Influence of Phosphorous, Nitrogenous Fertilizers and Seeding Rates on Green Forge Yield and Its Quality of Sudangrass (*Sorghum vulgare* var. *Sudanense* (Piper) Stapf) under Ismailia Governorate Conditions - Egypt

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Abstract: Two field experiments were conducted in summer seasons of 2010 and 2011 at Agricultural Research Station, Faculty of Agriculture; Suez Canal University at Ismailia governorate; Egypt. The soil textures of experiments were sandy. The experiments are aimed to study the response of Sudangrass cv. Giza "2" to three phosphorus fertilizer rates (0, 37 and 74 kg P2O5/ha), three rates of nitrogen (74, 121 and 171 kg N/ha), and two seeding rates (24 and 36 kg seed/ha). The design of each experiment was split-split plots design. Sowing date was 9th of May in two growing seasons. Plant height, leaves and stem fresh weight/plant, total plant fresh weight, leaf-stem ratio, green forage yield/cut, total green forage yield/season, CP %, and CP yield/cut were increased by increasing phosphorus fertilizer rates up to 74 kgP2O5/ha, and also, it were increased by increasing nitrogen fertilizer rates up to 171 kg N/ha, while crude fiber % was increased by increasing phosphorus levels and decreased by increasing nitrogen levels. At all cuts, increase seeding rates up to 36 kg/ha significantly increased plant height, green forage yield/cut and total green forage yield/season, but decreased significantly leaves and stem fresh weight/plant, total plant fresh weight, but didn't affect significantly leaf-stem ratio, CP yield/cut, and CF %..

Keywords: Sudangrass- sorghum- phosphorus fertilization - nitrogenous fertilization- seeding rates.

INTRODUCTION

Green forage yield of sorghum (*Sorghum bicolor* var. *Sudanense*) is an important forage crop in tropical, semitropical and even warm-temperate regions (Bahrani and Ghenateghestani (2004). The shortage of green forage in summer season is considered to be one of main problem in feeding animals in Egypt. Therefore, it was necessary to set a plan for improve forage yield and quality characteristics of Sudangrass, which is considered an important summer forage crop. Agricultural operations are considered one of the main objectives to achieve an increase in forage yield and crop quality. Nitrogen fertilizer is considered one of main nutrients to be most important factor to increase productivity of forage crops. This element can play an important role in some physiological operation such as photosynthesis rates of crop leaves, amino and nucleic acids assimilation. Therefore, if nitrogen is a limiting factor during active reproductive phase a reduction in forage yield and its quality will be occurred. Increasing nitrogen fertilizer significantly increase biomass above ground of sorghum cultivars (Almodares, *et al.,* 2009; El-Sarag and Abu Hashem 2009; Yagoub and Abdelsalam (2010); Dorde, *et al.,* 2011 and Afzal, *et al.,* 2012 and 2013).

Green forage yield was increased linearly with increasing nitrogen fertilization rates (Zahid *et al*, 2002). Afzal, *et al.,* (2013) found that total green forage yield of three cuttings were differed significantly among the different nitrogen levels (0, 28.75, 45 and 57.5 kg N/ha. Nitrogen fertilizer increased crude protein present increased while crude fiber present decreased. (Almodares, *et al.,* 2009; El-Sarag and Abu Hashem, 2009; Dorde, *et al.*, 2011); and Afzal, *et al.,* (2013) in Pakistan, showed that application of 100 kg N/acre, and the highest value of crude protein % (12.0 %) was observed by 100 kg N/acre followed by 75 kg N/acre (10.6%) while, the minimum crude protein content (7.5%) was observed by zero nitrogen per acre.

