Cochran [22] using MSTAT- C computer program ver. 4 (1986) and treatment means were compared by least significant difference test (LSD) at 0.05 probability level of significance.

RESULTS AND DISCUSSION

Plant Height (cm): Data in the Table (3) showed the effect of sowing dates on plant height of forage grass (*Panicum ramosum* L.). The best date for Brown-top millet recorded was the second one (1 May). It gave 118.59 and 129.30 cm height in the first and second, respectively. In that context, statistically significant higher plant height was observed for second sowing date than other times. Brown-top millet can be planted in late spring or early summer; May 1-June 15 by Bates *et al*. [6]. When looking at the combination between effects of sowing date and seeding rates for plant height, it is found that A2B2 recorded the best results. It gave a stem height of 124.33 and 136.11 cm in the two seasons, respectively.

It was observed that the interaction between the treatments was insignificant in cuts during the first season. By contrast in the second season the first and third cuts were significant but second cut and average of results were not significant. Additionally, ranges had larger values on plant height (124.33 -136.11 cm) was recorded for second sowing date (1 May) and second seeding rate (15 kg/fed).

Leaf / Stem Ratio: Data in Table (4) revealed that effect of sowing date on the leaf / stem ratio recorded higher values (1.69 and 1.62) in the first sowing date (April 15) in both seasons, respectively. Besides, the influence of seed rates on the leaf / stem ratio recorded also higher values (1.70 and 1.60) in second seeding rate (15 kg/fed) during the two seasons, respectively. The effect of the interaction between sowing dates and seeding rates recorded the lowest values (1.59 and 1.50) on average

Table 3: Effects of sowing dates and seeding rates (kg/ fed) on plant height (cm) of *Panicum ramosum* L. in the individual cuts for two seasons

Treatment	Plant height (cm)							
	First Season				Second Season			
Sowing date(A)	Cut 1	Cut2	Cut 3	Mean	Cut 1	Cut2	Cut 3	Mean
15/4 (A1)	115.11	119.89	104.00	113.00	121.22	128.00	119.78	123.00
1/5 (A2)	123.11	129.11	103.56	118.59	130.78	133.67	122.67	129.04
15/5 (A3)	112.22	117.11	94.89	108.07	116.89	120.89	109.11	115.63
L.S.D 0.05 (A)	5.14	4.891	3.186		4.494	5.323	1.876	
Seeding rate (B) 10kg/fed (B1)	116.22	121.11	104.44	113.93	123.76	128.78	117.78	123.44
15 kg/fed (B2)	122.78	128.33	103.67	118.26	110.55	134.44	125.33	129.30
20 kg/fed (B3)	111.44	116.67	94.33	107.48	117.02	119.33	108.44	114.93
L.S.D 0.05 (B)	3.245	3.226	1.137		3.526	4.075	1.321	
A1 B1	112.00	118.67	106.67	112.44	120.01	126.67	118.33	121.67
A1 B2	121.67	126.00	106.33	118.00	123.33	135.67	128.33	129.11
A1 B3	111.67	115.00	97.33	108.00	120.32	121.67	112.67	118.22
A2 B1	125.00	128.33	107.00	120.11	132.66	135.00	126.33	131.33
A2 B2	129.33	135.67	108.00		137.66	142.00	128.67	
A2 B3	115.00	123.33	97.33	111.89	122.01	124.00	113.00	119.67
A3 B1	111.67	116.33	99.67	109.22	118.65	124.67	108.67	117.33
A3 B2	117.33	123.33	96.67	112.44	123.34	125.67	119.00	122.67
A3 B3	107.67	111.67	88.33	102.56	108.77	112.33	99.67	106.89
L.S.D0.05 (A X B)	N.S.	N.S.	N.S.		6.108	N.S.	2.288	

N.S. = Non-significant

A2B3 (second sowing date and third seeding rate) and showed significantly differences among different treatments. The highest rate A1B2 (the first sowing date) 15 April with the second seeding rate (15 kg/fed) gave a ratio of 1.70 and 1.60 during the two seasons, respectively. Ranges with larger values on leaf/stem ratio gave (1.72-1.64) for third sowing date and second seeding rate (A3B2). In that context, Sarwar *et al.* [23] reported that Leaf to stem ratio of PA (*Panicum Anti*.) grass was decreased ($p<0.05$) with increasing clipping interval. In PA (*Panicum Anti*.) higher leaf mass was observed with more frequent clipping interval (C1) than with grass clipped at every two month or at four month age.

