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Growth and Prospective Forage Yields of Two *Cenchrus* Species in Relation to Bio- and Organic Fertilization

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THE GROWTH response and forage yield of two *Cenchrus* species, *i.e.*, *Cenchrus ciliaris* and *Cenchrus setigerus* to different bio- and organic fertilization levels was studied. The experiment was set up during 2002 and 2003 seasons at Maryut experimental station. The study comprised in addition to the above mentioned *Cenchrus* species three organic manure levels (0,20,40 m^3/fed) and three biofertilization treatments (*Azospirillum*, *Azotobacter* and without biofertilization as a control) in split-split plot design with three replications. The obtained results could be summarized as follows:

1. Data obtained indicate that *C. ciliaris* was superior as compared to *C. setigerus* in all growth parameters and yield.
2. Most of the studied growth traits and forage yield of *Cenchrus* species were increased with increasing organic manure levels from 0 to 40 m^3/ fed.
3. All growth traits and forage yield of *Cenchrus* spp. were favourably responded to biofertilization with *Azosbirillum* compared with the others.
4. Interaction between bio- and organic fertilization had a significant effect on number of tillers in the first cut of the second season. Moreover, plant height and dry forage yield were significantly affected in the second cut of the second season.
5. Specific leaf weight (SLW) and dry forage yield were significantly responded to the interaction between *Cenchrus* species and organic manure levels.

Keywords : *Cenchrus*, *Azotobacter* , *Azospirillum*, Organic manure, Biofertilizer, & Forage yield.

Under Egyptian conditions, animal grazing flocks suffer much from lack of summer green forages and mainly fed poor quality roughages and very little concentrates. Therefore, it is believed that cultivation of new forage crops with wide adaptability such as *Cenchrus* species may compensate for the severe deficient in green forage production throughout summer period.

Cenchrus ciliaris and *Cenchrus setigerus*,are perennial bunchgrasses in the grass family (Poaceae). *Pennisetum ciliare* (L.) Link is the most commonly used synonym for *Cenchrus ciliaris* whereas, synonym of *Cenchrus setigerus* Vahl is *Cenchrus setiger* Vahl. They are drought-resistant, nutritious and palatable

grasses (El-Houssini *et al.*, 1999) and are well accepted by cattle and find place in renovation of pasture improvement (Dwivedi *et al.*, 1991). They are much adapted to a number of harsh environmental conditions. *Cenchrus* spp. can occur in warm, temperate thornscrub habitats, tropical deserts and in moist forests (Duke, 1983). Also, they are native to Africa, Arabia, northern India and Pakistan.

Cenchrus is considered as an important pasture grass in many parts of the tropics, mainly because of its low cost of establishment, high yields and high level of nutrients, tolerance to drought conditions and its ability to withstand heavy grazing and trampling by livestock (Duke, 1983). Such plant has been introduced into many tropical and subtropical areas of the world for grazing purposes. It is in or near these pasture areas, where *Cenchrus* often becomes invasive and problematic (Mandy, 2000). Increasing forage productivity under conditions of the newly reclaimed lands such as Maryout region by applying the most suitable cultural practices on such areas, is considered as a main goal for researches. As most of the soils in the newly reclaimed areas are classified as sandy soil, organic manuring and biofertilization can be considered among the most important cultural practices for increasing forage productivity. In addition, natural fertilization resources (bio- and organic fertilizers) should be used to avoid the environmental polluted effects of chemical fertilizers.