The role of phosphorus is not conspicuous but it might have played a prominent role to increase rate of biochemical processes which are occurring in the plant to enhance plant growth (Zahid *etal*, 2002). Sorghum is response to addition of phosphorus especially soils has very low available phosphorus (Yoana, *et al.,* 2010). Phosphorus is critical for early development of young sorghum plant. A phosphorus deficiency can cause a restricted of root development and delayed flowering and maturity in sorghum (Mahmood, 2012). Mahmud, (2003) resulted that gradual increase in plant height and fodder yield also of two sorghum cultivars (Hegari and JS 263) was observed with the increase in phosphorus rates up to 100 kg P_2O_5/ha. A progressive increase in crude protein content, crude fiber was observed with the increase in phosphorus rates up to 100 kg P_2O_5/ha. Roy and Khandaker (2010) concluded that the tallest plant was found with application of 80 kg tri super phosphate (TSP)/ha and the shortest plant was at control group. Highest green fodder yield was observed at 40 kg TSP/ha followed by 80 kg TSP/ha followed by zero kg TSP/ha in first cutting. It may be suggested that sorghum fodder can be cultivated through the application of 80 kg (TSP) phosphorus fertilizer and harvested at the age of 66 days at first cutting for maximum production.

John, *et al.,* (2012) concluded that plant height of sorghum has increased with increasing seeding rates whereas, low seeding rates (116.000 seeds/ha) was preferable because higher seeding rates don't positively effect yield and may cause morphological changes (i.e. taller plants with thinner stems) conductive to lodging) In Pakistan Mahmood (2012) observed that higher plant density of sorghum bicolor (16, 24 and 32 plants m^{-2}) caused an increase in plant height, while plant density didn't cause a clear change in protein concentration

(7.8, 7.5 and 7.9 % for the three seeding rates, respectively). Bahrani and Ghenateghestani (2004) reported that increasing plant density (25, 33 and 50 plant/m^2) was decreased crude protein percentage of *Sorghum bicolor* L. Moench var. *Sudanense*. Therefore, the objective of this study was to evaluate the impact of different agronomic practices (phosphorus fertilizer levels, nitrogen fertilizer rates and different seeding rates) on quantity and quality of forage yield of Sudangrass. Our results are expected to be useful for assessing the optimal range for these factors in terms of forage production in Sudan grass, especially in arid and semiarid regions.

MATERIALS AND METHODS

Two field experiments were conducted to study the response of Sudangrass cv. Giza "2' as forage crop to three levels of each phosphorus and nitrogen fertilizer and two seeding rates. The experiments were carried out in Agricultural Research Station, Faculty of Agriculture; Suez Canal University at Ismailia governorate; Egypt, during summer seasons of 2010 and 2011. The soil texture of the experimental site is predominantly sandy as shown in Table (1) which explains mechanical and chemical analysis of experimental site in two successive growing seasons. Geographical location of the Agricultural Research Station is located at 30°58′N, 32°23′E and located at a height of 13 meters above sea level (m.a.s.l). The climate of Suez Canal Region is hot and dry from May to October months, and temperatures could be reached up to 40 °C. The growing season of Sudangrass is during this period. Meteorological data for two growing seasons are shown in Table (2). Sudangrass Giza-2 variety was selected and tested at two seeding rates 24 and 36 kg /ha. Nitrogenous fertilizer was tested at three rates; 74. 121 and 171 kg N/ha as ammonium sulfate (20.5% N) while Phosphorus fertilizer as calcium monophosphate (15.5% P_2O_5) was used at three rates 0, 37 and 74 kg P_2O_5/ha. A randomized complete block split-split plot design with three replications was used in each season. Each experimental plot contained 6 rows 50 cm apart and three meters in length (9 m^2 in total area). Sudangrass cv. Giza "2' seeds were drilled handily in rows on 9th of May in both growing seasons 2010 and 2011. In previous winter season the experimental soil sites were fallow. All other agronomic practices were applied as recommended for this crop. Three cuts were taken during each growing season; first cut was taken at 60 days after sowing, the second cut at 50 days from the first one and third cut was taken after 45 days from the second one. At each cut five surrounded plants were taken randomly from outer two rows to determine vegetative growth parameter as an average per plant. The growth parameters were as follows: Plant height (cm), Leave fresh weight (g/plant), Stems fresh weight (g/plant), Total plant fresh weight (g), leaves/stem ratio; Fresh forage yield per cut (ton/ha); Total fresh forage yield (ton/ha/season); crude protein percentage and crude fiber percentage per cut was determined according to method to Sadasivan and Manickam (1991).