Higher herbage yield in PO (*Panicum Ori*.) and PA grasses with longer clipping interval may be attributed to additional tillers and leaf formation, leaf elongation and stem development with increasing plant age [24, 25].

On the other hand by Gidenne [26] results reported that of the growth parameters, including plant height and DM, indicated that biomass was higher for cutting the plants after flowering stage (AF), compared with before flowering (BF). However, subsequent nutrient analyses indicate that the feed value actually decreased at the latest stage of cutting, compared to the first stage. Besides, leaf/stem ratio revealed higher values (1.20 - 1.72) at BF stage compared to AF stage (1.00 - 1.40).

Fresh Forage Yield (Ton/Fed): With respect to, fresh forage yield (FY) for forage grass *Panicum ramosum* L., (common name: Brown-top millet), effects of sowing data and seeding rate and total fresh forage yield in the two seasons are shown in Table (5).

Data in Table (5) showed that sowing date at the first planting date (15 April) recorded the highest value (30.47 and 25.17 ton/fed), while the lowest value was obtained in third date (6.99 and 6.88) ton/fed, respectively, during the two seasons. However, fresh yield was significantly different among treatments. In that respect, Proso millet is not seed shatters easily, the straw moisture is too high at harvest and it tends to lodge [27].

Data in Table (5) showed the effect of seeding rates and revealed that the highest productivity was at 10 kg/fed which gave 19.85 and 17.09 ton/fed during two seasons; followed by second rate, which less productive in spite of the higher seeding rate (20 kg/fed) that gave 18.86 and 17.52 ton /fed in season 1 and 2, respectively. They are increased for high significant among seeding rates and also, which the best productive in second cuts/ first rate gave 9.35 ton/fed.

Interaction between seeding rates and sowing dates showed that the first treatment A1B1 (10 kg/fed seeds rate with first seeding date for sowing date (i.e.15/4) recorded the highest productivity of fresh yield (31.59 and 26.13), followed by the second treatments (seeding rate of 15 ton/fed with the same time of sowing (i.e.15/4) that gave 30.25 and 25.26 ton/fed during the two seasons, respectively. It is obvious that the first sowing date was the best time.

Table 4: Effects of sowing date and seeding rate (kg/ fed) on leaf / stem ratio of *Panicum ramosum* L. in the individual cuts for the two seasons

Treatment	Leaf / Stem Ratio							
	First Season				Second Season			
Sowing date (A)	Cut 1	Cut 2	Cut 3	Mean	Cut 1	Cut2	Cut 3	Mean
15/4 (A1)	1.68	1.75	1.62	1.69	1.62	1.67	1.58	1.62
1/5 (A2)	1.65	1.72	1.60	1.66	1.58	1.64	1.55	1.59
15/5 (A3)	1.61	1.71	1.58	1.63	1.45	1.62	1.52	1.53
L.S.D 0.05 (A)	0.010	0.038	0.059		0.278	0.024	0.031	
Seeding rate (B) 10kg/fed (B1)	1.65	1.73	1.60	1.66	1.59	1.65	1.56	1.60
15 kg/fed (B2)	1.69	1.76	1.63	1.70	1.51	1.67	1.60	1.60
20 kg/fed (B3)	1.60	1.70	1.57	1.62	1.54	1.60	1.48	1.54
L.S.D 0.05 (B)	0.013	0.027	0.019		0.197	0.027	0.023	
A1 B1	1.65	1.73	1.60	1.66	1.59	1.65	1.56	1.60
A1 B2	1.73	1.77	1.65	1.72	1.66	1.71	1.57	1.65
A1 B3	1.60	1.68	1.57	1.62	1.54	1.60	1.48	1.54
A2 B1	1.62	1.69	1.58	1.63	1.58	1.62	1.48	1.56
A2 B2	1.66	1.75	1.61	1.67	1.26	1.65	1.65	1.52
A2 B3	1.56	1.68	1.54	1.59	1.50	1.58	1.42	1.50
A3 B1	1.69	1.76	1.62	1.69	1.60	1.69	1.63	1.64
A3 B2	1.69	1.76	1.63	1.70	1.61	1.67	1.61	1.63
A3 B3	1.63	1.73	1.60	1.66	1.59	1.61	1.54	1.58
LSD 0.05 (AXB)	0.228	0.047	0.032		0.341	0.047	0.040	

