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Yield Potential and Quality of Egyptian Clover Intercropped with Forage Grasses

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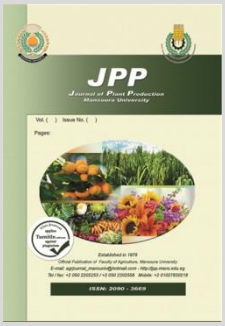

ABSTRACT

Egyptian clover is the main forage crop in Egypt due to its high production, high protein content and fast regrowth after cutting. Although Egyptian clover is rich in protein but it is poor in fiber and high in moisture content in early cuttings that caused a serious problem to animals. On the other hand, forage grasses have high dry matter yield but poor in quality. Intercropping is a good practice to increase yield and quality in forage crops. Two field experiments were carried out at the Faculty of Agriculture, Cairo University, Giza, Egypt in winter seasons of 2020/2021 and 2021/2022. The study aimed to evaluate the productivity and quality of Egyptian clover mixtures with forage grasses plants for first three cuts. The experiment included nine treatments, solid system of Egyptian clover, rye grass, oat, triticale, barley and binary mixtures of Egyptian clover with pervious grasses (50 %: 50 %). Treatments were arranged in Randomized Complete Block Design (RCBD) with three replications. Traits were measured such as plant height (cm), number of shoots/ unit area, fresh and dry forage yields (t fed^{-1}), protein and crude fiber yields (ton fed^{-1}). Generally, Egyptian clover + oat mixture had the highest total fresh and dry forage yields and protein and fiber yields in both seasons. Meanwhile, solid rye-grass gave the lowest total fresh and dry forage yields and protein and fiber yields in both seasons. The study concluded that intercropping Egyptian clover with grasses improved dry matter yield, protein and fiber content.

Keywords: Egyptian clover; forage grass; intercropping; mixture; yield

INTRODUCTION

Egyptian clover or Berseem or Berseem clover (*Trifolium alexandrinum*, L) is an annual winter forage legume. It is well adapted to a range of environments and is usually grown in the Mediterranean, central European, and southeast Asian countries for forage production (Sardana and Narwal, 2000; Iannucci, 2001; El-Bably, 2002; De Santis *et al*., 2004). Egyptian clover is the main forage crop in Egypt that cultivated in large area. Farmers used to grow Egyptian clover due to its long season of high production (seven months), high protein content and fast regrowth recovery after cutting, in addition to increasing soil organic matter. Egyptian clover is used for green chopping, grazing and hay production (Martiniello and Iannucci, 1998). Although Egyptian clover is rich in protein but it is poor in fiber (structural carbohydrates) (Knight, 1985). Besides, it has high moisture content in early cuttings that caused a serious problem to animals which induces bloat and diarrhea in ruminants (Hall *et al*., 1991 and Muhammad *et al*., 2014). On the other hand, forage grasses such as barley (*Hordeum vulgare* L.), rye grass (*Lolium multiflorium* L.), oat (*Avena sativa*, L.) and triticale (*X Triticosecale wittmack*) has higher dry matter yield but poor in quality that is insufficient for livestock (Lithourgidis *et al*., 2006).

Thus, intercropping of Egyptian clover with forage grasses is a good agricultural practice to sustain forage yield in low input agricultural systems. (Anil, *et al*., 1998 and Lithourgidis *et al*., 2006). Intercropping of Egyptian clover with forage grasses improved dry matter yield and nutritive value (high protein content of legumes and high fiber content of grasses), also reduced weeds competition (Singh *et al*., 1989; El-Karamany *et al*., 2014; Salama, 2015; Salem, *et al*., 2015; Thalooth *et al*., 2015; Akar *et al*., 2016 and Gill and Omokanye, 2018). Mixing of Egyptian clover with grasses can reduce adding nitrogen fertilizer because of N contributions by biological N fixation from Egyptian clover (Izaurralde *et al*., 1993 and Rakeih *et al*., 2008).

