Forage Yield and Nutritive Content of Barley Sown Alone and in Mixtures with Vetch and Egyptian Clover

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ABSTRACT

In a field trial of 1976–77 and 1977–78 seasons, barley and two legume species, vetch and Egyptian clover were grown in pure stands and in mixtures. The highest forage yield was obtained from Egyptian clover when planted in pure stands. Forage yield was increased with increasing legume (Egyptian clover) components in the mixture. Mixtures of barley, vetch and Egyptian clover in all combinations produced more forage than the combinations of barley and vetch mixtures. The percentage of crude protein, ether extract and mineral matter was higher in Egyptian clover than those of barley, vetch in pure stands and in the different combinations of mixture.

INTRODUCTION

More recently there have been a renewed interest of mixed planting of legumes and other crops such as grasses and cereals for increasing forage production as well as nutritive value. Many workers have pointed out that legume species add nitrogenous compound to the associated species from the roots (6, 8, 12 and 16). Roberts and Olson (15) from their greenhouse study reported that when one species in a legume-grass mixture produced more dry weight than when grown alone, the other species produced less in mixture compared to its growth in pure stands and they concluded that the response of crops in mixture was beneficial to each other. Grigoreb (4) from his experiment on sowing of legumes in Sudan grass reported that Sudan grass/pea mixture gave the higher yield than Sudan grass/vetch and Sudan grass/soybean mixtures. The yields were lower when they were grown in pure stands than grown in the mixture. Wagner (17) indicated that sowing of cereals or others with leguminous plants tend to increase the nitrogen rate in dry matter more than non leguminous mixture. Kuma Gai and Tobata (6) found in their field trials of mixture of cocksfoot, hybrid rye grass and red clover which was undersown with two oat cultivars grown for grain and another oat cultivar for fodder. Yields of the undersown fodder crop in the first year was reduced by fodder oats and grain oats. But the total yield of oats and undersown fodder was higher than the fodder crop grown alone. Grain oats increased

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the proportion of legumes and hybrid rye grass compared with the fodder crop grown alone. Dry matter was also higher with grain oats with undersown fodder than fodder alone. McCloud and Mott (8) working with legume-grass mixture found that there was a marked influence of well established legumes in increasing the yield, protein and carotene contents of associated grasses. Younie (18) made an experiment with cereal species grown alone and in mixtures for forage production. The cereal species were oats, barley and wheat which were grown in pure stands as well as in equal mixtures. The three species mixture gave the highest dry matter yield than barley, oat and wheat when grown alone. The three species mixture also gave the highest crude protein (40.5%) and lowest (26.2%) for wheat species when grown in pure stands. Rao, Reddi, and Ven Kateshawri (14) from their trials with bajra, jowar, soybeans and cowpeas in pure stands and in mixtures reported that highest fodder yield was obtained from jowar mixed with legume species and lowest yield was from soybeans when grown alone. The crude protein content was highest (23.4%) in soybeans and lowest (9.9%) was in bajra. Muller (12) conducted trials with seven mixtures of various combinations of Egyptian clover, Persian clover, American rye grass and Italian diploid and tetraploid rye grass. Highest dry matter (12.92 t/ha) was obtained from persian clover/Italian tetraploid rye grass mixture. Petrushi kana and Tyurin (13) indicated from their experiment of mixed sowing of oats and peas that oats/peas mixture gave 5–28% more fresh fodder and 20–47% more digestable crude protein (DCP) than oats in pure stands. Martin and Marten (7) tried five species of legumes, alfalfa, L. clover, birdsfood trefoil, crown vetch and milkvetch in the mixture of three grass species such as orchard grass, reed canary grass and smooth broome grass. They reported that alfalfa when grown in pure stands produced the highest dry matter comparison with other legumes and grass mixtures. Abdel Gewad *et al.* (1) reported from their field trials of Egyptian clover and oat seed mixtures that the highest green forage was obtained by planting Egyptian clover alone. The percentage of crude protein and ether extract of Egyptian clover was higher than the percentage of protein and ether extract in oats or oats with some other mixture. El-Ghayaty (3) from his trials on the effect of the mixtures of barley, rye grass and Egyptian clover with different seeding rate on forage yield and nutritional value reported that Egyptian clover produced highest yield in green matter when grown in pure stands in comparison with barley and rye grass grown alone as well as from the mixtures. The protein content was highest in Egyptian clover when grown alone compared with different mixtures. The protein content of different mixtures increased with increasing Egyptian clover ratio in the mixture.