Cenchrus species being a graminaceous fodder plant respond favourably to organic manuring because of their high content of nitrogen. Kandaswamy *et al.* (1975) studied the effect of 9 different fertilizer treatments on *Cenchrus ciliaris*. They mentioned that plants given 10 ton FYM + 50 lb P_2O_5 / ac had the highest nutritive value, and all treated plants had a higher nutritive value than the unfertilized control. In addition, Balasundaram *et al.* (1977) showed that the higher DM and protein yields of *C. glaucus* and *C. ciliaris* were obtained by application of 11 t. FYM + 33 kg P_2O_5 / ha. Application of 5 t. FYM [illegible] and [illegible] kg P_2O_5 / ha significantly increased plant height, tillering, [illegible] uptake, fresh herbage and DM [illegible] of *C. ciliaris* (Bhati & Mathur, [illegible]). Gonzalez-Ibarluoea (1982) conducted an experiment to compare [illegible] manure or given 135 – 480 kg N / ha as [illegible] or 50 – 200 kg N / ha as [illegible] nitrate, both incorporated into the soil before sowing. He reported that [illegible] equal N rates DM production [illegible] was similar. In field trials, *Bromus inermis*, *Medicago sativa* and *Agropyron cristatum* grown alone or in grass – legume mixtures were given no fertilizer, 55 kg N + 12 kg P, 110 kg N +24 kg P/ha or 11 or 22 t. FYM / ha annually. DM yield, N and P uptake and P content of all spp. and mixtures were increased both by inorganic fertilizer and FYM (Holt & Zentner, 1985). Also, Selim *et al.* (1998) stated that application of organic manure increased grain yield of maize. In addition, Badran (2002) reported that organic fertilizers were superior to mineral ones regarding grain yield and its compenent of some barley varieties. From soil physics point of view, organic farming treatments (composted town refuse, composted farmyard manure and their mixture) led to good reduction in soil bulk density by 15%, penetration resestance by 39% and cohesion force by 73% (El-Sersawy, 2002). Moreover,

application of 20 m^3 compost + 67.5 kg N + 31 kg P_2O_5 + 24 kg K_2O / fed significantly increased root weight / plant and root and top yields / fed of sugar beet plants comparing with 100 Kg N + 46.5 Kg P_2O_5 + 48 Kg K_2O / fed (Abd-El-Wahab *et al.*, 2005). Recently, El-Toukhy and Abdel-Azeem (2006) reached to apply organic manure increased all growth parameters and forage yield of *Phalaris canariensis*. Also, El-Etr *et al.* (2006) stated that applied farmyard manure at the rate of 3% significantly affected the dry matter of both shoots and roots of wheat plants.

Ecologically oriented farming practices are being developed within the farm of the recent advances in environmental and agricultural biotechnology. Biofertilized farming system gives rise to composts and organic manuring, bioremediating the rhizosphere with biofertilizers as well as using biopesticides in agricultural practice (Selim *et al.*, 1998).

The ability of nonleguminous plants of different families to fix atmospheric nitrogen in associative symbiosis with microorganisms was investigated by Berestetskii & Vasyuk (1983). They referred that diazotrophs were found to be widely distributed on the roots of nonleguminous plants. They also found that appreciable nitrogenase activity was observed on the roots of *Cenchrus* and millet. In this respect, Rao & Venkatswarlu (1987) mentioned that inoculation of seeds of *Cenchrus ciliaris* and *Lasiurus sindicus* with *Azospirillum brasilense* increased DM production. Inoculating seeds of winter rye, *Lolium perenne* and *Bromus inermis* with selected *Azospirillum* strains increased N fixation in the root zone (Mal'tseva *et al.*, 1995). Moreover, there was beneficial effect of inoculation with *Azospirillum and Azotobacter* strains (Rai & Pahwa, 1996 on *Cenchrus setigrus*; Kundu *et al.*, 1997 on pearl millet; Sheoram *et al.*, 1998 on *Avena sativa* L., Selim *et al.*, 1998 on maize; Meawed & Gebraiel, 2002 on Zea mexicana and El-Houssini, 2006 on *Phalaris canariensis* L.). Also, biofertilization as *Pseudomonas fluorescens* alone or mixture with *Azotobacter chroococcum* encouraged the formation of medium and fine pores rather than large pores (El-Sersawy, 2002).

Hence, the present work aims to maximize the use of organic fertilization and biofertilizers application and minimize chemical fertilizer application and their pollutant effects, especially in newly reclaimed areas.

Material and Methods

A field trail was set up throughout two successive seasons namely 2002 and 2003 in Maryut Experimental Station of the Desert Research Centre (DRC), which is located 35 km. west Alexandria. The objective of this investigation is to study the response of two *Cenchrus* species to bio- and organic fertilizers under new reclaimed soil conditions. Soil of the experimental farm was analyzed according to the methods described by Jackson (1971). Physical and chemical properties are shown in Tables (1 a & b).

