RESULTS AND DISCUSSIONS

I- Growth characters:

A- Root length :

Results in Tables (3) and (4) show the effect of potassium fertilization on fodder beet varieties and their interaction on root length at Abis and Nubaria regions in 1993/94 and 1994/95 seasons as well as combined analysis .

In Abis region, the obtained results (Table, 3) indicated that the differences among fodder beet varieties in root length in both seasons were not significant, but in combined analysis, there were significant differences in the root length among the studied varieties. The variety Brigadier was superior to Monovert and Rossessina in root length. The root length was 33.17, 30.63 and 35.88 cm for Monovert, Rossessina and Brigadier varieties, respectively without significant difference between Monovert and Rossessina.

The results of the 1st and 2nd seasons in Abis region showed an increase in root length due to K application, but the increase did not reach the 5% significance level. In the combined analysis, potassium levels resulted in a significant increase in root length. The combined showed that root length increased by 15.19, 19.85

Table: (3) Effect of potassium fertilization on root length (cm) of three fodder beet varieties at Abis region in 1993/94, and 1994/95 seasons as well as combined analysis.

Potassium levels	Season 1993/94				Season 1994/95				Combined analysis			
	Varieties				*Varieties*				*Varieties*			
	Mono.	Ross.	Brig.	Mean	Mono.	Ross.	Brig.	Mean	Mono.	Ross.	Brig.	Mean
0	23.00	21.00	26.67	23.56[a]	34.67	28.67	37.00	33.45[a]	28.84	24.84	31.84	28.5 [c]
48	27.67	27.33	28.00	27.67[a]	35.00	35.67	43.33	38.00[a]	31.43	31.50	35.67	32.84 [b]
96	29.67	27.67	32.33	29.89[a]	35.33	36.00	43.33	38.22[a]	32.50	31.84	37.83	34.17 [ab]
144	36.00	30.00	33.00	33.00[a]	44.00	38.67	43.33	42.00[a]	40.00	43.43	38.17	36.06 [a]
Mean	29.08[a]	26.50[a]	30.00[a]		37.25[a]	36.50[a]	41.75[a]		33.17 [b]	30.63 [b]	35.88 [a]	

Mono. = Monovert

Ross. = Rossessina

Bri. = Brigadier

Table : (4) Effect of potassium fertilization on root length (cm) of three fodder beet varieties at Nubaria region in 1993/94, and 1994/95 seasons as well as combined analysis.

Potassium level	Season 1993/94				Season 1994/95				Combined analysis			
	Varieties				*Varieties*				*Varieties*			
	Mono.	Ross.	Brig.	Mean	Mono.	Ross.	Brig.	Mean	Mono.	Ross.	Brig.	Mean
0	30.28	25.50	33.00	29.59 ^{d}	29.68	26.15	32.10	29.31 ^{b}	29.98	25.83	32.55	29.45 ^{d}
48	31.26	29.61	37.77	32.88 ^{c}	32.60	26.65	32.40	30.55 ^{a}	31.93	28.13	35.09	31.72 ^{c}
96	31.75	34.50	39.00	35.08 ^{b}	32.95	27.00	33.85	31.27 ^{a}	32.35	30.75	36.43	33.18 ^{b}
144	33.79	39.00	40.50	37.76 ^{a}	33.85	27.00	33.33	31.39 ^{a}	33.82	33.00	36.92	43.58 ^{a}
Mean	31.77 ^{b}	32.79 ^{b}	37.57 ^{a}		32.27 ^{a}	26.70 ^{b}	32.91 ^{a}		32.02 ^{b}	29.43 ^{c}	35.25 ^{a}	

Mono. = Monovert

Ross. = Rossessina

Bri. = Brigadier

and 26.48% due to adding 48,96 and 144 kg K_2O/fed. compared with control, respectively.

With regard to the effect of interaction between varieties and potassium fertilizer. The root length was not significantly affected by varieties X potassium levels.

At Nubaria region, the tabulated data (Table, 4) indicated clearly that there were significant difference in root length among the tested varieties in both seasons and their combined analysis. In the first season, root length of Brigadier variety surpassed over Monovert and Rossessina varieties. The length of roots were 37.57 , 32.79 and 31.77 cm for Brigadier, Rossessina and Monovert varieties, respectively without significant difference between Rossessina and Monovert varieties. Meanwhile, in the second season, roots of Brigadier (32.91 cm) and Monovert (32.27 cm) recorded the greatest length than Rossessina variety (26.70 cm). In combined analysis, beet varieties could be arranged according to the length of roots in a descending order as follows: Brigadier (35.25 cm), Monovert (32.02 cm) and Rossessina (29.43 cm).