All measurements in this study were analyzed by using an analysis of variance (ANOVA) appropriate for a randomized complete block split-split plot design. Comparisons among averages of each factor were accomplished by using LSD test or Duncan's (1955) multiple tests. Statistical analysis was done by using the COSTAT system for Windows, version 6.311 (Cohort Software, Berkeley, CA, USA).

RESULTS AND DISCUSSIONS

Effect of phosphorus fertilizer levels;

Data in table (3) indicate that plant height, leaves and stem fresh weights per plant, total plant fresh weight and leaf-stem ratio were affected significantly by increasing phosphorus fertilization rates up to 74 kg P_2O_5/ha. Green forage yield per cut also, was increased significantly by increasing phosphorus fertilization rates up to 74 kg P_2O_5/ha at all cuts of two growing seasons (table 6), and difference between rates of 37 and 74 kg P_2O_5/ha was insignificant at first cut in two growing seasons. Total green forage yield/ season was increased significantly by increasing phosphorus fertilization rates up to 74 kg P_2O_5/ha in the two seasons, this trait was increased from 72.77, 78.13 to 96.94 t/ha at first season and 74.44, 80.19 to 88.71 t/ha at second season for three phosphorus rates, respectively (Table 6).

Crude protein percentage (Table 6) was increased significantly by increasing phosphorus fertilization rates up to 74 kg/ha, but difference between rate of 37 and 74 kg P_2O_5/ha was insignificant at all cuts of two growing seasons. While, difference between rates of zero and 37 kg P_2O_5/ha was insignificant at all cuts, except at first and third cuts in the second season. Crude protein yield/cut was increased significantly by increasing phosphorus fertilization rates up to 74 kg/ha. Also, Crude fiber percentage was increased significantly by increasing phosphorus fertilization rates up to 74 kg/ha, but difference between rate 37 and 74 kg P_2O_5/ha was significant of first cut at first growing season. While, the differences between the rate 0 (zero) and 37 kg P_2O_5/ha was significant at all cuts of second season (Table 6). The obtained results of this investigation are in accordance with those obtained by Hassan (1976); Haggag *et al* (1986); Hafiz and El-Kholy, (2000); zahid, *et al* (2002); Mahmud (2003), and Mahmood, 2012).

Effect of nitrogenous fertilizer;

Data in table (4) show that plant height, leaves fresh weight per plant, stems fresh weight per plant, fresh leaf-stem ratio and total plant fresh weight were increased significantly with increasing nitrogen fertilizer rates up to 171 kg N/ha at all cuts in the two growing seasons. Green forage yield per cut was increased significantly by increasing nitrogen fertilizer rates up to 171 kg N/ha. Total green forage yield/ season was increased significantly by increasing nitrogen fertilizer rates up to 171 kg N/ha in the two seasons, where total green forage yield was recorded at first season 70.61, 83.45 and 93.76 t/ha and 68.29, 80.13 and 94.91 t/ha at second season for three nitrogen fertilizer rates in the two seasons, respectively (Table 7). Crude protein percentage and crude protein yield per

cutting at all cuts in the two growing seasons were increased by increasing nitrogen fertilizer rates up to 171 kg N/ha increased significantly (table 7). Increasing nitrogen fertilizer rates up to 171 kg nitrogen/ha decreased crude fiber percentage at second cut of first season and first beside to third cut of second season. The results of this study are compatible with results of other investigators such as Zahid *etal*, (2002); Almodares, *et al.,* 2009; El-Sarag and Abu Hashem 2009; Yagoub and Abdelsalam (2010) Dorde, *et al.,* 2011; Afzal, *et al.,* 2012 and Afzal, *et al.,* (2013)