TABLE 1. Mechanical and chemical analysis of the experimental soil.

a-Mechanical analysis

Texture class	Total	Particle size distribution			Saturation %
		Clay	Silt	Sand	
Sandy clay loam	100	24.048	20.497	55.455	44

b-Chemical analysis

Soluble anions (meq/L)				Soluble cations (meq/L)				pH	EC mmhos/cm
So_4^{--}	Cl^-	Co_3^{--}	Hco_3^-	Mg^{++}	Ca^{++}	K^+	Na^+		
14.133	12.955	-	1.303	3.70	5.82	1.45	17.42	8.4	2.97

A split-split plot design with three replications was used. The main plots were devoted to organic fertilizer treatments, while the sub plots were allocated to *Cenchrus* species whereas, the sub sub plots were occupied with biofertilizer treatments. Each sub-sub plot contains 6 ridges, each of 3 meters in length and 60 cm apart, then the sub-sub plot area was 10.5 m^2 (3 x 3.5).

The experiment included eighteen treatments which were the combinations of three organic fertilization levels (0.0 , 20.0 and 40.0 m^3/ fed), two *Cenchrus* species (*Cenchrus ciliars* and *Cenchrus setigerus*) and three biofertilization treatments (inoculation with *Azotobacter, Azospirillum* and uninoculated as control).

Seeds of the two *Cenchrus* species under study (*C.ciliars* and *C.setigerus*) were provided from seed propagation program of Range Management Unit and inoculated with different biofertilizers, *i.e., Azotobacter, Azospirillum* in addition to control. Inoculation was performed by dipping *Cenchrus* seeds in appropriate amounts of centrifugated bacterial culture (which was grown on nutrient broth for 24 hr) of each strain. Bacteria cultures used for inoculation had a cell density of 6 x 10^7 to 7 x 10^8 colonies farming units / ml by plate counts. The seeds were left for air drying about an hour in shaded place and sown immediately. This treatment provided a final density of about 10^6 cells per seed. Control treatment was treated as inoculated ones, but without bacterial culture. The coted seeds were sown with seeding rate of 1.5 kg / fed on 17 May, 2002. Farmyard manure at the studied three rates were applied to the soil for all treatment during preparing the experimental soil in the first season. Whereas, in the second one such amounts of farmyard manure were added again by the beginning of the second season (may, 15). Calcium superphosphate (15.5%P_2O_5) at a rate of 150 kg/fed was applied as a basal dose throughout soil preparation.

At the first season, harvesting was initiated 75 days after sowing, when the first cut was taken at cutting height of about 5 cm above the ground surface. Clipping was repeated later by cutting interval of 55 days. In the second season two cuts only were harvested.

Samples of ten surround plants were chosen randomly from the interior of the plot border before each cut to determine the following growth parameters: plant height (cm), No. of tillers per unit area "$^1/_{16}$ m^2", leaf area (cm^2) was calculated using the following formula:

Leaf erea = length X maximum width X 0.74 (Turner, 1974), specific leaf weight "S.L.W" (mg/cm^2) was determined by dividing dry weight of leaf (mg) / leaf area (cm^2). All plants of each experimental unit were clipped to determine fresh and dry forage yields in t/fed.

Data obtained were statistically analyzed using computer statistical program Co-STAT according to procedures outlined by Snedecor & Cochran (1980). Differences between means were compared using the LSD values at 5% level according to Waller & Duncan (1969).

Results and Discussion

Plant species effects

The mean of growth and yield performances of the two *Cenchrus* species are shown in Table 2. Plant height differed significantly in all harvested cuts of both seasons in favour of *C.ciliars*. No. of tillers take the same trend of plant height in its response to plant species with significant effect in the second season only. In this concern, Nittler & Jensen (1974) reported that the number of tillers differed between different barley cultivars.

TABLE 2. Some growth and forage yield traits of two *Cenchrus* species at different cuts harvested during 2002 and 2003 growing season.

