RESULTS AND DISCUSSION

Data will be presented and discussed for the 4 subsequent cuts of the first and the second growing seasons as well as their combined analysis, where the total yield is the accumulation of the productivity of the obtained cuts in each season. The following parameter was studied :-

I. Forage yield :

1. Fresh forage yield :

Data for fresh forage yield of the proposed binary forage mixtures and their relevant pure stands for each of the 4 cuts and their accumulated total yield of the two respective winter seasons are presented in Tables (1 & 2). And the combined analysis of the two seasons is recorded in Table (3) .

Over the varieties of ryegrass and clover in their pure stands, total fresh forage yield of ryegrass was significantly higher than for clover. The total fresh forage yield was 31.26 and 26.11 ton/fed for ryegrasses and clovers, respectively in the first season with a decrease of 15.6%; being 47.24 and 40.24 ton/fed in the second season with a significant decrease of 14.8%. Also, the combined analysis of the two season showed similar results, where the total fresh yield was 39.28 and 33.17 ton/fed for ryegrasses and clover, respectively, with a decrease of 15.54% ton/fed , but such difference did not reach the level of significance

Regarding ryegrass varieties in their pure stands, total fresh forage yield of primora (Pri) was slightly the highest among the other two varieties of Promenade (Pro) or Tewara sama (Te). This

result was true in the two seasons and their combined analysis with slight fluctuated significant differences among the other ryegrass varities.

Similar variations between varieties regarding fresh forage productivity of various grasses (Tonic, Etna, Andy, Clipper, Zeinith, Billion and Abercomo) were reported by **Lascu (1982), Paim and Riboldi (1994), Sarhan and El-Selemy (1996), Williams *et al.*, (2000), Renato *et al.*, (2001) and Williams *et al.*, (2003).**

In pure stands, berseem clover cv Serwl (se) was the highest in fresh forage production than the other two varieties Tarkeby seds (Ta) and Sakha 96 (Sa). Such result was true for the two seasons and their combined analysis with slight various significant differences among the other two varieties as it is clear from Tables (1, 2 and 3, respectively).

It is also clear that berseem clover cv Sa produced slightly higher fresh forage yield than Ta cv. with significant difference in the second season only. Whereas, such differences in the first season and the combined analysis for the later two berseem clover cultivars were not significant. Among researchers who found differences in forage productivity of the grown forage legumes in their pure stands were **Lascu (1982), Paim and Riboldi (1994), Bahy (1996), Williams *et al.*, (2000), Yarrow and Penning (2001) and Williams *et al.*, (2003).**

It is also clear from Tables (1, 2 and 3) that more or less pure stands of berseem clover varieties and ryegrass behaved unlikely concerning fresh forage yield of the subsequent cuts. Total forage yield of ryegrass increased substantially for the

subsequent cuts where the highest fresh forage yield was produced from the fourth or the latest cuts. This result was true in the first and second growing seasons as well as their combined analysis. Such result was not the case for the pure berseem clover varieties especially for the first season and the combined analysis.

The progressive substantial increase in fresh forage production of the pure grasses for the latest cuts were much more in quantity than the first cuts. This may indicate the relative aggressivity for growth and tillering and /or branching of ryegrasses plants compared to clovers as the age and duration of their stand proceed. This result was clear in the two seasons (Table 1 & 2) and the combined analysis (Table, 3).

Among the grown forage mixtures of legumes and grasses, the total fresh forage yield for each of the three berseem clover varieties (Se, Ta and Sa) with any of the associated three ryegrass varieties (Pro, Te and Pri) showed no significant differences. This indicates no preference for any of the there grown berseem clover varieties for the proposed forage mixtures with any of ryegrass variety as for as fresh forage yield is concerned.

The above results indicated no aggressively or severe competition between the associated crops were noticed on the total forage production. Moreover, the advantages of such associations in the proposed mixtures were obviously clear. The benefits were very well reflected on the obtained forage production of the associated mixtures than their pure stands.

The advantages of forage mixtures (Legumes and grasses)

are more likely due to the mutual benefits of such components of the mixture to each other. Legumes provide grasses with nitrogen from the ambient air through the inoculation with Rhyzobium bacteria. Whereas, grasses protect legumes from cold weather and lodging. Meanwhile each of the associated legumes and grasses required different nutrients in respect of variety and quantity which used to be supplied from various soil zones. So, the competition of the two kinds of the forage mixture for the adequate requirements to growth and development are out of question. Moreover, the competes of the mixture forage components over weeds will be another advantages as a biological weed control phenomenon which will leave chances for better growth of the associated forage mixtures.

In addition, better and favorable micro- environment for enhancing growth of the intensive forage mixture will be created within plant canopies. The above reasons and others confirm the advantages of forage mixtures (legumes and grasses) compared to each of their components in pure stands. Such reasons may explain the obtained significant superiority of the associated forage mixtures..

However, results showed that the effect of each berseem clover variety over the 3 ryegrass varieties in mixtures with ryegrass varieties was slightly more for Sa, than Ta followed by Se varieties in fresh forage productivity. This ranking order was noticed in the second season (Table 2) and the combined analysis of the two seasons (Table 3) but not in the first one (Table 1).

So, could be generally concluded that any of the proposed forage mixtures produced significantly higher fresh

forage yield than its relevant components in their pure stands in the first and second seasons (Tables 1 and 2) as well as their combined analysis. (Table 3). Similar results proved the beneficial effect of forage mixtures (Legumes and grasses) as compared with its relevant yields in their pure stands were reported by. **Kulich and Morhace (1981), Picard (1986), Abd El- Sattar *et al.* (1996), Nie *et al.* (2000) and Tisserand *et al.* (2002).**

Results evedintiated significant increase in total fresh forage yield of the proposed forage mixtures as compared with any of its relevant pure berseem clover or ryegrass varieties in their mixtures. Also, this result was true over the average of the three varieties of berseem clover and / or ryegrass varieties in their pure stands. The same trend of forage yield was noticed in first (Table 1) and second seasons (Table2) as well as their combined analysis (Table 3). Such obtained results for the superiority of the proposed forage mixtures of berseem clover and ryegrass varieties than their relevant pure stands was well confirmed by many other researchers. Among those are **Kulich and Morhace (1981), Evans and Hill (1983), Krzywiccki *etal.*,(1984), Tiwana and Puri (1984), Picard (1986), Gielen *et al.*, (1990), Menhace and Connolly (1990), Karakurt and Ekiz (1994), Abd El- Sattar *et al* (1996), Moustafa (1996), Sarhan and El- Selemy (1996), Nei *et al.*, (2000), Williams *et al.*, (2000), Callow *et al* (2001), Daniel *et al* (2001), and Tisserand *et al.* (2002).**

Results also showed that the grown forage mixtures were not of high differences in their fresh forage yield productivity.

This is because the obtained productivity ranged from 33.22 – 37.10 ton/fed in the first season, 47.74-52.03 ton/fed in the second season and 41.52-43.68 ton/fed in their combined analysis. Meanwhile, there was a number of significant differences in fresh forage yield productivity among the various mixture with relatively small variable magnitudes of no specific trend. These results were noticed in the two seasons and their combined analysis as well.

The obtained slight ignorable differences among the proposed mixture in total fresh forage yield could be due to the interelation benifits for the mixtures components on each other in a way that any shortage or differences in growth requirements used to be compensated through the specific botanical components of the mixtures. In addition the other advantages of forage mixture that presented previously could be other reason for the close yield values of the proposed mixtures.

It is worth noting that previously mentioned results were also noticed for the individual cuts of each season with more or less of acceptable differences according to the prevailing environment situation during each of the subsequent four cuts in each season. But the accumulated total fresh forage yield of such cuts of each of the two seasons and their combined analysis gave more clear picture about the overall situation concerning fresh forage productivity of the proposed forage mixtures and their relevant pure stands as previously presented and discussed .

Table (1): Fresh yield of binary forage mixtures and their relevant pure stands during the first season, (2001-2002).

No.	Treatment	1st cut	2nd cut	3rd cut	4th cut	Total
	Legumes (L).	.....(Ton/fed)				
1	Se	5.79 c-f	7.65 cd	8.05 d	5.85 g	27.34 h
2	Ta	5.18 fg	7.49 de	7.29 e	5.23 gh	25.19 I
3	Sa	5.43 e-g	7.56 c-e	7.83 de	4.98 h	25.79 I
Mean		5.47 CD	7.57 C	7.72 C	5.35 C	26.11 C
	Grasses (G)					
4	Pro	5.28 e-g	7.27 d-e	9.55 bc	8.65 f	30.75 g
5	Te	4.85 g	6.93 e	9.43 bc	9.99 c-e	31.19 g
6	Pri	5.49 e-g	7.57 c-d	8.84 c	9.95 c-e	31.85 fg
Mean		5.21 D	7.26 C	9.27 B	9.86 B	31.26 B
	Mixtures (M)					
7	Se x Pro (M1)	6.35 b-d	9.14 a	9.34 bc	10.88 ab	35.70 a-c
8	Se x Te (M2)	5.75 d-f	8.88 a	9.02 c	9.58 e	33.22 ef
9	Se x Pri (M3)	5.84 c-f	9.08 a	9.50 bc	9.94 c-e	34.36 c-e
Mean		5.98 BC	9.03 A	9.29 B	10.13 A	34.43 A
10	Ta x Pro (M4)	6.00 b-e	8.16 bc	9.97 ab	9.68 de	33.82 de
11	Ta x Te (M5)	6.57 ab	8.79 ab	10.60 a	10.00 c-e	35.96 ab
12	Ta x Pri (M6)	6.05 b-e	8.65 ab	9.90 ab	11.37 a	35.97 ab
Mean		6.21 AB	8.53 B	10.16 A	10.35 A	35.25 A
13	Sa x Pro (M7)	6.65 ab	8.77 ab	9.18 bc	10.60 bc	35.20 b-d
14	Sa x Te (M8)	5.89 b-f	8.85 a	9.47 bc	10.24 b-e	34.44 b-e
15	Sa x Pri (M9)	7.30 a	8.87 a	10.53 a	10.40 b-d	37.10 a
Mean		6.61 A	8.83 AB	9.73 AB	10.41 A	35.58 A

Legumes (L): Berseem clover varieties: Serw 1 (Se), Tarkeby seds (Ta) and Sakha 96 (Sa).

Grasses (G): Ryegrass varieties : Promenade (Pro), Tewara Sama (Te) and Primora (Pri).

Table (2): Fresh yield of binary forage mixtures and their relevant pure stands during the second season, (2002-2003).

No.	Treatment	1st cut	2nd cut	3rd cut	4th cut	Total
	Legumes (L).	.....(Ton/fed)				
1	Se	10.13 ef	9.79 d	9.22 f	12.14 ef	41.28 h
2	Ta	9.53 f	9.52 e	8.11 g	11.63 f	38.79 I
3	Sa	9.73 ef	9.70 e	9.11 f	12.10 ef	40.64 h
Mean		9.80 D	9.67 C	8.81 C	11.96 B	40.24 C
	Grasses (G)					
4	Pro	11.35 cd	9.69 e	10.70 de	14.05 a-d	45.79 g
5	Te	11.30 cd	11.03 cd	11.10 de	14.05 a-d	47.48 fg
6	Pri	11.50 cd	11.09 cd	11.11 de	14.76 abc	48.46 def
Mean		11.38 B	10.90 B	10.97 B	14.29 A	47.24 B
	Mixtures (M)					
7	Se x Pro (M1)	13.11 a	12.23abc	12.05 ab	13.86 bcd	51.26 abc
8	Se x Te (M2)	11.42 cd	12.11abc	12.47 a	13.88 bcd	49.88 a-e
9	Se x Pri (M3)	10.60 def	13.16 a	10.95 de	14.94 ab	49.66 b-f
Mean		11.71 B	12.50 A	11.82 A	14.23 A	50.27 A
10	Ta x Pro (M4)	12.91 ab	12.72 ab	11.93abc	14.47 a-d	52.03 a
11	Ta x Te (M5)	11.43 cd	12.64 ab	11.27cde	15.12 ab	50.46 a-d
12	Ta x Pri (M6)	13.54 a	13.12 a	11.39bcd	13.35 cde	51.40 ab
Mean		12.63 A	12.83 A	11.53 A	14.31 A	51.30 A
13	Sa x Pro (M7)	12.03 bc	13.03 a	10.81 de	13.17 de	49.04 c-f
14	Sa x Te (M8)	10.72 de	13.17 a	10.54 e	14.17 a-d	48.61 def
15	Sa x Pri (M9)	9.54 f	11.44 bc	11.32 cd	15.44 a	47.74 efg
Mean		10.76 C	12.55 A	10.89 B	14.26 A	48.46 B

Legumes (L): Berseem clover varieties: Serw 1 (Se), Tarkeby seds (Ta) and Sakha 96 (Sa).

Grasses (G): Ryegrass varieties : Promenade (Pro), Tewara Sama (Te) and Primora (Pri).

Table (3): Fresh yield of binary forage mixtures and their relevant pure stands (combined over the two seasons).

No.	Treatment	1st cut	2nd cut	3rd cut	4th cut	Total
	Legumes (L).	.....(Ton/fed)				
1	**Se**	**7.96** def	**8.72** cd	**8.63** d	**9.00** e	**34.31** g
2	**Ta**	**7.35** f	**8.50** d	**7.70** e	**8.43** e	**31.99** h
3	**Sa**	**7.58** ef	**8.63** cd	**8.48** d	**8.54** e	**33.21** gh
Mean		7.63 A	8.62 B	8.27 B	8.32 B	33.17 B
	Grasses (G)					
4	**Pro**	**8.32** d	**8.48** d	**10.06** c	**11.35** d	**38.21** f
5	**Te**	**8.08** de	**8.98** cd	**10.27** bc	**12.02** bcd	**39.34** ef
6	**Pri**	**8.50** cd	**9.33** c	**9.98** c	**12.36** abc	**40.15** e
Mean		8.30 A	8.93 AB	10.10 A	11.91 A	39.23 AB
	Mixtures (M)					
7	**Se x Pro** (M1)	**9.73** a	**10.68** ab	**10.69** ab	**12.37** abc	**43.48** ab
8	**Se x Te** (M2)	**8.58** cd	**10.50** ab	**10.74** ab	**11.73** cd	**41.55** d
9	**Se x Pri** (M3)	**8.22** de	**11.12** a	**10.23** bc	**12.44** abc	**42.01** cd
Mean		8.84 A	10.77 A	10.55 A	12.18 A	42.35 A
10	**Ta x Pro** (M4)	**9.46** ab	**10.44** ab	**10.95** a	**12.07** bcd	**42.92** a-d
11	**Ta x Te** (M5)	**9.00** bc	**10.71** ab	**10.94** a	**12.56** ab	**43.21** abc
12	**Ta x Pri** (M6)	**9.80** a	**10.89** ab	**10.64** ab	**12.36** abc	**43.68** a
Mean		9.42 A	10.68 AB	10.84 A	12.33 A	43.27 A
13	**Sa x Pro** (M7)	**9.34** ab	**10.90** ab	**10.00** c	**11.89** bcd	**42.12**bcd
14	**Sa x Te** (M8)	**8.30** d	**11.01** a	**10.00** c	**12.21** abc	**41.52** d
15	**Sa x Pri** (M9)	**8.42** cd	**10.15** b	**10.93** a	**12.92** a	**42.42** a-d
Mean		8.69 A	10.67 AB	10.31 A	12.34 A	42.02 A

Legumes (L): Berseem clover varieties: Serw 1 (Se), Tarkeby seds (Ta) and Sakha 96 (Sa).

Grasses (G): Ryegrass varieties : Promenade (Pro), Tewara Sama (Te) and Primora (Pri).

2. Dry forage yield :

Data for dry forage yield of the proposed forage mixtures and their relevant pure stands during the two successive seasons and their combined analysis are presented in Tables (4, 5 and 6). Such data represent the dry yield of each the four cuts of and the accumulated total yield of each season and their combined analysis.

Results obviously indicated significant superiority of the total dry forage yield for the grown ryegrass varieties than berseem clover varieties for the first and second seasons (Tables 4 and 5). The respective total dry yield for the berseem clovers and ryegrasses was 4.48 and 3.744 ton/fed in the first season being 5.738 and 5.225 ton/fed in the second season with significant differences. Whereas, the respective dry yield in the combined analysis (Table 6) showed the same trend with slight insignificant increase in yield for ryegrasses (5.11 ton/fed) compared to clovers (4.48 ton/fed).

Similar trend was noticed for the individual four cuts in each of the two seasons and their combined analysis as well. The obtained differences in dry yield of ryegrass than clovers were higher in all of the individual cuts except the second cut of the first season. However, such differences were slightly fluctuated in magnitudes among the subsequent cuts (Table 4, 5 and 6).