With regard to potassium application, the length of root was significantly increased by increasing the rates of potassium fertilizer from 0 up to 144 kg K_2O/fad. In both seasons as well as

combined analysis. In the first season, the increase in potassium rate from 0 to 48, 96 and 144 kg K_2O /fad. caused a remarkable significant increase in root length, being 3.29 , 5.49 and 8.17 cm, respectively. Similar results were obtained in the second season, where there were increases in length of roots, being 1.24, 1.96 and 2.08 cm due to the potassium application at the rates of 48,96 and 144 kg K_2O/fad., respectively. The combined analysis indicated that, adding 48,96 and 144 kg K_2O /fad. increased the root length with about 7.71, 12.67 and 17.42 %, respectively over the unfertilized treatment.

Result shows that there was no effect for the interaction between varieties and potassium fertilizer on root length.

B- Root perimeter :

The results in Tables (5) and (6) indicate the effect of varieties and potassium fertilizer and their interaction on root perimeter (cm) in Abis and Nubaria regions in 1993/94 and 1994/95 seasons as well as combined analysis.

In Abis region, the obtained results indicate that fodder beet root perimeter was not significantly affected by varieties in both seasons, but in combined analysis, there were significant differences in the root perimeter among the studied varieties.

Table : (5): Effect of potassium fertilization on root perimeter (cm) of three fodder beet varieties at Abis region in 1993/94, and 1994/95 seasons as well as combined analysis.

Potassium level	Season 1993/94				Season 1994/95				Combined analysis			
	Varieties				*Varieties*				*Varieties*			
	Mono.	Ross.	Brig.	Mean	Mono.	Ross.	Brig.	Mean	Mono.	Ross.	Brig.	Mean
0	37.33	38.67	38.00	38.00 ^{d}	47.33	41.67	45.67	44.89	42.33	40.17	41.84	41.45 ^{d}
48	42.67	42.67	43.67	43.00 ^{c}	50.00	60.33	48.00	52.78 ^{b}	46.33	51.50	45.84	47.89 ^{c}
96	47.00	50.67	45.00	47.56 ^{b}	53.00	63.33	51.00	55.78 ^{b}	50.00	57.00	48.00	51.67 ^{b}
144	53.00	54.67	48.35	52.00 ^{a}	60.33	64.33	60.00	61.55 ^{a}	56.67	59.50	54.17	56.78 ^{a}
Mean	45.00 ^{a}	46.67 ^{a}	43.75 ^{a}		52.67 ^{a}	57.42 ^{a}	51.17 ^{a}		48.83 ^{b}	52.04 ^{a}	47.46 ^{b}	

Mono. = Monovert

Ross. = Rossessina

Bri. = Brigadier

Table (6): Effect of potassium fertilization on root perimeter (cm) of three fodder beet varieties at Nubaria region in 1993/94, and 1994/95 seasons as well as combined analysis.

Potassium level	Season 1993/94				Season 1994/95				Combined analysis			
	Varieties				*Varieties*				*Varieties*			
	Mono.	Ross.	Brig.	Mean	Mono.	Ross.	Brig.	Mean	Mono.	Ross.	Brig.	Mean
0	37.50	39.50	37.30	38.10 ^{d}	28.80	31.78	30.00	30.19 ^{c}	33.15	35.46	34.15	34.31 ^{d}
48	37.75	40.55	43.20	40.50 ^{c}	31.48	32.68	32.28	32.15 ^{b}	34.62	36.62	37.74	36.33 ^{c}
96	41.00	42.20	52.00	45.07 ^{b}	34.60	33.28	33.20	33.69 ^{ab}	37.80	37.74	42.60	39.38 ^{b}
144	45.00	47.50	52.00	48.17 ^{a}	36.65	33.93	33.23	34.60 ^{a}	40.83	40.72	42.62	41.39 ^{a}
Mean	40.31 ^{c}	42.44 ^{b}	46.13 ^{a}		32.88 ^{a}	32.91 ^{a}	32.35 ^{a}		63.60 c	37.68 b	39.28 ^{a}	

Mono. = Monovert

Ross. = Rossessina

Bri. = Brigadier

Rossessina variety produced greater value of root perimeter (52.04 cm) than Monovert (48.83 cm) and Brigadier (47.46 cm) varieties as shown in Table (5).