Different studies indicated that intercropping Egyptian clover with forage grasses improved fresh and dry yield, forage quality as well. Ross and King (2001) indicated that binary mixtures of Egyptian clover with oat, barley and triticale increased dry forage yield but it did not differ with grasses type. Ross, *et al*. (2005) indicated that adding Egyptian clover to oat increased forage quality and support higher livestock productivity. Rady (2016) studied the effects of intercropping Italian-ryegrass with Egyptian clover (Helaly) in mixtures for four cuttings. Plant height of Egyptian clover significantly suppressed ryegrass at the first cutting, while there were no significant differences between them in the fourth cutting. Monoculture of Egyptian clover significantly gave the highest dry forage yield /m^2 in all the studied cuttings and the total yield as compared to binary mixtures of Egyptian clover with Italian-ryegrass. In addition, Monoculture of ryegrass significantly gave the lowest dry forage yield during the second, third, fourth cuttings and total yield. In the same trend with Thalooth *et al*., (2015) who revealed that Egyptian clover + ryegrass mixture had higher fresh and dry forage yield than solid stands. Yucel *et al*. (2018) found that intercropped Egyptian clover with triticale increased dry matter yield than sole crops. Vasilakoglou and Dhima (2008) found that intercropping between Egyptian

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clover + barely and solid stands of Egyptian clover had higher total dry matter and protein yields than solid barley stands. Salem, *et al.* (2015) indicated that intercropping Egyptian clover with barley increased the fresh and dry yields.

Sultan and Shafie (2015) cleared that intercropping of Egyptian clover (*cv.* Helaly) and barley (*cv.* Giza 129) gave the highest fresh and dry forage yields compared to yields of barley and Egyptian clover solid crops. Solid stands of Helaly cultivar of Egyptian clover had the highest crude protein content ranged from 16.98 % at the first cut to13.01% at the fourth cut. But crude protein content ranged from 12.85 at the first cut to 13.02% at the last cut for barley in solid stand. Crude protein content of Egyptian clover + barley mixture ranged from 14.54 % at the first cut to13.77 % at the fourth cut. The highest crude fiber was given from solid stand of barley at the first cut and declined as the stand aged where ranged from 29.07 at the first cut to 26.24 % at the second cut in both seasons. Crude fiber of Egyptian clover + barley mixture ranged from 25.26 at the first cut to 12.63% at the fourth cut. Also, Rady *et al.* (2022) revealed that intercropping of Egyptian clover with grass of triticale, ryegrass, barley and oats improved fresh and dry forage yields. Besides, Egyptian clover had the highest fresh, dry and protein yields as compared to other plants. Meanwhile, triticale gave the lowest concentration of crude protein and the highest fiber content. Salama (2020) investigated the productivity and nutritive value of four cuts of Egyptian clover, triticale, and oat cultivated as monocultures and legume-grass binary mixtures. The highest fresh yield was obtained from Egyptian clover mixtures with oat at the 1st and 2nd cuts and from mixtures with triticale at the 3rd cut. Solid Egyptian clover and clover-triticale mixture had the highest crude protein content. Therefore, the study aimed to evaluate the productivity and quality of solid plants of Egyptian clover, rye grass, oat, triticale and barley, and binary mixtures of Egyptian clover with forage grasses plants for the first three cuts.

MATERIALS AND METHODS

Two field experiments were carried out at the Faculty of Agriculture, Cairo University, Giza, Egypt in winter seasons of 2020/2021 and 2021/2022. The experiments aimed to study the effect of Egyptian clover mixtures with grasses plants on growth, productivity, and quality of Egyptian clover. Mechanical and chemical properties of soil in both seasons are presented in Table (1). The experiment included nine treatments, solid stands of Egyptian clover, rye grass, oat, triticale, barley, and binary mixtures of Egyptian clover with pervious grasses as follows in Table (2).

Table 1. Mechanical and chemical properties of soil in winter seasons of 2020/2021 and 2021/2022.

