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EFFECT OF SOWING DATE, MIXTURE PATTERN AND CUTTING DATE ON FORAGE YIELD PRODUCTIVITY OF FODDER MAIZE, COWPEA AND GUAR

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ABSTRACT: Two field experiments were carried out in administrative farm in Sefeta Village, Zagazig region, Sharkia Governorate, during two successive seasons 2001 and 2002, .This investigation aimed to study the effect of two sowing dates (June 1st and June 15th), different forage mixture patterns of fodder maize, cowpea and guar, as well as cutting dates (56 and 66 days after sowing) on forage and protein yields, in addition to land use efficiency.

The results of this study showed that the mixture fodder maize (100% of planting density/fad.) on both sides of two ridges alternated with cowpea (50% of planting density/fad.) on both sides of other two ridges gave higher fresh and dry forage yields compared with all other mixtures as well as fodder maize, cowpea and guar pure stands, the results indicated also that the above mentioned mixture caused an increase in land usage amounted 34%,since land equivalent ratio (LER) reached 1.34 calculated on basis of dry forage yield. Concerning protein yield, cowpea solid planting gave the highest protein yield/fad. followed by the forage mixture, fodder maize (75% of planting density/fad.) + cowpea (50% of planting density/fad.), then the forage mixture fodder maize (100 % of planting density/fad.) + cowpea (50% of planting density/fad.). The data showed also that delaying cutting from 56 to 66 days after

sowing increased both fresh and dry yields / fad. as well as protein yield / fad., while an opposite effect of delaying sowing was observed.

INTRODUCTION

Many attempts are doing for improving forage production, in Egypt, especially in summer season to face the shortage in animal feed. Sowing grass and legume forage crops in mixture may be an acceptable way to increase forage yield per unit area. Furthermore by mixing a legume forage crop with grass forage crop, the nutritive value of the mixture may be improved over that of grasses alone. Moursi et al. (1980) expressed the favourable effect of forage mixtures in fodder production of sorghum and cowpea and concluded that intercropping sorghum with cowpea gave highest forage yield .

Similarly, Tripathi *et al.*, (1984) stated that intercropping Pennisetum pedicellatum with cowpea, guar and other legume crops in alternate single or paired rows significantly increased fresh fodder yield compared with their pure stands. However cowpea and guar in pure stands gave highest protein yield. Mohamed (1989) studied the effect of intercropping guar with maize on forage and seed yields of guar and reported that the solid planting of guar followed by 3 : 3 cropping system had the highest dry forage yield, whereas the lowest one was obtained by 2 : 2 system.

Chang and Shibles (1985) found that dry forage yield of maize and cowpea was higher in mixture than in monoculture.

Abd El-Gawad *et al.*, (1992) found that intercropping pattern of sudangrass with cowpea 3 : 1 was the best pattern which yielded 1.31 ton/fad. dry matter and outyielded significantly sudan grass and cowpea pure stand.

Sherief and Said (1999) reported that intercropping cowpea with sorghum in alternate triple rows produced highest forage yield of the mixture compared with other intercropping systems and solid planting of either sorghum or cowpea. The results of Sherief and Said (1999) revealed, also that land equivalent ratio (LER) of both crops was greater than one in all intercropping systems.

Abdel-Aal *et al.*, (1991) found in their investigation on sorghum, sordan, cowpea and guar as solid planting and in mixture, that fresh

and dry forage yields were significantly higher than those obtained from guar and cowpea but lower than those obtained from sweet sorghum and sordan as sole croppings. The mixture of sordan × guar produced the highest forage yield compared to other mixtures. The highest land equivalent ratio (LER) was obtained by intercropping sordan with guar i.e. 15-24% yield advantage than their sole cropping

Geweifel (1990) stated that delaying cutting of fodder maize from 55 to 70 days after sowing significantly increased fresh and dry forage yield. The relative increase in dry forage yield reached 18.2% .

Mousa and Ghobrial (1996) found that delaying first cut of cowpea from 45 to 60 days after sowing increased both fresh and dry forage yield as well as protein yield. Therefor, this investigation aimed to study the effect of sowing forage mixture pattern and cutting date on forage and protein yields of fodder maize, cowpea and guar, in addition to land use efficiency.

MATERIALS AND METHODS

Two field experiments were carried out in administrative field in Sefeta Village, Zagazig region, Sharkia Governorate, during two successive seasons 2001 and 2002.

