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Response of Pearl Millet – Guar Mixture to Farmyard Manure Fertilzation under Calcareous Soil Conditions

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TWO FIELD experiments were performed at Mariut Research Station, Desert Research Centre (DRC) during 2006 and 2007 growing seasons to study the effect of organic manure levels viz. 0, 10 and 20 m^3/fed and the effect of five cropping patterns, *i.e.* Millet pure stand, Guar pure stand and millet/ guar (3:1) , (2:2) and (1:3) patternes on some growth parameters, forage yield and chemical composition.

Results can be summarized as follow:

1. Increasing organic manure significantly increased number of tillers and leaves of millet plants. Moreover increased plant height, number of branches and number of leaves of guar plants. Fresh and dry yield of each pearl millet or guar plants significantly increased due to increasing organic manure as well as the accumulated yield.
2. Growing pearl millet with guar plants significantly increased number of leaves of guar plants than sole cropping while the increase of millet growth not reach to significant level under intercropping. Fresh and dry yield of millet insignificantly increased under cropping compared to sole cropping. While the reverse was for guar plants which decreased. Total mixtures as well as accumulated yield were increased.
3. Organic manure significantly decreased crude fiber percentage mixture while the reverse was for ash content of plants. Guar plants surpassed millet and other intercropping in its content of crude protein, crude fiber and ash content comaring to sole millet or different intercropping.
4. Interaction effect was superior for total fresh and dry yield under 20 m^3/fed. Organic manure with intercropping (3: 1) M: G.

Keywords: Pearl millet, Guar. Crop patterns, Forage, Organic manures, Calcareous soils.

The newly reclaimed calcareous soils at west of Alexandria are about 100,000 ha. Great efforts have been undertaken to solve soils problems, *i.e.* hardeness of soil surface, compaction of surface layer, less organic content, low availability of phosphorus and micronutrients, physical and chemical properties. One of such efforts depends on the application of organic manure, as a soil amendment which reduce crusting and high soil temperature in summer season. It also supply some essential nutrients to the growing plants over a wide range of pH which inturns

increase forage productivity (Follett *et al.*, 1981). Rizk *et al.* (2000) revealed that increasing manure rates from 0 to 30 m^3/fed had no significant effect on height and leaf / stem ratio of Buffel grass, meanwhile leaf area was increased and most of alfalfa growth increased. Also, dry matter yield as well as accumulated yield of Buffel / alfalfa mixture were increased.

Mpairwe *et al.* (2002) revealed that manure application to Rye grasses with forage legumes cropping system significantly yielded higher grain and fodder dry matter than inorganic fertilizer, Amodu *et al.* (2004) found that forage and seed of lablab plant yield increased linearly with increasing manure application. Recently, Zewdu *et al.* (2006) showed that the use of 30 ton/ha of farmyard manure increased the growth and DM yield of Napier grass.

The lack of green forage during summer period especially in the new reclaimed lands is a great problem in Egypt. Introducing some fodder species which have a wide adaptability to climatic and edaphic factors and good forage quantity and quality is very important to face the forage deficiency in this period. Using different mixtures of forage grasses, *i.e. Pennisetum glaucum* (Pearl millet) and forage legumes, *i.e. Cyamobsis tetragonoloba* (guar) make utilization of all resources to sustain forage production in the semi- arid desert areas. Among the advantages of growing grass- legume mixtures is that they produce dry matter and nitrogen yield from mixture unit area of soil more than that from monoculture of grass or legume due to more efficient utilization of different available growth elements. Abou-Deya & Nassar (1995) reported that the highest forage yield of buffel grass was obtained with pure stand followed by the 1:1 mixture with alfalfa; Barik *et al.* (1996) revealed that Sorghum and Groundnut at 2:1 planting ratio significantly produced higher combined dry matter yield.