Season	Physical properties					Chemical properties				
	Sand (%)	Silt (%)	Clay (%)	Soil type	Soil (pH)	Ec (ds/m)	Organic matter	Total CaCO3 (%)	Total p (mg/L)	Total K (mg/L)
2020/2021	35.84	38.05	26.11	Loamy	7.31	1.43	2.21	3.73	3.9	5.10
2021/2022	37.55	37.25	25.20	Loamy	7.42	1.50	2.52	4.28	4.5	5.34

Table 2. Solid and mixture treatments, and recommended seeding rates.

No.	Treatments	Seeding rates
1	Solid Egyptian clover *cv*., Helaly	20 kg/fed
2	Solid rye grass *cv*., Balady	10-12 kg/fed
3	Solid oat *cv*., Balady	40-50 kg/fed
4	Solid triticale *cv*., Balady	35-40 kg/fed
5	Solid barley *cv*., Sico	50 kg/fed
6	Mixture of Egyptian clover+ rye grass	50 %:50 %
7	Mixture of Egyptian clover+ oat	50 %:50 %
8	Mixture of Egyptian clover+ triticale	50 %:50 %
9	Mixture of Egyptian clover+ barley	50 %:50 %

Seeds were sown in rows on 19th November 2020 and on 21st October 2021 in both seasons, respectively. Seeding rate was differed depending on the crop type (Table 2). Mixtures Seeds of crops were sown in rows alternately. The agricultural practices took place according to recommendations of Ministry of Agriculture and Land Reclamation (MALR), Egypt from fertilization, irrigation, and pest control. The plants were cutting at 50 cm of Egyptian clover height for all treatments for first three cuts because the grass did not give regrowth after third cutting. Number of Cuttings and dates in both seasons are presented as followed in Table 3. Treatments were arranged in Randomized Complete Block Design (RCBD) with three replications. The plot size was 4 m^2 (2×2 m), consist of 10 rows, 20 cm apart.

Table 3. Cutting dates in 2020 / 2021 and 2021 / 2022 seasons.

No. of cut	2020/2021 season	2021/2022 season
1st cut	26th January	5th January
2nd cut	1st March	16th February
3rd cut	23rd April	4th April

The measured traits were, plant height, cm: average of five plants, number (no.) of shoots/unit area (30cm×20cm = 0.06 m^2), fresh and dry forage yields (t fed^{-1}), the plot weight was measured and converted to t fed^{-1}, total fresh and dry forage yields/ 3cuts (t fed^{-1}), was calculated by the summation of fresh and dry forage yields for each cut, where dry forage yield determined from multiplying fresh forage yield (t fed^{-1}) with dry matter percentage (DM %) that was determined by taking plant sample (500 g) and weighed fresh (g), then dried in oven at 65 ^{0}C for 48 hour, and the dried weight was recorded, and calculated dm % as followed according to method No. 44-15 A of (A.A.C.C., 2000):

$$\text{Moisture \%} = \frac{\text{Fresh weight} - \text{Dry weight}}{\text{Total weight of sample}} \times 100$$

$$\text{Dry matter \%} = 100 - \text{Moisture \%}$$

A sample of dried leaves and stems from each plot was taken to analyze protein and crude fiber yields (t fed^{-1}) as follows:

1. Protein yield (t fed^{-1})=Dry forage yield × crude protein content (%)

Where, crude protein content was calculated by multiplying total nitrogen by 6.25. Total nitrogen was determined by the micro-Kjeldahl method (A.O.A.C., 1995).

2. Crude fiber yield (t fed^{-1}) = Dry forage yield × crude fiber content (%), which was determined by using the Weende method (A.O.A.C., 1995).

Crude protein and fiber contents (%) were measured by using the apparatus of NIR Spectra Star™ RTW1.