Among berseem clover or the ryegrass varieties in their pure stands, the differences in total dry yield were not that great. However, berseem clover Tarkeby seds (Ta) produced the lowest total dry yield than Serwl (Se) and Sakha 96 (Sa) where the difference for the later two varieties was very slight and could be

ignored. The respective total dry yield was 3.630, 3.935 and 3.666 ton/fed in the first season (Table 4) being 4.989, 5.472 and 5.214 ton/fedin the second season (Table 5) and 4.31, 4.70 and 4.44 ton/fed for their combined analysis (Table 6). Similar varieties between varieties and varieties concerning dry forage productivity among various forage legumes (Giza, Giza 10, Sakha4, Giza 15 and Helaly) were reported by **Evans and Hill (1983), Paim and Riboldi (1994), Bahy and Bakheit (1996), Williams *et al* (2000), Yarrow and Penning (2001) and Williams *et al* (2003).**

It is also clear among the growth of ryegrass varieties in their pure stands that promende variety (Pro) produced the lowest total dry yield compared with Twara Sama (Te) or Primora (Pri) varieties . The respective total dry yield was 4.381, 4.469 and 4.591 ton/fed in the first season, being 5.564, 5.810 and 5.841 ton/fed in second season, and 4.97, 5.14 and 5.22 in their combined analysis (Tables 4, 5 and 6). It is also noticed that the difference in total dry yield between the later two varieties of ryegrass was very slight and not significant that could be ignored. Similar result was noticed in total forage yield previously presented and discussed (Tables 4, 5 and 6). Among researchers who found differences in dry forage productivity of growen grasses in pure stands were **Kulich and Morhace (1981), Krzywiccki *et al* (1984), Paim and Riboldi (1994), Sarhan and El-Selemy (1996), Renato *et al* (2001) and Williams *et al* (2003).**

It could be concluded that Se or Sa berseem clover varieties were better than Ta in their pure stands compared with Ta variety in respect of total dry yield production. And Te or Pri ryegrass varieties are better than Pro variety in total forage dry yield production.

It is worth noting that the above trend was almost similar to the accumulated dry yield for the subsequent individual four cuts of the two seasons and in their combined analysis. In other words, dry yield of the individual cuts of each of the two seasons and their combined analysis was more or less behaved in a similar mannar as previously presented and discussed with the accumulated total dry yield (Tables 4, 5 and 6).

Results indicated that any of the proposed forage mixtures produced significantly higher dry yield as compared with any of their relevant components in their pure stands. These results were true for the two season (Tables 4 and 5) and their combined analysis (Table 6). Meanwhile , this trend was noticed on the basis of the individual cuts and over the three pure stands of ryegrass varieties and or clover varieties Similar results proved the beneficial effect of forage mixtures (Legumes and grasses) as compared with their sole crop of each. Among those researchers were **Evans and Hill (1983), Chujo and Daimon (1984), Krzywiccki *etal.* (1984), Paim and Riboldi (1994), Tiwana and Puri (1984), Giclen *et al.*, (1990), Menhace and Connolly (1990), Karakurt and Ekiz (1994), Moustafa (1996), Sarhan and El- Selemy (1996), Williams *et al.*, (2000), Callow *et al*** (2001), **Daniel *et al*** (2001), **Odhimbo and Bomke (2001),**

Renato *et al* (2001), Yarrow and Penning (2001) and Ghanbari and Lee (2003).

It should be noted that the behavior of the obtained dry forage yield of the proposed mixture and their pure stands was almost similar to fresh yield previously discussed (Tables 1, 2 and 3), with some slight variations of different magnitudes on the basis of the individual cuts and seasons which was reflected on the total yield. However, this trend was more or less similar in fresh and dry yield.

In other words, dry forage yield of the proposed associated mixtures was higher than their relevant pure stands. This result was true on the basis of individual cuts and total dry yield in the two seasons and combined analysis with slightly varied magnitudes, Moreover, variations between dry forage yield between the growen forage mixtures were not varied much in their dry forage yield on the basis of the individual cuts and / or the total dry yield in the two seasons and combined analysis as well. This is because the above limits of differences among mixtures in dry yield were very limited and could be ignored in most cases in spite of the obtained few significance differences.

Table (4): **Dry yield of binary forage mixtures and their relevant pure stands during the first season, (2001-2002).**

No.	Treatment	1st cut	2nd cut	3rd cut	4th cut	Total
	Legumes (L).	.....(Ton/fed)				
1	**Se**	**0.64** cd	**0.85** cd	**1.29** cd	**1.15** d	**3.935** f
2	**Ta**	**0.57** d	**0.86** cd	**1.18** d	**1.02** de	**3.630** f
3	**Sa**	**0.66** cd	**0.83** de	**1.28** cd	**0.90** e	**3.666** f
Mean		0.62 B	0.85 B	1.25 B	1.02 c	3.7444 C
	Grasses (G)					
4	**Pro**	**0.77** abc	**0.74** ef	**1.33** bcd	**1.54** c	**4.381** e
5	**Te**	**0.71** cd	**0.67** f	**1.37** bcd	**1.73** bc	**4.469** de
6	**Pri**	**0.73** bc	**0.83** de	**1.29** cd	**1.75** bc	**4.591** cde
Mean		0.74 A	0.75 C	1.33 AB	1.67 B	4.480 B
	Mixtures (M)					
7	**Se x Pro** (M1)	**0.76** abc	**0.95** abc	**1.47** abc	**2.04** a	**5.216** ab
8	**Se x Te** (M2)	**0.74** abc	**0.89** bcd	**1.40** a-d	**1.78** abc	**4.806** bcd
9	**Se x Pri** (M3)	**0.75** abc	**1.03** a	**1.45** abc	**1.86** ab	**5.086** ab
Mean		0.75 A	0.96 A	1.44 AB	1.89 A	5.036 A
10	**Ta x Pro** (M4)	**0.74** abc	**0.87** bcd	**1.46** abc	**1.97** ab	**5.032** ab
11	**Ta x Te** (M5)	**0.75** abc	**0.98** ab	**1.62** a	**1.82** ab	**5.163** ab
12	**Ta x Pri** (M6)	**0.75** abc	**0.89** bcd	**1.54** ab	**2.04** a	**5.220** ab
Mean		0.75 A	0.91 AB	1.54 A	1.94 A	5.138 A
13	**Sa x Pro** (M7)	**0.87** ab	**0.90** bcd	**1.37** bcd	**2.02** a	**5.165** ab
14	**Sa x Te** (M8)	**0.74** abc	**0.95** abc	**1.37** bcd	**1.91** ab	**4.970** abc
15	**Sa x Pri** (M9)	**0.89** a	**0.88** bcd	**1.53** ab	**2.02** a	**5.315** a
Mean		0.83 A	0.91 AB	1.42 AB	1.98 A	5.150 A

Legumes (L): Berseem clover varieties: Serw 1 (Se), Tarkeby seds (Ta) and Sakha 96 (Sa).

Grasses (G): Ryegrass varieties : Promenade (Pro), Tewara Sama (Te) and Primora (Pri).

Table (5): Dry yield of binary forage mixtures and their relevant pure stands during the second season, (2002-2003).

No.	Treatment	1st cut	2nd cut	3rd cut	4th cut	Total
	Legumes (L).	.....(Ton/fed)				
1	**Se**	**1.16** cd	**1.13** d	**1.29** abc	**1.89** bc	**5.472** def
2	**Ta**	**1.05** d	**1.05** d	**1.07** c	**1.82** c	**4.989** f
3	**Sa**	**1.13** d	**1.09** d	**1.05** c	**1.95** abc	**5.214** ef
Mean		1.12 C	1.09 B	1.14 A	1.89 A	5.225 D
	Grasses (G)					
4	**Pro**	**1.28** bcd	**1.08** d	**1.37** ab	**1.84** c	**5.564** cde
5	**Te**	**1.20** bcd	**1.26** bcd	**1.43** ab	**1.93** bc	**5.810** bcd
6	**Pri**	**1.23** bcd	**1.17** cd	**1.47** ab	**1.97** abc	**5.841** bcd
Mean		1.24 BC	1.17 B	1.42 A	1.91 A	5.738 C
	Mixtures (M)					
7	**Se x Pro** (M1)	**1.47** abc	**1.38** abc	**1.43** ab	**2.00** abc	**6.285** ab
8	**Se x Te** (M2)	**1.34** a-d	**1.39** abc	**1.42** ab	**2.12** abc	**6.276** ab
9	**Se x Pri** (M3)	**1.13** d	**1.46** ab	**1.30** abc	**2.15** abc	**6.030** abc
Mean		1.31 B	1.41 A	1.38 A	2.09 A	6.197 AB
10	**Ta x Pro** (M4)	**1.49** ab	**1.40** abc	**1.54** a	**2.10** abc	**6.525** a
11	**Ta x Te** (M5)	**1.28** bcd	**1.41** abc	**1.41** ab	**2.33** a	**6.428** a
12	**Ta x Pri** (M6)	**1.62** a	**1.50** ab	**1.45** ab	**1.91** bc	**6.479** a
Mean		1.46 A	1.44 A	1.43 A	2.11 A	6.478 A
13	**Sa x Pro** (M7)	**1.33** a-d	**1.56** ab	**1.24** bc	**1.98** abc	**6.100** abc
14	**Sa x Te** (M8)	**1.18** bcd	**1.49** ab	**1.31** abc	**2.00** abc	**5.974** a-d
15	**Sa x Pri** (M9)	**1.09** d	**1.27** bcd	**1.45** ab	**2.25** ab	**6.060** abc
Mean		1.20 BC	1.44 A	1.33 A	2.08 A	6.045 BC

Legumes (L): Berseem clover varieties: Serw 1 (Se), Tarkeby seds (Ta) and Sakha 96 (Sa).

Grasses (G): Ryegrass varieties : Promenade (Pro), Tewara Sama (Te) and Primora (Pri).

Table (6): Dry yield of binary forage mixtures and their relevant pure stands (combined over the two seasons).

No.	Treatment	1st cut	2nd cut	3rd cut	4th cut	Total
	Legumes (L).	.....(Ton/fed)				
1	**Se**	**0.90** de	**0.99** cd	**1.29** bc	**1.52** ef	**4.70** ef
2	**Ta**	**0.81** e	**0.95** cd	**1.12** d	**1.42** f	**4.31** g
3	**Sa**	**0.90** de	**0.96** cd	**1.16** cd	**1.42** f	**4.44** fg
Mean		0.87 A	0.97 A	1.19 C	1.45 B	4.48 B
	Grasses (G)					
4	**Pro**	**1.03** a-d	**0.91** d	**1.35** ab	**1.69** de	**4.97** de
5	**Te**	**0.95** b-e	**0.97** cd	**1.40** ab	**1.83** cd	**5.14** d
6	**Pri**	**0.98** b-e	**1.00** cd	**1.38** ab	**1.86** bcd	**5.22** cd
Mean		0.99 A	0.96 A	1.38 AB	1.79 A	5.11 AB
	Mixtures (M)					
7	**Se x Pro** (M1)	**1.12** ab	**1.17** ab	**1.45** ab	**2.02** abc	**5.75** ab
8	**Se x Te** (M2)	**1.04** a-d	**1.14** ab	**1.41** ab	**1.95** abc	**5.54** ab
9	**Se x Pri** (M3)	**0.94** cde	**1.25** a	**1.37** ab	**2.00** abc	**5.56** ab
Mean		1.03 A	1.19 A	1.41 AB	1.99 A	5.62 A
10	**Ta x Pro** (M4)	**1.11** abc	**1.13** ab	**1.50** a	**2.04** abc	**5.78** ab
11	**Ta x Te** (M5)	**1.01** bcd	**1.20** ab	**1.52** a	**2.07** ab	**5.80** ab
12	**Ta x Pri** (M6)	**1.18** a	**1.20** ab	**1.50** a	**1.97** abc	**5.85** a
Mean		1.10 A	1.18 A	1.51 A	2.03 A	5.81 A
13	**Sa x Pro** (M7)	**1.10** abc	**1.23** a	**1.30** bc	**2.00** abc	**5.63** ab
14	**Sa x Te** (M8)	**0.96** b-e	**1.22** a	**1.34** ab	**1.95** abc	**5.47** bc
15	**Sa x Pri** (M9)	**0.99** bcd	**1.08** bc	**1.49** a	**2.14** a	**5.69** ab
Mean		1.02 A	1.18 A	1.38 B	2.03 A	5.60 A

Legumes (L): Berseem clover varieties: Serw 1 (Se), Tarkeby seds (Ta) and Sakha 96 (Sa).

Grasses (G): Ryegrass varieties : Promenade (Pro), Tewara Sama (Te) and Primora (Pri).

II. Growth characteristics:

1. Plant Height :

Data for the height of plants in their pure stand were varied according their nature (legumes / grasses), varieties and or varieties , seasons and the subsequent duration of cuts as it is clear from Tables (7 & 8).

In pure stands difference in height of plants in pure stands over the four cuts indicated that Sakha, clover cultivar (Sa) was of significant tallest plants compared to serw 1 (Se) and Tarkeby Seds (Te) varieties, where height of their plant did not significantly varied among the later two varieties. There result was noticed during the two reasons (Tables 7 and 8) and their combined analysis (Table 9).

Also, the three varieties of ryegrass in their pure stands did not show appreciable differences in their plant heights in the first season (Table 7) and their combined analysis (Table 9). Whereas, in the second season (Table 8), ryegrass promenade variety (Pro) was significantly of the tallest plants as compared with Tewara sama (Te) and primora (Pri) varieties with no significant difference among the later two varieties.

Height of plants in pure stands for the individual cuts of each of the two seasons and their combined analysis showed slight significant differences within ryegrasses varieties and/or clover varieties with no specific trend among each of the subsequent cuts.

Also, in pure stands, over varieties of ryegrasses or varieties of berseem clover, ryegrasses plants were much taller

than clovers (73.33 vrs 62.93 cm) in the first season of the 3rd cut and (72.37 vrs 60.32 cm) in the second season of the 4th cut. Whereas, in the other cuts of the two seasons, such differences in plant heights of ryegrasses or clovers were not always constant and more likely fluctuated with no specific trend (Table 7 and 8). Further studies in this respect should be done.

In the proposed mixtures, results indicated that height of plants in the such proposed mixtures varied than what was noticed in their relevant pure stands. On the average of the four cuts, it was noticed that height of clover plants were slightly shorter in mixture than in their pure stands. Whereas, an opposite situation was noticed with ryegrasses in their mixtures with berseem clover. This result indicates that the competition in the proposed mixtures are in favour of grasses than legumes. In other words, grasses tried to compete with legumes for light and the essential requirements for growth and elongation, which finally produced taller grass plants in the grown mixture than in their pure stands.

Table (7): Plant height of binary forage mixtures and their relevant pure stands during the first season (2001-2002).

No.	Treatment	1st cut		2nd cut		3rd cut		4th cut		Mean	
		L	G	L	G	L	G	L	G	L	G
	Legumes (L).	(cm)									
1	**Se**	**33.00** abc		**55.60** a		**62.98** b		**52.78** bcd		**51.09** bc	
2	**Ta**	**31.75** abc		**51.03** b		**62.53** b		**54.78** abc		**50.02** b-e	
3	**Sa**	**35.88** a		**55.45** a		**63.28** b		**58.50** a		**53.28** a	
	Mean	33.54		54.03		62.93		55.35		51.46	
	Grasses (G)										
4	**Pro**		**31.93** de		**37.80** c		**75.10** ab		**38.40** d		**45.81** e
5	**Te**		**32.03** de		**39.35** c		**74.40** abc		**38.03** d		**45.95** e
6	**Pri**		**35.53** bcd		**38.30** c		**70.50** e		**38.53** d		**45.71** e
	Mean		33.16		38.48		73.33		38.32		45.82
	Mixtures(M)										
7	**Se xPro** (M1)	**32.65** abc	**38.13** b	**50.80** b	**56.78** a	**63.73** b	**73.98** bcd	**49.63** d	**45.38** b	**49.20** c-f	**53.56** b
8	**Se xTe** (M2)	**28.45** c	**33.08** cde	**44.43** def	**53.30** ab	**61.45** b	**69.65** e	**45.13** e	**44.83** b	**44.86** g	**50.21** cd
9	**Se xPri** (M3)	**32.18** abc	**29.40** e	**45.80** cde	**52.65** b	**64.85** ab	**71.18** de	**48.88** d	**44.68** b	**47.93** f	**49.48** d
	Mean	31.09	33.54	47.01	54.24	63.34	71.63	47.88	44.96	47.33	51.08
10	**Ta xPro**(M4)	**34.13** ab	**34.55** bcd	**46.53** cde	**55.38** ab	**61.65** b	**68.83** e	**51.53** cd	**44.75** b	**48.46** ef	**50.88** cd
11	**Ta x Te** (M5)	**35.03** a	**41.78** a	**46.83** cd	**55.38** ab	**67.28** a	**77.30** a	**56.58** ab	**47.45** ab	**51.43** b	**55.48** a
12	**Ta x Pri** (M6)	**32.15** abc	**36.28** bc	**47.93** c	**53.20** ab	**64.10** ab	**71.75** cde	**51.98** cd	**43.65** bc	**49.04** def	**51.22** cd
	Mean	33.77	37.52	47.10	54.65	64.34	72.63	53.36	45.28	49.64	52.53
13	**Sax Pro**(M7)	**34.23** ab	**32.28** de	**43.65** ef	**53.38** ab	**61.55** b	**69.15** e	**50.43** d	**51.75** a	**47.46** f	**51.64** c
14	**Sa xTe** (M8)	**29.80** bc	**32.35** de	**42.45** f	**54.55** ab	**62.88** b	**76.05** ab	**44.60** e	**39.38** cd	**44.93** g	**50.58** cd
15	**Sa xPri** (M9)	**35.68** a	**37.83** b	**51.30** b	**56.98** a	**64.88** ab	**76.45** ab	**50.10** d	**44.03** bc	**50.49** bcd	**53.82** ab
	Mean	33.24	34.15	45.80	54.97	63.10	73.88	48.38	45.05	47.63	52.01
	G.M	32.70	35.07	36.63	54.62	63.59	72.71	49.87	45.20	48.10	51.97

Legumes (L): Berseem clover varieties : Serw l (Se), Tarkeby seds (Ta) and Sakha 96 (Sa).