Mechanical analysis of the soil of the experimental field showed that the soil texture was clay (1.60% coarse sand, 18.64 fine sand, 26.90 cilt and 52.86 clay).

Each experiment included 36 treatments which were the combinations of two sowing dates, nine forage mixture patterns and two cutting dates. The two sowing dates were 1st and 15th June. The nine forage mixture patterns used were as follows :

1- Pure stand of fodder maize using planting distance of 20 cm on both sides of the ridge, i.e., 70.000 plant/fad. (100% plant population).

2- Pure stand of cowpea using planting distance of 7cm on both sides of the ridge i.e., 210.000 plant/fad (100% plant population).

3- Pure stand of guar using planting distance of 10 cm on both sides of the ridge, i.e., 140.000 plant/fad. (100% plant population).

4- Fodder maize on one side of the ridge using planting distance of 20 cm, i.e., 35.000 plant/fad. (50%) and cowpea on the other side of the ridge using planting distance of 7 cm, i.e., 105.000 plant/fad. (50%).

5- Fodder maize on one side of the ridge using planting distance of 20 cm, i.e., 35.000 plant/fad. (50%) and guar on the other side of the ridge using planting distance of 10 cm, i.e., 70.000 plant/fad. (50%).

6- Fodder maize on both sides of the ridge using planting distance of 13.3 cm, i.e., 52.500 plant/fad. (75%) and cowpea on both sides of the other ridge, alternatively using planting distance of 7 cm i.e., 105.000 plant/fad. (50%).

7- Fodder maize on both sides of the ridge using planting distance of 13.3 cm, i.e., 52.500 plant/fad (75%) and guar on both sides of the other ridge, alternatively, using plating distance of 10 cm, i.e., 70.000 plant/fad. (50%) .

8- Fodder maize on both sides of two ridges using plating distance of 10 cm, i.e., 70.000 plant/fad. (100%) and cowpea on both sides of other two ridges, alternatively, using planting distance of 7 cm, i.e., 105.000 plant/fad (50%).

9- Fodder maize on both sides of two ridges using planting distance of 10 cm, i.e., 70.000 plant/fad. (100%) and guar on both sides of other two ridges, alternatively, using planting distance of 10 cm, i.e., 70.000 plant / fad. (50%).

The two cutting dates were :

1- 56 days after sowing

2- 66 days after sowing

The experiments were laid out in a split spilt plot design with three replications, where sowing dates were assigned to the main plots and the sub plots included mixture patterns, while sub-subplots were occupied by the two cutting dates. The sub subplot area was 7.2 cm2 (3.6 × 2 m), i.e., 6 ridges of 0.6m width and 2m long. The preceding crop was wheat in both seasons. Basal dose of 15.5 kg P_2O_5 in form of super-phosphate was added at time of seedbed preparation whereas, N-fertilization at a rate of 30 kg N/fad. was added in the form of Amonium nitrate (33.5% N) at two equal doses the 1st dose was applied at the first irrigation, whereas the second dose was added at the 2nd irrigation.

At cutting time an area of 2.4m2 was cut (two inner ridges, 2 meter long) and fresh forage yield /fad. for each crop as well as for both components in case of mixtures was calculated. Samples of 250g fresh forage, were oven dried at 70°C up to constant weight and dry forage yield

ton/fad. was calculated. Protein yield (ton/fad.) was calculated after determination of protein percentage using (A.O.A.C.,1970). (only in 1st June planting) through multiplying protein % × dry forage yield /fad. The data of dry yield were used to estimate land equivalent ratio (LER). LER was determined as the sum of the fractions of the yield of mixtures relative to their sole crop yields (De Wit and den Bergh, 1965). Data were subjected to statistical analysis according to (Snedecor,1967) and treatment means were combared by Duncan's multiple range test (Duncan, 1955).

RESULTS AND DISCUSSION

A. Forage yield :

Data related to fresh and dry forage yields (ton/fad.) as influenced by sowing date, mixture pattern and cutting date during 2001 and 2002 growth seasons and their combined are presented in table (1).

The statistical analysis for fresh and dry forage yield showed significant differences between the two planting dates (1st June and 15th June). These results hold fairly true in the first season and combined analysis, while the results of the second season did not show any significant difference between both sowing dates. It is apparent from the data of the first season and the combined analysis that, planting in June 1st increased fresh and dry forage yields over planting in June 15th. The reduction in forage yield due to delaying in planting date reached 22.58 % and 21.27 % in fresh and dry forage yields, respectively (combined data). The differences observed between both sowing dates may be due to the different of climatic conditions such as day length and heat prevailing during growth. This reflect the role impact, of planting date as one of the most cultural practices for determining the productivity of summer forage crops. The same trend was shown from the results of Abd El-Raouf *et al.*, (1988), Soliman *et al.*, (1983) and Abd El-Shafy and Ahmed (2002).