Rizk *et al.* (2000) stated that alfalfa – buffel grass mixture had a superiority of fresh and dry yields as well as accumulated yield over that of sole cropping. Moreover, Shata *et a.l* (2007) concluded that intercropping of cowpea with corn significantly affected grain yield and improved yield of millet when intercropped with cow pea than these of pure stand.

The main target of the present research is to figure out the influence of farmyard manure on growth, forage yields and chemical composition of pearl millet, Guar and their mixture under Mariut Region, Egypt.

Materials and Methods

Two field experiments were set up at Mariut Research Station, Desert Research Centre (DRC.), for the following two successive growing seasons, 2006 and 2007, to study the effect of cropping patterns (sole and mixed cropping) and organic manure levels on growth, forage yield of pearl millet, guar plants and their mixture.

The experiment included 15 treatments which were the combination of five cropping patterns viz, pure stand of pearl milt, pure stand of guar plant and pearl

miller/ guar mixture at 3:1 , 2:2 and 1:3 patterns, and three levels of farmyard manure, *i.e.*, 0, 10 and 20 m^3/fed.

Organic manure used in the study (sheep dung) contained organic carbon of 36.80%, C/N ratio 10.5 and pH 8.20. The soil of the experimental site was sandy clay loam soil with pH 8.4 and 46.50% $CaCO_3$.

The experiment was laid out with four replicates in split- block design, the main plots having the organic manure levels and the sub plots with intercropping. Plot size was (3 x 2 m) consisted of 4 ridges each of 3 meters in length and 50 cm in width .

Pearl millet *Pennisetum glaucum* (L.) and guar plants *Cyamobsis tetragonoloba* (L.) Taub. were grown in sole cropping and in mixture in alternating ridges.

Seeding rates were 15 and 25 kg/ fed for millet and guar as sole crop or in mixture, respectively. The pure stand of millet and guar plants as well as their mixture were sown in May 1st in both seasons.

Organic manure were added during land preparation. Two cuts were taken, the first at 60 days from sowing and the second after 45 days from first one.

Samples of five guarded plants were taken at every cut from each plot to determine plant height (cm), number of tillers/ plant for millet and number of branches/ plant for guar and number of leaves / plant .

The whole plants were harvested to determine total fresh forage yield (ton/fed). Samples of 200 g were dried to calculate dry matter percent and dry forage yield. Accumulated fresh or dry forage yields (ton/ fed) were determined every season. The percentage of total nitrogen was determined by the modified Micro- Kjeldahl method as described by Peach & Tracy (1956). Crude protein percentage was estimated by multiplying total nitrogen percentage by the factor of 6.25. Crude fiber and total ash were detrmined according to the A.O.A.C (1970).

Data were statistically analyzed using the ANOVA computer program according to procedures outlined by Snedecor & Cochran (1980). Means were compared by using Duncan's new multiple range test as described by Steel & Torrie (1980).

Results and Discussion

Effect of organic manure levels

Growth parameters

Data given in Table 1 show the effect of organic manure and intercropping patterns on some growth characters of pearl millet and guar in two seasons.

TABLE 1. Effect of organic manure (m^3/fed) and Intercropping patterns on some growth parameters of pearl millet and guar plants in 2006 and 2007 growing seasons.