Grasses (G): Ryegrass varieties : Promenade (Pro), Tewarsama (Te) and Primora (Pri).

Table (8): Plant height of binary forage mixtures and their relevant pure stands during the second season (2002-2003).

No.	Treatment	1st cut		2nd cut		3rd cut		4th cut		Mean	
		L	G	L	G	L	G	L	G	L	G
	Legumes (L).	(cm)									
1	Se	52.18 ab		42.63 bc		51.88 a		63.03 a		52.43 a	
2	Ta	45.73 c		48.18 a		46.78 abc		54.80 c		48.87 de	
3	Sa	47.33 bc		44.13 bc		50.85 ab		63.15 a		51.36 abc	
	Mean	45.08		44.98		49.90		60.33		50.89	
	Grasses (G)										
4	Pro		52.60 ab		51.70 abc		50.55 b		72.90 abc		56.94 abc
5	Te		50.28 b		48.33 b-e		49.63 b		70.48 bc		54.68 d
6	Pri		44.45 c		53.90 a		49.93 b		73.75 abc		55.51 bcd
	Mean		49.11		51.31		50.04		72.38		55.71
	Mixtures(M)										
7	Se xPro(M1)	53.83 a	55.05 ab	45.00 abc	46.23 de	48.70 abc	52.90 ab	59.73 abc	76.50 a	51.81 ab	58.42 a
8	Se xTe (M2)	50.03 abc	56.68 a	45.80 ab	46.93 cde	47.68 abc	53.23 ab	61.25 ab	74.90 abc	51.19 abc	57.93 a
9	Se xPri (M3)	48.60 abc	52.85 ab	43.38 bc	51.55 abc	45.88 abc	53.23 ab	61.08 ab	73.73 abc	49.73 bcd	57.84 a
	Mean	50.82	54.86	44.73	48.24	47.42	53.12	60.69	75.04	50.91	58.06
10	TaxPro(M4)	50.93 abc	55.35 ab	41.50 c	48.70 b-e	45.58 b-e	55.38 a	62.00 ab	73.98 abc	50.00 bcd	58.35 a
11	Ta x Te(M5)	47.85 bc	54.43 ab	41.55 c	49.75 a-d	43.65 a-d	53.15 ab	56.33 bc	74.30 abc	47.34 e	57.91 a
12	Ta xPri(M6)	47.78 bc	54.50 ab	44.45 abc	51.93 ab	45.25 ab	53.15 ab	57.38 abc	70.15 bc	48.71 de	57.43 ab
	Mean	48.85	54.76	42.50	51.13	44.83	53.89	58.57	72.81	48.68	57.90
13	Sax Pro(M7)	49.00 abc	50.05 b	44.08 bc	50.28 ab	51.10 a-d	50.68 b	58.4 abc	64.20 c	50.64 a-d	53.05 d
14	Sa xTe (M8)	47.45 bc	52.28 ab	43.48 bc	44.10 abc	48.08 e	49.85 b	56.90 bc	73.98 abc	48.98 de	55.05 cd
15	Sa xPri (M9)	46.63 bc	51.28 b	45.78 ab	52.63 c	44.55 ab	53.60 ab	60.40 abc	79.48 a	46.34 cde	58.62 a
	Mean	47.69	51.20	44.45	49.00	47.91	51.38	58.57	72.55	48.65	55.57
	G.M	49.12	53.61	43.89	49.12	46.72	52.80	59.28	73.47	49.41	57.18

Legumes (L): Berseem clover varieties : Serwl (Se), Tarkeby seds (Ta) and Sakha 96 (Sa).
Grasses (G): Ryegrass varieties : Promenade (Pro), Tewarsama (Te) and Primora (Pri).

Table (9): Plant height of binary forage mixtures and their relevant pure stands (combined over the two seasons).

No.	Treatment	1st cut		2nd cut		3rd cut		4th cut		Mean	
		L	G	L	G	L	G	L	G	L	G
		(cm)									
	Legumes (L).										
1	**Se**	**42.59** ab		**49.11** a		**57.43** a		**57.90** ab		**51.76** ab	
2	**Ta**	**38.74** c		**49.60** a		**54.65** ab		**54.79** bcd		**49.44** cd	
3	**Sa**	**41.60** abc		**49.79** a		**57.06** ab		**60.83** a		**52.32** a	
	Mean	40.98		49.50		56.38		57.84		51.17	
	Grasses (G)										
4	**Pro**		**42.26** cd		**44.75** d		**62.83** a-d		**55.65** cd		**51.37** ef
5	**Te**		**41.15** d		**43.84** d		**62.01** cde		**54.25** d		**50.31** f
6	**Pri**		**39.99** d		**46.10** d		**60.21** de		**56.14** bcd		**50.61** f
	Mean		41.13		44.90		61.68		55.35		50.76
	Mixtures(M)										
7	**Se xPro**(M1)	**43.24** a	**46.59** ab	**47.90** ab	**51.50** bc	**56.21** ab	**63.44** abc	**54.68** bcd	**62.44** a	**50.51** bc	**55.99** ab
8	**Se xTe** (M2)	**33.24** bc	**44.88** bc	**45.11** cd	**50.11** bc	**54.55** ab	**61.44** cde	**53.19** cd	**59.86** abc	**48.02** de	**54.07** cd
9	**Se xPri** (M3)	**40.39** abc	**41.13** d	**44.59** cd	**52.10** abc	**55.36** ab	**62.20** cde	**54.98** bcd	**59.20** a-d	**48.83** cd	**53.66** cd
	Mean	38.96	44.20	45.87	51.23	55.37	62.36	54.28	60.50	49.12	54.57
10	**TaxPro**(M4)	**42.53** ab	**44.95** bc	**44.01** cd	**52.04** abc	**53.61** b	**62.10** cde	**56.76** abc	**59.36** a-d	**49.23** cd	**54.61** bc
11	**Ta x Te**(M5)	**41.44** abc	**48.10** a	**44.19** cd	**52.56** ab	**55.46** ab	**65.23** a	**56.45** bc	**60.88** ab	**49.38** cd	**56.69** a
12	**Ta xPri**(M6)	**39.96** abc	**45.39** abc	**46.19** bc	**52.56** ab	**54.68** ab	**62.45** b-e	**54.68** bcd	**56.90** bcd	**48.88** cd	**54.33** cd
	Mean	41.31	46.15	44.80	52.37	54.58	63.26	55.96	59.05	49.16	55.21
13	**Sax Pro**(M7)	**41.61** abc	**41.16** d	**43.86** cd	**51.83** abc	**56.33** ab	**59.91** e	**54.41** bcd	**60.48** abc	**49.05** cd	**53.34** cd
14	**Sa xTe** (M8)	**38.63** c	**42.31** cd	**42.96** d	**49.33** c	**55.48** ab	**62.95** a-d	**50.75** d	**56.68** bcd	**46.95** e	**52.82** de
15	**Sa xPri** (M9)	**41.15** abc	**44.55** bc	**48.54** a	**54.80** a	**54.71** ab	**65.03** ab	**55.25** bcd	**60.50** abc	**49.91** c	**56.22** ab
	Mean	40.46	42.67	45.12	51.99	55.51	62.63	53.47	59.22	48.64	54.13
	G.M	40.24	44.34	45.29	51.86	55.15	62.75	54.27	59.59	48.97	54.63

Legumes (L): Berseem clover varieties : Serwl (Se), Tarkeby seds (Ta) and Sakha 96 (Sa).
Grasses (G): Ryegrass varieties : Promenade (Pro), Tewarsama (Te) and Primora (Pri).

2. Number of plants (colums and/or branches) / 0.25 sq meter:

Results showed that number of ryegrass plants/ 0.25 sq in pure stands over the obtained cuts were almost similar for the three varieties, where there was no significant difference in between for such studied trait. This result was obviously clear in the first reason (Table 10) and the combined analysis of the two seasons (Table 12). Whereas, in the second season (Table 11) the only ryegrass variety Pro showed to be slightly inferior in number of plants / 0.25 sq meter with significant differences as compared with the other two varieties (Te and Pri), where no significant difference between the later two varieties were noticed.

Meanwhile, over the four cuts, berseem clover varieties did not significantly varied in their number of plants / 0.25 sq meter in their pure stand as showed in the combined analysis of the two seasons (Table 12). However, Se and Ta clover varieties were of higher and similar number of plants, 0.25 sg meter with slight significant lower difference for So variety in the first reason (Table 10). Whereas, in the second season, over the cuts clover variety Sa was the highest (Table 11) in number of plants, followed by Se, then Te variety with significant differences in their pure stands.

From the combined analysis of the two seasons (Table 12), mean number of ryegrass plants over the subsequent cuts was significantly higher in each of the proposed mixtures as compared with each variety of ryegrass in their pure stand. Similar results were noticed in the second season (Table 11) with

some exceptions where the increase in number of ryegrass than in relevant its pure stands was not significant. Whereas, similar trend was also noticed in the first season with slight insignificant difference for most cases (Table 10).

Such obtained increase in the number of ryegrass plants for each of the three varieties in the proposed mixtures than their relevant in pure stands indicated more germination and/or survival of seedlings in mixtures with clover plants than in their pure stands. This may be due to the more favourable micro environment within plant canopies of the mixtures for better growth and development.

Number of clover plants/ .25 sq meter in mixtures compared to its relevant pure stands behaved in a similar mannar as that of ryegrass plants previously presented and discussed with slightly lower magnitudes. This is due to the more favorable circumstances within the mixed stands which enhance and survival and growth of clover plants.

Similar trend was noticed for the number of clover plants noticed with slight ignorable fluctuated differences among mixtures (Tables 10, 11 and 12).

Data also indicated that plant number of ryegrass varieties generally increased in the proposed mixture as the subsequent individual cuts proceeded up to the third cut. Whereas, an opposite trend was noticed for berseem clover varieties. In other wards, number of ryegrass plants increased on the expens of the number of plants for E. clover varieties . This results were more or less obtained from the combined analysis of the two seasons (Table 12) and each of the two seasons as well (Tables 10 and

11). Similar results were respected by **Nasr (1981), Morhace and Vahala (1983), El-Hattab *et al.* (1984), Davidson and Robson (1988) and Zagloul (1995).**

In mixtures, it is very well noticed that when comparing height of plants (above the 3 varieties of ryegrasses or above the 3 varieties of clover) in their pure stands with their similars in the proposed mixtures, it is obviously clear that ryegrasses plants were taller in their mixtures with clovers than in their pure stands. However, slight different situation was noticed for clovers where height of plants were relatively shorter in mixtures than in the pure stands. This result was obtained in the two season (Table 7, 8) and the combined analysis (Table 9) in almost all cuts with few exceptions in the first two cuts of the second season .

Also , it should be pointed out that such differences in height of plants in mixtures and in their pure stands varied with different magnides where the smallest differences were noticed in the early cuts and the latest cuts.

The obtained increase in elongation of ryegrass plants in their mixtures than in their pure stand may be due to more growth stimulation caused by the beneficial association with clover plants. Similar results were reported by **Hill and Ycates (1987).** This produced relatively higher densities of vegetation in the mixture may force plants to elongate searching for more height. Also, the more forage yield in mixtures compared to their relevant association in pure stands was noticed and presented in Tables (7, 8 and 9).

Moreover, it is generally noticed that height of clover plants slightly decreased in mixtures with ryegrasses as compared with their plants in pure stands. This is opposite to what was noticed for ryegrasses which were taller in their mixtures compared to its pure stands. **Moustafa (1996)** previously observed shorter plants in mixtures as noticed in this study with clover plants when mixed with ryegrasses.

Results indicated that mixing each of the three clover varieties with any of the three varieties of ryegrass did not show appreciable differences in heights of each of the associated plants in the proposed mixtures. In other wards, height of ryegrasses plants did not varey much within the proposed nine mixture, and so for clovers plant heights which were more or less similar within the various mixtures.

The previously mentioned trend of the height of the associated plants in their proposed mixture was noticed in the two seasons (Table 10 and 11) and their combined analysis (Table 9) with few exceptions of variable magnitudes which are very well accepted under any biological experimental study of such terementonls amount of data. However, further investigations in needed in this respect.

Table (10): Number of plant (columns and/or branches) / 0.25 m^2 of binary forage mixtures and their relevant pure stands during the first season (2001-2002).

No.	Treatment	1st cut		2nd cut		3rd cut		4th cut		Mean	
		L	G	L	G	L	G	L	G	L	G
	Legumes (L).										
1	**Se**	**215.3** b		**137.8** e		**149.3** b-e		**134.5** e		**159.2** e	
2	**Ta**	**233.5** ab		**154.8** de		**134.0** e		**109.3** f		**157.9** e	
3	**Sa**	**160.5** c		**130.5** e		**144.0** cde		**110.5** f		**136.4** f	
	Mean	203.1		141.0		142.4		118.1		151.2	
	Grasses (G)										
4	**Pro**		**314.3** c		**397.3** abc		**261.5** d		**258.5** f		**307.9** b
5	**Te**		**288.8** c		**340.3** de		**281.8** cd		**280.8** ef		**297.9** b
6	**Pri**		**304.8** c		**367.0** bcd		**263.8** d		**262.0** f		**299.3** b
	Mean		302.6		368.2		268.9		267.1		301.7
	Mixtures(M)										
7	**Se xPro**(M1)	**171.0** c	**331.0** bc	**154.0** de	**264.0** bcd	**153.0** b-e	**294.8** bc	**158.5** cd	**373.5** bc	**159.1** e	**340.8** ab
8	**Se xTe** (M2)	**254.0** a	**313.5** c	**182.0** c	**373.5** bcd	**138.0** de	**314.3** ab	**231.0** a	**313.5** de	**201.3** a	**328.7** ab
9	**Se xPri** (M3)	**160.0** c	**402.0** a	**209.5** b	**359.5** bcd	**153.5** bcd	**316.5** ab	**185.5** b	**308.5** de	**177.1** d	**346.6** ab
	Mean	195.0	348.8	181.8	365.7	148.2	308.5	191.7	331.8	179.2	338.7
10	**TaxPro**(M4)	**250.5** ab	**282.0** c	**190.5** bc	**323.0** de	**164.0** b	**328.5** a	**151.0** de	**401.0 ab**	**189.0** a-b	**333.6** ab
11	**Ta x Te**(M5)	**237.5** ab	**291.5** c	**179.0** cd	**402.5** ab	**188.5** a	**342.5** a	**172.0** bcd	**329.0 d**	**194.3** abc	**341.4** ab
12	**Ta xPri**(M6)	**214.0** b	**299.0** c	**155.5** de	**306.0** e	**159.0** bc	**329.5** a	**190.0** b	**398.0 ab**	**179.6** cd	**333.1** ab
	Mean	234.0	290.8	175.0	343.8	170.5	333.5	171.0	342.7	187.6	336.0
13	**Sax Pro**(M7)	**267.5** a	**325.5** bc	**187.0** bc	**432.5** a	**145.5** b-e	**312.0** ab	**183.5** b	**430.0** a	**195.9** ab	**375.0** a
14	**Sa xTe** (M8)	**180.5** c	**292.5** c	**248.0** a	**347.5** cde	**140.5** cde	**336.8** a	**191.0** b	**326.0** d	**190.0** a-d	**325.7** ab
15	**Sa xPri** (M9)	**233.5** ab	**369.5** ab	**144.5** e	**334.0** de	**188.5** a	**321.0** ab	**175.0** bc	**364.0** c	**185.4** bcd	**348.4** ab
	Mean	227.2	329.2	193.2	373.0	158.2	323.3	183.2	340.0	190.4	349.7
	G.M.	218.7	322.9	183.3	360.8	159.0	321.8	182.0	338.2	185.7	341.5

Legumes (L): Berseem clover varieties : Serwl (Se), Tarkebbcy seds (Ta) and Sakha 96 (Sa).
Grasses (G): Ryegrass varieties : Promenade (Pro), Tewarsaama (Te) and Primora (Pri).

Table (11): Number of plant (columns and/or branches) / 0.25 m^2 of binary forage mixtures and their relevant pure stands during the second season (2002-2003).