Traits	No.of cut	2002			2003		
		Plant species		LSD	Plant species		LSD
		Cil.	Set.	5%	Cil.	Set.	5%
Plant height (cm)	1st	86.0	59.0	22.4	82.0	53.0	29.0
	2nd	88.0	68.0	20.0	79.0	71.0	8.0
	3rd	98.0	63.0	7.0	-	-	-
No. of tillers	1st	32.0	26.0	NS	75.0	51.0	21.0
	2nd	43.0	42.0	NS	53.0	41.0	11.0
	3rd	35.0	31.0	NS	-	-	-
Leaf area (cm^2)	1st	9.80	8.09	NS	10.08	8.89	NS
	2nd	11.72	9.23	0.46	15.17	11.60	NS
	3rd	11.00	4.10	6.87	-	-	-
SLW (mg/cm^2)	1st	4.20	3.80	NS	6.99	5.89	0.97
	2nd	5.91	3.00	2.87	4.87	4.37	0.33
	3rd	5.10	5.10	NS	-	-	-
F.F.Y. (t/fed)	1st	1.143	1.088	NS	2.611	1.186	1.418
	2nd	3.510	2.033	1.355	2.862	2.537	NS
	3rd	4.056	2.028	1.220	-	-	-
D.F.Y (t/fed)	1st	0.299	0.277	NS	1.413	0.442	NS
	2nd	1.033	0.417	0.497	0.831	0.713	NS
	3rd	0.814	0.384	0.358	-	-	-

Cil.= *Cenchrus ciliari.* Set.= *Cenchrus* setiger. SLW= Specific Leaf Weight.
FFY.=Fresh Forage Yield . DFY= Dry Forage Yield .

The differences between the two tested *Cenchrus* species in leaf area were statistically significant only in the second and third cuts taken in the first season. *C.ciliaris* had a larger leaf area than *C.setgerus*. This was true in all cuts of both seasons. Specific leaf weight was responded significantly to *Cenchrus* species. Considering the effect of *Cenchrus* species on their fresh and dry forage yields, it can be observed from data in Table 2 that the highest values of both fresh and dry forage yields were achieved by *C.ciliaris* while the lowest values of such traits were obtained by *C.setgerus*. The increments in fresh and dry forage yields were achieved by cultivation *C.ciliaris* were significant in all cuts taken in the first season except the first cut. Whereas, this increments were only significant in the first cut of the second season for fresh forage yield.

It is worth mentioning that forage yield per unit area is a product of all growth traits of any forage plant. *Cenchrus ciliaris* exhibited the greatest values of all growth traits tested, resulted in an expected high forage yield. On the contrary, the appreciable low forage yield previously noted for *C.setgerus* may be attributed to its inferiority in all growth traits especially plant height and No. of tillers.

Effect of organic manure rates

Results presented in Table 3 indicate that increasing organic manure rate from 0 to 40 m^3 / fed caused a significant increase in most growth traits of *Cenchrus* plants. Such effect was noticed in most taken cuts in both seasons. Consequently, fresh and dry forage yields were positively responded to raising organic manure rate. This may be attributed to ameliorating effect of organic manure on the physical chemical and microbiological properties of soil, as well as to the stimulation of macro-and micro – nutrients released and its availability to the growing plants (Sabrah *et al.*, 1995). In this respect, Negm *et al.* (2003) mentioned that manure application to calcareous soil had favorable effects on its pH, cation exchange capacity and available N, P and K contents. The obtained results emphasized the well established conclusion stated by a considerable number of researchers worked on *Cenchrus* species such as Kandaswamy *et al.* (1973); Balasundaram *et al.* (1977); Bhati & Mathur (1984); Badran (2002) on some barlay varieties, El-Sersawy (2002) on maize plants, abd-El-Wahab *et al* . (2005) on sugar beet; El-Toukhy & Abedel-Azeem (2006) on *Phalaris canariensis* and El-Etr *et al.* (2006) on wheat plants.