Potassium fertilization rates (zero, 48 , 96 and 144 kg K_2O /fad.) affected root perimeter in both seasons as well as the combined analysis. The root perimeter was significantly increased by increasing the potassium rate. The combined analysis indicated that root perimeter increased with about 15.54, 24.66 and 36.98 % by adding 48 ,96 and 144 kg K_2O /fad., respectively as compared with zero level.

With regard to the effect of interaction between varieties and potassium fertilizer. The root perimeter was significantly affected by varieties X potassium in both seasons and combined analysis. The highest values, 54.67, 64.33 and 59.50 were produced from Rossessina variety given 144 kg K_2O /fad in the first, second seasons and combined analysis, respectively. The lowest values 37.33, 41.67 and 40.17 were obtained at zero level of K_2O with Monovert, Rossessina and Rossessina variety at the same respective seasons.

In Nubaria region, data in Table (6) indicate clearly that there was significant difference among varieties in root perimeter. This

was true in the first season and combined analysis. Brigadier variety had higher root perimeter followed by Rossessina and Monovert as shown in Table (6).

The results indicate that root perimeter responded to potassium fertilizer and this was the fact in both seasons as well as the combined analysis. However, there was no significant differences between the different four doses of K applied in the 2nd season. But in the 1st season and the combined analysis increase in K rate was always followed by a significant increase in root perimeter. In combined analysis, when fodder beets were fertilized with 48,96 and 144 kg K_2O /fad., root perimeter increased with about 5.89, 14.78 and 20.64% respectively as compared with zero level of K_2O.

Results revealed that there was no effect for the interaction between varieties and potassium fertilizer in the first, and second seasons as well as combined analysis.

C- Fresh top weight/plant

Tables (7) and (8) present the effect of varieties, potassium fertilizer and their interaction on fresh top weight/ plant (kg) in Abis and Nubaria regions in 1993/94 and 1994/95 seasons as well as combined analysis.

Table: (7) Effect of potassium fertilization on fresh top weight (kg) / plant of three fodder beet varieties at Abis region in 1993/94, and 1994/95 seasons as well as combined analysis

Potassium level	Season 1993/94				Season 1994/95				Combined analysis			
	Varieties				*Varieties*				*Varieties*			
	Mono.	Ross.	Brig.	Mean	Mono.	Ross.	Brig.	Mean	Mono.	Ross.	Brig.	Mean
0	0.300	0.300	0.417	0.339[a]	0.311	0.245	0.347	0.301[a]	0.306	0.273	0.382	0.320 [c]
48	0.584	0.433	0.467	0.495[a]	0.372	0.274	0.431	0.359[a]	0.478	0.354	0.449	0.427 [b]
96	0.600	0.467	0.500	0.522[a]	0.441	0.295	0.481	0.406[a]	0.521	0.381	0.491	0.464 [b]
144	0.634	0.584	0.750	0.656[a]	0.449	0.504	0.482	0.478[a]	0.542	0.544	0.616	0.567 [a]
Mean	0.530[a]	0.446[a]	0.534[a]		0.393[a]	0.330[a]	0.435[a]		0.462[a]	0.388[a]	0.485[a]	

Mono. = Monovert

Ross. = Rossessina

Brl. = Brigadier

Table (8): Effect of potassium fertilization on fresh top weight (kg)/ plant of three fodder beet varieties at Nubaria region in 1993/94, and 1994/95 seasons as well as combined analysis.