Data obtained in each year of the study were statistically analyzed according to procedures outlined by Steel *et al.* (1997) using Mstat-C computer program (Freed, 2005). The differences among treatment means were

compared by the least significant difference test (LSD) at 0.05 level of probability.

RESULTS AND DISCUSSION

Plant height and no. of shoots of Egyptian clover and grasses and their mixtures are presented in Table 4. Egyptian clover + oat mixture and solid Egyptian clover stands had the insignificant tallest plants (105.50 cm and 103.33 cm) and the highest no. of shoots (64.33 and 66.00) while the grasses plants had shorter plants and lower no. of shoots/unit area than Egyptian clover and their mixtures at first cut in the first season. Meanwhile, there were no significant differences between treatments in plant height and no. of shoots at second cut in the first season. These results are accordance with (Rady, 2016). Solid triticale plants had the tallest plants (117.33 cm) than the other treatments at the third cut in the first season. Egyptian clover + rye-grass or oat mixtures gave the highest no. of shoots at the third cut in the first season (63.67 and 51.67). In the second season, the tallest plants were given from Egyptian clover stands (103.33 cm) at the first cut, Egyptian clover +triticale mixture (92.67 cm) at the second cut and Egyptian clover + oat mixture (110.00 cm) at the third cut in second season. The highest no. of shoots were obtained from Egyptian clover + barely mixture at first cut (86.00), Egyptian clover + rye-grass mixture at the second cut and solid rye-grass stands and their mixture with Egyptian clover at the third cut in the second season. The date found in Table 4 resulted in may be because of the competition between Egyptian clover and grasses on the area at the same time when there cultivated together that is why the plants in mixtures were taller than the solid grasses stands. Egyptian clover is a competitive crop, due to its upright growth habit, long stems, high biomass accumulation, and high growth rate (Ross, 1999 and Vasilakoglou and Dhima, 2008). But this was in contrast with Holland and Brummer, 1999 that mentioned grasses plants are more competitive than legumes.

Table 4. Means of plant height and no. of shoots as affected by solid stands of Egyptian clover, rye-grass, oat, triticale, barely and mixtures of Egyptian clover with forage grasses during 2020/2021 and 2021/2022 seasons.

Treatments	Plant height (cm)			No. shoots (0.06 m^2)		
	1st cut	2nd cut	3rd cut	1st cut	2nd cut	3rd cut
First season (2020/2021)						
Egyptian clover(EC)	103.33	93.67	94.00	66.00	37.00	34.67
Rye-grass (R)	58.33	96.67	81.67	36.67	57.33	49.00
Oat (O)	80.00	98.67	91.67	31.33	47.00	23.00
Triticale (T)	56.67	103.00	117.33	35.00	47.33	24.00
Barely (B)	74.33	95.00	77.33	28.33	45.67	18.00
EC + R	91.00	88.33	105.00	61.00	76.00	63.67
EC + O	105.50	99.67	103.33	64.33	55.00	51.67
EC + T	84.83	97.17	91.33	53.67	67.33	33.33
EC + B	96.17	88.67	96.67	55.33	70.67	37.67
$LSD_{0.05}$	36.80	NS*	28.46	30.39	NS*	24.88
Second season (2021/2022)						
Egyptian clover(EC)	103.33	81.67	105.00	68.67	58.00	38.33
Rye-grass (R)	67.50	70.00	79.00	33.33	40.00	76.00
Oat (O)	78.33	58.33	70.00	47.00	44.00	16.33
Triticale (T)	67.67	76.00	94.00	40.33	27.67	14.00
Barely (B)	76.67	70.00	96.00	27.00	58.67	10.00
EC + R	80.83	79.17	90.83	76.33	89.67	68.33
EC + O	91.67	67.50	110.00	71.67	68.67	35.67
EC + T	92.00	92.67	105.00	64.67	62.67	30.00
EC + B	83.00	72.50	107.33	86.00	60.67	53.67
$LSD_{0.05}$	23.67	30.36	22.91	30.56	53.47	27.26