Regarding the effect of mixture pattern, it is apparent from the data in table (1) that mixture pattern exerted highly statistical significant effect on fresh and dry forage yields of fodder maize, cowpea, guar and their mixtures. Fodder maize sole planting gave higher fresh and dry forage yields than either cowpea or guar. This was true in both seasons and their

combined analysis. With regard to the combined data, fresh forage yield amounted 16.19, 12.01 and 8.51 ton/fad for Fodder maize, cowpea and guar in respective order. The same trend could be seen from the results of dry forage yield. It is evident from the data that the mixture fodder maize (100%) on both sides of two ridges alternated with cowpea (50%) on both sides of other two ridges caused significant increase in mixture fresh as well as dry forage yield compared with all other mixtures or fodder maize, cowpea and guar pure stands as well. This was true in first season and the combined analysis of both seasons. Also, it is worth noting here that the mixture fodder maize (75%) on both sides of the ridge alternated with cowpea on both sides of other ridge ranked second in mixture fresh and dry forage yields. The lowest mixture yield was obtained from planting fodder maize (50%) on one side of the ridge with guar (50%) on the other side of the same ridge. This result hold fairly true in both seasons and their combined analysis. This reduction may be mainly due to the severe interspecific competition between plants for light, water and nutrients.

However, the obtained data regarding the effect of grass + legume mixtures are in harmony with those obtained by Moursi *et al.*, (1980), Tripathi *et al.*, (1984), Chang and Shibles (1985) and Abd El-Gawad *et al.*, (1992).

Concerning the effect of cutting date on fresh and dry yield, the results in table (1), show highly significant increase due to cutting delay from 56 to 66 days after sowing. This increase reached 23.21 % and 34.48 % for fresh and dry forage yields (combined analysis), in respective order. In general, the obtained results are in agreement with those reported by Geweifel (1990) and Mousa and Ghobrial (1996).

The interaction between each two fact ors under study proved to affect fresh and dry forage yield. The most important of these interactions are shown in tables (1a, b and c) . It is clear to note that under different mixture patterns, delaying cutting till 66 days from sowing significantly increased fresh yield (ton/fad). Also, the highest fresh forage yield can be achieved by planting fodder maize on both sides of two ridges using 100% of planting density alternated with cowpea on both sides of other two ridges using

50% of planting density and delaying cutting until 66 days from sowing (table 1a). On the other hand, under different mixture patterns, delaying sowing from 1st June to 15th June decreased fresh forage yield (ton/fad.). The highest fresh forage yield can be obtained by planting the above mentioned mixture pattern on 1st June . Guar pure stand gave the lowest fresh forage yield when sowing date was undertaken on June 15th (table 1b). The interaction between sowing date and cutting date showed that sowing the tested forage crops early on June 1st and delaying cutting until 66 days from sowing achieved the highest fresh forage yield (table 1c).

B. Protein yield (ton/fad.) :

Protein yield of solid planting of the three forage crops i.e., fodder maize, cowpea and guar and their mixture as influenced by mixture pattern and cutting date during growing seasons of 2001 and 2002 is presented in table (2).

The statistical analysis of variance showed highly significant differences between the nine forage planting patterns. This was true in the first season and the combined analysis. In both cases cowpea solid planting gave the highest protein yield/fad. when compared with other sole cropping i.e., fodder maize and guar as well as most of mixture patterns. The superiority of cowpea sole planting than other sole cropping and mixtures might be due to the increase in protein percentage. Likewise, the data of first season and combined analysis indicate also that the protein yield of fodder maize (75%) + cowpea (50%) mixture and fodder maize (100%)+cowpea (50%) surpassed that of the other forage mixtures. The superiority of these two mixtures over the other mixtures may be due to the increase in dry matter production (table 1). Similar results were obtained by many researchers who found that high protein yield was produced from the mixture of maize or sorghum with different legumes compared to sole cropping of grasses (Moursi *et al.*, 1980; Tripathi *et al.*, (1984); Abd El-Gawad *et al.*, 1985 and Abdel-Aal *et al.*, 1991).