Factors studied	Plant height (cm)				Number of tillers or branches / plant				Number of leaves / plant			
	1st cut		2nd cut		1st cut		2nd cut		1st cut		2nd cut	
	Millet	Guar	Millet	Guar	Millet	Guar	Millet	Guar	Millet	Guar	Millet	Guar
2006												
Organic manure (m^3/fed)												
0	119.9 a	27.0 c	139.8 a	45.7a	10.3sa	4.8b	7.8b	3.3a	6.7ab	5.8a	5.6b	1.8b
10	122.2a	36.3b	147.7a	47.7a	6.7b	4.2b	7.6b	3.5a	6.6b	5.6a	5.3b	2.5b
20	133.7a	47.2a	150.2a	48.9a	13.3a	6.4a	9.6a	4.3a	7.4a	6.6a	6.19a	3.3a
Intercropping patterns (M: G)												
Pur 4:0	163.8a	-	181.8a	-	11.7a	-	10.6a	-	9.7a	-	7.9a	-
Pur 0: 4	-	49.0a	-	50.4a	-	8.3a	-	5.3a	-	8.8a	-	3.4a
3: 1	151.4a	44.8a	189.6a	57.4a	12.0a	6.5b	9.5a	3.5b	8.3a	6.8b	7.9a	2.7b
2:2	150.3a	45.7a	176.7a	6.5a	13.3a	5.8bc	9.4a	4.9a	8.5a	7.7b	6.5b	2.7b
1: 3	146.3a	44.7a	181.6a	58.7a	13.5a	5.0c	12.0a	5.1a	8.0a	6.7b	6.5b	3.8a
2007												
Organic manure (m^3/fed)												
0	115.8b	26.0b	121.1b	45.8a	7.4b	6.1a	5.9b	3.3a	6.0a	5.2b	5.2b	1.7c
10	128.2b	40.2a	124.6b	44.3a	8.1b	7.5a	6.1b	3.5a	6.4a	6.2ab	5.4b	3.4a
20	148.6a	37.1a	140.6a	43.4a	13.2a	7.2a	8.7a	3.5a	7.5a	6.9a	6.2a	2.6b
Intercropping patterns (M: G)												
Pur 4:0	178.4a	-	166.5a	-	14.3a	-	8.5a	-	9.2a	-	7.5a	-
Pur 0: 4	-	43.2a	-	58.5a	-	8.7a	-	3.7a	-	9.3a	-	3.1b
3: 1	164.4ab	43.5a	173.7a	50.1a	8.7a	7.5a	8.2a	3.6a	8.7a	6.7b	6.9c	3.8bc
2:2	155.9b	44.11a	148.2a	56.6a	10.2a	9.2a	8.8a	3.8a	8.3ab	6.8b	7.3b	2.3c
1: 3	155.7b	41.2a	155.8a	57.4a	14.7a	9.2a	9.1a	4.4a	7.0b	7.7b	6.4d	4.7a

Pearl millet: Data presented in Table 1 indicate that increasing organic manure rates from 0 up to 20 m^3/fed showed a significant increase on pearl millet plant height at all cuts of second season.

Significant differences in number of tillers/ plant due to organic manure application were noticed at both cuts of both seasons. This increment might be owe to the effect of manure in offering nutrients for plants which reflected on the number of tillers. Qamar *et al.* (2000) found that number of tillers/ plant of millet grass increased significantly with FYM application over control.

Number of leaves/ plant increased as increasing organic manure from 0 up 20 m^3/fed. Such increase was noticed at both cuts of first season and 2nd cut of first one. Generally, raising sheep dung manure fertilization up to 20 m^3/fed increased plant height, number of leaves, branches and plant height.

Guar: Results in Table 1 showed the effect of manure rates on some growth parameters of guar plants. A significant increase was observed for the influence of manure application on plant height of 1st cut of both seasons.

Number of branches/ plant showed a significant increase of guar plants as increasing organic manure up to 20 m^3/fed. This results was only significant at 1^{st} cut of first season.

Increasing organic manure increased the number of leaves/ plant. This trend was frilly true and significant at 2^{nd} cut of both seasons. These results are in a accordance with the finding of Abd El- Gawad *et al.* (1992) who found that some growth parameters of each crop (cowpea and Sudan grass) were enhanced by organic manure application. The enhancement role of manure was noticed under this condition and this may be attributed to the role of organic matter to fertility soil and improvement the physical properties.

Forage yield

Fresh Forage yield: Data given in Table 2 show the effect of organic manure and intercropping patterns on fresh forage yield for pearl millet, guar plants and their mixture in the two seasons. Fresh forage yield seemed to be significantly increased with increasing organic manure up to 20 m^3/fed. This was true for sole crop (Millet, guar) and their mixture at all cuts of both seasons as well as total yield in 2006 and 2007. Similar results were obtained by Abd El- Gawad *et al.* (1992), Abou- Deya & Nassar (1995) and Rizk *et al.* (2000).