Biofertilization effects

From data presented in Table 4, it could be seen that biofertilization treatments resulted in significant differences in all growth traits of *Cenchrus* species, *i.e.*, plant height, No. of tillers, leaf area and specific leaf weight. Such significant effects were detected in all harvested cuts in the two experimentation years except in the first cut of both seasons. Fresh and dry forage yields of the two *Cenchrus* species followed closely the same trend of growth traits in their response to biofertilizer treatments. The highest values of all studied growth traits and forage yield were achieved when seeds of *Cenchrus* species were

inoculated with *Azospirillum* as compared with inoculation by *Azotobacter* and uninoculated control. *Azospirillum* inoculation augmented *Cenchrus* fresh forage yield by about 5.1, 39.0 and 31.6 % and dry forage yield by 11.9, 38.3 and 50.2 % , compared with the control for the first, second and third cuts of the first season , respectively. Whereas, in the second one such increments reached about 11.5 and 55.4 % for fresh forage yield and 16.4 and 42.4 % for dry forage yield ,compared with the control in the first and second cuts, respectively. These results may be attributed to the principle mechanism that biofertilizer could benefit the plant growth through fixing molecular nitrogen and its transfer to the plant as direct effect on growth hormones that bacteria could release in the root media and affect its growth and extension positively. This may encourage the plant to absorb more nutrients which reflects positively on growth activity, nitrogenous compound assimilation, forming more growth substances, more cell division and enlargement and more forming of tissues and organs (Said, 1998). On the other side, biofertilizers encourged the formation of medium and fine pores rather than large pores. (El-Sersawy, 2002). These results are in good agreement with those obtained by many investigators among whom Rao & Venkateswariu (1987) on *Cenchrus ciliaris* and *Lasiurus sindicus;* Mal'tseva *et al.*(1995) on *Lolium perenne & Bromus inermis,* Rai & Pahwa (1996) on *Cenchrus setigrus*, Meawed & Gebraiel (2002) on Zea mexicana and El-Houssini (2006) on *Phalaris canariensis*.

TABLE 3. Effect of organic manure levels on some growth and forage yield parameters of *Cenchrus* species at different cuts harvested during 2002 and 2003 seasons.

Traits	No. of cut	2002			LSD 5%	2003			LSD 5%
		Organic manure (m^3/fed.)				Organic manure (m^3/fed.)			
		0	20	40		0	20	40	
Plant height (cm)	1st	67.0	72.0	78.0	9.4	64.0	65.0	73.0	9.0
	2nd	73.0	84.0	77.0	10.0	65.0	77.0	81.0	15.0
	3rd	74.0	87.0	79.0	12.0	-	-	-	-
No.of tillers	1st	27.0	28.0	31.0	NS	60.0	68.0	65.0	8.0
	2nd	35.0	44.0	46.0	10.0	43.0	46.0	51.0	NS
	3rd	30.0	36.0	33.0	4.0	-	-	-	-
Leaf area (cm^2)	1st	7.89	8.88	10.10	1.54	8.10	9.41	10.93	2.33
	2nd	8.26	11.44	11.56	3.33	11.80	12.21	16.13	4.32
	3rd	6.96	8.48	7.93	NS	-	-	-	-
SLW (mg/cm^2)	1st	3.90	4.10	4.00	NS	6.00	6.60	6.16	0.52
	2nd	4.22	4.29	4.79	0.54	4.47	4.60	5.25	0.34
	3rd	5.10	5.20	5.10	NS	-	-	-	-
F.F.Y. (ton/fed)	1st	0.913	1.419	1.014	NS	1.400	2.131	2.084	0.678
	2nd	2.228	3.018	3.314	0.858	2.205	2.746	3.149	0.526
	3rd	2.412	3.680	3.034	1.022	-	-	-	-
D.F.Y (ton/fed.)	1st	0.232	0.373	0.259	NS	0.671	1.238	0.874	0398
	2nd	0.554	0.751	0.870	0.205	0.612	0.785	0.919	0.216
	3rd	0.406	0.615	0.776	0.2 06	-	-	-	-

TABLE 4. Effect of biofertilizer treatments on some growth traits and forage yield of *Cenchrus* species at different cuts harvested during 2002 and 2003 seasons.