Delaying cutting from 56 to 66 days after sowing showed highly significant increase in total protein yield/fad. in both seasons and their combined analysis. The superiority of late cutting in protein yield/fad. may be owing to the increase in dry yield/fad. (table 1).

C. Land equivalent ratio (LER):

Total land productivity in terms of LER and its fractions of maize (Lm) and legume (Lc or Lg) obtained from dry forage yield of fodder maize + cowpea or guar as influenced by sowing date, mixture pattern and cutting date in two seasons and their combined are given in table (3).

The data revealed that intercropping fodder maize as a grass crop with one of the two legume crops (cowpea or guar) produced land equivalent ratio for each crop less than unity i.e., the forage yield of each crop obtained from the mixture was less than its monoculture. This depression is expected due to the intercompetition between different crops in the mixture on light and nutrients. These results were observed in all studied mixture patterns in both seasons and their combined analysis . The same trend could be seen also in both sowing and cutting date effects. However, the two tested mixtures, fodder maize (100%) on both sides of two ridges alternated with cowpea (50%) or guar (50%) as well, significantly produced land equivalent ratio (LER) more than unity indicating a yield advantage. Since, intercropping of fodder maize (100%) with cowpea (50%) or guar (50%) resulted in LER determined from dry forage yield between 1.337 and 1.225 respectively . This was the fact as apparent in the data of the combined analysis. These values of LER indicate that 34% to 22% more land would be required to plant the sole crops to produce the same quantity of the yield of the mixture. In other words, it can be noticed that the above mentioned mixture caused an increase in land usage amounted 34% and 22%. However, the two mixtures fodder maize (50%) on one side of the ridge and cowpea (50%) or guar (50%) on other side of the ridge produced land equivalent ratio (LER) of 0.867 and 0.775, respectively, i.e., less than unity, indicating disadvantage in forage yield production, as shown in the combined analysis. This reduction in combined forage yield of the two crops may be due to increased shading of legume plants (cowpea or guar) which were planted narrow to maize plants.

Many investigations studied the effect of grass-legume mixture patterns on land equivalent ratio (LER) and reported that when forage grasses were sown in mixture with legumes, higher

Table (1) : Total fresh and dry forage yield (ton/fad.) of Fodder maize, Cowpea and Guar as influenced by sowing date, mixture pattern and cutting date.

Main effects and interactions	Total fresh yield (ton/fad.)			Total Dry yield (ton/fad.)		
	First season (2001)	Second season (2002)	Combined analysis	First season (2001)	Second season (2002)	Combined analysis
Sowing date (S) :-						
1st June	19.738	10.594	15.166	4.007	2.188	3.098
15th June	14.108	9.374	11.741	2.806	2.071	2.439
F-test	**	N.S	**	**	N.S	**
Mixture pattern (M) :-						
1- Fodder maize (100%)	19.678 c	12.718 a	16.198 b	4.083 c	2.833 a	3.458 b
2- Cowpea (100%)	15.022 e	9.001 d	12.012 e	2.681 e	1.383 e	2.032 g
3- Guar (100%)	10.397 h	6.637 f	8.517 h	1.799 g	1.052 f	1.425 h
4- Fodder maize (50%) + Cowpea (50%)	13.392 f	9.198 d	11.295 f	2.620 e	2.259 bc	2.439 e
5- Fodder maize (50%) + Guar (50%)	12.436 g	7.564 e	10.000 g	2.468 f	1.826 d	2.147 f
6- Fodder maize (75%) + Cowpea (50%)	21.768 b	10.867 b	16.317 b	4.271 b	2.427 b	3.349 bc
7- Fodder maize (75%) + Guar (50%)	17.554 d	9.866 c	13.710 d	3.615 d	2.102 c	2.859 d
8- Fodder maize (100%) + Cowpea (50%)	22.850 a	12.973 a	17.911 a	4.924 a	2.842 a	3.883 a
9- Fodder maize (100%) + Guar (50%)	19.211 c	11.034 b	15.122 c	4.200 b	2.443 b	3.321 c
F-test	**	**	**	**	**	**
Cutting date (C) :-						
56 days after sowing	15.367	8.742	12.055	2.963	1.760	2.361
66 days after sowing	18.479	11.226	14.853	3.851	2.499	3.175
F-test	**	**	**	**	**	**
Interactions :-						
S × M	**	N.S	**	**	N.S	**
S × C	**	**	**	**	**	**
M × C	**	N.S	**	**	**	**

Table (1a) : Total fresh forage yield (ton/fad.) of Fodder maize, Cowpea and Guar as influenced by the interaction between mixture patterns and sowing dates (combined analysis).