The present study was conducted to determine the behaviour of barley and legume species such as Egyptian clover and vetch both sown in pure stands and in mixtures with the object of finding out the forage production as well as its nutritional value.

MATERIALS AND METHODS

A field trial was made at the Experimental Farm of the Faculty of Agriculture, Tripoli, during 1976–77 and 1977–78 seasons. In December 15, 1976 and December 19, 1977, mixtures of Barley (*Hordium valgure*) vetch (*Lathyrus sativa*) and Egyptian clover (*Trifolium alexandrinum*) were seeded in plots 3 × 3 meters with four replications.

The treatments were:

T_1 = 100% Barley

T_2 = 100% Vetch
T_3 = 100% Egyptian clover
T_4 = 25% Barley and 75% Vetch
T_5 = 50% Barley and 50% Vetch
T_6 = 40% Barley, 30% Vetch and 30% Egyptian clover
T_7 = 50% Barley, 25% Vetch and 25% Egyptian clover
T_8 = 75% Barley, 15% Vetch and 15% Egyptian clover

Compound fertilizer 12-24-12 was added to each plot at the rate of 450 kg/ha. in three applications. The first application 135 g/plot was added to each plot at the seeding time. The other two applications were added after the first and second cuts, respectively.

The seeding rate was 72 g/plot (80 kg/ha.) for barley, 40 g/plot (45 kg/ha.) for vetch and 21.5 g/plot (24 kg/ha.) for Egyptian clover. Germination percentage of the seeds were tested in the laboratory and recorded 97% for barley, 85% for vetches and 83% for Egyptian clover. Sprinkler irrigation was done whenever needed to all plots.

In each trial three harvests were obtained. The first harvest was on March 17 in the first year and March 15 in the second year about 90 days after seed sowing. The other two harvests were done in 45 days interval. Green weight from each plot was recorded in the field just after harvest. About one kg samples were saved for moisture percentage and proximate analysis from each plot at each harvest. The samples were then oven dried at 70°C for 48 hours and calculated for dry matter in tons per hectare. The percentage of crude protein, crude fibre, ether extract, mineral matter and nitrogen free extract from the oven dried samples of 1977–78 season were determined by the Weende method as described in A.O.A.C. (2). Barley and vetches when grown alone and in mixtures did not produce any forage in the third cut for both years.

The data were analyzed statistically according to the split plot design with years occupying the main plots for green and oven dried weight respectively.

RESULTS AND DISCUSSION

The total yield of forage t/ha. on green weight as well as oven dried weight for the seasons 1976–77 and 1977–78 is presented in Table 1. The combined analysis of the green as well as dry weight showed that the forage yield was significantly affected by treatments and years. The treatments × years interaction was not significant. The highest mean yield of green forage was obtained from treatment T_3 (33.50 t/ha.) by growing Egyptian clover alone and the lowest was from treatment T_2 (15.00 t/ha.) when vetch grown in pure stands. The yield of treatment T_3 was significantly higher than from all treatments except the treatment T_6 (27.21 t/ha.). When the mean yields of two years were compared, it was found that the yield of 1976–77 season (23.37 t/ha) was significantly higher than that of 1977–78 season (19.92 t/ha). From the weather report of the two seasons it was found that the total rainfall in 1976–77 season was 114 mm in 33 days which was distributed from January to April 1977. In 1977–78 season, the total rainfall was 338 mm in 14 days which was distributed from September to December 1977. There was no rainfall from January to June 1978 i.e. during the growing season. So the high forage yield in 1976–77 season was obtained due to the better distribution of rainfall during the growing season.

The highest oven dried mean yield was obtained from T_3 (7.41 t/ha.) and the lowest

Table 1. The mean green and dry weight of barley and legume species grown alone and in mixtures after grouping the readings of the three cuts for 1976–77 and 1977–78 seasons.