* **Non: significant**

Results of fresh and dry forage yields for each cut and total yield of solid stands and binary mixtures are presented in Table (5). Results showed that there were significant differences between solid stands and mixtures plans in fresh and dry forage yields in both seasons. The highest fresh and dry yields were insignificantly given from Egyptian clover +oat or triticale mixtures at all cuts in the first season, except at the second cut for fresh yield. Solid Egyptian clover had insignificantly the highest fresh yield (13.40 and 13.28 t fed^{-1}) than Egyptian clover + triticale mixture at the second and third cuts in the first season. Egyptian clover had faster regrowth after cutting than grasses and that may be increase fresh yield in third cut then increased the ratio of the Egyptian clover in mixture. This was in agreed with Yucel *et al.* (2018).

Besides Egyptian clover stands had the highest fresh and dry yields at the first cut in the second season (12.84 and 1.43 t fed^{-1}, respectively). Egyptian clover + oat mixture had the highest fresh and dry yields (11.58, 14.06, 1.64 and 2.65 t fed^{-1}, res.) at the second and third cuts in the second season, respectively. The highest total fresh forage yield was insignificantly obtained from solid Egyptian clover and Egyptian clover + oat mixture in both seasons. However, the highest total dry yield was significantly obtained from Egyptian clover + oat mixture in both seasons, except in the first season there was no significant between Egyptian clover + oat and Egyptian clover + triticale mixtures. In general, solid rye-grass gave the lowest total fresh (10.02 and 10.08 t fed^{-1}) and dry (1.27 and 1.53 t fed^{-1}) forage yields in both seasons, respectively. Except, in the second season there was insignificant between solid rye-grass and solid triticale for total fresh forage yield (Table 5). These results are agreed with Salama (2020) that found grasses improved the dry matter accumulation in the forage mixtures, with triticale and oat. Similarly, Egyptian clover dry yield was less than Egyptian clover with oat mixture which reported by Holland and Brummer, (1999) and Yucel *et al.* (2018). In contrary, it was disagreed with Salem *et al.* (2015) and Rady *et al.* (2022), who found that intercropping Egyptian clover and Italian ryegrass or with barely were very effective for improving fresh and dry forage yields and quality than intercropping

with triticale and oat. In the same trend, Lithourgidis *et al*. (2006) reported that oat and triticale wither in solid or in mixtures systems with Egyptian clover had less dry yield and quality may be because they have low compatibility between them and Egyptian clover.

Table 5. Means of fresh and dry forage yields (t fed^{-1}) as affected by solid stands of Egyptian clover, rye-grass, oat, triticale, barely and mixtures of Egyptian clover with forage grasses during 2020/2021 and 2021/2022 seasons.

Treatments	Fresh yield (t fed^{-1})			Total fresh yield	Dry yield (t fed^{-1})			Total dry
	1st cut	2nd cut	3rd cut	(t fed^{-1})	1st cut	2nd cut	3rd cut	yield (t fed^{-1})
First season (2020/2021)								
Egyptian clover (EC)	9.40	13.40	13.28	36.08	0.96	1.40	1.46	3.82
Rye-grass (R)	2.19	4.44	3.40	10.02	0.33	0.47	0.47	1.27
Oat (O)	6.78	8.54	0.74	16.06	1.05	0.98	0.11	2.14
Triticale (T)	3.68	8.64	4.84	17.16	0.57	1.02	1.04	2.62
Barely (B)	6.04	7.93	1.39	15.36	0.93	0.83	0.26	2.01
EC + R	7.43	9.45	9.82	26.71	1.05	1.23	2.09	4.36
EC + O	10.38	14.81	12.88	38.07	1.31	1.84	2.12	5.27
EC + T	10.48	11.11	12.40	33.99	1.35	1.61	2.38	5.33
EC + B	7.44	10.26	7.33	25.03	0.97	1.37	1.71	4.05
LSD $_{0.05}$	2.41	2.07	1.57	3.59	0.40	0.31	0.48	0.57
Second season (2021/2022)								
Egyptian clover (EC)	12.84	10.55	13.98	37.38	1.43	1.31	2.01	4.75
Rye-grass (R)	2.69	3.95	3.44	10.08	0.42	0.48	0.63	1.53
Oat (O)	6.62	4.31	0.99	11.93	0.92	0.66	0.20	1.78
Triticale (T)	4.43	4.25	1.30	9.98	0.61	0.66	0.30	1.56
Barely (B)	6.80	3.44	2.33	12.56	0.88	0.65	0.56	2.08
EC + R	10.20	8.41	12.37	30.99	1.22	1.13	2.26	4.60
EC + O	10.74	11.58	14.06	36.37	1.34	1.64	2.65	5.63
EC + T	10.45	8.63	12.39	31.46	1.24	1.27	2.15	4.66
EC + B	8.93	9.12	12.72	30.77	1.22	1.16	2.22	4.61
LSD $_{0.05}$	1.83	2.38	2.14	3.06	0.23	0.33	0.31	0.53