Mixture pattern	Sowing date	
	1st June	15th June
1- Fodder maize (100%)	A 18.029 c	B 14.368 b
2- Cowpea (100%)	A 13.640 f	B 10.383 e
3- Guar (100%)	A 9.487 i	B 7.547 g
4- Fodder maize (50%) + Cowpea (50%)	A 12.749 g	B 9.840 e
5- Fodder maize (50%) + Guar (50%)	A 11.151 h	B 8.850 f
6- Fodder maize (75%) + Cowpea (50%)	A 18.755 b	B 13.879 bc
7- Fodder maize (75%) + Guar (50%)	A 15.343 e	B 12.077 d
8- Fodder maize (100%) + Cowpea (50%)	A 20.498 a	B 15.325 a
9- Fodder maize (100%) + Guar (50%)	A 16.845 d	B 13.400 c

Table (1b) : Total fresh forage yield (ton/fad.) of Fodder maize, Cowpea and Guar as influenced by the interaction between forage mixture patterns and cutting dates (combined analysis).

Sowing date	Cutting date (days after sowing)	
	56 (DAS)	66 (DAS)
1st June	B 13.571 a	A 16.762 a
15th June	B 10.538 b	A 12.944 b

Table (1c) : Total fresh forage yield (ton/fad.) of Fodder maize, Cowpea and Guar as influenced by the interaction between mixture patterns and cutting dates (combined analysis).

Mixture pattern	Cutting date (days after sowing)	
	56 (DAS)	66 (DAS)
1- Fodder maize (100%)	B 14. 731 b	A 17. 666 b
2- Cowpea (100%)	B 10.316 e	A 13.707 e
3- Guar (100%)	B 7.460 g	A 9.574 h
4- Fodder maize (50%) + Cowpea (50%)	B 9. 830 e	A 12. 760 f
5- Fodder maize (50%) + Guar (50%)	B 8. 762 f	A 11. 239 g
6- Fodder maize (75%) + Cowpea (50%)	B 15. 189 b	A 17.445 b
7- Fodder maize (75%) + Guar (50%)	B 12. 241 d	A 15.179 d
8- Fodder maize (100%) + Cowpea (50%)	B 16. 258 a	A 19. 565 a
9- Fodder maize (100%) + Guar (50%)	B 13. 705 c	A 16. 539 c

Table (2) : Total crude protein yield (ton/fad.) of Fodder maize, Cowpea and Guar as influenced by mixture pattern and cutting date (first June planting).

Main effects and interactions	First season (2001)	Second season (2002)	Combined analysis
Mixture pattern (M) :-			
1- Fodder maize (100%)	0.372 cd	0.223	0.293 de
2- Cowpea (100%)	0.713 a	0.232	0.472 a
3- Guar (100%)	0.402 c	0.162	0.282 de
4- Fodder maize (50%) + Cowpea (50%)	0.402 c	0.225	0.313 cde
5- Fodder maize (50%) + Guar (50%)	0.302 d	0.185	0.244 e
6- Fodder maize (75%) + Cowpea (50%)	0.625 ab	0.241	0.433 ab
7- Fodder maize (75%) + Guar (50%)	0.442 c	0.229	0.335 cd
8- Fodder maize (100%) + Cowpea (50%)	0.632 ab	0.222	0.427 ab
9- Fodder maize (100%) + Guar (50%)	0.548 b	0.199	0.374 bc
F-test	**	N.S	**
Cutting date (C) :-			
56 days after sowing	0.430	0.191	0.310
66 days after sowing	0.556	0.235	0.396
F-test	**	**	**
Interaction :-			
M × C	N.S	N.S	N.S

Table (3) : Land equivalent ratio (LER) calculated on basis of total dry forage yield as influenced by sowing date, mixture pattern and cutting date.