Treatments	Green weight (t/ha.)			Oven dried weight (t/ha.)		
	1976–77	1977–78	Mean	1976–77	1977–78	Mean
T_1	20.19	17.92	19.05	4.83	3.79	4.31
T_2	18.20	11.80	15.00	3.69	2.83	3.26
T_3	32.36	33.50	32.93	7.58	7.24	7.41
T_4	18.01	12.66	15.34	3.77	2.44	3.11
T_5	18.61	14.93	16.77	3.87	3.51	3.69
T_6	28.37	26.04	27.21	6.53	5.31	5.92
T_7	23.39	22.99	23.19	4.94	4.58	4.76
T_8	27.82	19.53	23.68	5.54	4.35	4.94
Mean	23.37	19.92	21.65	5.09	4.26	4.68

L.S.D. at 0.05 for treatments = 4.49 tons.
L.S.D. at 0.05 for years = 2.06 tons.

L.S.D. at 0.05 for treatments = 0.95 tons.
L.S.D. at 0.05 for years = 0.47 tons.

was from treatment T_4 (3.11 t/ha.). Treatment T_3 was significantly higher than all the treatments. The mean yield of forage in 1976–77 season (5.09 t/ha) was significantly higher than the mean yield of 1977–78 season (4.26 t/ha.).

When the yields of the mixtures of treatment T_4, T_5, T_6, T_7 and T_8 were considered for both green and oven dried weight it was found that only significant differences existed between treatment T_6 and treatment T_4 and T_5. The results showed that forage in the mixture was increased due to the higher percentage of Egyptian clover seeds. These information agree with the findings obtained by Abdel Gewad *et al.* (1) and El-Ghayaty (3), who found highest yield of green forage for Egyptian clover when grown

Table 2. Mean green yield of three cuts of barley and legume species grown alone and in mixtures.

Treatments	1976–77				1977–78			
	1st cut t/ha.	2nd cut t/ha.	3rd cut t/ha.	Mean	1st cut t/ha.	2nd cut t/ha.	3rd cut t/ha.	Mean
T_1	16.66	3.53	0.00	10.10	10.25	7.67	0.00	7.71
T_2	14.70	3.50	0.00	9.10	8.70	3.10	0.00	5.90
T_3	18.59	7.47	6.30	10.79	14.20	10.25	9.05	11.17
T_4	14.51	3.50	0.00	9.00	8.15	4.51	0.00	6.33
T_5	15.04	3.57	0.00	9.31	11.58	3.34	0.00	7.46
T_6	17.79	7.33	3.25	9.46	13.50	7.94	4.60	8.68
T_7	15.27	5.35	2.77	7.80	11.72	7.13	4.14	7.66
T_8	17.46	5.72	4.64	9.27	8.69	6.54	4.30	6.51
Mean	16.25	5.00	4.24	9.36	10.85	6.31	5.52	7.68

L.S.D. at 0.05 for treatments = 2.95 tons.
L.S.D. at 0.05 for cuts = 1.52 tons.

L.S.D. at 0.05 for treatments = 1.80 tons.
L.S.D. at 0.05 for cuts = 1.20 tons.
L.S.D. at 0.05 for t.r.x. cuts = 2.60 tons (Between two treatments of the same cut).
L.S.D. at 0.05 for t.r.x. cuts = 3.34 tons. (Between two cuts of the same treatment).

in pure stands. They concluded that the Egyptian clover percentage in the mixture had the effective factor for increasing forage yield.

The effects of treatments on the number of cuts of green forage production for both years are shown in Table 2. Significant differences in yields between treatments and cuts were found for both seasons but the interaction between treatments × cuts was found significant only for 1977–78 season. In 1976–77 season trial, the highest mean yield was obtained from treatment T_3 (10.79 t/ha.) and the lowest was from treatment T_7 (7.80 t/ha.). Significant difference was found only between treatments T_3 and T_7. Among the three cuts, the mean highest yield was obtained from the first cut (16.25 t/ha.) which was significantly higher than the second and third cuts but the difference between the second and third cut was not significant. In 1977–78 trial, the highest mean yield was obtained from treatment T_3 (11.17 t/ha.) and was significantly higher than all the treatments. Among the mixtures, treatment T_6 was significantly higher. Among the yields of the three cuts, the mean yield was obtained from the first cut (10.85 t/ha.) and was significantly higher than the second and third cuts. The difference in yield between the second and third cut was not significant. When the treatments were compared in the same cut, the highest yield was obtained from treatment T_3 (14.20 t/ha.) and was significantly higher than all treatments except treatment T_6 (13.50 t/ha) in the first cut. In the second cut, the highest yield was obtained from treatment T_3 (10.25 t/ha.) and was significantly higher than all treatments except treatment T_6 (7.94 t/ha.). In the third cut, treatment T_3 (9.05 t/ha.) was significantly higher than all other treatments. Among the cuts in the same treatment the yield decreased gradually from first to the third cuts for all the treatments and the difference between the first and second cuts was significant for all treatments except treatments T_1 and T_8.