Table 5: Effects of sowing dates and seeding rates (kg/ fed) on fresh yield (ton fed^{-1}) of *Panicum ramosum* L. in the individual cuts for the two seasons

Treatment	Fresh yield (ton/fed)							
	First Season				Second Season			
Sowing date (A)	Cut 1	Cut 2	Cut 3	Total	Cut 1	Cut 2	Cut 3	Total
15/4 (A1)	7.194	16.042	7.233	30.469	7.019	11.173	6.981	25.173
1/5 (A2)	5.017	7.836	6.008	18.861	4.554	7.253	5.717	17.523
15/5 (A3)	2.139	3.238	1.614	6.990	1.847	3.792	1.244	6.883
L.S.D 0.05 (A)	0.176	0.399	0.329	0.349	0.137	0.611	0.304	0.855
Seeding rate (B) 10kg/fed (B1)	5.007	9.353	5.493	19.853	4.433	7.972	4.686	17.092
15 kg/fed (B2)	4.832	9.149	4.939	18.919	4.433	7.292	4.919	16.644
20 kg/fed (B3)	4.511	8.614	4.424	17.549	4.554	6.953	4.336	15.843
L.S.D 0.05 (B)	0.195	0.350	0.283	0.382	0.103	0.298	0.172	0.688
A1 B1	7.263	16.538	7.788	31.588	7.233	11.492	7.408	26.133
A1 B2	7.496	15.721	7.029	30.246	6.942	11.842	6.475	25.258
A1 B3	6.825	15.867	6.883	29.575	6.883	10.185	7.058	24.127
A2 B1	5.425	8.225	6.650	20.300	4.725	7.233	6.067	18.025
A2 B2	5.192	7.875	6.358	19.425	4.550	7.467	6.183	18.200
A2 B3	4.433	7.408	5.017	16.858	4.387	7.058	4.900	16.345
A3 B1	2.333	3.296	2.042	7.671	1.633	4.842	1.517	7.992
A3 B2	1.808	3.850	1.429	7.088	2.392	3.617	1.050	7.058
A3 B3	2.275	2.567	1.371	6.213	1.517	2.917	1.167	5.600
LSD 0.05 (A X B)	0.338	0.606	0.490	0.661	0.178	0.516	0.298	1.192

In Table (5) Showed that the third date of sowing recorded the lowest values of productively among different treatments as well as the third seeding rate that gave 6.21 and 5.60 ton/fed, respectively, during the two seasons. Proso millet is planted as a warm-season cover crop in the Great Plains in late May to early June [28]. It has been successfully grown as a dry land crop with little or no supplemental irrigation.

Dry Forage Yield (Ton/Fed): Data in Table (6) showed the effect of the three different sowing dates. Better productivity was achieved in first date 15/4 and second cut during the two seasons. It was found that the first seeding rate (10 kg/fed) gave the highest value of production for dry yield and the second cut gave the highest value.

Table 6: Effects of sowing dates and seeding rates (kg/ fed) on dry yield (ton / fed) of *Panicum ramosum* L. in the individual cuts for the two seasons