No.	Treatment	1st cut		2nd cut		3rd cut		4th cut		Mean	
		L	G	L	G	L	G	L	G	L	G
	Legumes (L).										
1	**Se**	**201.0** bcd		**211.8** bc		**156.3** ab		**163.5** a		**183.1** b	
2	**Ta**	**189.0** de		**172.3** ef		**142.0** b-e		**163.3** a		**166.6** cd	
3	**Sa**	**193.0** cd		**242.3** a		**171.5** a		**178.3** a		**196.3** a	
	Mean	194.3		208.8		156.6		168.4		182.0	
	Grasses (G)										
4	**Pro**		**337.5** e		**372.8** f		**326.3** g		**199.0** f		**308.9** e
5	**Te**		**336.3** e		**456.8** e		**346.0** fg		**206.8** f		**336.4** d
6	**Pri**		**342.5** de		**363.5** f		**374.3** f		**230.0** ef		**327.6** de
	Mean		338.8		397.7		348.9		211.9		324.3
	Mixtures(M)										
7	**Se xPro**(M1)	**215.5** bc	**457.0** a	**152.0** fg	**662.5** b	**144.5** b-e	**475.0** b-e	**103.0** cd	**284.0** cd	**153.8** def	**469.6** ab
8	**Se xTe** (M2)	**216.0** bc	**355.5** de	**195.5** cde	**738.0** a	**145.0** bcd	**511.0** ab	**103.0** cd	**297.0** bc	**164.9** cd	**475.4** a
9	**Se xPri** (M3)	**192.0** cde	**342.5** de	**231.0** ab	**579.5** d	**132.5** de	**467.5** bcd	**119.5** bc	**327.5** b	**168.8** c	**429.2** c
	Mean	207.8	385.0	192.8	660.0	140.7	487.7	108.5	302.8	162.5	458.9
10	**TaxPro**(M4)	**224.5** b	**431.0** ab	**185.5** de	**626.0** bc	**134.5** cde	**492.5** bc	**105.5** bcd	**303.5** bc	**162.5** cd	**463.3** ab
11	**Ta x Te**(M5)	**180.0** def	**411.0** bc	**172.0** ef	**597.0** cd	**124.5** e	**480.5** bcd	**121.5** bc	**319.0** bc	**149.5** ef	**451.9** bc
12	**Ta xPri**(M6)	**249.0** a	**432.5** ab	**145.0** g	**591.0** cd	**154.0** abc	**469.5** cde	**96.0** d	**309.0** bc	**161.0** cde	**450.5** bc
	Mean	217.8	424.8	167.5	604.7	137.7	480.8	107.7	310.5	157.7	455.2
13	**Sax Pro**(M7)	**204.0** bcd	**410.0** bc	**202.0** cd	**620.5** bcd	**136.5** cde	**438.0** e	**117.0** bc	**261.0** de	**164.9** cd	**432.4** c
14	**Sa xTe** (M8)	**169.0** ef	**383.5** cd	**230.0** ab	**707.5** a	**129.5** de	**442.5** de	**125.5** b	**293.0** bcd	**163.5** cd	**456.6** ab
15	**Sa xPri** (M9)	**165.0** f	**320.0** e	**181.5** de	**623.5** bcd	**125.5** de	**546.5** a	**111.5** bcd	**364.5** a	**145.9** f	**463.6** ab
	Mean	179.3	371.2	204.5	650.5	130.5	472.8	118.0	306.2	158.1	450.2
	G.M.	201.6	393.7	188.3	638.4	136.3	480.4	111.4	306.5	159.4	454.8

Legumes (L): Berseem clover varieties : Serwl (Se), Tarkeby seds (Ta) and Sakha 96 (Sa).
Grasses (G): Ryegrass varieties : Promenade (Pro), Tewarsama (Te) and Primora (Pri).

Table (12): Number of plant (columns and/or branches) / 0.25 m^2 of binary forage mixtures and their relevant pure stands (combined over the two seasons)

No.	Treatment	1st cut		2nd cut		3rd cut		4th cut		Mean	
		L	G	L	G	L	G	L	G	L	G
	Legumes (L).										
1	**Se**	**208.1** b		**174.8** de		**152.8** ab		**149.0** bc		**172.2** bcd	
2	**Ta**	**211.3** b		**163.5** ef		**138.0** cd		**136.3** cde		**162.3** de	
3	**Sa**	**176.8** c		**186.4** cd		**157.8** a		**144.4** bcd		**166.3** cd	
	Mean	198.7		174.9		149.5		143.2		166.9	
	Grasses (G)										
4	**Pro**		**325.9** ef		**385.0** ef		**293.9** e		**228.8** e		**308.4** b
5	**Te**		**312.5** f		**398.5** e		**313.9** de		**243.8** e		**317.2** b
6	**Pri**		**323.6** ef		**365.3** f		**319.1** d		**246.0** e		**313.4** b
	Mean		320.7		382.9		308.9		239.5		313.0
	Mixtures(M)										
7	**Se xPro**(M1)	**193.3** bc	**394.0** a	**153.0** f	**513.3** b	**148.8** abc	**384.9** c	**130.8** de	**328.8** bcd	**156.4** e	**405.3** a
8	**Se xTe** (M2)	**235.0** a	**334.5** def	**188.8** cd	**555.8** a	**141.5** bcd	**412.7** ab	**167.0** a	**305.3** d	**183.1** a	**402.1** a
9	**Se xPri** (M3)	**176.0** c	**372.3** ab	**220.3** b	**469.5** cd	**143.0** bcd	**392.0** bc	**152.5** b	**318.0** d	**172.9** bc	**388.0** a
	Mean	201.4	366.9	187.4	512.9	144.4	398.1	150.1	317.4	170.8	398.9
10	**TaxPro**(M4)	**237.5** a	**356.9** b-e	**188.0** cd	**474.5** cd	**149.3** abc	**410.5** ab	**128.3** e	**352.3** ab	**175.8** abc	**398.5** a
11	**Ta x Te**(M5)	**208.8** b	**351.3** b-e	**175.5** de	**499.8** bc	**156.5** a	**411.5** ab	**146.8** bc	**324.0** cd	**171.9** bcd	**396.7** a
12	**Ta xPri**(M6)	**231.5** a	**365.3** a-d	**150.3** f	**449.5** d	**156.5** a	**399.5** bc	**143.0** bcd	**353.5** a	**170.3** bcd	**392.0** a
	Mean	225.9	357.7	171.3	474.6	154.1	407.2	139.4	343.3	172.7	395.7
13	**Sax Pro**(M7)	**235.8** a	**367.8** abc	**194.5** c	**526.5** ab	**141.0** bcd	**375.0** c	**150.3** bc	**345.5** abc	**180.4** ab	**407.7** a
14	**Sa xTe** (M8)	**174.8** c	**338.0** c-f	**239.0** a	**527.5** ab	**135.0** d	**389.7** bc	**158.3** ab	**309.5** d	**176.8** ab	**391.2** a
15	**Sa xPri** (M9)	**199.3** b	**344.8** b-f	**163.0** ef	**481.3** cd	**157.0** a	**433.8** a	**143.3** bcd	**364.3** a	**165.6** cde	**406.0** a
	Mean	203.3	350.2	198.8	511.8	144.3	398.1	150.6	339.8	174.3	400.0
	G.M.	210.2	358.3	185.8	499.8	147.6	401.1	146.7	333.5	172.6	398.3

Legumes (L): Berseem clover varieties : Serwl (Se), Tarkeby seds (Ta) and Sakha 96 (Sa).

Grasses (G): Ryegrass varieties : Promenade (Pro), Tewarsama (Te) and Primora (Pri).

3. Leaf / stem ratio:

Leaf /stem ratio on fresh basis for berseem. clover and ryegrass varieties in their pure stands and their mixtures for the subsequent cuts of the two seasons and their combined analysis are presented in Tables (13, 14 and 15).

In pure stands, data generally showed that leaf/stem ratio for ryegrass varieties were more than double as that for berseem clover varieties. This trend was noticed in the two seasons (Tables 13 and 14) and their combined analysis (Table 15).

The average leaf/stem ratio over the whole cuts for clover and ryegrass varieties in their pure stands was 0.51 and 1.93 , respectively in the first season, being 0.38 and 1.83 in the second season and 0.45 and 1.8 for their combined analysis. Moreover, leaf/stem ratio of ryegrasses was slightly and continuously decreased as the cuts proceeded. However, such trend was not much clear with clover.

So it is obviously clear that leaf/stem ratios were much higher for ryegrass than that for clover varieties in their pure stands of in their mixtures. This result was noticed in the two seasons (Tables 13 and 14) and their combined analysis (Table 15).

Above the cuts in pure stands, within ryegrass varieties , Pro was of the highest leaf/stem ratio followed by Pri, then Te ryegrass varieties with significant differences in between in the first season (Table 13). In the same season the three berseem clover varieties did not show significant differences in leaf/stem ratio. Whereas, the second season (Table 14) and the combined analysis (Table 15) did not show significant differences among

the three varieties of ryegrass or between the e berseem clover varieties except for ryegrass varieties in pure stands above the cuts during the first season, as previously presented and discussed . Also , it should be noted that differences in leaf/stem ratio for the individual cuts between ryegrass varieties or within berseem clover varieties in their pure stands were fluctuated within a very narrow ranges in spite of obtained slightly significant differences in few cases as shown in the first and second season and their combined analysis.

Also, it should be pointed out that either in pure stands or in associations of mixtures, ryegrass varieties remained to have more leaf/ stem ratio as compared with clover varieties. This results was true in most cuts of the two seasons and their combined analysis (Tables 13, 14 and 15).

However, it is generally noticed that leaf/stem ratio was continuously decreased as the cuts proceeded for both of clover and ryegrass varieties in almost each of the proposed mixtures. So, first cuts have the highest leaf/stem ratio, whereas, the last cut have the lowest ones for the associated clover and ryegrass in the mixtures. This results was noticed in both of the two seasons and their combined analysis with very minor few exceptions within cuts.

Results also showed significant variations in leaf / stem ratios within each of the two associated components of each mixture in each of the obtained cuts of the two seasons and their combined analysis (Tables 13, 14 and 15). However, each of the proposed mixture has its owen, identity as far as this studied trait is concerned. Similar results were reported in this respect by

Nasr (1981), Morhace and Vahala (1983), El-Hattab *et al.* (1984), Davidson and Robson (1988) and Zagloul (1995). Meanwhile, nonspecific trend for leaf / stem ratio of the proposed mixtures could be quite detected under the circumstances of this study.

Whereas, results indicated that among mixture and above the average of the whole cuts, mixture M3 (clover cv Serw 1 x ryegrass variety promenade) components showed the highest significant leaf / stem ratio. Such ratio for clover and ryegrass was 0.66, 212, respectively, in the first season, being 0.43 and 1.90 in the second one, and 0.55 and 2.01 in their combined analysis (tables 13, 14 and 15).

So it could be generally noticed that leaf / stem ratio for any of the grown ryegrass or berseem clover varieties have its owen identity, which is controlled by the unique specific genetic make up which could be very slightly affected by the seasonal environmental conditions, cutting sequence and or/other factors that could be studied later. However, no appreciable differences between ryegrass or clover varieties in their pure stands could be firmly detected under the circumstances of this study.

Table (13): Leaf / stem ratio of binary forage mixtures and their relevant pure stands during the first season (2001-2002).

No.	Treatment	1st cut		2nd cut		3rd cut		4th cut		Mean	
		L	G	L	G	L	G	L	G	L	G
	Legumes (L).										
1	**Se**	**0.76** bcd		**0.36** de		**0.46** e		**0.52** c		**0.53** de	
2	**Ta**	**0.56** g		**0.41** cd		**0.49** de		**0.56** bc		**0.50** e	
3	**Sa**	**0.63** efg		**0.36** e		**0.49** de		**0.57** bc		**0.51** e	
	Mean	0.65		0.38		0.48		0.55		0.51	
	Grasses (G)										
4	**Pro**		**3.52** b		**2.42** a		**1.15** cd		**1.10** bc		**2.05** ab
5	**Te**		**2.45** def		**2.59** a		**1.09** d		**1.03** bc		**1.79** de
6	**Pri**		**3.07** bc		**2.63** a		**1.08** d		**1.07** bc		**1.96** bc
	Mean		3.01		2.55		1.11		1.07		1.93
	Mixtures(M)										
7	**Se xPro**(M1)	**0.57** fg	**2.92** cd	**0.51** a	**1.83** bc	**0.51** cd	**1.12** bc	**0.68** abc	**1.06** bc	**0.57** bcd	**1.75** def
8	**Se xTe** (M2)	**0.81** ab	**2.15** f	**0.48** ab	**1.98** bc	**0.46** e	**1.45** a	**0.83** a	**1.16** b	**0.65** a	**1.69** efg
9	**Se xPri** (M3)	**0.77** abc	**4.17** a	**0.49** a	**2.06** b	**0.56** abc	**1.15** cd	**0.80** ab	**1.08** bc	**0.66** a	**2.12** a
	Mean	0.72	3.08	0.49	1.96	0.51	1.24	0.77	1.10	0.63	1.85
10	**TaxPro**(M4)	**0.56** g	**2.51** def	**0.42** c	**1.75** c	**0.53** bcd	**1.21** bc	**0.69** abc	**1.37** a	**0.55** cde	**1.71** efg
11	**Ta x Te**(M5)	**0.69** cde	**2.33** ef	**0.44** bc	**1.82** bc	**0.55** bc	**1.31** b	**0.67** abc	**1.02** c	**0.59** bc	**1.62** fg
12	**Ta xPri**(M6)	**0.57** fg	**2.20** f	**0.43** bc	**1.77** c	**0.53** bcd	**1.18** cd	**0.62** b	**1.15** bc	**0.54** cde	**1.57** g
	Mean	0.61	2.35	0.43	1.78	0.45	1.23	0.66	1.18	0.56	1.63
13	**Sax Pro**(M7)	**0.86** a	**2.36** ef	**0.48** ab	**1.98** bc	**0.57** ab	**1.13** cd	**0.68** abc	**1.15** bc	**0.65** a	**1.65** efg
14	**Sa xTe** (M8)	**0.73** bcd	**3.52** b	**0.53** a	**1.78** c	**0.53** bcd	**1.18** cd	**0.68** abc	**1.08** bc	**0.62** ab	**1.89** cd
15	**Sa xPri** (M9)	**0.66** def	**2.76** cde	**0.42** c	**1.75** c	**0.60** a	**1.11** cd	**0.66** abc	**1.04** bc	**0.59** bc	**1.67** efg
	Mean	0.75	2.88	0.48	1.84	0.57	1.14	0.67	1.09	0.62	1.74
	G.M	0.69	2.77	0.47	1.86	0.54	1.20	0.70	1.12	0.60	1.74

Legumes (L): Berseem clover varieties : Serwl (Se), Tarkeby seds (Ta) and Sakha 96 (Sa).
Grasses (G): Ryegrass varieties : Promenade (Pro), Tewarsama (Te) and Primora (Pri).

Table (14): Leaf / stem ratio of binary forage mixtures and their relevant pure stands during the second season (2002-2003).

No.	Treatment	1st cut		2nd cut		3rd cut		4th cut		Mean	
		L	G	L	G	L	G	L	G	L	G
	Legumes (L).										
1	**Se**	**0.35** cd		**0.33** ab		**0.41** c-f		**0.42** bc		**0.38** bcd	
2	**Ta**	**0.41** a		**0.28** bcd		**0.39** d-g		**0.43** bc		**0.38** bcd	
3	**Sa**	**0.40** ab		**0.37** a		**0.34** fg		**0.44** abc		**0.39** a-d	
	Mean	0.39		0.33		0.38		0.43		0.38	
	Grasses (G)										
4	**Pro**		**1.53** e		**3.06** cd		**1.88** bc		**0.73** cde		**1.80** cd
5	**Te**		**1.61** de		**3.78** a		**1.48** e		**0.83** bc		**1.93** abc
6	**Pri**		**1.60** de		**3.17** bcd		**1.57** de		**0.65** e		**1.75** d
	Mean		1.58		3.34		1.64		0.74		1.83
	Mixtures(M)										
7	**Se xPro**(M1)	**0.32** d	**1.76** a-d	**0.25** d	**3.65** ab	**0.38** efg	**1.85** bcd	**0.42** bc	**0.72** de	**0.34** d	**2.00** ab
8	**Se xTe** (M2)	**0.35** cd	**1.68** cde	**0.30** bc	**3.31** a-d	**0.49** ab	**1.60** cde	**0.40** c	**0.74** b-e	**0.39** a-d	**1.83** bcd
9	**Se xPri** (M3)	**0.43** a	**1.60** de	**0.29** bcd	**3.51** a-d	**0.53** a	**1.84** bcd	**0.48** a	**0.64** e	**0.43** a	**1.90** a-d
	Mean	0.37	1.68	0.28	3.49	0.47	1.70	0.43	0.70	0.39	1.91
10	**TaxPro**(M4)	**0.34** cd	**1.71** bcd	**0.33** ab	**3.27** a-d	**0.50** ab	**1.63** cde	**0.42** bc	**0.93** a	**0.40** abc	**1.88** a-d
11	**Ta x Te**(M5)	**0.36** bcd	**1.82** abc	**0.32** b	**3.55** abc	**0.40** def	**1.64** cde	**0.42** bc	**0.67** e	**0.38** bcd	**1.92** a-d
12	**Ta xPri**(M6)	**0.39** abc	**1.64** de	**0.31** b	**2.95** d	**0.33** g	**1.88** bc	**0.39** c	**0.85** ab	**0.35** cd	**1.83** bcd
	Mean	0.36	1.72	0.32	3.26	0.41	1.72	0.41	0.82	0.38	1.88
13	**Sax Pro**(M7)	**0.43** a	**1.87** ab	**0.31** b	**2.98** cd	**0.44** b-e	**1.76** cde	**0.46** ab	**0.81** bcd	**0.41** ab	**1.86** bcd
14	**Sa xTe** (M8)	**0.35** cd	**1.61** de	**0.29** bcd	**3.72** ab	**0.46** a-d	**2.10** ab	**0.40** c	**0.79** bcd	**0.38** bcd	**2.05** a
15	**Sa xPri** (M9)	**0.35** cd	**1.91** a	**0.25** cd	**3.05** cd	**0.48** abc	**2.17** a	**0.40** c	**0.79** bcd	**0.37** bcd	**1.98** ab
	Mean	0.38	1.80	0.28	3.25	0.46	2.01	0.42	0.80	0.39	1.96
	G.M	0.37	1.73	0.29	3.33	0.45	1.81	0.42	0.77	0.39	1.92

Legumes (L): Berseem clover varieties : Serwl (Se), Tarkeby seds (Ta) and Sakha 96 (Sa).
Grasses (G): Ryegrass varieties : Promenade (Pro), Tewarsama (Te) and Primora (Pri).