TABLE 2. Effect of Organic manure and Intercropping patterns on fresh yield (ton/fed) of guar and millet in 2006 and 2007 growing seasons.

Factors studied	1st cut			2nd cut			Total yield		
	Millet	Guar	Mixture	Millet	Guar	Mixture	Millet	Guar	Mixture
2006									
Organic manure (m^3/fed)									
0	10.099b	1.811b	11.911c	16.732b	0.88b	17.681b	26.831c	2.691c	29.522c
10	11.086b	3.141a	14.227b	18.055ab	1.479b	19.543b	29.141b	4.620b	33.761b
20	14.708a	3.340a	18.148a	21.475a	2.406a	23.881a	36.183a	5.746a	41.929a
Intercropping patterns (M : G)									
4: 0	21.113a	-	21.113a	29.313a	-	29.313a	50.426a	-	50.426a
0: 4	-	6.227a	6.277d	-	3.794a	3.794c	-	10.021a	10.021d
3:1	19.443a	1.844ab	21.287a	30.039a	0.852c	30.891a	49.482a	3.125ab	52.607a
2:2	12.229b	2.273ab	14.50b	20.554ab	1.712b	22.266ab	32.783b	3.985ab	36.768b
1: 3	7.039c	3.475ab	10.514c	13.864b	1.584b	15.448b	20.903c	5.059b	25.962c
2007									
Organic manure (m^3/fed)									
0	5.44b	2.137b	7.627b	12443b	0.977b	13.420b	17.933b	3.114c	21.047b
10	12.904a	4.128a	17.032a	19.414a	1.400b	20.814a	32.318a	5.528b	37.846a
20	14.127a	4.039a	18.166a	24.297a	3.071a	27.368a	38.424a	7.11a	45.534a
Inter cropping patterns (M : G)									
4: 0	16.133a	-	16.133a	26.604a	-	26.604a	42.737a	-	42.737ab
0: 4	-	7.585a	7.585b	-	3.623a	3.623c	-	11.208a	11.208d
3:1	15.813a	1.995c	17.768a	25.532a	0.813cd	26.345a	41.345a	2.768c	44.114a
2:2	12.341b	3.559b	15.900a	21.983c	2.700ab	24.683a	34.324c	6.259b	40.583b
1: 3	9.914b	4.073b	13.987a	15.847c	1.945bc	17.792	25.761c	6.018b	31.779c

Dry forage yield: Data given in table 3 show the effect of organic manure and intercropping patterns on dry forage yield for millet, guar and their mixture in 2006 and 2007 seasons. Dry forage yield of millet, guar and their mixture followed closely the same trend of fresh forage yield. Total dry forage yield of mixture outyielded significantly both millet grass or guar monoculture at both seasons. This may be due mainly to the ability of O.M. to support both plants with some of their needs from nutrients and activates the micro flora of plant roots (Rihzobiun) which could result in releasing some of needed nutrients to be observed by plants as well as it change soil pH towards neutrality absorption by plant roots. Many investigators came to similar conclusion, among those Mpairwe *et al.* (2002) who reveled that fodder dry matter yield of manure over control in sole crop averaged 46.9 % for maize and Amodu *et al.* (2004) reported that forage yield of lablab increased, linearly with increase manure application .

TABLE 3. Effect of organic manure and Intercropping patterns on dry yield (ton/fed) of guar and millet in 2006 and 2007 growing seasons.