Treatment	Dry yield (ton/fed)							
	First Season				Second Season			
Sowing date (A)	Cut 1	Cut 2	Cut 3	Total	Cut 1	Cut 2	Cut 3	Total
15/4 (A1)	1.024	3.011	1.463	5.497	0.916	2.911	1.356	5.183
1/5 (A2)	0.554	1.522	1.262	3.338	0.650	1.431	1.198	3.279
15/5 (A3)	1.633	0.734	0.378	2.745	0.301	0.653	0.272	1.226
L.S.D 0.05 (A)	0.219	0.083	0.131	0.083	0.131	0.093	0.252	0.245
Seeding rate (B) 10kg/fed (B1)	1.154	1.841	1.138	4.132	0.700	1.749	1.049	3.498
15 kg/fed (B2)	1.099	1.751	1.051	3.900	0.649	1.663	0.943	3.255
20 kg/fed (B3)	0.958	1.675	0.915	3.547	0.519	1.584	0.833	2.936
L.S.D 0.05 (B)	0.092	0.065	0.056	0.126	0.056	0.065	0.198	0.203
A1 B1	1.104	3.105	1.632	5.840	0.996	3.019	1.458	5.472
A1 B2	1.059	3.021	1.505	5.585	0.964	2.879	1.412	5.256
A1 B3	0.908	2.907	1.251	5.066	0.790	2.836	1.197	4.822
A2 B1	0.524	1.632	1.349	3.505	0.667	1.552	1.358	3.577
A2 B2	0.639	1.500	1.234	3.374	0.669	1.437	1.164	3.270
A2 B3	0.498	1.433	1.204	3.135	0.615	1.306	1.071	2.991
A3 B1	1.834	0.785	0.432	3.051	0.436	0.676	0.331	1.443
A3 B2	1.597	0.732	0.413	2.742	0.314	0.673	0.253	1.240
A3 B3	1.468	0.685	0.289	2.442	0.153	0.610	0.232	0.994
LSD 0.05 (AXB)	0.159	N.S	0.097	N.S	0.097	0.113	N.S	N.S

N.S = Non-significant

Table (6) reflect a relationship between treatments of sowing dates and seeding rates and interaction including the first treatment A1B1 (10 kg/fed seeding rates with first sowing dates 15/4) which recorded the highest productivity of forage dry yield (5.84 and 5.47 ton/fed); followed by the second treatment A1B2 (15 ton/fed for seeding rates with the same sowing date 15/4) during the two seasons.

Although there were highly significantly differences among treatments both sowing date and seeding rate, the interaction in the first season was insignificant in the second cut and total dry yield and in the second season it was insignificant in cut three and total dry yield.

Chemical Analysis: Sowing dates and seeding rates significantly ($P < 0.05$) influenced CP and DCP whereas their interaction (SD × SR) was not significant (Table 7).

Data in Table (7a and 7b) illustrated the effect of sowing dates and seeding rates on crude protein and digestible crude protein percentage. It was found that first sowing date (April 15) gave the highest value for crude protein (11.55 and 9.75) per cent and digestible crude protein of 5.54 and 5.32 % during the two seasons, respectively. It was also that the second seeding rate recorded the highest values (11.62 and 9.79) crude protein and 5.57 and 5.29 digestible crude protein during two seasons, respectively. Followers to effect of the interaction between first sowing dates with second seeding rate (A1B2) will observe that it gave the highest values 11.24 and 9.83 for crude protein and gave 5.59 and 5.29 % for digestible crude protein during the two seasons, respectively.

A high percentage of protein is required in the diet of ruminants because production of milk, meat and reproduction mainly depends on the protein ingredient of the animal diet [29]. Among grass species the crude protein percentage is statistically non - significant; however the highest crude protein gave (7.17%). The amount of crude protein lower than 6-7% in animal diet may depress microbial activity due to no availability of nitrogen in the rumen [30].

Decreasing CP contents of grasses with increasing clipping interval may be because of reduced leaf to stem ratio or by a dilution effect due to increased DM yield with less frequent grass clipping, [31- 25]. The results of the present date are consistent with those of Mero and Uden [32] and Fraser *et al.* [33] who attributed decline in CP concentration to higher cell wall contents in more mature grasses.

Table 7a: Effects of time of sowing and seeding rate (kg/ fed) on Crude Protein (CP) percentage of *Panicum ramosum* L.in the individual cuts for the two seasons.