Table (15): Leaf/ stem ratio of binary forage mixtures and their relevant pure stands (combined over the two seasons).

No.	Treatment	1st cut		2nd cut		3rd cut		4th cut		Mean	
		L	G	L	G	L	G	L	G	L	G
	Legumes (L).										
1	**Se**	0.55 bcd		0.35 cd		0.44 de		0.47 f		0.45 de	
2	**Ta**	0.48 efg		0.34 cd		0.44 de		0.49 ef		0.44 e	
3	**Sa**	0.52 def		0.37 bcd		0.42 e		0.51 def		0.45 de	
	Mean	0.52		0.35		0.43		0.49		0.45	
	Grasses (G)										
4	**Pro**		2.53 b		2.74 bc		1.52 ab		0.91 bcd		1.92 abc
5	**Te**		2.03 d		3.19 a		1.28 d		0.93 bcd		1.86 cde
6	**Pri**		2.34 bc		2.90 b		1.33 cd		0.86 d		1.85 cde
	Mean		2.30		2.94		1.38		0.90		1.88
	Mixtures(M)										
7	**Se xPro**(M1)	0.45 g	2.34 bc	0.38 abc	2.74 bc	0.45 cde	1.53 ab	0.55 cd	0.89 cd	0.64 de	1.87 bcd
8	**Se xTe** (M2)	0.58 bc	1.92 d	0.39 ab	2.65 b-e	0.48 bcd	1.53 ab	0.61 ab	0.95 bc	0.52 ab	1.76 def
9	**Se xPri** (M3)	0.60 ab	2.88 a	0.39 ab	2.78 bc	0.55 a	1.50 ab	0.64 a	0.86 d	0.55 a	2.01 a
	Mean	0.54	2.38	0.39	2.72	0.53	1.52	0.60	0.90	0.51	1.88
10	**TaxPro**(M4)	0.45 g	2.11 cd	0.38 abc	2.51 cde	0.52 ab	1.42 bcd	0.56 cd	1.15 a	0.47 cde	1.80 def
11	**Ta x Te**(M5)	0.53 c-f	2.08 cd	0.38 abc	2.69 bcd	0.48 bcd	1.48 b	0.54 cd	0.85 d	0.48 cd	1.77 def
12	**Ta xPri**(M6)	0.48 fg	1.92 d	0.37 bc	2.36 e	0.43 de	1.53 ab	0.51 def	1.00 b	0.45 de	1.70 f
	Mean	0.49	2.00	0.38	2.52	0.48	1.48	0.54	1.00	0.47	1.76
13	**Sax Pro**(M7)	0.64 a	2.12 cd	0.39 ab	2.48 cde	0.50 abc	1.44 bc	0.57 bc	0.98 b	0.53 ab	1.76 ef
14	**Sa xTe** (M8)	0.54 b-e	2.57 b	0.41 a	2.75 bc	0.50 abc	1.64 a	0.54 cde	0.93 bcd	0.50 bc	1.97 ab
15	**Sa xPri** (M9)	0.51 def	2.34 bc	0.34 d	2.40 de	0.54 a	1.64 a	0.53 cde	0.92 bcd	0.48 cd	1.82 cde
	Mean	0.56	2.34	0.38	2.54	0.51	1.57	0.55	0.94	0.50	1.85
	G.M	0.53	2.24	0.38	2.59	0.51	1.52	0.56	0.95	0.49	1.83

Legumes (L): Berseem clover varieties : Serwl (Se), Tarkeby seds (Ta) and Sakha 96 (Sa).
Grasses (G): Ryegrass varieties : Promenade (Pro), Tewarsama (Te) and Primora (Pri).

4. Leaf area index (LAI):

Results indicated that over the varieties of clover or ryegrass in their pure stands, LAI of ryegrasses was almost double as for clovers. The respective mean values of LAI was 5.51, 2.75 in the first season (Table, 16), 5.5 and 2.91 in the second season (Table 17), being 5.52 and 2.83 for the combined analysis of the two seasons.

Meanwhile, there is no significant differences in LAI between each of the three varieties of berseem clover or varieties within the three ryegrass in their pure stands over the four cuts. This result was noticed in each of the two seasons (Table 16 and 17) and their combined analysis (Table 18). Such results may indicate similar photosynthetic and ryegrass activities and growth behaviour for all of the studied clover varieties that are planted in pure stands under the same conditions using the approved cultural practices including seeding rates.

Regarding the individual cuts, results showed that the highest values of LAI were noticed in the second cuts as compared with the earlier or the later cuts for either ryegrass or clover varieties. In such second cuts the highest respective mean values of LAI over the varieties of ryegrass and clover varieties were 6.27, 3.30 in the first season, (Table 16) 7.62 and 3.22 in the second season (Table 17) being 6.95 and 3.26 in their combined analysis (Table 18) for their pure stands. However it should be pointed out that the obtained differences in LAI values between the three ryegrass or the three clover varieties were not significant in most of the obtained cuts of the two seasons and their combined analysis.

Such LAI values were fluctuated within a very narrow range giving no clear cut performance for any of ryegrass or clover variety in respect of this studied trait in their pure stands. So, it could be anticipated that any of the selected ryegrass or clover varieties are of almost similar LAI value, and they are of best fit to be used in any of the proposed mixture without any detected clear differences.

It is generally noticed from the following set of data extracted from Tables 16, 17 and 18, that LAI values tended to increase for ryegrass varieties in the second cut and kept almost constant in the third cut, then slightly decreased in the 4th cuts in the two seasone.

	1st cut		2nd cut		3rd cut		4th cut		Average	
	R	C	R	C	R	C	R	C	R	C
1st season	4.61	2.97	6.38	3.11	7.19	3.26	7.10	3.18	6.30	3.14
2nd season	7.05	3.52	11.57	3.10	8.21	2.01	5.72	1.8	8.08	2.61
Combination	5.78	3.24	8.93	3.22	7.70	2.63	6.20	2.51	7.34	2.87

R = Ryegrass C = Berseem clovers

Mean values of LAI over the subsequent cuts of the second season (Table 17) and the combined analysis of the two seasons (Table 18) for the proposed mixtures, indicated significant higher LAI for each variety of ryegrass in the proposed mixtures (M1 – M9) as compared with its relevants in pure stands. Similar trend was noticed in the first season except for M4,and M8. Where, such differences were not significant. Results indicated the superiority of ryegrass varieties in the associated mixtures with clover varieties in this studied trait.

It is also noticed that over the obtained cuts, the combined analysis of the two season (Table 18) did not show any differences in LAI of berseem clover varieties in the mixtures (M1-M9) as compared with its relevant in their pure stands. However, this was not always the case in the first and second seasons, where such increase in LAI of clover varieties was not always significant in the mixtures than in its pure stands. Such LAI values were fluctuated with insignificant increase in some mixtures. Similar trend with some exceptions was noticed for the LAI values within the individual cuts of the two seasons and their combined analysis (Tables 16 , 17 and 18).

It should be generally noted that any of the proposed mixtures of ryegrass and clover varieties produced relatively higher LAI than in their relevant in pure stands. Similar results in this respect were reported by **Rimmington (1984), Dennis and Woledge (1985), Hill (1989), Arunk *et al.* (1996), Badrul and Manzoor (1997) and Nassiri and Elgersma (1998).**

This result was true over the cuts for this studied trait in the second season (Table 17) and the combined analysis (Table 18) of the two seasons as well as most of the proposed mixtures of the first season (Table 16).

Also, such results was almost noticed for ryegrass varieties in almost all of the subsequent individual cuts. Slight inconsistent trend was noticed for clover varieties with very low limits of insignificant differences was noticed in most cases of the individual cuts.

Table (16): Leaf area index of binary forage mixtures and their relevant pure stands during the first season, (2001-2002).

No.	Treatment	1st cut		2nd cut		3rd cut		4th cut		Mean	
		L	G	L	G	L	G	L	G	L	G
	Legumes (L).										
1	**Se**	**2.54** cd		**3.37** bcd		**3.22** bcd		2.33 efg		**2.87** ef	
2	**Ta**	**2.64** cd		**3.68** abc		**2.81** d		2.10 g		**2.81** ef	
3	**Sa**	**2.22** d		**2.85** def		**3.10** bcd		2.15 fg		**2.58** f	
	Mean	2.47		3.30		3.04		2.19		2.75	
	Grasses (G)										
4	**Pro**		**4.92** ab		**6.85** ab		**5.61** c		**5.54** c		**5.71** cd
5	**Te**		**3.96** bc		**5.84** bc		**5.86** bc		**6.04** c		**5.42** d
6	**Pri**		**4.51** bc		**6.12** bc		**5.45** c		**5.48** c		**5.39** d
	Mean		4.46		6.27		5.64		5.66		5.51
	Mixtures(M)										
7	**Se xPro**(M1)	**2.54** cd	**4.71** abc	**2.61** ef	**6.26** bc	**3.16** bcd	**7.07** a	**2.78** def	**7.73** ab	**2.77** ef	**6.44** ab
8	**Se xTe** (M2)	**3.09** abc	**4.36** bc	**3.18** cde	**6.79** ab	**2.78** d	**7.15** a	**3.91** a	**6.16** c	**3.24** abc	**6.12** bc
9	**Se xPri** (M3)	**2.10** d	**5.63** a	**3.84** ab	**6.25** bc	**3.16** bcd	**6.82** a	**2.89** cde	**6.73** bc	**3.00** cde	**6.36** ab
	Mean	2.58	4.90	3.21	6.43	3.03	7.01	3.19	6.87	3.03	6.31
10	**TaxPro**(M4)	**3.11** abc	**3.78** c	**2.73** def	**5.01** c	**3.44** b	**6.71** ab	**2.20** fg	**8.33** a	**2.87** def	**5.96** bcd
11	**Ta x Te**(M5)	**3.16** abc	**4.04** bc	**2.68** ef	**6.71** ab	**3.92** a	**7.50** a	**3.15** bcd	**6.01** c	**3.23** bcd	**6.07** bc
12	**Ta xPri**(M6)	**2.92** bc	**3.94** bc	**2.51** f	**5.69** bc	**3.26** bc	**7.62** a	**3.51** abc	**8.53** a	**3.05** b-e	**6.45** ab
	Mean	3.06	4.25	2.64	5.80	3.54	7.28	2.95	7.62	3.05	6.16
13	**Sax Pro**(M7)	**3.48** ab	**4.34** bc	**2.73** def	**6.60** b	**2.84** cd	**7.26** a	**3.15** bcd	**7.58** ab	**3.05** b-e	**6.44** ab
14	**Sa xTe** (M8)	**2.69** cd	**4.09** bc	**4.15** a	**6.21** bc	**2.83** cd	**7.21** a	**3.78** ab	**6.01** c	**3.36** ab	**5.88** bcd
15	**Sa xPri** (M9)	**3.61** a	**5.63** a	**3.54** abc	**7.93** a	**3.92** a	**7.39** a	**3.29** a-d	**6.84** bc	**3.59** a	**6.95** a
	Mean	3.26	4.69	3.47	6.91	3.20	7.29	3.41	6.81	3.33	6.42
	G.M.	2.97	4.61	3.11	6.38	3.26	7.19	3.18	7.10	3.14	6.30

Legumes (L): Berseem clover varieties : Serwl (Se), Tarkeby seds (Ta) and Sakha 96 (Sa).
Grasses (G): Ryegrass varieties : Promenade (Pro), Tewarsama (Te) and Primora (Pri).

Table (17): Leaf area index of binary forage mixtures and their relevant pure stands during the second season, (2002-2003)

No.	Treatment	1st cut		2nd cut		3rd cut		4th cut		Mean	
		L	G	L	G	L	G	L	G	L	G
	Legumes (L).										
1	**Se**	3.16 b-e		3.47 a		2.69 a		2.81 b		3.03 a	
2	**Ta**	2.75 de		3.20 a		2.26 abc		2.58 b		2.70 abc	
3	**Sa**	3.00 cde		2.99 a		2.59 ab		3.41 a		3.00 ab	
	Mean	2.97		3.22		2.51		2.93		2.91	
	Grasses (G)										
4	**Pro**		5.23 d		6.96 c		5.05 g		3.47 c		5.18 c
5	**Te**		5.65 cd		8.59 bc		5.44 fg		3.78 c		5.86 c
6	**Pri**		5.71 cd		7.32 c		5.71 f		3.66 c		5.60 c
	Mean		5.53		7.62		5.40		3.64		5.55
	Mixtures(M)										
7	**Se xPro**(M1)	4.09 a	8.98 a	3.00 a	12.89 a	1.97 bc	8.11 d	1.81 c	5.45 b	2.71 abc	8.86 a
8	**Se xTe** (M2)	3.97 ab	6.23 bcd	2.91 a	12.98 a	2.45 ab	8.93 b	1.65 c	6.30 ab	2.74 abc	8.61 ab
9	**Se xPri** (M3)	3.57 a-d	6.24 bcd	3.23 a	11.00 ab	2.08 abc	7.44 e	1.99 c	5.77 b	2.72 abc	7.61 b
	Mean	3.88	7.15	3.05	12.27	2.17	8.18	1.82	5.84	2.72	8.36
10	**TaxPro**(M4)	3.74 abc	7.60 ab	3.06 a	10.93 ab	1.89 bc	8.32 cd	1.94 c	5.20 b	2.66 abc	8.01 ab
11	**Ta x Te**(M5)	2.61 e	7.20 bc	3.32 a	10.77 a	1.64 c	8.67 bc	1.91 c	6.06 ab	2.37 c	8.67 ab
12	**Ta xPri**(M6)	4.31 a	7.86 ab	1.97 b	9.41 abc	2.21 abc	7.87 d	1.68 c	5.44 b	2.54 bc	7.64 ab
	Mean	3.55	7.55	2.78	11.04	1.91	8.29	1.84	5.57	2.52	8.11
13	**Sax Pro**(M7)	3.63 a-d	7.30 bc	3.72 a	10.95 ab	2.09 abc	7.37 e	1.74 c	5.15 b	2.80 abc	7.70 ab
14	**Sa xTe** (M8)	2.89 cde	6.46 bcd	3.52 a	12.24 a	2.03 abc	7.14 e	2.03 c	5.09 b	2.62 abc	7.73 ab
15	**Sa xPri** (M9)	2.91 cde	5.58 cd	3.18 a	9.97 abc	1.72 c	9.96 a	1.68 c	7.14 a	2.37 c	8.16 ab
	Mean	3.14	6.45	3.47	11.39	1.95	8.16	1.82	5.79	2.60	7.76
	G.M.	3.52	7.05	3.10	11.57	2.01	8.21	1.83	5.72	2.61	8.08

Legumes (L): Berseem clover varieties : Serwl (Se), Tarkeby seds (Ta) and Sakha 96 (Sa).
Grasses (G): Ryegrass varieties : Promenade (Pro), Tewarsama (Te) and Primora (Pri).

Table (18): Leaf area index of binary forage mixtures and their relevant pure stands (combined over the two seasons).

No.	Treatment	1st cut		2nd cut		3rd cut		4th cut		Mean	
		L	G	L	G	L	G	L	G	L	G
	Legumes (L).										
1	**Se**	**2.85** cde		**3.42** abc		**2.95** a		**2.57** abc		**2.95** a	
2	**Ta**	**2.69** de		**3.44** abc		**2.34** ab		**2.34** bcd		**2.75** a	
3	**Sa**	**2.61** e		**2.92** cd		**2.84** ab		**2.78** ab		**2.79** a	
	Mean	2.72		3.26		2.71		2.56		2.83	
	Grasses (G)										
4	**Pro**		**5.08** bc		**6.91** de		**5.33** e		**4.46** e		**5.44** c
5	**Te**		**4.81** c		**7.21** cde		**5.65** e		**4.91** de		**5.64** c
6	**Pri**		**5.11** bc		**6.72** e		**5.58** e		**4.57** e		**5.49** c
	Mean		5.00		6.95		5.58		4.65		5.52
	Mixtures(M)										
7	**Se xPro**(M1)	**3.31** abc	**6.85** a	**2.80** d	**9.57** a	**2.56** ab	**7.59** bcd	**2.30** cd	**6.59** ab	**2.74** a	**7.65** a
8	**Se xTe** (M2)	**3.53** a	**5.30** bc	**3.04** bcd	**9.88** a	**2.61** ab	**8.04** abc	**2.78** ab	**6.23** abc	**2.99** a	**7.36** ab
9	**Se xPri** (M3)	**2.83** cde	**5.94** b	**3.53** ab	**8.62** a-d	**2.62** ab	**7.13** d	**2.44** bcd	**6.25** abc	**2.86** a	**6.99** ab
	Mean	3.22	6.03	3.46	9.36	2.60	7.59	2.51	6.36	2.86	7.33
10	**TaxPro**(M4)	**3.43** ab	**5.69** bc	**2.89** cd	**7.97** a-e	**2.67** ab	**7.52** bcd	**2.07** d	**6.76** ab	**2.76** a	**6.98** ab
11	**Ta x Te**(M5)	**2.88** b-e	**5.62** bc	**3.00** bcd	**9.74** a	**2.78** ab	**8.09** ab	**2.53** abc	**6.04** bc	**2.80** a	**7.37** ab
12	**Ta xPri**(M6)	**3.62** a	**5.90** b	**2.24** e	**7.55** b-e	**2.73** ab	**7.75** bcd	**2.60** abc	**6.99** a	**2.80** a	**7.04** ab
	Mean	3.31	5.74	2.71	8.45	2.73	7.79	2.40	6.60	2.79	6.13
13	**Sax Pro**(M7)	**3.56** a	**5.83** bc	**3.23** bcd	**8.77** a-b	**2.47** b	**7.31** bcd	**2.45** bcd	**6.36** abc	**2.92** a	**7.07** ab
14	**Sa xTe** (M8)	**2.79** cde	**5.28** bc	**3.84** a	**9.22** ab	**2.43** b	**7.17** cd	**2.91** a	**5.55** cd	**2.99** a	**6.81** b
15	**Sa xPri** (M9)	**3.26** a-d	**5.61** bc	**3.36** abc	**8.95** abc	**2.82** ab	**8.67** a	**2.49** a-d	**6.99** a	**2.98** a	**7.55** a
	Mean	3.20	5.57	3.48	8.98	2.57	7.72	2.62	5.64	2.96	7.14
	G.M.	3.24	5.78	3.22	8.93	2.63	7.70	2.51	6.20	2.87	6.66

Legumes (L): Berseem clover varieties : Serwl (Se), Tarkeby seds (Ta) and Sakha 96 (Sa).
Grasses (G): Ryegrass varieties : Promenade (Pro), Tewarsama (Te) and Primora (Pri).