Effect of seeding rates

Data in table (5) cleared that plant height was increased by increasing seeding rate from 24 to 36 kg seeds/ha at three cuts in two growing season. While, leaves fresh weight per plant, stems fresh weight per plant and total plant fresh weight were increasing by decreasing seeding rate from 36 to 24 kg seeds/ha at the three cuttings in the two growing season, while leaf-stem ratio wasn't affected significantly by seeding rates at all cuts in the two growing successive seasons (Table 5).

Green forage yield/cut was increased significantly by increasing seeding rate from 24 to 36 kg seeds/ha at three cuts in the two growing season. The higher seeding rate recorded the highest weight of fresh forage yield per cut than the lower one. Green forage yield per cut from using 36 kg seeds/ha overcome that from using 24 kg seeds/ha by 4.64, 3.99 and 5.13 t/ha for three cuts of first season, respectively and by 3.84, 4.46 and 4.68 t/ha for three cuts, respectively in second season (Table 8).

Total green forage yield was increased significantly by increasing seeding rate from 24 to 36 kg seeds/ha in two seasons. The higher seeding rate increased total green forage yield by 12.35 and 18.44 % at first and second season, respectively (table 8).

Table (1): The mechanical and chemical analysis of soil at the experimental site in two growing seasons (2010 and 2011).

Properties	Over two seasons	Properties	Over two seasons
Particle size distribution (%)		**Soluble anions (meqL $^{-1}$)**	
Sand	93.12	$(CO_3)^{-2}$	0.00
Silt	2.38	$(HCO_3)^{-}$	4.75
Clay	4.50	Cl^{-}	9.50
Texture class	Sandy	$(SO_4)^{-2}$	9.66
Soil order	1.55	Organic C (g kg $^{-1}$)	1.72
Field capacity (%)	17.20	Total N (g kg $^{-1}$)	0.16
pH	8.19	Available N (mg kg $^{-1}$)	5.50
ECe (dSm-^{1})	2.35	Available P (mg kg $^{-1}$)	1.17
Soluble cations (meqL^{-1})		**Micronutrients (mg kg^{-1})**	
Ca^{+2}	11.50	Fe	.68
Mg^{+2}	7.50	Mn	1.16
Na^{+}	3.93	Zn	1.23
K^{+}	0.98	Cu	0.24

Source: Water and Soil Department, Agriculture Faculty, Suez Canal University.

Table (2): The Meteorological data of air and soil at the experimental site in two growing seasons (2010 and 2011).

Meteorological data	**Air tempera (^{o}C)**				**Air moisture %**			
Season	**2010**		**2011**		**2010**		**2011**	
	max	**min**	**max**	**min**	**max**	**min**	**max**	**min**
***1st cutting**	33.4	19.2	33.8	20.0	82.1	24.6	89.6	28.2
***2nd cutting**	34.9	23.5	37.5	23.9	85.3	35.2	89.0	28.3
***3rd cutting**	32.8	20.4	35.7	21.3	85.2	31.2	88.6	28.1
Meteorological data	**soil tempera at 10 cm depth**				**soil tempera at 15 cm depth**			
	max	min	max	min	max	min	max	min
***1st cutting**	35.3	24.4	33.0	24.3	31.3	27.5	27.7	24.6
***2nd cutting**	38.3	29.2	35.9	27.0	27.7	24.6	28.5	26.0
***3rd cutting**	35.0	26.6	34.5	24.8	27.7	24.6	27.7	24.6

	Soil tempera at 5 cm depth				**Evaporation%**	
	max	**min**	**max**	**min**	**2010**	**2011**
***1st cutting**	48.27	20.0	45.8	20.0	4.0	5.7
***2nd cutting**	55.4	23.9	51.4	21.7	4.4	7.9
***3rd cutting**	46.9	21.4	40.0	17.3	4.0	7.1

*1st cutting = 60 days from 9/5 to 7/7 & *2nd cutting = 50 days from 8/7 to 26/8 & *3rd cutting = 45 days from 27/8 to 10/10
Source: Ministry of Agriculture and Land Reclamation, ARC, ARE.