Treatment	CP %							
	First Season				Second Season			
Sowing date (A)	Cut 1	Cut 2	Cut 3	Mean	Cut 1	Cut 2	Cut 3	Mean
15/4 (A1)	10.12	14.53	10.01	11.55	9.72	9.83	9.72	9.75
1/5 (A2)	10.05	10.10	9.95	10.03	9.64	9.93	9.63	9.73
15/5 (A3)	10.11	10.14	10.06	10.11	8.73	9.88	9.68	9.43
L.S.D 0.05 (A)	0.071	0.043	0.037		0.022	0.067	0.029	
Seeding rate (B) 10kg/fed (B1)	10.08	10.12	9.99	10.07	9.74	9.89	9.67	9.77
15 kg/fed (B2)	10.17	14.59	10.08	11.62	9.69	9.96	9.73	9.79
20 kg/fed (B3)	10.02	10.06	9.94	10.01	8.66	9.78	9.63	9.35
L.S.D 0.05 (B)	0.079	0.040	0.043		0.018	0.039	0.024	
A1 B1	10.08	10.12	9.99	10.07	9.74	9.89	9.67	9.77
A1 B2	10.17	13.48	10.08	11.24	9.79	9.96	9.73	9.83
A1 B3	10.02	10.06	9.94	10.01	9.66	9.78	9.63	8.69
A2 B1	10.05	10.13	9.93	10.04	9.76	9.91	9.64	9.77
A2 B2	10.13	10.14	10.05	10.11	7.50	10.00	9.69	9.73
A2 B3	9.97	10.03	9.87	9.96	7.66	9.86	9.57	9.70
A3 B1	10.12	10.11	10.06	10.10	7.72	9.87	9.71	9.76
A3 B2	10.17	10.20	10.12	10.16	7.78	9.91	9.77	9.82
A3 B3	10.06	10.10	10.01	10.06	7.66	9.70	9.68	9.68
LSD 0.05 (AXB)	0.073	0.068	0.074		0.032	0.068	0.042	

Table 7b: Effects of sowing dates and seeding rates (kg/ fed) on Digestible Crude Protein (DCP) percentage of *Panicum ramosum* L in the individual cuts for the two seasons

Treatment	DCP %							
	First Season				Second Season			
Sowing date (A)	Cut 1	Cut 2	Cut 3	Mean	Cut 1	Cut 2	Cut 3	Mean
15/4 (A1)	5.55	5.57	5.50	5.54	5.20	5.33	5.15	5.32
1/5 (A2)	5.52	5.55	5.44	5.51	5.21	5.38	5.11	5.22
15/5 (A3)	5.49	5.54	5.40	5.48	5.19	5.29	5.19	5.13
L.S.D 0.05 (A)	0.093	0.037	0.037		0.064	0.062	0.023	
Seeding rate (B) 10kg/fed (B1)	5.52	5.56	5.43	5.50	5.21	5.34	5.15	5.23
15 kg/fed (B2)	5.58	5.60	5.52	5.57	5.25	5.41	5.20	5.29
20 kg/fed (B3)	5.46	5.50	5.39	5.45	5.13	5.24	5.11	5.16
L.S.D 0.05 (B)	0.038	0.036	0.045		0.034	0.035	0.022	
A1 B1	5.52	5.56	5.41	5.50	5.21	5.35	5.15	5.23
A1 B2	5.60	5.63	5.55	5.59	5.25	5.41	5.20	5.29
A1 B3	5.46	5.51	5.39	5.45	5.13	5.24	5.11	5.16
A2 B1	5.49	5.57	5.38	5.48	5.22	5.36	5.12	5.23
A2 B2	5.57	5.57	5.49	5.54	5.26	5.45	5.15	5.29
A2 B3	5.42	5.47	5.33	5.41	5.13	5.32	5.05	5.17
A3 B1	5.55	5.55	5.50	5.53	5.19	5.32	5.18	5.23
A3 B2	5.58	5.60	5.52	5.57	5.24	5.36	5.24	5.28
A3 B3	5.50	5.53	5.46	5.50	5.13	5.17	5.16	5.16
LSD 0.05 (AXB)	0.065	0.062	0.077		0.059	0.060	0.037	

CONCLUSIONS

This article underscores the potential for growing forage *grass Panicum ramosum* L. (common name Brown-top millet) grass under sandy loam conditions. Until today, this crop has not received much consideration because of the lack of scientific information about its feed value. In this article, we explore the feed value of blue panic grass more comprehensively, in order to fill this gap in the current literature. The study suggests the early sowing date (15 April)-or (1 May) and low seeding rate to enhance both the yield and quality of the crop for quality feed.