Factors studied	1st cut			2nd cut			Total yield		
	Millet	Guar	Mixture	Millet	Guar	Mixture	Millet	Guar	Mixture
2006									
Organic manure (m^3/fed)									
0	2.903b	0.524b	3.427b	5.091b	0.241b	5.332b	7.994b	0.765b	8.759b
10	3 043b	0.926a	3.969b	5.048b	0.476ab	5.524a	8.091b	1.402a	9.493b
20	5.676a	0.933a	6.609a	8.221a	0.691a	8.912a	13.897a	1.624a	15.521a
Intercropping patterns (M : G)									
4: 0	7.209a	-	7.2091a	10.593a	-	10.593a	17.802a	-	17.802a
0: 4	-	1.89a	1.89c	-	1.193a	11.193d	-	3.083a	3.083c
3:1	6.56a	0.457b	7.017a	9.95a	0.202c	0.152ab	16.51a	0.659c	17.169a
2:2	3.589b	0.674ab	14.183b	5.988b	0.488b	6.476b	9.497b	1.162b	10.659b
1: 3	2.093b	0.953ab	3.046bc	4.069b	0.445b	4.514cd	6.162c	1.398b	7.56b
2007									
Organic manure (m^3/fed)									
0	1.628c	0.638b	2.266b	4.544b	0.252b	4.796b	6.172b	0.89b	7.062c
10	3.368b	1.131a	4.499a	4.930b	0.539ab	5.469b	8.298a	1.67a	9.968b
20	5.174a	1.192a	6.366a	8.261a	0.865a	9.126a	13.435a	2.057a	15.492a
Inter cropping patterns (M : G)									
4: 0	5.125a	-	5.125a	9.846a	-	9.846a	14.971a	-	14.971a
0: 4	-	2.379a	2.379b	-	1.173a	1.173d	-	3.552a	3.553c
3:1	5.501a	0.487c	5.988a	9.015a	0.185c	9.290a	14.516a	0.672c	15.189a
2:2	3.55b	0.979b	4.529a	6.22b	0.719b	6.947b	9.778ab	1.698b	11.476a
1: 3	2.772c	1.089b	3.861ab	4.69c	0.683b	5.373c	7.462b	1.772b	9.234b

Chemical composition

Data in Table 4 show the effect of organic manure and intercropping on chemical percentage and amount (kg/fed) of pearl millet, guar and their mixture.

No significant differences due to manure application on crude protein percentage was detected for different plants at both cuts of both seasons. Similar trend was observed by El Shesheny (1999) who revealed that no significant different in CP % for both alfalfa and Buffel grass due to organic manure.

TABLE 4. Effect of organic manure (m^3/fed) and intercropping patterns on chemical percentage and amount (kg/fed) of pearl millet, Guar and their mixture in 2006 and 2007 seasons.

Factors studies	CP%		CF %		Ash %		CP%		CF %		Ash %	
	1st cut	2nd cut	1st cut	2nd cut	1st cut	2nd cut	1st cut	2nd cut	1st cut	2nd cut	1st cut	2nd cut
	2006						2007					
Organic manure (m^3/fed)												
0	12.85a	13.99a	20.70a	25.15a	10.03c	13.4c	12.21a	12.21a	22.55a	24.21a	11.21c	11.21c
10	12.71a	13.71a	19.96a	21.62b	11.67b	14.18b	11.90a	11.90a	19.73b	22.39b	2.10b	12.11b
20	13.14a	13.64a	17.52b	20.46c	13.93a	14.99a	12.18a	12.18a	20.20b	21.98b	13.08a	13.08a
Intercropping patterns (M: G)												
Pur4:0	12.20b	12.42b	18.30b	16.26a	12.86a	14.0b	10.61a	12.18c	19.19a	16.64d	13.2a	16.22ab
Pur0:4	13.66a	14.72a	20.87a	30.09a	10.06b	16.62a	12.73a	13.92a	9.82c	23.13a	9.82c	17.1a
3: 1	12.15b	12.2b	18.73b	16.84d	12.46a	13.62bc	12.57a	11.96c	19.8cd	17.91d	12.75b	15.88b
2:2	13.28a	14.03a	19.01ab	22.02c	12.11a	13.46bc	12.24a	13.33b	20.48c	22.87c	12.55b	15.66b
1: 3	13.17a	14.54a	20.07ab	26.84b	11.89a	13.26c	12.35a	13.92a	21.54b	26.38b	13.34b	15.36 b
	2006				amount (kg/fed)				2007			
Organic manure (m^3/fed)												
0	440b	745b	709b	1340b	344b	714b	276c	585b	510c	11.61b	254c	5.37b
10	504ab	756b	792b	1194b	463b	783b	535b	650ab	887b	1224b	544b	662b
20	868a	1215a	1157a	1825a	920a	1335a	775a	1111a	1285a	1969a	833a	1193a
Intercropping patterns (M: G)												
Pur 4:0	879a	1315a	1319a	1722a	927a	1483a	543b	1199a	983ab	1632a	676a	1597a
Pur0: 4	258b	175c	394c	358b	190c	198c	302c	163d	550d	349b	233c	200d
3: 1	852a	12380a	1314a	1709a	874a	1382a	752a	1100a	1185a	1647a	763a	1460a
2:2	555ab	908b	795b	1426ab	506ab	871ab	553ab	926b	927b	1588ab	568ab	1087ab
1: 3	401ab	656b	611b	1211ab	362b	598b	476b	747c	831c	1417ab	476b	825c