Crude protein percentage was increased by decreasing seeding rate from 36 to 24 kg seeds/ha, but this increases were significant only in first cut of first season and second cut in second season. While, crude protein yield per cut and crude fiber percentage were increased by increasing seeding rate from 24 to 36 kg seeds/ha., but these increases were significant only in second and third cuttings in second season only. (Table 8). These results are in accordance with those obtained by (Ahmed (2004) and Bahrani and Ghenteghestani (2004).

Effect of the interaction among phosphorus: nitrogenous and seeding rates:

The effect of the third interaction among the three studied factors on all studied characters wasn't significant at all cuts in the two growing seasons.

Table (3): Effect of phosphorus rates (kg/ha.) on vegetative characteristics of Sudangrass in two growing seasons (2010 and 2011).

Season	Season 2010			Season 2011		
Cutting No.	**1st cut**	**2nd cut**	**3rd cut**	**1st cut**	**2nd cut**	**3rd cut**
			1- Plant height			
0 kg P_2O_5/ha	192.33 a	173.00 b	145.56 b	221.39 a	215.28 b	141.11 b
37 kg P_2O_5/ha	206.22 a	186.11 ab	174.17 a	238.33 a	226.67 a	143.33 b
74 kg P_2O_5/ha	208.33 a	201.39 a	179.06 a	243.89 a	230.83 a	159.17 a
			2- Leaves fresh wt/plant (g)			
0 kg P_2O_5/ha	41.78 c	36.72b	27.00 b	48.33 b	40.44 c	36.67a
37 kg P_2O_5/ha	48.33 b	41.67b	32.83 b	55.83ab	47.44 b	38.33 a
74 kg P_2O_5/ha	54.17 a	48.33 a	38.61 a	58.61 a	52.28 a	40.56 a
			3- Stems fresh wt/plant (g)			
0 kg P_2O_5/ha	133.61 a	131.83a	97.22 c	150.11 b	128.89 b	130.78 a
37 kg P_2O_5/ha	141.39 a	140.83a	111.78 b	170.17 a	145.83 a	135.61 a
74 kg P_2O_5/ha	145.00 a	145.56a	125.00 a	178.72 a	158.44 a	142.56 a
			4- Total plant fresh wt (g)			
0 kg P_2O_5/ha	175.38 b	168.56b	124.22 c	198.44 b	169.89 c	167.44 b
37 kg P_2O_5/ha	189.72 a	182.50a	144.61 b	226.00ab	193.28 b	173.94ab
74 kg P_2O_5/ha	199.17 a	193.89a	163.61 a	237.33 a	210.72 a	183.11 a
			5- Fresh Leaf / stem ratio			
0 kg P_2O_5/ha	31.65 b	28.30 b	29.29 a	32.62 a	31.76 a	28.30 a
37 kg P_2O_5/ha	34.69ab	29.51ab	29.45 a	33.40 a	32.74 a	28.20 a
74 kg P_2O_5/ha	37.73 a	33.32 a	30.79 a	33.41 a	33.07 a	28.40 a

1st cut =60 days after sowing & 2nd cut =50 days from 1st & 3rd cut =45 days from 2nd cut

Table (4): Effect of nitrogenous levels vegetative characteristics of Sudangrass in two growing seasons (2010 and 2011).