Table 6 cleared that cultivating Egyptian clover with grasses improved protein and fiber content in both seasons all over the cuts. Egyptian clover and Egyptian clover + oat or triticale had the highest insignificant protein yield at the first cut in the first season. Meanwhile, Egyptian clover had the highest protein and fiber yields (0.24 t fed^{-1}) at the first cut in the second season. Egyptian clover +oat mixture had the highest protein (0.24 and 0.38 t fed^{-1}) and fiber (0.33 and 0.55 t fed^{-1}) yields at the second and third cuts in the second season, respectively. Egyptian clover + oat mixture had the best total protein and fiber yields during the study in both seasons. Adding legumes to mixture increased crude protein content, in the same way adding grasses to mixture increased crude fiber content that is may be is a result for high protein and fiber in mixture. There were no significant differences between Egyptian clover + oat mixture and Egyptian clover + triticale mixture in the first season and between Egyptian clover + oat mixture and solid Egyptian clover stands in the second season for total protein yield. Yucel *et al*. (2018) mentioned that solid Egyptian clover produced higher crude protein ratio than Egyptian clover + triticale mixture. In contrast, the lowest values of total protein (0.18 and 0.21 t fed^{-1}) and fiber (0.27 and 0.37 t fed^{-1}) yields were achieved from solid rye-grass in both seasons, respectively. These results are agreed with Salama (2020) that found grasses improved the dry matter accumulation and carbohydrate components in the forage mixtures, with triticale and oat.

Table 6. Means of Protein and fiber yields (t fed^{-1}) as affected by solid stands of Egyptian clover, rye-grass, oat, triticale, barely and mixtures of Egyptian clover with forage grasses during 2020/2021 and 2021/2022 seasons.