Potassium level	Season 1993/94				Season 1994/95				Combined analysis			
	Varieties				*Varieties*				*Varieties*			
	Mono.	Ross.	Brig.	Mean	Mono.	Ross.	Brig.	Mean	Mono.	Ross.	Brig.	Mean
0	0.470	0.430	0.475	0.458[a]	0.487	0.475	0.547	0.503[a]	0.479	0.453	0.511	0.481 [c]
48	0.582	0.488	0.542	0.537[a]	0.575	0.518	0.565	0.553[a]	0.579	0.503	0.554	0.545 [b]
96	0.600	0.513	0.550	0.554[a]	0.575	0.562	0.562	0.566[a]	0.588	0.538	0.556	0.561 [b]
144	0.738	0.550	0.650	0.646[a]	0.638	0.587	0.562	0.596[a]	0.686	0.569	0.606	0.620 [a]
Mean	0.598 [a]	0.495 [c]	0.554 [b]		0.569 [a]	0.536 [a]	0.559 [a]		0.583 [a]	0.516 [c]	0.557 [b]	

Mono. = Monovert

Ross. = Rossessina

Bri. = Brigadier

In Abis region, data in Table (7) indicate clearly that there were not significant differences among varieties in fresh top weight/plant. This was completely true in both seasons as well as the combined analysis.

The results clearly show that potassium fertilization did not affect fresh top weight/plant. This was the fact as shown in Table (7) in both seasons.

The fresh top yield/plant was significantly increased as potassium fertilizer rate increased up to 144 kg K_2O /fad. in combined analysis. The highest value of top fresh weight/plant (0.567 kg) was obtained from the application of 144 kg K_2O /fad., whereas the lowest one (0.320 kg) was obtained from the unfertilized treatment. In addition, the difference between 48 and 96 kg K_2O /fad. was not great enough to reach the 5% level of significance as shown in Table (7).

The interaction between potassium and varieties was not significant.

In Nubaria region, from Table (8) it could be seen that in the second season, the fresh top yield/plant was not significantly affected by varieties. While in the first season and the combined

analysis, the fresh top weight/plant was significantly affected by varieties. Fodder beet Monovert processed superiority over Rossessina and Brigadier varieties. Therefore, the above mentioned varieties could be arranged according to the fresh top weight/plant in a descending order as follows: Monovert, Brigadier and Rossessina . This was true in the first season and combined analysis.

Statistical analysis showed that the fresh top weight/plant was not significantly affected by the application of different doses of potassium fertilizer in the first and second seasons. But in combined analysis the application of potassium fertilizer up to 144 kg K_2O /fad. increased significantly the fresh top weight/plant. This increase was 13.31, 16.63 and 28.90% for 48, 96 and 144 kg K_2O /fad., respectively as compared with the unfertilized plants.

There was no significant interaction of varieties with potassium fertilizer on fresh top weight /plant in both seasons and combined analysis.

D- Fresh root weight/plant:

Tabulated data in Tables (9) and (10) show the effect of varieties, potassium fertilizer and their interaction on fresh root

Table :(10) Effect of potassium fertilization on fresh root weight (kg)/plant of three fodder beet varieties at Nubaria region in 1993/94, and 1994/95 seasons as well as combined analysis.

Potassium level	Season 1993/94				Season 1994/95				Combined analysis			
	Varieties				*Varieties*				*Varieties*			
	Mono.	Ross.	Brig.	Mean	Mono.	Ross.	Brig.	Mean	Mono.	Ross.	Brig.	Mean
0	1.838	1.375	1.800	1.671 ^{d}	1.813	1.488	1.988	1.763 ^{b}	1.826	1.432	1.894	1.717 ^{d}
48	1.988	1.875	1.848	1.904 ^{c}	2.175	1.620	2.013	1.936 ^{b}	2.082	1.748	1.931	1.920 ^{c}
96	2.600	2.025	1.925	2.183 ^{b}	2.300	1.913	2.238	2.150 ^{b}	2.450	1.969	2.082	2.167 ^{b}
144	3.000	2.450	2.200	2.550 ^{a}	2.400	2.038	2.513	2.317 ^{a}	2.700	2.249	2.357	2.434 ^{a}
Mean	2.357 ^{a}	1.931 ^{b}	1.943 ^{b}		2.172 ^{a}	1.765 ^{b}	2.188 ^{a}		2.265 ^{a}	1.848 ^{c}	2.066 ^{b}	

Mono. = Monovert

Ross. = Rossessina

Bri. = Brigadier

weight/plant in Abis and Nubaria regions in 1993/94 and 1994/95 seasons as well as combined analysis.