The above obtained results indicated slight vigority and the tendency of aggressively of ryegrass varieties over the associated clover varieties in the proposed mixtures in this particular studied trait. However, this effect was of similar magnitude for each of the three ryegrass varieties . So, there was not any favourability among the three ryegrasses to be associated with any of the studied clover varieties as for as this trait is concerned.

III. Botanical composition:

Data for the botanical composition of the 9 proposed mixtures (M1-M9) of berseem clover and ryegrass varieties for the subsequent individual cuts of the two seasons are presented in Tables (19). Over the proposed mixtures, percentage of clover to ryegrass on fresh weight basis which were generaled from Table (19) are presented as follows:

Season	1st cut		2nd cut		3rd cut		4th cut	
	R	C	R	C	R	C	R	C
	..... %							
1st season	50.7	49.3	45.2	54.8	44.3	55.7	36.4	63.6
2nd season	43.4	56.6	36.3	63.7	34.2	65.8	27.5	72.5
Mean	47.0	53.0	40.7	59.3	39.3	60.7	31.9	68.1

R = Ryegrass C = Berseem clovers

It could be generally noticed that on fresh basis, ryegrasses percentage in the mixture substantially increased and that of clover decreased as the cutting sequence proceeded. This

results was true for each of the two seasons as presented and discussed previously.

For such binary mixtures, percentage clover to ryegrasses at the 4th cut was 36.4 and 63.6% respectively for the first season; being 27.5 and 72.5% for the second season with a respective average of 31.9 and 68.1%. Similar results concerning the substantial increases of grasses and decreases of legumes present ages in their mixtures as the stand duration proceeded were reported by **Luten and Remmelink (1984) and Abd El-Sattar (1999). Whereas, Abo Raya *et al.* (1995)** could not get to that conclusion under the circumstances of their experiment. These results indicated the superiority of ryegrasses over clovers at the later stages of the mixtures duration.

Moreover, such results could be explained by the lower leaf / stem ratio of clover due to the sensence of clovers at the later stages of growth close to the end of seasons. Also, relatively more leaves to stems for grasses than legumes used to be at the later stages of stands duration.

It should be also noticed that the above mentioned trend of the botanical composition was noticed for each of the proposed mixtures with slight fluctuation having relatively similar behaviour as shown in Table (19).

Also, the elongation of clover plants at the end of season and the less number and area of leaves are logically expected due to the unfavourable environmental conditions of growth and development at the end of the winter season as higher temperature and long days.

Table (19): Botanical composition of binary forage mixtures and their revalent pure stands during the first and the second seasons.

No.	Treatment	1st cut		2nd cut		3rd cut		4th cut	
		L	G	L	G	L	G	L	G
		..... %							
	The first season								
1	Se xPro(M1)	47.56	52.44	46.72	53.28	44.65	55.35	35.02	64.98
2	Se xTe (M2)	49.57	50.43	43.02	56.98	41.57	58.43	39.98	60.02
3	Se xPri (M3)	46.58	53.42	50.11	49.89	44.00	56.00	38.23	61.77
	Mean	47.90	52.10	46.62	53.38	43.41	56.59	37.74	62.26
4	TaxPro(M4)	52.67	47.33	46.81	53.19	44.63	55.37	35.54	64.46
5	Ta x Te(M5)	59.06	40.94	42.43	57.57	48.30	51.70	38.00	62.00
6	Ta xPri(M6)	50.41	49.59	46.24	53.76	43.74	56.26	36.15	63.85
	Mean	54.05	45.95	45.16	54.84	45.56	54.44	36.56	63.44
7	Sax Pro(M7)	50.68	49.32	42.53	57.47	43.03	56.97	35.66	64.34
8	Sa xTe (M8)	51.27	48.73	46.67	53.33	40.34	59.66	34.18	65.82
9	Sa xPri (M9)	48.36	51.64	42.28	57.72	48.62	51.38	35.19	64.81
	Mean	50.10	49.90	43.83	56.17	44.00	56.00	35.01	64.99
	GM	50.68	49.32	45.20	54.80	44.32	55.68	36.44	63.56
		..... %							
	The second season								
1	Se xPro(M1)	41.50	58.50	37.29	62.71	35.02	64.98	27.56	72.44
2	Se xTe (M2)	47.64	52.36	37.65	62.35	34.24	65.76	27.59	72.41
3	Se xPri (M3)	45.75	54.25	35.64	64.36	35.43	64.57	29.65	70.35
	Mean	44.96	55.04	36.86	63.14	34.90	65.10	28.27	71.73
4	TaxPro(M4)	43.84	56.16	37.34	62.66	32.27	67.73	25.92	74.08
5	Ta x Te(M5)	39.63	60.37	32.67	67.33	31.68	68.32	28.57	71.43
6	Ta xPri(M6)	46.31	53.69	30.72	69.28	43.20	56.80	25.69	74.31
	Mean	43.26	56.74	33.58	66.42	35.72	64.28	26.73	73.27
7	Sax Pro(M7)	42.73	57.27	38.83	61.17	33.58	66.42	30.07	69.93
8	Sa xTe (M8)	39.83	60.17	37.51	62.49	32.64	67.36	27.88	72.12
9	Sa xPri (M9)	43.61	56.39	38.81	61.19	29.51	70.49	24.35	75.65
	Mean	42.06	57.94	38.38	61.62	31.91	68.09	27.43	72.57
	GM	43.43	56.57	36.27	63.73	34.18	65.82	27.48	72.52
	Overall mean	47.06	52.95	40.74	59.27	39.25	60.75	31.94	68.04

Legumes (L): Berseem clover varieties : Serwl (Se), Tarkeby seds (Ta) and Sakha 96 (Sa).
Grasses (G): Ryegrass varieties : Promenade (Pro), Tewarsama (Te) and Primora (Pri).

IV. Chemical constituents and nutritive analysis:

As previously mentioned in the materials and methods section, that chemical analysis and the nutritive components of the produced forage materials under experimentation was conducted for the second and the fourth cuts. This was done to investigate how much such components behaved at the earlier and later stages of growth. The following constituents under study were:

1. Crude protein (CP) content:

Data in Table (20) showed no appreciable differences in CP content within each of the three berseem clover varieties or between any of the three ryegrass varieties in their pure stands. This trend was noticed either in the earlier or later cuts in the two seasons or and their means. In other words CP contents were more or less similar for the three berseem clover varieties and within the three ryegrass varieties as well.

These results are very well accepted since the variation between varieties were not that wide under similar circumstances, since these varieties have its owen unique specific characteristics for the parameter under study. However, some of the specific futures of varieties could show up under the ideal situation of specific well identified environmental factors.

Results also showed that any of the grown berseem clover varieties exerted relatively higher CP content than any of the grown ryegrass varieties in their pure stands. These results were clear for the earlier and the later cuts of the two seasons. Meanwhile, these results were constant over the three varieties of

berseem clover and the three varieties of ryegrass in their pure stands. These results are in general agreement with those reported by several investigators as **Whitehead *et al.* (1983), Krzywiccki *et al.* (1984), Jamriska (1987), Marllarino and Wedin (1990), Abd El-Sattar *et al.* (1996), Evans *et al.* (1996), Moustafa (1996) and Thompson and Stout (1997)**.

It should be also noted from Table (20) that CP content decreased clearly as the stage of growth proceeded from the second to the fourth cut. These results were obtained for either berseem clover ryegrass varieties in their pure stands during the two seasons. However, differences in the decrease of CP content for the later cuts than the earlier cuts as the stages of growth proceeded, slightly varied within a very limited and acceptable magnitudes that could ignored.

In pure stands and over the three berseem clover varieties, CP content decreased from 18.87 to 15.605 from the 2nd to the 4th cuts of the first season, respectively, being 19.37 to 15.20 in the second season with an average of 19.12 to 15.40%, respectively. Also, the respective decrease in ryegrass values of its CP content were 16.12 to 13.36 for the second season, being 15.96 to 12.90% in the second season with an average of 16.04 to 13.4%.

The above mentioned decrease in CP content of the forage plants (either legumes or grasses) in the later than the earlier cuts is more likely due to the more leaf / stem ratio of the earlier cuts than the later ones. Such leaves are more active in CP synthesis and accumulation. Also, plants used to be more active

in growth and metabolic activities in its earlier stages of growth than the later stages at the end of the season.

Moreover, at the later stages of plants, the environmental factors started to be unfavorable for more metabolism of plants, and plants started to get into a senescence stages where the long days and higher temperature started to increase. Hence, annual winter plants started to have more anabolism rather than metabolism with a less leaf/stem ratio. These could be good reasons for explaining the decrease of the CP content in plants at the later stages of growth during the end of winter season and the beginning of summer season.

Results in Table (20) also, clarified that for all of the proposed binary forage mixtures (M_1 – M_9) of berseem clover and ryegrass varieties, CP content were almost on the average between what was obtained for berseem clovers and ryegrasses in their CP content for their pure stands. So, the proposed forage mixtures acquired more CP content than for grasses when mixed with berseem clover in their pure stands.

These results were noticed for all of the proposed mixtures. So, the benefits of rhizobium inoculation of berseem clover seeds acted positively in fixing the ambient nitrogen for the sake of the growth of clovers and their associated ryegrasses. Such nitrogen takes its owen role in protein synthesis and accumulation for the associated forage plants in their mixtures.

The associated mixtures (M1 – M9) contained almost similar CP contents. This results was true for the second (earlier cut) and the fourth cut (later one). However, earlier cuts

Table (20): Crude protein (CP) content of the proposed forage mixtures and their relevant pure stands for early and late cuts during two seasons (2001 / 2002 – 2002 / 2003).

No.	Treatment	1st Season		2nd Season		Over the two season mean	
		2nd cut	4th cut	2nd cut	4th cut	2nd cut	4th cut
	Legumes (L).	..... %					
1	**Se**	**19.03**	**15.99**	**19.98**	**15.36**	**19.51**	**15.68**
2	**Ta**	**19.04**	**14.77**	**18.94**	**14.89**	**18.99**	**14.83**
3	**Sa**	**18.53**	**16.05**	**19.19**	**15.35**	**18.86**	**15.70**
Mean		18.87	15.60	19.37	15.20	19.12	15.40
	Grasses (G)						
4	**Pro**	**16.23**	**13.68**	**14.87**	**12.82**	**15.55**	**13.26**
5	**Te**	**15.94**	**12.15**	**15.88**	**12.40**	**15.91**	**12.28**
6	**Pri**	**16.19**	**14.25**	**17.13**	**13.49**	**16.66**	**13.87**
Mean		16.12	13.36	15.96	12.90	16.04	13.14
	Mixtures (M)						
7	**Se x Pro** (M1)	**17.33**	**14.36**	**19.42**	**15.16**	**18.38**	**14.76**
8	**Se x Te** (M2)	**18.51**	**14.14**	**19.32**	**14.64**	**18.92**	**14.39**
9	**Se x Pri** (M3)	**18.32**	**15.27**	**19.75**	**14.31**	**19.04**	**14.79**
Mean		18.05	14.59	19.50	14.70	18.78	14.65
10	**Ta x Pro** (M4)	**18.45**	**13.84**	**18.72**	**13.32**	**18.59**	**13.58**
11	**Ta x Te** (M5)	**17.01**	**14.30**	**18.52**	**14.57**	**17.77**	**14.44**
12	**Ta x Pri** (M6)	**17.41**	**14.40**	**18.92**	**14.24**	**18.17**	**14.32**
Mean		17.62	14.18	18.72	14.04	18.18	14.11
13	**Sa x Pro** (M7)	**18.42**	**14.71**	**18.44**	**14.16**	**18.43**	**14.44**
14	**Sa x Te** (M8)	**18.44**	**15.15**	**17.71**	**13.91**	**18.08**	**14.53**
15	**Sa x Pri** (M9)	**18.27**	**14.96**	**18.35**	**13.27**	**18.31**	**14.12**
Mean		18.38	14.94	18.17	13.78	18.27	14.36

Legumes (L): Berseem clover varieties : Serw 1 (Se), Tarkeby seds (Ta) and Sakha 96 (Sa).

Grasses (G): Ryegrass varieties : Promenade (Pro), Tewarsama (Te) and Primora (Pri).

contained relatively higher CP content as compared with the later ones. Similar trend was noticed with clover and ryegrass varieties in their pure stands as previously presented and discussed. So, it could be considered that no preference for any of the proposed forage mixtures (M1 – M9) in their CP content. The CP content was fluctuated within a very acceptable narrow ignorable differences within the proposed mixtures (Table 20). Meanwhile, more CP content was detected for their earlier than their later cuts with similar trend as noticed for their relevant pure stands previously discussed. These obtained results previously mentioned are in agreement with those reported by **Chujo and Daimon (1984), Sterz and Meinson (1986), Boberfeld *et al.* (1995), Abd El-Shafy and Ali (1996), induk *et al.* (1998) and Ghanbari and Lee (2003).**

2. Crude fiber (CF) content:

Crude fiber percentage was relatively higher for each of ryegrass varieties than for each of berseem clover varieties in their relevant pure stands as it is clear in Table (21). This result was true for the two studied seasons.

From the above result, it is very well noticed that grasses with its nature of stemmy structure posses more CF percentage than the leguminous berseem clover in their pure stands.

It is also clear that the 4th cut contained more fibers than the 2nd one of the earlier stage in growth. This is for pure stands of ryegrass or clover varieties. These obtained results were noticed for each of the two seasons. Such result insured that the late cuts at the end of the season have had low leaf / stem ratio or

in other words of more stemy nature with low leaf ratio. The more stemy structure is responsible for more CF percentage for the obtained grasses and/or the leguminous forage crops in their pure stands.

Results evidentiated no appreciable differences in CF percentages among the three berseem clover varieties or the three ryegrass varieties in their pure stands neither in the second cuts nor in the fourth cuts (Table 21). Similar observations was recorded in the two seasons. **Krzywiccki *et al.* (1984), Abd El-Sattar *et al.* (1996), Lehmann and Meiste (1990), Seo *et al.* (1997) and Induk *et al.* (1998)** reported similar reaults in this respect.

From the above results it could be considered that CP percentage is not a variable to be distinguish between specific varieties of berseem clover or ryegrass under the circumstances of this study.

The proposed binary mixtures of berseem clover and ryegrass varieties (M1 – M9) did not show appreciable noticeable differences among each other in CF percentage as it is clear in Table (21). Such result was clear in the early or the late cuts during the two seasons where the recorded CP percentage ranged within a very narrow ranges which could be ignorable. So, CF percentages of the grown mixture could be considered similar among mixtures of different varieties of clover and ryegrass during the two seasons.

However, it should be also noted that in general, CF content of the proposed binary forage mixtures was relatively higher for the later cuts (4^{th} cut) as compared with the earlier cuts (2^{nd} cut). This result was true for each of the two seasons as it is obviously clear in Table (21).

So, it is more likely that all of the obtained forage mixtures were not varied appreciably in their CF content within the same cut. But, CF content was clearly higher for the later than the earlier cuts in the two seasons as previously mentioned.

Also, it could be generally noted from the data in Table (21) that the ranges in the values of CF percentage of the proposed nine forage mixtures were almost similar within each particular cuts, with noticeable higher magnitudes for the 4^{th} cuts as compared with the 2^{nd} cuts in the two seasons.

Moreover, such obtained CF values were half-way in between as compared with their relevant components of clover and ryegrass varieties in their pure stands (Table 21). In other words, the higher CF content of ryegrasses imposed its impact on the lower CF of the associated clovers which came up with a moderate CF content of the forage mixtures. In general, those results are in accordance with those reported by **Mohamed (1982), Sterz and Meinson (1986), Abd El-Sattar *et al.* (1996), Moustafa (1996), Ghanbari and Lee (2003) and Hassan-hend (2003).**

Table (21): Crude fiber (CF) content of the proposed forage mixtures and their relevant pure stands for early and late cuts during two seasons (2001 / 2002 – 2002 / 2003).