Traits	No. of cut	2002				2003			
		Biofertilizers			LSD	Biofertilizers			LSD
		control	At.	As.	5%	control	At.	As.	5%
Plant height (cm)	1st	65.0	77.0	75.0	NS	62.0	69.0	62.0	NS
	2nd	70.0	80.0	85.0	14.0	70.0	76.0	80.0	10.0
	3rd	72.0	81.0	86.0	12.0	-	-	-	-
No. of tillers	1st	28.0	28.0	30.0	NS	63.0	64.0	65.0	NS
	2nd	33.0	44.0	49.0	15.0	40.0	49.0	59.0	18.0
	3rd	30.0	34.0	37.0	6.0	-	-	-	-
Leaf area (cm^2)	1st	8.24	9.66	8.93	NS	8.00	9.47	11.04	2.10
	2nd	9.58	10.29	11.56	NS	8.31	12.16	19.68	10.09
	3rd	6.65	6.65	8.68	1.54	-	-	-	-
SLW (mg/cm^2)	1st	3.80	4.00	4.10	NS	5.99	6.11	6.33	NS
	2nd	4.28	4.76	4.31	NS	4.45	4.82	5.04	0.40
	3rd	4.70	5.70	5.00	0.9	-	-	-	-
F.F.Y. (ton/fed.)	1st	1.054	1.184	1.108	NS	1.743	2.009	1.944	NS
	2nd	2.310	3.059	3.211	0.786	2.114	2.699	3.286	0.802
	3rd	2.661	2.962	3.503	0.822	-	-	-	-

As.=*Azospirillum* At.=*Azotobacter*

Interaction effects

Data of the interactions between the main investigated factors (organic fertilization, plant species and biofertilization) were divided into significant and nonsignificant interactions. The later were excluded and the significant ones will only be presented and discussed. It can be also noticed that the effects of the interactions were significant in the second season only.

Interaction between bio-and organic fertilization

Results in Table 5 indicate that the interaction between bio- and organic fertilization had a significant effect on No. of tillers in the first cut. Plant height and dry forage yield were significantly affected by that interaction in the second cut. The greatest No. of tillers of Cenchrus plants (89.0 tillers/unit area) were appeared when the plants were fertilized by the highest level of organic manure (40 m3/fed) and their seeds were inoculated with Azospirillum. The lowest values of plant height and DFY were obtained when Cenchrus plants were uninoculated with any source of biofertilization inspite of using 40 m3/fed organic matter.

It seems from the above finding that using the highest level of organic fertilization (40 m3/fed.) and inoculation Cenchrus seeds with Azospirillum act together to produce the highest value of No. of tillers in comparison with that of applying 40 m3 organic feartilizer and Cenchrus seeds not inoculated with any biofertilizer. All of the other treatments were not differ significently. Plant height and dry forage yield were significantly responded to that interaction in the second cut of the second season merely. It was noticed that the tallest Cenchrus plants with the highest dry forage yield were produced when Cenchrus species were fertilized by 20.0 m3/fed and inoculated with Azotobacter. In this respect, Bohn et al. (1985) reported that organic matter could be a main source of nitrogen and 50 – 60 % of phosphorus. It is also a main source of energy for the growth of Azotobacter which fixes nitrogen .

TABLE 5. Effect of the interaction between bio-and organic fertilization on some growth traits and forage yield of *Cenchrus* species in 2003 season.

Treatments		No. of cut	Traits		
			Plant height	No. of tillers	D.F.Y
	O_1	First cut	-	73.0	-
B_1	O_2		-	64.0	-
	O_3		-	39.0	-
	O_1		-	54.0	-
B_2	O_2		-	69.0	-
	O_3		-	89.0	-
	O_1		-	54.0	-
B_3	O_2		-	70.0	-
	O_3		-	64.0	-
LSD 5%			-	49.02	-
	O_1	Second cut	81.0	-	0.795
B_1	O_2		92.0	-	1.264
	O_3		65.0	-	0.663
	O_1		64.0	-	0.548
B_2	O_2		80.0	-	0.760
	O_3		68.0	-	0.603
	O_1		97.0	-	1.995
B_3	O_2		56.0	-	0.200
	O_3		72.0	-	0.570
LSD 5%			23.80	-	1.740

B_1= without biofertilization.
B_2= *Azospirillum.*
B_3= *Azotobacter.*

O_1= 0.0 m^3/fed organic manure .
O_2= 20.0 m^3/fed organic manure .
O_3= 40.0 m^3/fed organic manure .