In Abis region, The obtained results in Table (9) indicate that fresh root weight/plant was not significantly affected by varieties in the 1st season, whereas in 2nd season and the combined analysis, there were significant differences in the fresh weight of root/plant among the studied varieties. Brigadier variety produced greater fresh weight of root/plant than \Monovert and Rossessina varieties. This result was true in both 2nd season and the combined analysis. In the 2nd season, Brigadier recorded the highest fresh weight of root/plant (3.075 kg) followed by Rossessina (2.669 kg) and Monovert (2.335). In the combined analysis, the fresh root weight/plant was 2.151, 2.302 and 2.458 kg for Monovert, Rossessina and Brigadier varieties, respectively without significant difference between Monovert and Rossessina . as shown in Table, (9).

A gradual increase in fresh root weight/plant was obtained due to the increase of potassium fertilizer rate from 0 to 144 kg K_2O /fad. and this was the fact in both seasons as well as in the combined analysis. That increase in the first season as well as the combined analysis was always significant for any increase in potassium fertilizer i.e. the differences between the four rates of

potassium used were significant. As shown in the combined analysis increasing rate of potassium from 0 to 48, 96 and 144 kg K_2O /fad. increased fresh root weight/plant with about 25.53, 44.56 and 83.30% respectively.

Data presented in Table (9) indicate that the interaction of varieties X potassium fertilizer did not significantly affect the fresh root weight/plant in this study.

In Nubaria region, the results clearly show that the fresh root weight/plant was significantly affected by varieties as shown in Table, (10) and this was true for the two seasons and the combined analysis. Monovert variety possessed superiority over Rossessina and Brigadier varieties in fresh root weight/plant in the first season as well as in the combined analysis. Whereas, Monovert and Brigadier varieties produced greater values of fresh root weight than Rossessina variety in the second season.

It is clear from the same Table, (10) that the data indicate that fresh root weight/plant was significantly increased throughout the first growing season and combined analysis as potassium fertilization rates increased up to 144 kg K_2O /fad. Data of the second season showed no significant difference between adding 48 and 96 kg K_2O /fad. compared with control (untreated treatment)

Table :(11) Effect of potassium fertilization on fresh plant weight (kg)/plant of three fodder beet varieties at Abis region in 1993/94, and 1994/95 seasons as well as combined analysis.

Potassium level	Season 1993/94				Season 1994/95				Combined analysis			
	Varieties				*Varieties*				*Varieties*			
	Mono.	Ross.	Brig.	Mean	Mono.	Ross.	Brig.	Mean	Mono.	Ross.	Brig.	Mean
0	1.533	1.500	1.517	1.517^{d}	2.432	2.563	2.362	2.452^{c}	1.983	2.032	1.941	1.985^{d}
48	2.117	1.633	2.217	1.989^{c}	2.564	2.907	3.663	3.045^{b}	2.341	2.270	2.940	2.517^{c}
96	2.767	2.667	2.267	2.567^{b}	2.718	2.938	3.870	3.175^{b}	2.743	2.803	3.069	2.872^{b}
144	3.567	3.717	3.500	3.595^{a}	3.197	3.586	4.144	3.642^{a}	3.382	3.652	3.822	3.619^{a}
Mean	2.496^{a}	2.379^{a}	2.375^{a}		2.728^{b}	2.999^{b}	3.510^{a}		2.600^{b}	2.689^{ab}	2.955^{a}	

Mono. = Monovert

Ross. = Rossessina

Bri. = Brigadier

but, adding 144 kg/fad. was followed by an increase in fresh root weight compared with 0,48 and 96 kg K_2O /fad. In general, fresh root weight/plant increased with about 11.82, 26.21 and 41.76 % by adding 48, 96 and 144 kg K_2O /fad., respectively as compared with unfertilized treatment.

Statistical analysis showed that root weight/plant was not significantly affected by interaction between varieties and potassium fertilizer in both seasons and the combined analysis and this shows that varieties and potassium fertilizer levels act independently on this character.

E- Fresh plant weight:

Effects of varieties and potassium fertilization on fresh plant weight are shown in Tables (11) and (12) in Abis and Nubaria regions in 1993/94 and 1994/95 seasons as well as combined analysis.

At Abis region, data illustrated in Table (11) show the influence of varieties and potassium fertilizer and their interaction on fresh plant weight (kg) in Abis region.

There were marked differences among the studied varieties in fresh plant weight. These differences were significant in the second season as well as combined analysis. The variety Brigadier was superior to Monovert and Rossessina in plant weight. Whereas in

Table (12): Effect of potassium fertilization on fresh plant weight (kg)/plant of three fodder beet varieties at Nubaria region in 1993/94, and 1994/95 seasons as well as combined analysis.