A similar trend of yield on oven dried weight among the cuts for all treatments was found in both years as in green weight (Table 3). In 1976–77 season trial, among the mean yield of treatments, the highest yield was obtained from treatment T_3 (2.53 t/ha.)

Table 3. Mean dry yield of three cuts of barley and legume species grown alone and in mixtures.

Treatments	1976–77				1977–78			
	1st cut t/ha.	2nd cut t/ha.	3rd cut t/ha.	Mean	1st cut t/ha.	2nd cut t/ha.	3rd cut t/ha.	Mean
T_1	3.92	0.91	0.00	2.42	2.25	1.54	0.00	1.90
T_2	2.79	0.90	0.00	1.85	2.09	0.74	0.00	1.42
T_3	4.53	1.79	1.26	2.53	2.98	2.45	1.81	2.41
T_4	3.04	0.73	0.00	1.89	1.46	0.98	0.00	1.22
T_5	3.01	0.86	0.00	1.94	2.78	0.73	0.00	1.76
T_6	3.91	1.46	1.16	2.18	2.57	1.67	1.07	1.78
T_7	3.05	1.34	0.55	1.65	1.99	1.64	0.95	1.53
T_8	3.66	1.26	0.62	1.85	2.12	1.37	0.86	1.45
Mean	3.49	1.16	0.90	2.04	2.28	1.39	1.18	1.68

L.S.D. at 0.05 for treatments = 0.62 tons.
L.S.D. at 0.05 for cuts = 0.36 tons.

L.S.D. at 0.05 for treatments = 0.37 tons.
L.S.D. at 0.05 for cuts = 0.20 tons.
L.S.D. at 0.05 for tr × cuts = 0.53 tons (between two treatments of the same cut).
L.S.D. at 0.05 for tr × cuts = 0.70 tons (between two cuts of the same treatment).

and was significantly higher than treatments T_2, T_5, T_7 and T_8. Among the mean yield of cuts, the yield in the first cut (3.49 t/ha.) was significantly higher than the second and third cuts but the difference between the second and third cuts was not significant. In 1977–78 season trial, the highest mean yield was obtained from T_3 (2.41 t/ha.) and was significantly higher than all treatments. Among the yield in mixtures, treatment T_6 (1.78 t/ha.) was higher than all other treatments and significant difference existed between treatments T_4 and T_6. Among the mean yields of cuts, the highest yield was in the first cut (2.28 (t/ha.) and was significantly higher than the second and third cuts. The second cut was also significantly higher than the third cut. Among the treatments of the same cut, the highest yield was obtained from treatment T_3 (2.98 t/ha.) and was significantly higher than all treatments except treatments T_5 and T_6 in the first cut. In the second cut treatment T_3 was the highest (2.45 t/ha.) was significantly higher than all other treatments. In the third cut, treatment T_3 (1.81 t/ha.) also was the highest and significantly higher than all other treatments. Among the cuts of each treatment, the yield was decreased from first to third cuts. The yields from the first cut significantly decreased to the second cut in all treatments except treatments T_3 and T_4.

Among the three cuts in both seasons' trial, the highest forage yield was obtained from the first cut and reduced gradually in the second and third cuts for both green as well as oven dried weight. The first cut was taken after 120 days of seeding and second and third cuts were after 45 days of the first and second cuts. The plants had better chances to grow for longer period and consequently produced more forage in the first cut. After second cuts, barley and vetch did not produce any forage which reduced the yield in the third cut. These results agree with the findings of Haland (5), Monson (10) and Tosun (16) who obtained higher forage yield in the first cut than the second and third cuts.

Nutritive value of the forage

The percent and transformed values for crude protein, crude fibre, mineral matter, ether extract and nitrogen free extract are presented in Table 4. There were significant differences between treatments, cuts and treatment × cuts interaction for all elements.