Season	Season 2010			Season 2011		
Cutting No.	**1st cut**	**2nd cut**	**3rd cut**	**1st cut**	**2nd cut**	**3rd cut**
			Plant height (cm)			
74 kg N/ha	195.94b	178.06 b	151.28b	222.50 b	211.39 c	142.22b
121.kg N/ha	200.28b	189.50 a	170.00a	239.44 a	226.11b	146.11b
171 kg N/ha	210.67a	192.94 a	177.50a	241.67 a	235.28a	155.28a
			2- Leaves fresh wt/plant (g)			
74 kg N/ha	40.00b	34.17 c	26.00 c	41.83 c	39.50 c	32.78 c
121.kg N/ha	46.22 b	42.42 b	32.56 b	56.67 b	45.39 b	38.06 b
171 kg N/ha	58.06 a	50.14 a	39.89 a	64.28 a	55.28 a	44.72 a
			3- Stems fresh wt/plant (g)			
74 kg N/ha	127.78 c	121.94 c	93.61 c	131.56 b	129.72b	120.44 b
121.kg N/ha	138.89 b	135.72b	110.11 b	177.56 a	146.50a	136.83 b
171 kg N/ha	153.33 a	160.56a	130.28 a	189.89 a	156.94a	151.67 a
			4- Total plant fresh wt (g)			
74 kg N/ha	167.78 c	156.11c	119.61c	173.39 c	169.78 c	153.22 c
121.kg N/ha	185.11 b	178.14b	142.67b	234.22 a	191.89 b	174.89 b
171 kg N/ha	211.39 a	210.69a	170.17a	254.17 a	212.22 a	196.39 a
			5- Fresh Leaf / stem ratio			
74 kg N/ha	32.16 b	28.10 a	28.22 b	32.61 a	30.53 b	27.58 a
121.kg N/ha	34.01ab	31.83 a	30.56 a	32.88 a	31.32 b	27.79 a
171 kg N/ha	37.91 a	31.20 a	30.76 a	33.94 a	35.72 a	29.53 a

1st cut =60 days after sowing & 2nd cut = 50 days from first & 3rd cut = 45 days from second cutting.

Table (5): Effect of seeding rates on vegetative characteristics of Sudangrass in two growing seasons (2010 and 2011).

Season	Season 2010			Season 2011		
Cutting No.	**1st cut**	**2nd cut**	**3rd cut**	**1st cut**	**2nd cut**	**3rd cut**
			1- Plant height			
24 kg seed/ha	191.93b	176.07 b	149.74b	217.96 b	212.96b	133.52b
36 kg seed/ha	212.67a	197.59 a	182.78a	251.11 a	235.56a	162.22a
			2- Leaves fresh wt/plant (g)			
24 kg seed/ha	56.00 a	49.94 a	35.81 a	60.63 a	50.15 a	42.96 a
36 kg seed/ha	40.19 b	34.54 b	29.81 b	47.89 b	43.30 b	34.07 b
			3- Stems fresh wt/plant (g)			
24 kg seed/ha	158.70 a	154.07a	125.93 a	189.67 a	160.74a	148.22 a
36 kg seed/ha	121.30 b	124.74b	96.74 b	143.00 b	128.04b	124.41 b
			4- Total plant fresh wt (g)			
24 kg seed/ha	214.70 a	204.02a	161.74a	250.30 a	210.89 a	191.19 a
36 kg seed/ha	161.48 b	159.28b	126.56b	190.89 b	171.33 b	158.48 b
			5- Fresh Leaf / stem ratio			
24 kg seed/ha	36.22 a	32.46 a	28.30 a	32.23 a	31.84 a	28.88 a
36 kg seed/ha	33.17 a	28.29 a	31.39 a	34.06 a	33.75 a	27.71 a

1st cut =60 days after sowing & 2nd cut = 50 days from first & 3rd cut = 45 days from second cutting.

Table (6): Effect of phosphorous rates on forage yield and quality of Sudangrass in two growing seasons (2010 and 2011).