REFERENCES

1. UF (University of Florida), 2007. Forages of Florida: solutions for your life. UF IFAS Extension. Http: // agronomy. ifas. ufl. Edu / Forages of Florida/detail. php? sp =Brown-top 20% millet & type = G.
2. Mitchell, W.A. and W.H. Tomlinson, Jr., 1989. Brown- top millet (*Panicum ramosum*): Section 7.1.5. USACE wild life resources management manual. Technical Report EL - 89-12. US Army Engineer Water ways Experiment Station, Vicksburg, Miss. http://www.dtic.mil/cgi-in/GetTRDoc?AD= ADA212491&Location=U2&doc=GetTRDoc.pdf.
3. Mississippi State University (MSU), 2010. Mississippi forages: cowpea (*Vignaun guiculata*). Mississippi Agric. and For. Exp. Stnhttp:// msucares.com /crops/forages/grasses /warm/ brown top millet. html.
4. Clayton, W.D., M.S. Vorontsova, K.T. Harman and H. Williamson, 2006. Grass Base-the online world grass. http://www.kew.org /data/grasses-db.html.
5. Lakshmi, P.M., S. Jaison, T. Muthukumar and M. Muthukumar, 2013. Assessment of metal accumulation capacity of Brachiaria ramose collected from cement waste dumping area for the remediation of metal contaminated soil. doi: 10.1016/j.ecoleng. 07.043.
6. Bates, G., C. Harper and F. Allen, 2008. Forage and field crop seeding guide for Tennessee. UT Extension Document # PB 378. . https://utextension.tennessee. edu/publications/documents
7. Oelke, E.A., E.S. Oplinger, D.H. Putnam, B.R. Durgan, J.D. Doll and D.J. Undersander, 1990. Millets. In Alternative Field Crops Manual. Univ. of Wisc.-Ext. Serv., Univ. of Minn. Ext. Serv. and Univ. of Minn. CAPAP. http://www.hort.purdue.edu/newcrop/ afcm/index.html.
8. FAO, 2007. Economic crop data Sheet: Brachiaria ramosa. Food and Agriculture Organization of the UN. http://ecocrop.fao.org/ecocrop/srv/ en/dataSheet?id=3814.
9. Miller, P. and E. Lord, 2007. Florida Cow-Calf Management, 2nd ed.; forages. Univ. of FL. UF/IFAS Extension. Publication #AN118, http://edis.ifas.ufl.edu/an118.
10. Atis, I., O. Konuskan, M. Duru, H. Gozubenli and S. Yilmaz, 2012. Effect of harvesting time on yield, composition and forage quality of some forage sorghum cultivars. Int. J. Agric. Biol., 14: 879?886.
11. Arshadullah, M., M. Rasheed, S.I. Hyder and M. Anwar, 2011. Screening of Panicum Antidotale grass species under spring screening and monsoon seasons in the Mesick climate of pothowar plateau (Pakistan). J. Anim. Plant Sci., 21(2): 531.
12. Long, R.J., S.O. Apori, F.B. Castrocorres Pondence and E.R. Grskov, 1999. Feed value of native forages of the Tibetan Plateau of China. Anim. Feed Sci. Tech., 80(2): 101-113.
13. Barry, T.N., 2013. The feeding value of forage brassica plants for grazing ruminant livestock. Anim. Feed Sci. Tech., 181: 15-25.
14. Geren, Hakan and T.Y. Kavut, 2015. Effect of different plant densities on the yield and some silage quality characteristics 216 of giant king grass (*Pennisetum hybridum*) under Mediterranean climatic conditions.Turk J. Field Crops., 20(1): 85-91.
15. Dong, C.F., X.Y. Shen, C.L. Ding, N.X. Xu, Y.H. Cheng and H.R. Gu, 2013. The feeding quality of rice (*Oryza sativa* L.) straw at different cutting heights and the related stem morphological traits. Field Crop Res., 141: 1-8.
16. Geren, Hakan, 2014. Dry matter yield and silage quality of some winter cereals harvested at different stages under Mediterranean climate conditions. Turk J. Field Crops., 19(2): 206-211.
17. Khajeh-Hosseini, M., A.A. Powell and I.J. Bimgham, 2003. The interaction between salinity stress and seed vigor during germination of soybean seeds. Seed Sci. Technol., 31: 715-725.
18. Blackmore, L.C., 1972. Methods for chemical analysis of soil analysis. Newzealand soil durean. Rep. No. 10.
19. Black, C.A., D.D. Evans, L.E. Ensminger, G.L. White and Clarck, 1982. Methods of soil analysis. Parts. Agron. Inc., Madison, Wisc.
20. A.O.A.C., 2000. Official Methods of Analysis of the Association of Official Analytical Chemist. 17th ed. AOAC, Washington, DC. USA.
21. Mc-Donald, P.R., A. Edward and J.F. Green halgh, 1978. Animal Nutrition. Longman Group. London, UK.
22. Snedecor, G.W. and W.G. Cochran, 1989. "Statistical Methods", 8th ed., Iowa State Univ. Press, Ames., Iowa, USA.