The mean percent of crude protein was found to be highest in treatment T_3 (15.90%) and the lowest in treatment T_1 (6.38%). All the treatments were found significantly different from each other except between treatments T_4 and T_6. Among the cuts, the highest mean percent was found in the third cut (10.22%) and was significantly higher than the first and second cuts, but there was no significant difference between the first and second cuts. Within the treatments of the same cut, the highest percent of crude protein was obtained from T_3 (15.98) and all the treatments were significantly different from each other except between treatments T_1 and T_8 in the first cut. In the second and third cuts, treatment T_3 was the highest and significantly higher from all the treatments. Among the cuts in each treatment, none of them was found significantly different from each other.

These results showed that the high percentage of crude protein was obtained by decreasing barley seed ratio and increasing the leguminous species. These agree with the findings of El-Ghayaty (3) and Abdel Gewad *et al.* (1) who obtained higher crude protein percentage in the Egyptian clover and they concluded that the protein percentage was increased as the ratio of seeds of Egyptian clover was increased in the mixture.

The mean percent of crude fibre was found the highest in treatment T_1 (40.50%) and the lowest in treatment T_3 (19.88%). All the treatments were significantly different from each other except between treatments T_4, T_5 and T_7. Between the mean cuts, the highest percentage was from the first cut (31.24%) and was significantly higher than the second and third cuts. The difference between the second and third cuts was significant. Among the treatments of the same cut, the highest percent of crude fibre was obtained from treatment T_1 (41.00%). All the treatments were significantly different from each other except between treatments T_4 and T_5 and between treatments T_7 and T_8 in the first cut. In the second cut, treatment T_1 was the highest and significantly higher than all treatments. In the third cut, treatment T_8 had the highest percentage and was significantly higher than other treatments. Among the cuts in each treatment, the significant differences between the second and third cuts was found only in treatment T_3. These results showed that the percentage of crude fibre was increased by increasing the percentage of barley in the mixture. So the high crude fibre percentage in forage mixture was obtained by increasing the barley seed ratio. Morrison (11) found higher percent of crude fibre in barley (37.7%) than clover (21.6%) and vetches (25.2%).

The mean percentage of ether extract was the highest in treatment T_3 (3.87%) and the lowest in treatment T_8 (2.82%). Significant differences were found between treatments T_1, T_2 and T_3. Among the mean cuts, the highest ether extract percentage was found in the third cuts (3.38%). There were significant differences between the three cuts. Among the treatments of the same cut, the highest percentage was obtained from treatment T_3 (4.08%). The treatments were found significantly different from each other except between T_1 and T_4 for the first cut. In the second and third cuts treatment T_3 was the highest for both cuts. Significant difference existed between all treatments in the second cut. Among the cuts of each treatment, significant difference was found only in treatment T_3 between the first and second cut. McDonald, Edwards and Greenhalgh (9) found higher amount of ether extract in clover (3.3%) than barley (2.8%) and vetches (2.7%) which support the trend of our findings.

The mean percentage of mineral matter was found the highest in treatment T_3 (10.42%) and significantly higher than all other treatments. The treatments were found significantly different from each other except between treatments T_1, T_4 and T_8 and also between T_6 and T_7. Among the cuts, the highest percentage was obtained from third cut (7.62%) and was significantly higher than the second cut. The difference between the first and second cuts were not significant. Among the treatments of the same cut, the highest percentage was found in treatment T_3 (10.63%) and significant difference existed only between treatments T_1, T_2 and T_3 in the first cut. In the second and third cuts, the highest percentage of mineral matter was found in treatment T_3 for both cuts. Treatment T_3 was significantly higher than treatments T_1 and T_2 in the second cut and all treatments in the third cut. Among the cuts in the same treatment, there were significant decrease in percentage from the first to the second cuts for treatments T_1, T_2, T_3 and T_5. These results agree with the findings of Morrison (11) who obtained mineral matter 9.3%, 7.2% and 6.8% for clover, vetch and barley respectively.

The mean percentage of nitrogen free extract was found the highest in treatment T_1 (48.73%) and the lowest was from treatment T_3 (33.85%). All the treatments were significantly different from each other. Among the cuts, the highest mean percentage was found in the second cut (40.15%) and was significantly higher than the third cut (36.46%), but the difference between the first and second cuts was not significant.

Table 4. Nutritive value of forage in pure stands and in mixtures.