Season	Season 2010				Season 2011			
Cutting No.	**1st cut**	**2nd cut**	**3rd cut**	**Total**	**1st cut**	**2nd cut**	**3rd cut**	**Total**
				6- Green forage yield (ton/ha)				
0 kg P_2O_5/ha	27.48c	25.63c	19.66b	72.77c	27.14 b	25.08 b	22.22 b	74.44 c
37 kg P_2O_5/ha	29.58ab	29.53b	19.02b	78.13b	29.58ab	26.11 b	23.96 b	80.19 b
74 kg P_2O_5/ha	34.52a	35.12a	27.29a	96.94a	32.25 a	30.05 a	26.41 a	88.71 a
				1- Crude protein %				
0 kg P_2O_5/ha	6.49 b	7.30 b	7.34 b		6.74 b	7.26 b	7.73 b	
37 kg P_2O_5/ha	7.10ab	7.72ab	8.32ab		7.33 a	7.54ab	8.41 a	
74 kg P_2O_5/ha	7.83 a	8.13 a	8.85 a		7.55 a	7.98 a	8.79 a	
				2- Crude protein yield (ton/ha)				
0 kg P_2O_5/ha	0.37 b	0.36 b	0.22 b		0.41 b	0.37 b	0.29 b	
37 kg P_2O_5/ha	0.44 b	0.45ab	0.24 b		0.50 a	0.41 b	0.34ab	
74 kg P_2O_5/ha	0.58 a	0.59 a	0.39 a		0.56 a	0.51 a	0.39 a	
				3- Crude fiber %				
0 kg P_2O_5/ha	53.86b	51.12a	44.12b		45.97b	42.21b	34.57 b	
37 kg P_2O_5/ha	62.45b	53.22a	48.39ab		54.06a	49.86a	42.99 a	
74 kg P_2O_5/ha	69.81a	54.37a	53.30 a		57.38a	54.86a	47.32 a	

1st cut =60 days after sowing & 2nd cut = 50 days from first & 3rd cut = 45 days from second cutting

Table (7): Effect of nitrogenous levels on forage yield and quality of Sudangrass in two growing seasons (2010 and 2011).

Season	Season 2010				Season 2011			
Cutting No.	**1st cut**	**2nd cut**	**3rd cut**	**Total**	**1st cut**	**2nd cut**	**3rd cut**	**Total**
				6- Green forage yield (ton/ha)				
74 kg N/ha	26.47 c	25.94 c	18.21 c	70.61 c	24.81 c	22.96 c	20.52 c	68.29 c
121.kg N/ha	31.28 b	29.84 b	22.33 b	83.45 b	29.63 b	26.65 b	23.85 b	80.13 b
171 kg N/ha	33.84 a	34.50 a	25.42 a	93.76 a	35.08 a	31.63 a	28.20 a	94.91 a
				1- Crude protein %				
74 kg N/ha	6.58 c	7.17 b	7.09 b		6.77 b	7.36 a	7.89 b	
121.kg N/ha	7.19 b	7.74ab	8.58 a		7.04 b	7.70 a	8.18 b	
171 kg N/ha	7.63 a	8.24 a	8.84 a		7.81 a	7.72 a	8.86 a	
				2- Crude protein yield (ton/ha)				
74 kg N/ha	0.39 b	0.40 b	0.20 b		0.39 c	0.38 b	0.28 c	
121.kg N/ha	0.47 a	0.46ab	0.30 a		0.47 b	0.42 b	0.34 b	
171 kg N/ha	0.53 a	0.53 a	0.34 a		0.61 a	0.49 a	0.41 a	
				3- Crude fiber %				
74 kg N/ha	65.76a	57.75a	50.91a		57.82a	51.45a	45.31a	
121.kg N/ha	61.53a	51.46b	47.92a		50.24b	50.25a	41.64ab	
171 kg N/ha	58.84a	49.51b	46.97a		49.34b	45.23a	37.94 b	

1st cut =60 days after sowing & 2nd cut = 50 days from first & 3rd cut = 45 days from second cutting

Table (8): Effect of seeding rates (kg/ha) on forage yield and quality of Sudangrass in two growing seasons (2010 and 2011).