23. Sarwar, M., Mahr-un-Nisa, M. Ajmal Khan and M. Mushtaque, 2006. Chemical Composition, Herbage Yield and Nutritive Value of Panicum antidotale and Pennisetum orientale for Nili Buffaloes at Different Clipping Intervals. Institute of Animal Nutrition and Feed Technology, University of Agriculture, Faisalabad, Pakistan. Asian-Aust. J. Anim. Sci., 19(2): 176-180.
24. Cuomo, G.J., D.C. Blouin, D.L. Corkern, J.E. Mc Coy and R. Walz, 1996. Plant morphology and forage nutritive value of three bahia grasses as affected by harvest frequency. Agron. J., 88: 85-90.
25. Crowder, L.V. and H.R. Chheda, 1982. Tropical Grass Land Husbandry. 1st ed. Longman, London, New York.
26. Gidenne, T., 2015. Dietary fibers in the nutrition of the growing rabbit and recommendations to preserve digestive health: a review. Animal., 9(2): 227-242.
27. Mc-Donald, S.K., L. Hofsteen and L. Downey, 2003. Crop profile for proso millet in Colorado. USDA Crop Profiles, Regional IPM Centers. http://www. ipmcenters.org/Crop Pro files/ (accessed 07 Oct. 2014).
28. Lyon, D.J., P.A. Burgener, K.L. De Boer, R.M. Harveson, G.L. Hein, G.W. Hergert, T.L. Holman, L.A. Nelson, J.J. Johnson, T. Nleya, J.M. Krall, D.C. Nielsen and M.F. Vigil, 2008. Proso millet in the Great Plains. Publication # EC137. Univ. of Nebraska Ext. Serv. Lincoln, NB.
29. Javed A., M.A. Ullah and M. Anwar, 2007. Assessing carrying capacity of pabbi Hills Kharian Range. J. Anim. Pl. Sci., 17(1-2): 27-29.
30. Bose, M.S.C. and V. Balakarishnan, 2001. Forage Production Technologies. South Asian Publication Pvt., limited New Delhi, India, pp: 253.
31. Chaparro, C.J. and L.E. Sollen Berger, 1997. Nutritive value of clipped 'Mott' Elephant grass herbage. Agron. J., 89: 789-794.
32. Mero, R.N. and P. Uden, 1998. Promising tropical grasses and legumes as feed resources in central Tanzania. 3. Effect of feeding level on digestibility a voluntary intake of four grasses by sheep. Anim. Feed Sci. Technol., 70: 79-78.
33. Fraser, M.D., R. Fychan and R. Jones, 2001. The effect of harvest date and inoculation on the yield, fermentation characteristics and feeding value of forage pea and field bean silages. Grass Forage Sci., 56: 218-224.