Main effects and interactions	First season (2001)			Second season (2002)			Combined analysis		
	L_m	L_{corg}	LER	L_m	L_{corg}	LER	L_m	L_{corg}	LER
Sowing date (S) :-									
1st June	0.719	0.382	1.101	0.594	0.388	0.982	0.657	0.385	1.042
15th June	0.666	0.368	1.034	0.694	0.457	1.151	0.680	0.413	1.093
F-test			N.S			*			N.S
Mixture pattern (M) :-									
1- Fodder maize (50%) + Cowpea (50%)	0.476	0.246	0.722 e	0.629	0.383	1.012 d	0.553	0.314	0.867 e
2- Fodder maize (50%) + Guar (50%)	0.480	0.279	0.759 e	0.556	0.235	0.791 e	0.518	0.257	0.775 f
3- Fodder maize (75%) + Cowpea (50%)	0.763	0.433	1.196 c	0.650	0.444	1.094 bc	0.707	0.438	1.145 c
4- Fodder maize (75%) + Guar (50%)	0.725	0.356	1.081 d	0.592	0.435	1.027 cd	0.659	0.395	1.054 d
5- Fodder maize (100%) + Cowpea (50%)	0.898	0.464	1.362 a	0.730	0.582	1.312 a	0.814	0.523	1.337 a
6- Fodder maize (100%) + Guar (50%)	0.815	0.470	1.285 b	0.703	0.463	1.166 b	0.759	0.466	1.225 b
F-test			**			**			**
Cutting date (C) :-									
56 days after sowing	0.694	0.382	1.076	0.662	0.429	1.091	0.678	0.405	1.083
66 days after sowing	0.691	0.368	1.059	0.625	0.418	1.043	0.658	0.393	1.051
F-test			**			N.S			*
Interactions :-									
S × M			N.S			N.S			N.S
S × C			**			**			**
M × C			**			*			**

forage yield was obtained, which was more than that when each of them was planted alone. In this concern, Abd El-Gawad *et al.*, (1992) recorded LER of 1.6 due to planting cowpea on one side of the ridge alternated with Sudan grass on one side of the other ridge. However Abd El-Aal *et al.*, (1991) found land usage advantage ranged between 15 and 24% due to planting Sordan 79 in alternated rows with guar, whereas sowing sweet sorghum in alternated rows with guar did not show any yield advantage in one of the two seasons of experimentation. However, Sherief and Said (1999) reported forage yield advantage due to sowing sorghum in mixture with cowpea.

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تأثير ميعاد الزراعة ونظام الخلط وميعاد الحش على إنتاجية محصول العلف للدراوه ولوبيا العلف والجوار

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أقيمت تجربتان حقليتان بحقل إرشادي بقرية صفيطة مركز الزقازيق بمحافظة الشرقية خلال الموسمين الزراعيين ٢٠٠١ ، ٢٠٠٢ ، وذلك بهدف دراسة تأثير ميعاد زراعة (أول يونية ومنتصف يونية) والزراعة بنظم خلط مختلفة لثلاثة محاصيل علف أخضر وهي الدراوة ولوبيا العلف والجوار ، وذلك بالإضافة إلى دراسة تأثير ميعادين للحش (بعد ٥٦ ، ٦٦ يوم من الزراعة) ، على محصول العلف ومحصول البروتين للفدان بالإضافة إلى كفاءة استخدام الأرض ، ويمكن تلخيص أهم النتائج المتحصل عليها فيما يلي :

١- أدى تأخير الزراعة من أول يونية إلى منتصف يونية إلى انخفاض محصول العلف الأخضر والجاف وكذلك محصول البروتين .

٢- أعطى المخلوط العلفي دراوه مستخدماً ١٠٠% من الكثافة النباتية والزراعة على الريشتين لخطين بالتبادل مع لوبيا العلف مستخدماً ٥٠% من الكثافة النباتية والزراعة على الريشتين للخطين الآخرين ، أعلى القيم لمحصول العلف الأخضر والجاف للفدان بالمقارنة بباقي نظم الخلط أو الزراعة المنفردة لكل من الدراوة ولوبيا العلف والجوار .

٣- حقق المخلوط المذكور أعلى ميزة محصولية قدرت بـ ٣٤% حيث كانت نسبة المكافئ الأرضي لهذه المعاملة ١,٣٤ محسوبة على أساس المحصول الجاف .

٤- أوضحت النتائج تفوق لوبيا العلف المنفرد في محصول البروتين للفدان على كل من الدراوة المنفرد والجوار المنفرد وكذلك نظم الخلط المختلفة المتبعة في هذه الدراسة ، تلاها المخلوط العلفي دراوه مستخدماً ٧٥% من الكثافة النباتية والزراعة على ريشتي الخط بالتبادل مع لوبيا العلف والزراعة مستخدماً ٥٠% من الكثافة النباتية على ريشتي الخط .

٥- أدى تأخير الحش من ٥٦ يوم إلى ٦٦ يوم من الزراعة إلى زيادة المحصول الأخضر والجاف وكذلك محصول البروتين للفدان .