Potassium level	Season 1993/94				Season 1994/95				Combined analysis			
	Varieties				*Varieties*				*Varieties*			
	Mono.	Ross.	Brig.	Mean	Mono.	Ross.	Brig.	Mean	Mono.	Ross.	Brig.	Mean
0	2.300	1.963	2.535	2.266 ^{c}	2.308	1.813	2.275	2.132 ^{d}	2.304	1.888	2.405	2.199 ^{d}
48	2.750	2.138	2.578	2.489 ^{b}	2.570	2.363	2.390	2.441 ^{c}	2.660	2.251	2.484	2.465 ^{c}
96	2.875	2.475	2.800	2.717 ^{ab}	3.200	2.538	2.475	2.738 ^{b}	3.038	2.507	2.638	2.722 ^{b}
144	3.038	2.625	3.075	2.913 ^{a}	2.738	3.000	2.850	2.862 ^{a}	3.388	2.813	2.963	2.887 ^{a}
Mean	2.741 ^{a}	2.300 ^{b}	2.747 ^{a}		2.704 ^{a}	2.428 ^{b}	2.498 ^{b}		2.795 ^{a}	2.365 ^{c}	2.623 ^{b}	

Mono. = Monovert

Ross. = Rossessina

Bri. = Brigadier

the first season, varieties had no significant effect on fresh plant weight of fodder beet.

Potassium rates exhibited significant effects on plant weight. This was the fact in both seasons as well as in the combined analysis. Increasing potassium rates from zero up to 144 kg K_2O /fad. increased significantly fresh plant weight of fodder beet. The fresh plant weight increased by about 26.80, 44.69 and 82.32% in combined analysis by the application of 48, 96 and 144 kg K_2O /fad., respectively, as compared with the untreated plants.

Results also indicated that interaction between the varieties and potassium fertilizer was not significant on plant weight in both season and combined analysis.

In Nubaria region, differences among varieties in fresh plant weight were significant and this was the true in both seasons as well as in the combined analysis. Monovert and Brigadier varieties possessed superiority over Rossessina variety in fresh plant weight in the first season. Whereas, Monovert variety was superior to Rossessina and Brigadier varieties in this respect in the second season. The fresh plant weight was 2.969, 2.498 and 2.428 kg for Monovert, Brigadier and Rossessina varieties, respectively in the combined analysis, as shown in Table (12).

Concerning potassium fertilizer effect, the fresh plant weight was significantly increased by increasing K_2O from zero up to 144 kg K_2O /fad. in the second season and combined analysis whereas during the season Plant weight was significantly increased by increasing potassium rates from zero to 48 kg K_2O /fad. without significant difference between 48 and 96 kg K_2O /fad. and 96 and 144 kg K_2O /fad. Generally, in the combined, analysis, increasing potassium rates from zero to 48, 96 and 144 kg K_2O /fad. increased fresh plant weight from 2.199 to 2.465, 2.728 and 3.055 kg, respectively.

Results revealed that there was no significant effect for the interaction between varieties and potassium application.

In short. data presented in Tables (3) to (12) show that fodder beet, Brigadier variety significantly surpassed the other two tested varieties in root length ,and fresh top and root weight/plant, and total plant weight. In this concern Soheir Latif and Maria Beshay (1994) reported that brigadier variety significantly surpassed Monovex , Echodort and Monovert varieties in the root length and diameter, fresh top and root weight/plant and total plant weight.

Also, the data in Tables (3) to (12) indicate that application of potassium increased the values of root length and perimeter, fresh

root and top weight/plant and total plant weight up to the highest rate used (144 kg K_2O/fad.)This positive effect of potassium on fodder beet characters may be due to the important role of potassium in the function of enzymes needed for vital processes and its beneficial effect in the translocation of carbohydrate to the storage organs (Hartt, 1969, Hearn, 1981, Scnieder 1986, Stumpe *et al.* 1989, El-Khawaga and Zeiton, 1993 and Geweifel and Aly, 1996).

II- Yield and yield contributing Traits:

A- Fresh yield of tops (tons/faddan):

Data presented in Tables (13) and (14) and figures, (1) and (2) show the effect of varieties, potassium fertilizer and their interaction on fresh yield of tops (tons/faddan) at Abis and Nubaria regions in 1993/94 and 1994/95 seasons as well as combined analysis.