Crude fiber percentage decreased significantly due to added organic manure such trend was true at both cuts of both seasons. Opposite trend was observed for ash percent which significantly increased under increasing the dose of organic manure. This results was found at both cuts of both seasons.

It could be concluded that applying organic manure to calcareous soil tends to affect slightly the nutritive value of the obtained forage and improving the uptake of different elements which inturn caused on improvement of the forage quality and quantity.

Concerning to the amount, a significant increase was observed for each of CP, CF and ash amount under fertilization of 20 m^3/fed. Such result was true at both cuts of both seasons.

Effect of cropping patterns

Growth parameters

Pearl millet: Data in Table 1 indicate that plant height of pearl millet grass was significantly decreased in mixture than sole crop. This trend was fairly ture at the 1st cut of second season. This may be attributed to the competition between plants grown in mixture than those grown in sole. These results are in agreement with those obtained by Rizk *et al.* (2000) who revealed that plant height of Buffel grass was decreased significantly in mixture with alfalfa comparing with sole crop.

No clear trend was detected for number of tillers / plant and there was no significant different between sole crop and mixture planting. These finding hold fairly ture for all cuts in both seasons.

Number of leaves/ plant tended to decrease in mixture compared to sole crop planting. This effect was merely significant at the 2nd cut of first season and both cuts of second one.

Guar: Data in Table 1 illustrate the effect of intercropping patterns on some growth parameters of guar plants. Results revealed that planting guar with pearl millet in crop mixture had no significant effect on plant height of guar at all cuts of both seasons. This could be attributed to the highly competitive ability of pearl millet when mixed with guar plants in mixture. These finding are in agreement with Mots (1996) who found that plant height of Leucaena intercropped with maize significantly lower than when grown as a sole crop. Opposite trend was obtained by Rizk *et al.* (2000) who found that legumes were taller and more mature in mixture than in monoculture.

Number of branches / plant tended to decreased in mixture compared to sole crop planting. Such effect was fairly true and significant at both cuts of first season. while the reveres was true at the other cuts of second season but the differences did not reach the level of significance. These finding are in harmony with Rizk *et al.* (2000).

Number of leaves/ plant were significantly decreased in mixture at 1st cut of both seasons while a significant increase of mixture at (1:3) (M : G) were detected comparing to other different intercropping and for sole crop planting at 2nd cut of both seasons.

Forage yield

Fresh forge yield: Data given tin Table 2 show the effect of cropping patterns on fresh forage yield of millet, guar and their mixture. Cropping patterns had a significant effect on fresh forage yield of millet gass at both cuts of both seasons. These results are in agreement with those obtained by Abou - Deya & Nassar (1995), Shehu (1999) and Abbas *et al.* (2001) who showed that intercropping improved productivity of non legumes.