Season	Season 2010				Season 2011			
Cutting No.	**1st cut**	**2nd cut**	**3rd cut**	**Total**	**1st cut**	**2nd cut**	**3rd cut**	**Total**
6- Green forage yield (ton/ha)								
24 kg seed/ha	28.21 b	28.10 b	19.42 b	75.73 b	27.92 b	24.85 b	21.85 b	74.62b
36 kg seed/ha	32.85 a	32.09 a	24.55 a	89.49 a	31.76 a	29.31 a	26.53 a	87.60a
1- Crude protein %								
24 kg seed/ha	7.31 a	7.79 a	8.50 a		7.27 a	7.75 a	8.35 a	
36 kg seed/ha	6.96 b	7.64 a	7.84 a		7.14 a	7.43 b	8.27 a	
2- Crude protein yield (ton/ha)								
24 kg seed/ha	0.46 a	0.45 a	0.26 a		0.48 a	0.41 b	0.31 b	
36 kg seed/ha	0.47 a	0.49 a	0.30 a		0.50 a	0.45 a	0.37 a	
3- Crude fiber %								
24 kg seed/ha	62.20a	53.46a	47.05 a		56.68a	49.66a	40.13a	
36 kg seed/ha	61.88a	52.35a	50.15 a		48.25b	48.29a	43.13a	

1st cut =60 days after sowing & 2nd cut = 50 days from first & 3rd cut = 45 days from second cutting

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الملخص العربى

تأثير التسميد الفوسفاتى والازوتى ومعدل التقاوى على محصول العلف الاخضر وجودته فى حشيشة السودان تحت ظروف محافظة الاسماعيلية – مصر

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اقيمت تجربتان حقليتان لدراسة تأثير كل من التسميد الفوسفاتى و التسميد الازوتى و معدل التقاوى على انتاجية محصول العلف الاخضر لمحصول حشيشة السودان تحت الظروف البيئية لمحافظة الاسماعيلية خلال موسمى ٢٠١٠ و ٢٠١١. حيث سجلت الصفات التالية: ارتفاع النبات، وزن الاوراق الغض/نبات (جم) ، وزن الساق الغض/نبات (جم) ، الوزن الكلى الغض/نبات (جم) ، نسبة الاوراق الى الساق ، محصول العلف الاخضر/حشة (طن/هكتار)، اجمالى محصول العلف/موسم (طن/هكتار)، نسبة البروتين الخام ، محصول البروتين/حشة (طن/هكتار)، نسبة الالياف الخام، وقد اظهرت النتائج زيادة جميع الصفات المدروسة زيادة معنويةً بزيادة كل من التسميد الفوسفاتى حتى ٧٤ كجم فوسفور/هكتار وكذلك التسميد الازوتى حتى ١٧١ كجم ازوت/هكتار بينما سلكت نسبة الالياف سلوك معاكس بالنسبة للتسميد الازوتى. ادى زيادة معدل التقاوى حتى ٣٦ كجم/هكتار الى زيادة معنوية فى كل من ارتفاع النبات ، محصول العلف الاخضر/حشة (طن/هكتار) واجمالى محصول العلف/موسم (طن/هكتار)، بينما انخفضت صفات وزن الاوراق والساق ووزن النبات الكلى الغض، فى حين لم تتأثر صفات نسبة البروتين ، محصول البروتين/حشة و نسبة الالياف بزيادة معدل التقاوى.

الكلمات المرشدة: حشيشة السودان – السورجم – التسميد الفوسفاتى – التسميد الازوتى – معدلات التقاوى.