Interaction between Cenchrus species and organic manure levels

Specific leaf weight and dry forage yield were affected significantly as a response to the interaction between *Cenchrus* species and organic manure levels. This significant effect was observed in the first cut of the second season only (Table 6). *Cenchrus ciliaris* fertilized with the highest level of organic manure, *i.e.*, 40 m^3/fed produced higher value of specific leaf weight than other treatments, whereas, the highest value of dry forage yield was achieved when *Cenchrus ciliaris* was fertilized by the medium level of organic manure (20 m^3/fed.) in comparison with other treatments. It can be observed from results in Table 6 that the lowest values of specific leaf weight and dry forage yield were obtained when *Cenchrus setigerus* was fertilized by the highest level of organic fertilization, *i.e.*, 40m^3/fed.

TABLE 6. Effect of interaction between plant species and organic manure levels on specific leaf weight and dry forage yield of *Cenchrus* species in the first cut of 2003 season.

Treatments	Traits	
	SLW (mg/cm^2)	DFY (ton/fed.)
O_1	5.80	0.893
S_1 O_2	6.56	2.414
O_3	6.97	1.332
O_1	6.34	0.449
S_2 O_2	5.84	0.463
O_3	4.28	0.415
LSD 5%	2.66	1.960

S_1= *Cenchrus ciliaris* . S_2 = *Cenchrus setigerus* .

Concluion

It could be concluded that inoculating seeds of *Cenchrus* species , especially *Cenchrus ciliaris*, with *Azospirillum* and fertilizing with 40m^3/fed organic manure were the best management for attending the highest values of growth parameters consequently forage yield under the ecological conditions prevailling in Maryut Region.

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النمو و الحاصل العلفى لنوعين من السنكرس و علاقتهما بالتسميد الحيوي و العضوي

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لمعرفة مدى استجابة صفات النمو والحاصل العلفى لنوعين من السنكرس هما *C.ciliaris* و *C.setigerus* لمستويات مختلفة من التسميد العضوي و كذلك مصادر مختلفة للتسميد الحيوي. أقيمت تجربة حقليه خلال عامي ٢٠٠٢، ٢٠٠٣ بمحطة التجارب الزراعية بمريوط. و قد تضمنت الدراسة مقارنة بين النوعين من السنكرس و ثلاثة مستويات من التسميد العضوي (صفر،٢٠، ٤٠ م^3/ فدان) وأيضا ثلاثة مصادر للتسميد الحيوي (الازوسبيرلم ، الازوتوبكتر و بدون تسميد حيوى). وزعت هذه المعاملات في تصميم قطع منشقة مرتين في ثلاثة مكررات شغلت فيها معاملات السماد العضوى القطع الرئيسيه بينما وضعت الاصناف فى القطع تحت الرئيسيه و كذلك التسميد الحيوى شغل القطع تحت تحت الرئيسيه ويمكن تلخيص أهم النتائج المتحصل عليها كالأتي:-

١- اتضح من النتائج المتحصل عليها تفوق النوع *C.ciliaris* على النوع *C.setigerus* في كل صفات النمو المدروس، كان الحاصل العلفى الغض والجاف المتحصل عليه من *C.ciliaris* أعلى من تلك المتحصل عليه من *C.setigerus*
٢- زادت معظم صفات النمو والحاصل العلفى المدروسة لنبات السنكرس بزيادة مستويات التسميد العضوي تحت الدراسة.
٣- تحسنت كل صفات النمو والحاصل العلفى للتسميد الحيوي ببكتريا *Azosbirellum* مقارنة بمعاملتي التسميد الحيوي الأخريين و هما التسميد بـ *Azotobacter* أو بدون تسميد حيوى .
٤- كان للتفاعل بين التسميد الحيوي و العضوي أثرا معنويا على عدد الاشطاء بوحدة المساحة و ذلك في الحشه الأولى للموسم الثاني. بينما تأثر معنويا كل من ارتفاع النبات و الحاصل العلفى الجاف بنفس التفاعل في الحشه الثانية للموسم الثاني.
٥- كان للتفاعل بين الأنواع النباتية ومستويات التسميد العضوي أثرا معنويا على كل من الوزن النوعي للورقه وكذلك الحاصل العلفى الجاف.