In Abis region, varieties exhibited significant differences in fresh yield of tops in both seasons as well as combined analysis (Table, 13). Generally, Brigadier variety possessed superiority over Monovert and Rossessina varieties. The fresh weight of tops yield were 15.074, 13.808 and 12.073 tons/fad. for Brigadier, Monovert and Rossessina varieties, respectively in the combined analysis.

Table (13) Effect of potassium fertilization on fresh yield of tops (tons)/fad. of three fodder beet varieties at Abis region in 1993/94, and 1994/95 seasons as well as combined analysis.

Potassium level	Season 1993/94				Season 1994/95				Combined analysis			
	Varieties				*Varieties*				*Varieties*			
	Mono.	Ross.	Brig.	Mean	Mono.	Ross.	Brig.	Mean	Mono.	Ross.	Brig.	Mean
0	10.238	9.095	13.613	10.982 ^{d}	11.143	10.800	12.930	11.624 ^{c}	10.691	9.948	13.272	11.303 ^{c}
48	12.458	11.140	14.342	12.647 ^{c}	11.787	11.199	13.781	12.256 ^{c}	12.123	11.170	14.062	12.452 ^{c}
96	15.346	12.672	16.660	14.893 ^{b}	14.782	13.470	14.971	14.408 ^{b}	15.064	13.070	15.816	14.650 ^{b}
144	17.913	13.416	18.194	16.508 ^{a}	16.791	14.789	16.100	15.893 ^{a}	17.352	14.103	17.147	16.201 ^{a}
Mean	13.989 ^{b}	11.581 ^{c}	15.702 ^{a}		13.626 ^{a}	12.565 ^{b}	14.446 ^{a}		13.808 ^{b}	12.073 ^{c}	15.074 ^{a}	

Mono. = Monovert

Ross. = Rossessina

Bri. = Brigadier

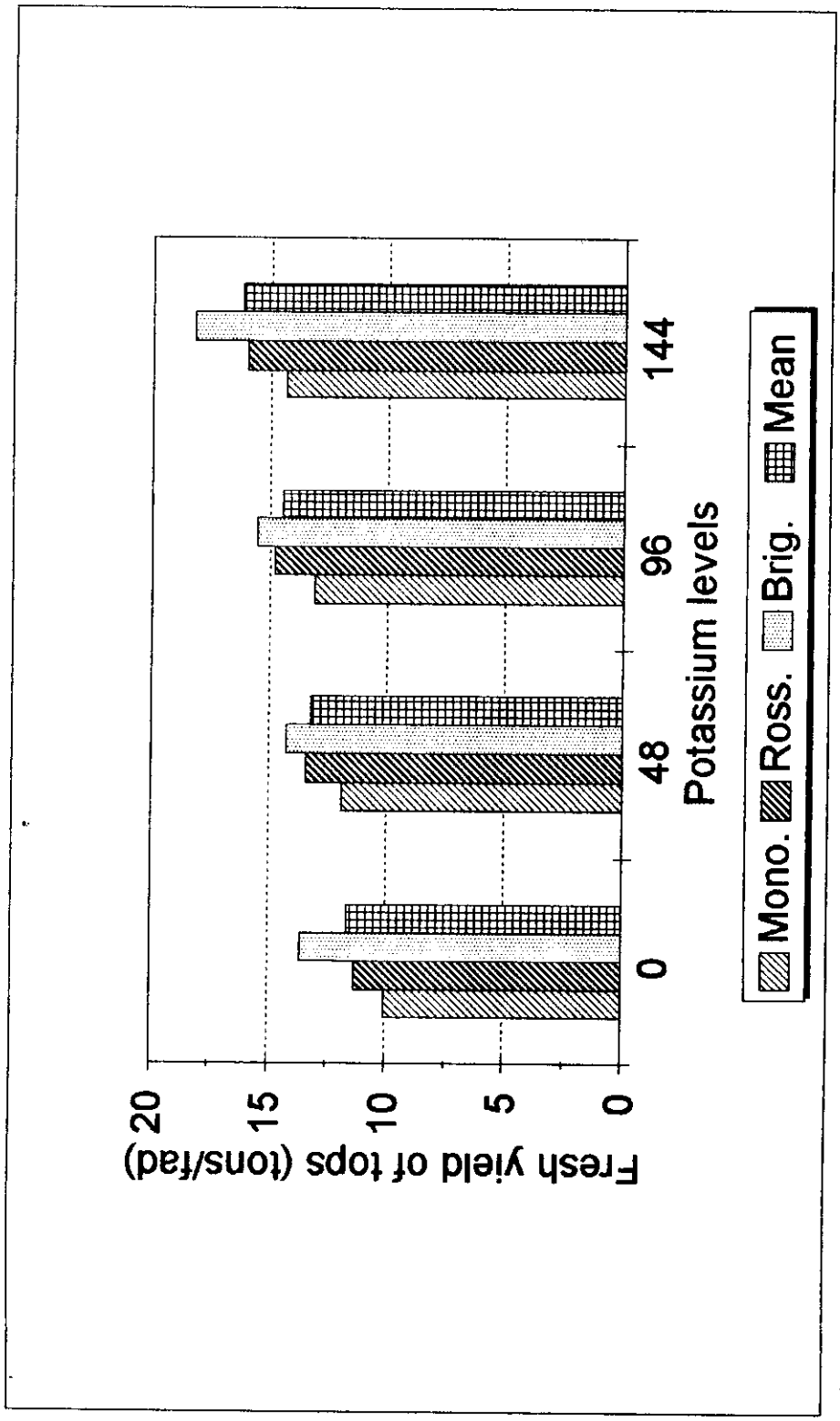
Table (14): Effect of potassium fertilization on fresh yield of tops (tons)/fad of three fodder beet varieties at Nubaria region in 1993/94, and 1994/95 seasons as well as combined analysis.