No.	Treatment	1st Season		2nd Season		Over the two season mean	
		2nd cut	4th cut	2nd cut	4th cut	2nd cut	4th cut
	Legumes (L).	..... %					
1	Se	25.95	27.05	24.64	27.92	25.30	27.49
2	Ta	25.78	27.34	25.12	27.54	25.45	27.44
3	Sa	25.15	27.94	25.17	27.96	25.16	27.95
Mean		25.63	27.44	24.98	27.81	25.30	27.63
	Grasses (G)						
4	Pro	26.09	28.97	27.44	28.47	26.77	28.72
5	Te	27.43	29.57	27.18	29.10	27.46	29.34
6	Pri	26.58	28.26	25.76	28.81	26.17	28.54
Mean		26.70	28.93	26.79	28.79	26.80	28.87
	Mixtures (M)						
7	Se x Pro (M1)	26.28	28.16	25.22	27.77	25.75	27.97
8	Se x Te (M2)	25.87	28.66	25.00	27.31	25.44	27.99
9	Se x Pri (M3)	25.91	27.24	24.52	28.08	25.22	27.66
Mean		26.02	28.02	24.91	27.72	25.47	27.87
10	Ta x Pro (M4)	25.73	28.22	25.13	28.92	25.43	28.57
11	Ta x Te (M5)	26.22	28.43	27.48	27.48	26.85	27.96
12	Ta x Pri (M6)	26.12	28.16	25.88	28.59	26.00	28.38
Mean		26.02	28.27	26.16	28.33	26.09	28.30
13	Sa x Pro (M7)	25.62	27.23	25.20	28.57	25.41	27.90
14	Sa x Te (M8)	25.66	27.72	26.39	28.14	26.03	27.93
15	Sa x Pri (M9)	25.99	27.13	25.75	28.35	25.87	27.74
Mean		25.76	27.36	25.78	28.35	25.77	27.86

Legumes (L): Berseem clover varieties : Serwl (Se), Tarkeby seds (Ta) and Sakha 96 (Sa).

Grasses (G): Ryegrass varieties : Promenade (Pro), Tewara Sama (Te) and Primora (Pri).

3. Ash content:

Ash content was (on the average) slightly higher for berseem clover than ryegrass varieties in their pure stands with no differences among clover or ryegrass varieties (Table 22) during the two seasons for each of the assigned individual cuts.

It is also, clear that slight reduction in ash percentage was obtained for the 4th cuts as compared with the 2nd cuts of the two seasons over the three clover varieties. Similar trend was noticed over the three ryegrass varieties in the second season and on the means of the two seasons.

The relatively higher ash content of the earlier cuts as compared with the later ones in either in ryegrasses or clovers could be attributed to the higher activities for mineral absorption and accumulation during the active earlier stages of growth in presence of the optimum prevailing environmental conditions.

The nine grown forage mixtures (m1 – m9) were of almost similar in ash percentage with slightly lower magnitudes in the later cuts (4th cuts) than the earlier ones (2nd cuts). This result was noticed in the two seasons as presented in Table (22). In general, these results are in accordance with those reported by **Mohamed (1982), Jamriska (1987) and Abd El-Shafy and Ali (1996).**

Table (22): Ash content of the proposed forage mixtures and their relevant pure stands for early and late cuts during two seasons (2001 / 2002 – 2002 / 2003).

No.	Treatment	1st Season		2nd Season		Over the two season mean	
		2nd cut	4th cut	2nd cut	4th cut	2nd cut	4th cut
	Legumes (L).	..... %					
1	**Se**	**16.01**	**15.86**	**16.58**	**15.58**	**16.30**	**15.72**
2	**Ta**	**16.40**	**15.22**	**16.31**	**15.25**	**16.36**	**15.24**
3	**Sa**	**15.61**	**15.60**	**15.93**	**15.69**	**15.77**	**15.65**
Mean		16.01	15.56	16.27	15.51	16.14	15.54
	Grasses (G)						
4	**Pro**	**14.89**	**14.14**	**14.91**	**14.27**	**14.90**	**14.21**
5	**Te**	**14.62**	**14.43**	**15.41**	**14.38**	**15.02**	**14.41**
6	**Pri**	**15.34**	**14.68**	**15.68**	**14.71**	**15.51**	**14.70**
Mean		14.95	14.42	15.33	14.45	15.14	14.44
	Mixtures (M)						
7	**Se x Pro** (M1)	**15.92**	**14.93**	**16.30**	**15.35**	**16.11**	**15.14**
8	**Se x Te** (M2)	**15.57**	**14.81**	**16.04**	**14.75**	**15.81**	**14.78**
9	**Se x Pri** (M3)	**15.89**	**14.82**	**16.38**	**15.25**	**16.14**	**15.04**
Mean		15.79	14.85	16.24	15.12	16.02	14.99
10	**Ta x Pro** (M4)	**15.62**	**15.14**	**15.57**	**15.50**	**15.60**	**15.32**
11	**Ta x Te** (M5)	**15.95**	**15.20**	**15.62**	**14.84**	**15.79**	**15.02**
12	**Ta x Pri** (M6)	**15.44**	**14.79**	**16.04**	**15.22**	**15.74**	**15.01**
Mean		15.67	15.04	15.74	15.19	15.71	15.12
13	**Sa x Pro** (M7)	**15.47**	**15.41**	**15.60**	**15.49**	**15.54**	**15.45**
14	**Sa x Te** (M8)	**15.58**	**15.57**	**15.65**	**14.83**	**15.62**	**15.20**
15	**Sa x Pri** (M9)	**15.50**	**14.82**	**15.70**	**14.79**	**15.60**	**14.81**
Mean		15.52	15.27	15.65	15.04	15.59	15.15

Legumes (L): Berseem clover varieties : Serwl (Se), Tarkeby seds (Ta) and Sakha 96 (Sa).

Grasses (G): Ryegrass varieties : Promenade (Pro), Tewara Sama (Te) and Primora (Pri).

4. Ether Extract (EE) content:

The EE percentages were slightly higher with noticeable magnitudes for ryegrass than berseem clover varieties. This result was obviously clear on the individual basis of pure stands and over varieties of berseem clover and ryegrass. Also, similar results were obtained in the two seasons. (Table, 23).

Moreover, EE percentages were slightly higher in the 2nd (earlier) cuts as compared with the 4th (later) cuts with slightly larger magnitudes for grasses than legumes in their pure stands. This trend was clear in the two seasons over ryegrass and of clover varieties in their pure stands for each of the two studied seasons.

Similar trend was noticed for EE content for each of the proposed forage mixtures (M1 – M9) with lower magnitudes as compared with their relevant pure stands, where ryegrass varieties contained more EE percentage as compared with berseem clover varieties in their pure stands as it is clear from Table (23).

It should be also noted that the EE percentages of the studied forage mixtures or their relevant pure stands were of narrow and limited magnitudes. However, differences, in this studied trait were fluctuated into constant clear trend as previously discussed. Moreover, differences in EE percentage of the obtained forage mixture were not varied much to be recognized. However, the proposed mixtures were generally lower in EE content than grasses and higher than legumes in their relevant pure stands with slight differences.

Table (23): Ether extract (EE) content of the proposed forage mixtures and their relevant pure stands for early and late cuts during two seasons (2001 / 2002 – 2002 / 2003).

No.	Treatment	1st Season		2nd Season		Over the two season mean	
		2nd cut	4th cut	2nd cut	4th cut	2nd cut	4th cut
	Legumes (L).	.....%					
1	**Se**	**2.35**	**1.89**	**2.96**	**2.16**	**2.66**	**2.03**
2	**Ta**	**2.29**	**1.61**	**2.57**	**1.86**	**2.43**	**1.74**
3	**Sa**	**2.03**	**1.88**	**2.72**	**1.94**	**2.38**	**1.91**
Mean		2.22	1.79	2.75	1.99	2.49	1.89
	Grasses (G)						
4	**Pro**	**3.65**	**2.45**	**3.46**	**2.45**	**3.56**	**2.45**
5	**Te**	**3.83**	**2.18**	**3.54**	**2.60**	**3.69**	**2.39**
6	**Pri**	**3.56**	**2.56**	**3.51**	**2.52**	**3.54**	**2.54**
Mean		3.68	2.40	3.50	2.52	3.60	2.46
	Mixtures (M)						
7	**Se x Pro** (M1)	**2.25**	**2.29**	**3.04**	**2.34**	**2.65**	**2.32**
8	**Se x Te** (M2)	**2.73**	**2.40**	**3.13**	**2.40**	**2.93**	**2.40**
9	**Se x Pri** (M3)	**2.52**	**2.48**	**3.16**	**2.30**	**2.84**	**2.39**
Mean		2.50	2.39	3.11	2.35	2.81	2.37
10	**Ta x Pro** (M4)	**2.52**	**2.33**	**3.18**	**1.71**	**2.85**	**2.02**
11	**Ta x Te** (M5)	**3.05**	**2.47**	**3.14**	**2.25**	**3.10**	**2.36**
12	**Ta x Pri** (M6)	**2.45**	**2.31**	**3.19**	**1.44**	**2.82**	**1.88**
Mean		2.67	2.37	3.17	1.80	2.92	2.09
13	**Sa x Pro** (M7)	**2.43**	**2.30**	**3.14**	**2.14**	**2.79**	**2.22**
14	**Sa x Te** (M8)	**2.62**	**2.44**	**2.64**	**2.27**	**2.63**	**2.36**
15	**Sa x Pri** (M9)	**2.78**	**2.85**	**3.12**	**1.84**	**2.95**	**2.35**
Mean		2.61	2.53	2.97	2.08	2.79	2.31

Legumes (L): Berseem clover varieties : Serwl (Se), Tarkeby seds (Ta) and Sakha 96 (Sa).

Grasses (G): Ryegrass varieties : Promenade (Pro), Tewara Sama (Te) and Primora (Pri).

Also, in mixtures, the late cuts (4^{th} cut) were slightly lower in EE percentages than the earlier ones (2^{nd} cut) with slightely more differences in the second season and the means of the two seasons. However, such differences were more clear of relatively larger magnitudes on pure stand basis. In this respect **Mohamed (1982)** came to similar results.

5. Nitrogen free extract (NFE) content :

Results in Table (24) indicated that NFE of ryegrass varieties was relatively higher than clover varieties in their pure stands. This result was noticed in the two seasons with relatively higher magnitudes for the fourth cuts as compared with the second ones. Such obtained results matches with the real fact that ryegrasses usually have more NFE content than clovers. Whereas, opposite situation was reported for CP as noticed and recorded previously in this study.

The higher NEF content of ryegrasses than clovers could be more likely due to the a abundance of carbohydrates content in its free structure in form of sucrose, frnctozanes and or even monosaccrides. On the same respect clovers contained more CP content than grasses.

No noticed differences could be specifically recognized for the NFE contents within the grown ryegrass varieties or within clover varieties in their pure stands. This is because of the very narrow ranges of NFE within each group of grasses or legumes, in spite of the relatively higher values of NFE content of ryegrass than clover varieties. These results are similar to what was obtained by **Mohamed (1982), Davies *et al.* (1991),**

Boberfeld *et al.* (1995), Abd El-Shafy (1996) and Evans *et al.* (1996).

Data in Table (24) also showed relatively higher values of NFE percentage in ryegrass and berseem clover varieties at the later 4th cut) than the earlier ones (2nd cuts). This result could be due to the more accumulation of NFE content across the stand life which used to be reflected on the later cuts of the season. The above results was noticed during the two seasons in pure stands of the mixtures components.

Regarding the proposed mixtures (M1 – M9), the obtained forage mixtures were almost similar in their NFE where such values were much close to each other as shown in Table (24). Also, it is generally noticed that in spite of the relative similarities in NFE values for each of the grown mixtures, such values were relatively higher than in their associated clover varieties in their pure stands.

Higher NFE contents were also obtained for the 4th cuts than the 2nd cuts in all mixtures as previously presented in their relevant pure stands with slightly lower magnitudes in most cases. Such results were true for each of the two seasons and their means. Similar trend could be almost noticed in NFE (Table, 24). **Mohamed (982), Boberfeld *et al.* (1995), Evans *et al.* (1996) and Ghanbari and Lee (2003)** reported similar results in this respect.

Table (24): Nitrogen free extract (NFE) content of the proposed forage mixtures and their relevant pure stands for early and late cuts during two seasons (2001 / 2002 – 2002 / 2003).

No.	Treatment	1st Season		2nd Season		Over the two season mean	
		2nd cut	4th cut	2nd cut	4th cut	2nd cut	4th cut
	Legumes (L).	..... %					
1	Se	36.66	38.81	35.84	38.98	36.25	38.90
2	Ta	36.49	41.06	37.06	40.46	36.78	40.76
3	Sa	38.60	38.53	36.99	39.06	37.80	38.80
Mean		37.25	39.47	36.63	39.50	36.94	39.49
	Grasses (G)						
4	Pro	39.14	40.81	39.32	41.99	39.23	41.40
5	Te	38.13	41.67	37.99	41.52	38.06	41.60
6	Pri	38.33	40.25	37.94	40.47	38.14	40.36
Mean		38.53	40.91	38.42	41.33	38.48	41.12
	Mixtures (M)						
7	Se x Pro (M1)	38.22	40.26	36.02	39.38	37.12	39.82
8	Se x Te (M2)	37.32	39.99	36.51	40.90	36.92	40.45
9	Se x Pri (M3)	37.36	40.19	36.19	40.06	36.78	40.13
Mean		37.63	40.15	36.24	40.11	36.94	40.13
10	Ta x Pro (M4)	37.68	40.47	37.40	40.55	37.54	40.51
11	Ta x Te (M5)	37.77	39.60	35.24	40.86	36.51	40.23
12	Ta x Pri (M6)	38.58	40.34	35.97	39.94	37.28	40.14
Mean		38.01	40.14	36.20	40.45	37.11	40.29
13	Sa x Pro (M7)	38.06	40.35	37.62	39.64	37.84	40.00
14	Sa x Te (M8)	37.70	41.12	37.61	40.85	37.66	40.99
15	Sa x Pri (M9)	37.46	40.24	37.08	41.75	37.27	41.00
Mean		37.74	40.57	37.44	40.75	37.59	40.66

Legumes (L): Berseem clover varieties : Serwl (Se), Tarkeby seds (Ta) and Sakha 96 (Sa).

Grasses (G): Ryegrass varieties : Promenade (Pro), Tewara Sama (Te) and Primora (Pri).

6. Digestible Protein (DP) content:

Data for the digestible protein (DP) percentages of the proposed forage mixtures and their relevant pure stands for the early and late cuts in the two seasons and their average are presented in Table (25).

In pure stands, any of the three berseem clover varieties contained relatively higher digestible protein content as compared with any of the three ryegrass varities meanwhile their DP% were relatively higher for the 2nd cut as compared with the 4th cut. Such trend was noticed for the two seasons.

The DP% over the three clover varieties were 14.55 and 11.42% for the early and late cuts, respectively in the first season, being 15.03 and 11.04% in the second season, with a respective average of 14.80 and 11.235. Corresponding DP over the three ryegrass varieties were 11.92 and 9.25% in the first season being 11.77 and 8.83% in the second season, with a respective average of 11.84 and 9.04%.

It is clear that no detectable differences in DP content could be recognized within each the three berseem clover varieties or within the each of the three ryegrass varieties. This was true since the DP content were fluctuated within a very narrow range with no specific trend within clover or within ryegrass varieties in their pure stands. So, in conclusion, no preference for any of the three clover or ryegrass varieties in DP content could be suggested.

Regarding DP of the proposed mixtures (M1-M9) of clover and ryegrass varieties, this nutritive parameter in their mixtures was slightly lower (or more or less similar) as compared to their relevant clover varieties in their pure stands. However, such mixtures were higher in DP content than its relevant grasses in their pure stands. This trend was noticed in each of the two seasons.

In other words, mixtures almost contain DP content similar to their clover varieties and higher than their ryegrasses in their pure stands. It could be concluded that DP content of ryegrasses increased by the presence of clover in the mixture, but DP content of clover was not detectably reduced or affected in presence of ryegrasses. So, clovers imposed its influence in increasing DP when mixed with ryegrasses of low DP%.

Moreover, such DP contents were noticed to be higher for early than late cuts for either ryegrasses or berseem clover varieties in their pure stands or their mixtures. This result was noticed during each of the two seasons and could be used in upgrading quality of the assigned forage mixtures through selecting the associated botanical components.

Table (25): Digestible protein (DP) content of the proposed forage mixtures and their relevant pure stands for early and late cuts during two seasons (2001 / 2002 – 2002 / 2003).