On the other hand, a significant decrease of fresh forage yield were observed for Guar plants. Such decrease was detected at both cuts of both seasons. This result revealed that planting millet with Guar in crop mixture had a negative effect on the productivity of Guar. This could be attributed to the highly competitive ability of millet when mixed with Guar in a mixture plants.

Concerning the forage yield of mixture, It could be noticed that the cropping had a significant effect on forage yield at both cuts of both seasons and the mixture yield exceeded that of sole cropping of each crop at most of obtained cuts.

Total fresh forage yield varied significantly for millet and guar at both seasons. For mixtures accumulated forage yield, it exceeded that of sole millet from 50.426 to 52.607 and from 42.737 to 44.114 at two seasons, respectively, Meanwhile exceeded Guar plants form 10.02 to 52.607 and from 11.208 to 44.114 (ton/fed) for the two seasons, respectively under intercropping (3:1) patterns. This last finding is in agreement with the finding of Abou - Deye & Nassar (1995), *Barik et al.* (1996), Hassan & Sheikh (1997), Rizk *et al.* (2000) and Shata *et al.* (2007). They indicated that intercropping of legumes with grasses significantly improved that forage yield than pure culture. This increment may be due to the ability of both plants to make use of climatic and edaphci factors and this reflect in more photosynthates which produce more forage for the mixture than sole crop.

Dry forage yield: Data given in Table 3 show that dry forage yield of Millet, Guar and their mixture followed closely the same trend of fresh forage yield. Accumulated dry forage yield of the mixture out yielded significantly both Millet or guar monoculture at second season under intercropping (3:1) (M:G) patterns. These findings are in agreement with those abstained by Rizk *et al.* (2000) and Mpairwe *et al.* (2002). They indicated that intercropping significantly yielded more fodder dry matter than sole crop.

Chemical composition

Data in Table 4 show the effect of Intercropping patterns on the different percentage of chemical content.

Crude protein percentage of different mixture enhanced by growing millet with guar plants than sole cropping. Such result was found at both cuts of first season. This increment in CP % of millet when mixed with guar may be due to the benefit of release from guar plants and increasing nodules formation. Similar results were reported by Rai & Verna (1999) and El- Shesheny (1999) who concluded that mixed cropping increased the nitrogen content of cereal.

Crud fiber percentage of mixture increased by growing millet with guar plants than with millet sole intercropping. Such effect was found at both cuts of both seasons. In this respect Lee *et al.* (1996) and El- Shesheny (1999) reported that the differences between mixtures did not reach the level of significant.

Concerning ash percentage, no significant differences in mixtue than millet in sole cropping but increasing in mixture than sole cropping in guar alone at first cut meanwhile a significant decrease in different mixture than sole cropping of Millet or Guar at second cut of first season.

About the amount we could notice a significant increase of CP amount in first mixture than millet or guar in sole cropping at 1st cut of second season.

Finally, we could be concluded that intercropping under calcareous soils enhanced most of elements in its mixture which reflect on the productivity and improved the quality.

Interaction effect

Interaction effect between organic manure levels and intercropping patterns

Data in Table 5 show that maximum total fresh and dry forage yield at first season and total dry yield at second one was achieved by adding organic manure at the rate of 20 m^3/fed to pearl millet grown with guar plants at intercropping patterns (3:1) 65.60 , 27.16 and 25.79 (ton/fed), respectively.

TABLE 5. Interaction effect between organic manure (m^3/fed) and intercropping patterns on total fresh and dry forage yield (ton/ fed) of first season and total dry yield on second season.