Treatments	Protein yield (t fed^{-1})			Total protein	Fiber yield (t fed^{-1})			Total fiber
	1st cut	2nd cut	3rd cut	yield (t fed^{-1})	1st cut	2nd cut	3rd cut	yield (t fed^{-1})
First season (2020/2021)								
Egyptian clover (EC)	0.16	0.23	0.23	0.61	0.16	0.27	0.26	0.69
Rye-grass (R)	0.05	0.07	0.07	0.18	0.06	0.12	0.09	0.27
Oat (O)	0.16	0.13	0.02	0.30	0.18	0.27	0.02	0.47
Triticale (T)	0.08	0.15	0.13	0.36	0.10	0.26	0.26	0.61
Barely (B)	0.12	0.12	0.03	0.27	0.18	0.22	0.07	0.47
EC + R	0.16	0.19	0.32	0.67	0.21	0.25	0.40	0.86
EC + O	0.21	0.28	0.31	0.80	0.27	0.38	0.46	1.12
EC + T	0.21	0.23	0.35	0.79	0.22	0.29	0.49	1.00
EC + B	0.15	0.20	0.24	0.59	0.19	0.26	0.33	0.78
LSD $_{0.05}$	0.08	0.05	0.08	0.09	0.05	0.08	0.11	0.11
Second season (2021/2022)								
Egyptian clover (EC)	0.24	0.21	0.30	0.75	0.24	0.27	0.38	0.89
Rye-grass (R)	0.06	0.07	0.08	0.21	0.09	0.14	0.15	0.37
Oat (O)	0.12	0.09	0.03	0.24	0.18	0.19	0.05	0.42
Triticale (T)	0.09	0.08	0.04	0.21	0.11	0.18	0.08	0.37
Barely (B)	0.12	0.08	0.08	0.28	0.16	0.17	0.15	0.48
EC + R	0.20	0.17	0.32	0.69	0.20	0.24	0.47	0.91
EC + O	0.21	0.24	0.38	0.82	0.24	0.33	0.55	1.12
EC + T	0.19	0.18	0.31	0.68	0.22	0.29	0.44	0.95
EC + B	0.18	0.16	0.33	0.68	0.23	0.26	0.47	0.96
LSD $_{0.05}$	0.01	0.05	0.02	0.08	0.08	0.05	0.09	0.12

CONCLUSION

The results from this study indicated that intercropping Egyptian clover with rye-grass or oat or triticale and barely ameliorate fresh and dry forage yields and nutritive value. Intercropping of Egyptian clover with oat or triticale suppressed the other mixture in fresh and dry forage yields and then quality. This study recommends oat or triticale to intercrop with Egyptian clover because it could be a good companion crop for Egyptian clover.

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الإنتاجية الممكنة وجودة البرسيم المصرى محملاً مع النجيليات العلفية

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الملخص

يعتبر البرسيم المصرى محصول العلف الرئيسى فى مصر نظراً لانتاجيته المرتفعه ومحتواه المرتفع من البروتين وسرعة إعادة النمو بعد القطع. وبالرغم من محتوى البرسيم المصرى من البروتين المرتفع ولكنه فقير فى محتواه من الالياف وارتفاع محتواه من الرطوبة فى الحشات الأولى التى تسبب مشكلة خطيرة للحيوان. ومن ناحية أخرى، تتميز النجيليات العلفية بارتفاع حاصل المادة الجافة وانخفاض جودتها. لذلك يعتبر التحميل ممارسة جيدة لزيادة حاصل وجودة المحاصيل العلفية. أجريت تجربتان حقليتان بكلية الزراعة –جامعة القاهرة - الجيزة –مصر فى شتاء مواسم 2021/2020 و2022/2021. هدفت الدراسة لتقييم إنتاجية وجودة مخاليط البرسيم المصرى مع النجيليات العلفية خلال الثلاث حشات الأولى. أشتملت التجربة على تسع معاملات بنظام الزراعة المنفردة للبرسيم المصرى والراى جراس والشوفان والترتيكال والشعير والمخاليط الثنائية لكل من البرسيم المصرى والنجيليات العلفية السابقة بنسبة 50%:50%. رتبت المعاملات فى تصميم القطاعة الكاملة العشوائية باستخدام ثلاثة مكررات. وكانت الصفات المدروسة هى إرتفاع النبات (سم) وعدد الأفرع/وحدة المساحة وحاصل العلف الأخضر والجاف (طن/فدان) وحاصل البروتين والالياف الخام (طن/فدان). أظهرت النتائج بشكل عام أن مخلوط البرسيم المصرى + الشوفان أعطى أكثر حاصل كلى لكل من العلف الأخضر والجاف والبروتين والألياف الخام فى كلا الموسمين. وخلصت الدراسة إلى ان تحميل البرسيم المصرى مع النجيليات العلفية حسنت حاصل المادة الجافة ومحتوى النباتات من البروتين والألياف.

الكلمات الدالة: البرسيم المصرى، النجيليات العلفية، التحميل، المخاليط العلفية، الحاصل