No.	Treatment	1st Season		2nd Season		Over the two season mean	
		2nd cut	4th cut	2nd cut	4th cut	2nd cut	4th cut
	Legumes (L).	……%……					
1	**Se**	**14.71**	**11.79**	**15.62**	**11.19**	**15.17**	**11.49**
2	**Ta**	**14.72**	**10.62**	**14.62**	**10.74**	**14.67**	**10.68**
3	**Sa**	**14.23**	**11.85**	**14.86**	**11.18**	**14.55**	**11.52**
Mean		14.55	11.42	15.03	11.04	14.80	11.23
	Grasses (G)						
4	**Pro**	**12.02**	**9.52**	**10.72**	**8.75**	**11.37**	**9.14**
5	**Te**	**11.75**	**8.11**	**11.69**	**8.35**	**11.72**	**8.23**
6	**Pri**	**11.99**	**10.12**	**12.89**	**9.40**	**12.44**	**9.76**
Mean		11.92	9.25	11.77	8.83	11.84	9.04
	Mixtures (M)						
7	**Se x Pro** (M1)	**13.08**	**10.23**	**15.09**	**11.00**	**14.09**	**10.62**
8	**Se x Te** (M2)	**14.21**	**10.02**	**14.99**	**10.49**	**14.60**	**10.26**
9	**Se x Pri** (M3)	**14.03**	**11.10**	**15.40**	**10.18**	**14.72**	**10.64**
Mean		13.77	10.45	15.16	10.56	14.47	10.51
10	**Ta x Pro** (M4)	**14.15**	**9.73**	**14.41**	**9.23**	**14.28**	**9.48**
11	**Ta x Te** (M5)	**12.77**	**10.17**	**14.22**	**10.43**	**13.50**	**10.30**
12	**Ta x Pri** (M6)	**13.16**	**10.27**	**14.92**	**10.13**	**14.04**	**10.20**
Mean		13.36	10.06	14.52	9.93	13.94	9.99
13	**Sa x Pro** (M7)	**14.13**	**10.57**	**14.15**	**10.03**	**14.14**	**10.30**
14	**Sa x Te** (M8)	**14.16**	**9.07**	**13.44**	**9.80**	**13.80**	**9.44**
15	**Sa x Pri** (M9)	**13.98**	**10.81**	**14.06**	**9.14**	**14.02**	**9.98**
Mean		14.09	10.15	13.88	9.66	13.99	9.91

Legumes (L): Berseem clover varieties : Serwl (Se), Tarkeby seds (Ta) and Sakha 96 (Sa).

Grasses (G): Ryegrass varieties : Promenade (Pro), Tewara Sama (Te) and Primora (Pri).

7. Total Digestible Nutrients (TDN) content :

Results in Table (26) indicated that over each of the three ryegrass and / or the three varieties of berseem clover, TDN content was relatively higher for grasses than clovers. This trend was also noticed for each variety of ryegrass and each variety of clover. Meanwhile, such results were obtained in each of the two seasons and their combined analysis as well.

Over the three varieties of clover, TDN content was 62.33 and 62.95% for the early cuts in the first and second seasons, respectively, being reduced to 59.76 and 59.45% for the two late cuts. The corresponding TDN% over the 3 varieties of ryegrass was 63.31, 65.13; 62.26 and 61.81% as presented in Table (26).

This result is more likely due to the different structure and components of ryegrass plants and clover, where grasses contained more NFE contents and clovers contained more CP, in addition to the other nutrient components that could be easily digested .

Data revealed that TDN of the pure stands of either ryegrasses or clovers were noticeably higher for the earlier cuts than the later cuts during each of the two seasons. This could be due to the higher leaf / stem ratio of such forage plants early in the season (2^{nd} cuts) as compared by the leaf / stem ratio of the later cuts at the end of the season (4^{th} cuts).

This result could be due to the prevailing environmental factors and plants age which play an important role in reducing the TDN content of the forage. The long day and high temperature of such annual winter forages at the and of the growing reason, as well as the senescence of plant which end up with more deposited fibers and/or lignin's with some other anti-quality components that may reduce the TDN content of the obtained forages. Such obtained results were noticed during each of the two seasons.

The TDN% of the nine proposed forage mixtures (M1 – M9) were almost similar, but having relatively lower values than grasses and relatively higher ones than legumes in their pure stands. Meanwhile, such values in forage mixtures behaved in a similar manner as previously presented among the earlier than the later cuts. In other words, clovers and ryegrasses reflected its owen identity in TDN % on their mixtures.

The above presemtal trend of TDN content was noticed for each of the individual mixtures and for the 2nd and 4th cuts as well as during the two seasons. In general these results are in accordance with those reported by **Kunelius and Narasimhalu (1983), Shalaby *et al.* (1983), Krzywiecki *et al.* (1984), Chauhan (1995), Seo *et al.* (1997) and Lee and Lee (2000).**

Table (26): Total digestible (TDN) content of the proposed forage mixtures and their relevant pure stands for early and late cuts during two seasons (2001 / 2002 – 2002 / 2003).

No.	Treatment	1st Season		2nd Season		Over the two season mean	
		2nd cut	4th cut	2nd cut	4th cut	2nd cut	4th cut
	Legumes (L).	……%……					
1	**Se**	**62.15**	**59.99**	**63.35**	**59.42**	**62.75**	**59.71**
2	**Ta**	**62.27**	**59.64**	**62.72**	**59.54**	**62.50**	**59.59**
3	**Sa**	**62.56**	**59.65**	**62.77**	**59.39**	**62.67**	**59.52**
Mean		62.33	59.76	62.95	59.45	62.64	59.61
	Grasses (G)						
4	**Pro**	**65.46**	**62.56**	**63.95**	**61.75**	**64.71**	**62.16**
5	**Te**	**65.07**	**60.98**	**65.02**	**61.27**	**65.05**	**61.13**
6	**Pri**	**65.39**	**63.25**	**66.42**	**62.42**	**65.91**	**62.84**
Mean		65.31	62.26	65.13	61.81	65.22	62.04
	Mixtures (M)						
7	**Se x Pro** (M1)	**63.81**	**61.28**	**63.65**	**60.59**	**63.73**	**60.94**
8	**Se x Te** (M2)	**63.61**	**60.49**	**64.19**	**60.35**	**63.90**	**60.42**
9	**Se x Pri** (M3)	**63.77**	**61.62**	**64.89**	**60.94**	**64.33**	**61.28**
Mean		63.73	61.13	64.24	60.63	63.99	60.88
10	**Ta x Pro** (M4)	**63.87**	**61.10**	**62.99**	**60.65**	**63.43**	**60.88**
11	**Ta x Te** (M5)	**63.67**	**60.31**	**63.87**	**60.41**	**63.77**	**60.36**
12	**Ta x Pri** (M6)	**63.83**	**61.45**	**64.57**	**60.98**	**64.20**	**61.22**
Mean		63.79	60.95	63.81	60.68	63.80	60.82
13	**Sa x Pro** (M7)	**64.01**	**61.11**	**63.36**	**60.57**	**63.69**	**60.84**
14	**Sa x Te** (M8)	**63.82**	**60.32**	**63.90**	**60.33**	**63.86**	**60.33**
15	**Sa x Pri** (M9)	**63.98**	**61.45**	**64.60**	**60.91**	**64.29**	**61.18**
Mean		63.94	60.96	63.95	60.60	63.95	60.78

Legumes (L): Berseem clover varieties : Serwl (Se), Tarkeby seds (Ta) and Sakha 96 (Sa).

Grasses (G): Ryegrass varieties : Promenade (Pro), Tewara Sama (Te) and Primora (Pri).

8. Total Digestable Nutrients yield (TDNY)

The estimated total digestible nutrients yield (TDNY) of the proposed binary forage mixtures and their relevant pure stands (Table 27) was almost similar and having the similar trend as for the TDN% (Table 27) and dry forage yield (Table 4, 5) previously presented and discussed.

For the sake of more information, results of chemical constituents and nutritive parameters of the tested forage mixture and their associations in pure stands during the earlier (2^{nd} cuts) and later cuts (4^{th} cuts) are presented for the first and second season. This will summarize and facilitate any of the required further information for comparisons, trends, relations and limits for such studied parameters.

Results in Table (27) reflected the behavior of the obtained yield of the total digestible nutrients for the proposed forage mixture of berseem clover varieties associated with ryegrass varieties previously presented and discussed. Similar results were obtained by **Kunelius and Narasimhalu (1983), Shalaby *et al.* (1983), Chauhan (1995) and Lee and Lee (2000).**

- Final conclusion and further needed information:

For further details whenever needed, the chemical contents (CP, CF, Ash, EE, NFE, DP and RDN) and its contribution to the total digestible nutrients of the proposed forage mixtures and their relevant pure stands for the early and late cuts of the two seasons are summarized in Tables (28 and 29) .

Table (27): Total digestible nutrients yield of the proposed forage mixtures and their relevant pure stands for early and late cuts during two seasons (2001 / 2002 – 2002 / 2003).

No.	Treatment	1st Season		2nd Season		Over the two season mean	
		2nd cut	4th cut	2nd cut	4th cut	2nd cut	4th cut
	Legumes (L).	.....Kg/fed.....					
1	Se	538	690	716	1123	627	907
2	Ta	536	608	659	1084	598	846
3	Sa	519	537	684	1158	602	848
Mean		531	612	686	1122	609	867
	Grasses (G)						
4	Pro	484	963	691	1136	588	1050
5	Te	436	1055	819	1183	628	1119
6	Pri	543	1107	777	1230	660	1169
Mean		488	1042	762	1183	625	1113
	Mixtures (M)						
7	Se x Pro (M1)	606	1250	.878	1212	742	1231
8	Se x Te (M2)	566	1077	892	1279	729	1178
9	Se x Pri (M3)	657	1146	947	1310	802	1228
Mean		610	1158	906	1267	758	1212
10	Ta x Pro (M4)	556	1204	882	1274	719	1239
11	Ta x Te (M5)	624	1098	901	1408	763	1253
12	Ta x Pri (M6)	568	1254	969	1165	769	1210
Mean		583	1185	917	1282	750	1234
13	Sa x Pro (M7)	576	1234	988	1199	782	1217
14	Sa x Te (M8)	606	1152	952	1207	779	1180
15	Sa x Pri (M9)	563	1241	820	1370	692	1306
Mean		582	1209	920	1259	751	1234

Legumes (L): Berseem clover varieties : Serwl (Se), Tarkeby seds (Ta) and Sakha 96 (Sa).

Grasses (G): Ryegrass varieties : Promenade (Pro), Tewara Sama (Te) and Primora (Pri).

Table (28): Chemical constituents and total digestible nutrients of the proposed forage mixtures and their relevant pure stands for early and late cuts during the first season (2001-2002).

No.	Treatment	CP		CF		Ash		EE		NFE		DP		TDN	
		2nd cut	4th cut	2nd cut	4th cut	2nd cut	4th cut	2nd cut	4th cut	2nd cut	4th cut	2nd cut	4th cut	2nd cut	4th cut
	Legumes (L).														
1	**Se**	19.03	15.99	25.95	27.05	16.01	15.86	2.35	1.89	36.66	38.81	14.71	11.79	62.15	59.99
2	**Ta**	19.04	14.77	25.78	27.34	16.40	15.22	2.29	1.61	36.49	41.06	14.72	10.62	62.27	59.64
3	**Sa**	18.53	16.05	25.15	27.94	15.61	15.60	2.03	1.88	38.60	38.53	14.23	11.85	62.56	59.65
Mean		18.87	15.60	25.63	27.44	16.01	15.56	2.22	1.79	37.25	39.47	14.55	11.42	62.33	59.76
	Grasses (G)														
4	**Pro**	16.23	13.68	26.09	28.97	14.89	14.14	3.65	2.45	39.14	40.81	12.02	9.52	65.46	62.56
5	**Te**	15.94	12.15	27.43	29.57	14.62	14.43	3.83	2.18	38.13	41.67	11.75	8.11	65.07	60.98
6	**Pri**	16.19	14.25	26.58	28.26	15.34	14.68	3.56	2.56	38.33	40.25	11.99	10.12	65.39	63.25
Mean		16.12	13.36	26.70	28.93	14.95	14.42	3.68	2.40	38.53	40.91	11.92	9.25	65.31	62.26
	Mixtures (M)														
7	**Se x Pro** (M1)	17.33	14.36	26.28	28.16	15.92	14.93	2.25	2.29	38.22	40.26	13.08	10.23	63.81	61.28
8	**Se x Te** (M2)	18.51	14.14	25.87	28.66	15.57	14.81	2.73	2.40	37.32	39.99	14.21	10.02	63.61	60.49
9	**Se x Pri** (M3)	18.32	15.27	25.91	27.24	15.89	14.82	2.52	2.48	37.36	40.19	14.03	11.10	63.77	61.62
Mean		18.05	14.59	26.02	28.02	15.79	14.85	2.50	2.39	37.63	40.15	13.77	10.45	63.73	61.13
10	**Ta x Pro** (M4)	18.45	13.84	25.73	28.22	15.62	15.14	2.52	2.33	37.68	40.47	14.15	9.73	63.87	61.10
11	**Ta x Te** (M5)	17.01	14.30	26.22	28.43	15.95	15.20	3.05	2.47	37.77	39.60	12.77	10.17	63.67	60.31
12	**Ta x Pri** (M6)	17.41	14.40	26.12	28.16	15.44	14.79	2.45	2.31	38.58	40.34	13.16	10.27	63.83	61.45
Mean		17.62	14.18	26.02	28.27	15.67	15.04	2.67	2.37	38.01	40.14	13.36	10.06	63.79	60.95
13	**Sa x Pro** (M7)	18.42	14.71	25.62	27.23	15.47	15.41	2.43	2.30	38.06	40.35	14.13	10.57	64.01	61.11
14	**Sa x Te** (M8)	18.44	15.15	25.66	27.72	15.58	15.57	2.62	2.44	37.70	41.12	14.16	9.07	63.82	60.32
15	**Sa x Pri** (M9)	18.27	14.96	25.99	27.13	15.50	14.82	2.78	2.85	37.46	40.24	13.98	10.81	63.98	61.45
Mean		18.38	14.94	25.76	27.36	15.52	15.27	2.61	2.53	37.74	40.57	14.09	10.15	63.94	60.96

Legumes (L): Berseem clover varieties : Serwl (Se), Tarkeby seds (Ta) and Sakha 96 (Sa).
Grasses (G): Ryegrass varieties : Promenade (Pro), Tewara Sama (Te) and Primora (Pri).

Table (29): Chemical constituents and total digestible nutrients of the proposed forage mixtures and their relevant pure stands for early and late cuts during the second season (2002-2003).

No.	Treatment	CP		CF		Ash		EE		NFE		DP		TDN	
		2nd cut	4th cut	2nd cut	4th cut	2nd cut	4th cut	2nd cut	4th cut	2nd cut	4th cut	2nd cut	4th cut	2nd cut	4th cut
	Legumes (L).														
1	**Se**	19.98	15.36	24.64	27.92	16.58	15.58	2.96	2.16	35.84	38.98	15.62	11.19	63.35	59.42
2	**Ta**	18.94	14.89	25.12	27.54	16.31	15.25	2.57	1.86	37.06	40.46	14.62	10.74	62.72	59.54
3	**Sa**	19.19	15.35	25.17	27.96	15.93	15.69	2.72	1.94	36.99	39.06	14.86	11.18	62.77	59.39
Mean		19.37	15.20	24.98	27.81	16.27	15.51	2.75	1.99	36.63	39.50	15.03	11.04	62.95	59.45
	Grasses (G)														
4	**Pro**	14.87	12.82	27.44	28.47	14.91	14.27	3.46	2.45	39.32	41.99	10.72	8.75	63.95	61.75
5	**Te**	15.88	12.40	27.18	29.10	15.41	14.38	3.54	2.60	37.99	41.52	11.69	8.35	65.02	61.27
6	**Pri**	17.13	13.49	25.76	28.81	15.68	14.71	3.51	2.52	37.94	40.47	12.89	9.40	66.42	62.42
Mean		15.96	12.90	26.79	28.79	15.33	14.45	3.50	2.52	38.42	41.33	11.77	8.83	65.13	61.81
	Mixtures (M)														
7	**Se x Pro** (M1)	19.42	15.16	25.22	27.77	16.30	15.35	3.04	2.34	36.02	39.38	15.09	11.00	63.65	60.59
8	**Se x Te** (M2)	19.32	14.64	25.00	27.31	16.04	14.75	3.13	2.40	36.51	40.90	14.99	10.49	64.19	60.35
9	**Se x Pri** (M3)	19.75	14.31	24.52	28.08	16.38	15.25	3.16	2.30	36.19	40.06	15.40	10.18	64.89	60.94
Mean		19.50	14.70	24.91	27.72	16.24	15.12	3.11	2.35	36.24	40.11	15.16	10.56	64.24	60.63
10	**Ta x Pro** (M4)	18.72	13.32	25.13	28.92	15.57	15.50	3.18	1.71	37.40	40.55	14.41	9.23	62.99	60.65
11	**Ta x Te** (M5)	18.52	14.57	27.48	27.48	15.62	14.84	3.14	2.25	35.24	40.86	14.22	10.43	63.87	60.41
12	**Ta x Pri** (M6)	18.92	14.24	25.88	28.59	16.04	15.22	3.19	1.44	35.97	39.94	14.92	10.13	64.57	60.98
Mean		18.72	14.04	26.16	28.33	15.74	15.19	3.17	1.80	36.20	40.45	14.52	9.93	63.81	60.68
13	**Sa x Pro** (M7)	18.44	14.16	25.20	28.57	15.60	15.49	3.14	2.14	37.62	39.64	14.15	10.03	63.36	60.57
14	**Sa x Te** (M8)	17.71	13.91	26.39	28.14	15.65	14.83	2.64	2.27	37.61	40.85	13.44	9.80	63.90	60.33
15	**Sa x Pri** (M9)	18.35	13.27	25.75	28.35	15.70	14.79	3.12	1.84	37.08	41.75	14.06	9.14	64.60	60.91
Mean		18.17	13.78	25.78	28.35	15.65	15.04	2.97	2.08	37.44	40.75	13.88	9.66	63.95	60.60

Legumes (L): Berseem clover varieties : Serwl (Se), Tarkeby seds (Ta) and Sakha 96 (Sa).
Grasses (G): Ryegrass varieties : Promenade (Pro), Tewara Sama (Te) and Primora (Pri).