Intercrop. M: G	Fresh yield(ton/fed) 1st season			Dry yield (ton/ fed)			Dry yield (ton/ fed) 2nd season		
	Organic manure m^3/fed								
	0	10	20	0	10	20	0	10	20
Pure(M)	50.088Aa	43.16Aa	58.03Aa	17.011Aab	11.358ABb	25.053Aa	11.597Ab	9.172ABb	24.145Aa
Pure(G)	7.11Bb	8.087Bb	15.147Ba	2.231Bb	2.235Bb	4.787Bb	1.833 Bb	3.232Bb	5.593Ba
3 : 1	43.492Ab	47.231Ab	65.601Aa	12.231Ab	12.036Bb	27.158Aa	9.643Abb	10.138ABb	25.786Aa
2: 2	25.661ABb	43.771Aa	40.971Aa	6.399Bb	14.248Aa	11.329Abab	6.574 Bb	19.247Aa	13.108Aab
1: 3	21.61ABb	30.464ABa	29.968Ba	5.954Bb	7.59Bab	9.131Ba	5.662 Bb	12.954Aa	8.827Bab

* Means having small letters in the same row and capital letters in the same column are not statictically differed at p = 0.05 level of significantly.

The lowest values was obtained as Guar plants in sole intercropping without added organic manure 7.11, 2.23 and 1.83, respectively.

It could be concluded that highest values of forage productivity was obtained by growing pearl millet with guar in (3:1) patterns and adding 20 m^3/fed under calcareous soils of Mariut conditions.

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إستجابة مخلوط الدخن والجوار للتسميد العضوى تحت ظروف الأراضى الجيرية

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وحدة المراعى- مركز بحوث الصحراء – القاهرة – مصر.

أقيمت تجربتين حقليتين بمحطة بحوث مريوط التابعة لمركز بحوث الصحراء خلال موسمى ٢٠٠٦ و ٢٠٠٧ وذلك لدراسة تاثير الزراعة المنفردة لكل من الدخن والجوار وكذلك المخلوط بينهما بنظم زراعة مختلفة وهى (٣ : ١) ، (٢:٢)، (٣:١) (دخن: جوار) حيث تم زراعة ٤ خطوط فى القطعة الواحدة من كل نبات منفردا وبالنسب السابقة فى الخطوط وثلاثة معدلات من السماد العضوى (مخلفات الأغنام)، هى (صفر، ١٠، ٢٠ متر مكعب/ فدان) وذلك على صفات النمو والمحصول العلفى الغض والجاف والتركيب الكيماوى وقد صممت التجربة فى تصميم قطاعات منشقة حيث وضع التسميد العضوى فى القطع الرئيسية ونظم الخلط فى القطع المنشقة من خلال ٤ مكررات ويمكن تلخيص أهم النتائج كما يلى:

١- أدت زيادة التسميد العضوى من صفر إلى ٢٠ م٣/فدان إلى زيادة معنوية فى كلاً من عدد الأشطاء وعدد الأوراق / نبات الدخن. كذلك ارتفاع النبات وعدد الأفرع وعدد الأوراق / النبات بالنسبة للجوار، وزيادة معنوية للوزن الغض والجاف للدخن والجوار كذلك المحصول الكلى للخليط .
٢- أدت أضافة الدخن إلى الجوار فى التراكيب المختلفة إلى زيادة معنوية لعدد الأوراق للجوار. زيادة الوزن الغض والجاف فى الدخن زيادة غير معنوية مقارنة بالدخن منفردا. وقل الوزن الغض والجاف مقارنة بالجوار منفردا. بينما زاد المحصول الكلى للحشتين غض وجاف مقارنة بكلا النباتين منفردين.
٣- أدت إضافة السماد العضوى إلى نقص النسبة المئوية للألياف بينما زاد محتوى الرماد للنباتات .
٤- احتوى الجوار منفردا على اعلى نسبة من البروتين الخام والألياف والرماد مقارنة بالدخن منفردا وأيضاً التراكيب المختلفة.
٥- أعطى التفاعل بين عاملى الدراسة أعلى حاصل تجميعى غض وجاف عند ٢٠م٣ للتسميد العضوى والتراكيب (٣: ١) دخن : جوار.