Treatments		Crude Protein 1st cut	2nd cut	3rd cut	Mean	Crude fibre 1st cut	2nd cut	3rd cut	Mean
T_1	%	6.48	6.27	0.00	6.38	41.00	40.00	0.00	40.50
	T	14.77	14.54	0.00	14.65	39.82	39.23	0.00	39.53
T_2	%	12.40	12.30	0.00	12.35	26.77	26.75	0.00	26.76
	T	20.62	20.53	0.00	20.58	31.18	31.18	0.00	31.18
T_3	%	15.98	15.67	16.05	15.90	18.67	19.43	21.55	19.88
		23.58	23.34	23.66	23.53	25.62	26.21	27.69	26.51
T_4	%	10.65	10.37	0.00	10.51	31.57	30.28	0.00	30.93
	T	19.09	18.81	0.00	18.95	34.20	33.40	0.00	33.80
T_5	%	8.98	9.07	0.00	9.03	32.37	31.95	0.00	32.16
	T	17.46	17.56	0.00	17.51	34.70	34.45	0.00	34.58
T_6	%	10.00	10.02	10.02	10.01	28.75	28.53	29.45	28.91
	T	18.44	18.44	18.44	18.44	32.46	32.27	32.90	32.54
T_7	%	8.00	8.17	7.85	8.01	34.90	31.75	32.00	32.88
	T	16.43	16.64	16.32	16.46	36.21	34.33	34.45	35.00
T_8	%	6.98	7.05	6.97	7.00	35.85	35.55	36.10	35.83
		15.34	15.45	15.34	15.38	36.81	36.63	36.93	36.79
Mean	%	9.93	9.87	10.22	9.90	31.24	30.35	29.78	30.98
	T	18.22	18.16	18.69	18.19	33.88	33.46	32.99	33.74

*% = Percent, T = Angular transformation

L.S.D. at 0.05 for treatments = 0.64.

L.S.D. at 0.05 for cuts = 0.20.

L.S.D. at 0.05 for tr × cuts = 0.62 (between two treatments of the same cut).

L.S.D. at 0.05 for tr × cuts = 0.92 (between two cuts of the same treatment).

L.S.D. at 0.05 for treatments = 1.55.

L.S.D. at 0.05 for cuts = 0.12.

L.S.D. at 0.05 for tr × cuts = 1.36 (between two treatments of the same cut).

L.S.D. at 0.05 for tr × cuts = 1.43 (between two cuts of the same treatment).

Treatments		Ether extract			
		1st cut	2nd cut	3rd cut	Mean
T_1	%	2.95	3.05	0.00	3.00
	T	9.98	10.14	0.00	10.06
T_2	%	3.35	3.43	0.00	3.39
	T	10.63	10.63	0.00	10.63
T_3	%	4.08	3.63	3.90	3.87
		11.68	10.94	11.39	11.34
T_4	%	2.93	2.95	0.00	2.94
	T	9.81	9.98	0.00	9.90
T_5	%	3.23	3.23	0.00	3.23
	T	10.31	10.31	0.00	10.31
T_6	%	3.53	3.73	3.35	3.54
	T	10.78	11.09	10.63	10.83
T_7	%	3.15	3.30	3.43	3.29
	T	10.31	10.47	10.63	10.47
T_8	%	2.73	2.90	2.83	2.82
		9.46	9.81	9.63	9.63
Mean	%	3.24	3.28	3.38	3.26
	T	10.37	10.42	10.57	10.40

L.S.D. at 0.05 for treatments = 0.25.

L.S.D. at 0.05 for cuts = 0.02.

L.S.D. at 0.05 for tr × cuts = 0.18 (between two treatments of the same cut).

L.S.D. at 0.05 for tr × cuts = 0.36 (between two cuts of the same treatment).

Treatments		Mineral matter			
		1st cut	2nd cut	3rd cut	Mean
T_1	%	6.13	5.98	0.00	6.06
	T	14.30	14.18	0.00	14.24
T_2	%	7.68	7.33	0.00	7.51
	T	16.11	15.68	0.00	15.90
T_3	%	10.63	10.30	10.33	10.42
		19.00	18.72	18.72	18.81
T_4	%	6.05	6.05	0.00	6.05
	T	14.18	14.18	0.00	14.18
T_5	%	6.85	6.15	0.00	6.50
	T	15.23	14.42	0.00	14.83
T_6	%	7.00	7.08	7.05	7.04
	T	15.34	15.45	15.45	15.41
T_7	%	7.15	7.15	7.00	7.10
	T	15.56	15.56	15.34	15.49
T_8	%	5.95	6.18	6.08	6.07
		14.18	14.42	14.30	14.30
Mean	%	7.18	7.03	7.62	7.28
	T	15.49	15.33	15.95	15.40

L.S.D. at 0.05 for treatment = 0.25.

L.S.D. at 0.05 for cuts = 0.01.

L.S.D. at 0.05 for tr × cuts = 0.38 (between two treatments of the same cut).

L.S.D. at 0.05 for tr × cuts = 0.06 (between two cuts of the same treatment).

(*Table 4—continued*)

Treatments		Nitrogen free extract			
		1st cut	2nd cut	3rd cut	Mean
	%	49.10	48.35	0.00	48.73
T_1	T	44.48	44.03	0.00	44.26
	%	38.78	38.73	0.00	38.76
T_2	T	38.53	38.47	0.00	38.50
	%	33.25	34.18	34.13	33.85
T_3		35.24	35.79	35.73	35.59
	%	41.48	42.18	0.00	41.83
T_4	T	40.11	40.51	0.00	40.31
	%	42.58	42.88	0.00	42.73
T_5	T	40.74	40.92	0.00	40.83
	%	37.93	37.95	37.83	37.90
T_6	T	37.94	38.06	38.00	38.00
	%	36.25	35.80	34.40	35.82
T_7	T	37.05	36.75	36.51	36.77
	%	41.33	41.15	40.48	40.99
T_8		39.99	39.93	39.52	39.81
	%	40.09	40.15	36.46	40.08
Mean	T	39.26	39.31	37.44	39.26

L.S.D. at 0.05 for treatments = 0.22.

L.S.D. at 0.05 for cuts = 0.58.

L.S.D. at 0.05 for tr × cuts = 1.27 (between two treatments of the same cut).

L.S.D. at 0.05 for tr × cuts = 1.61 (between two cuts of the same treatment).

Among the treatments of the same cut, the highest percentage of nitrogen free extract was obtained from treatment T_1 (49.10%). These were significant differences between the treatments except between treatments T_4 and T_8 in the first cut. In the second cut, the highest percentage was obtained also from treatment T_1 (48.35%) and was significantly higher than from all other treatments. In the third cut, treatment T_8 (40.48%) had the highest percent and was significantly higher than all treatments. Among the cuts of each treatment, none of the treatment was found significantly different from each other. Morrison (11) mentioned that the percent of nitrogen free extract was 49.3%, 43.2% and 36.7% for barley, vetch, and clover respectively. This agree with the trend of our findings.

This trial has shown that barley when grown with vetch and Egyptian clover produced more forage than when grown alone. The highest forage yield was obtained from Egyptian clover when grown in pure stand. The percentage of crude protein, ether extract and mineral matter were higher in Egyptian clover than those of barley, vetches and in mixtures. So it may be recommended that the highest forage yield and nutritive value can be obtained by planting Egyptian clover alone.

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سلوك نبات الشعير وبعض الأعلاف البقولية التي زرعت منفردة وفي مخاليط

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المستخلص

أجريت هذه التجربة خلال موسمي ٧٦ — ١٩٧٧ م ، ٧٧ — ١٩٧٨ م لدراسة سلوك نبات الشعير والجلبانة والبرسيم المصري عند زراعتها منفردة ومخلوطة بنسب مختلفة ، وقد دلت النتائج على أن زراعة البرسيم المصري منفردة أعطت أعلى محصول علفي وأن محصول العلف المنتج للهكتار قد زاد بزيادة نسبة البرسيم المصري في المخاليط ، ومن ناحية أخرى زاد محصول العلف المنتج من المخاليط المختلفة للشعير والجلبانة والبرسيم المصري عن العلف الناتج من مخلوط الشعير والجلبانة فقط بنسب مختلفة ، كذلك فإن نسبة البروتين الخام والمواد الدهنية والمواد المعدنية قد تفوقت في العلف الناتج من البرسيم المصري غير المخلوط عن الأعلاف المنتجة من الشعير والجلبانة منفردة أو الناتجة من المخاليط المختلفة .