Potassium level	Season 1993/94				Season 1994/95				Combined analysis			
	Varieties				*Varieties*				*Varieties*			
	Mono.	Ross.	Brig.	Mean	Mono.	Ross.	Brig.	Mean	Mono.	Ross.	Brig.	Mean
0	9.793	11.317	12.766	11.292 ^{c}	10.301	11.310	14.501	12.037 ^{d}	10.047	11.314	13.634	11.665 ^{d}
48	10.980	12.100	13.310	12.130 ^{bc}	12.780	14.781	15.212	14.258 ^{c}	11.880	13.441	14.261	13.194 ^{c}
96	11.781	13.831	13.879	13.170 ^{b}	14.414	15.682	17.193	15.763 ^{b}	13.098	14.757	15.545	14.467 ^{b}
144	13.831	14.780	16.372	14.994 ^{a}	14.843	17.191	20.013	17.349 ^{a}	14.337	15.986	18.193	16.172 ^{a}
Mean	11.596 ^{c}	13.007 ^{b}	14.086 ^{a}		13.085 ^{c}	14.741 ^{b}	16.370 ^{a}		12.341 ^{c}	13.875 ^{b}	15.408 ^{a}	

Mono. = Monovert

Ross. = Rossessina

Bri. = Brigadier



Figure(2): Effect of potassium fertilization on fresh yield of tops (tons)/fad of three fodder beet varieties at Nubaria region in combined analysis.

Also, data listed in Table (13) demonstrated that increasing the rate of potassium fertilizer up to 144 kg K_2O/fad. increased significantly fresh yield of tops/fad. in both seasons as well as combined analysis without significant differences between 0 and 48 kg K_2O/fad. in the second season and combined analysis. The tops yield/fad. increased from 11.303 to 12.452, 14.650 and 16.201 tons/fad. by application of 48,96 and 144 kg K_2O /fad. respectively in combined analysis as shown in Fig, (1).

The interaction between fodder beet varieties and K-levels was not significant affect in both seasons and combined analysis under Abis region

In Nubaria region, differences among varieties in the fresh yield of tops was obtained from Brigadier variety with an average of 14.086 , 16.730 and 15.408 tons/fad. in the 1^{st}, 2^{nd} seasons and combined analysis, respectively. On the other hand, the lightest fresh tops yield resulted from Monovert in both seasons and combined analysis (11.596, 13.085 and 12.341 tons/fad. respectively) as shown in Table (14).

• Potassium levels exhibited a significant effect on fresh yield of tops in both seasons as well as combined analysis. Increasing potassium level from 0 to 144 kg K_2O/fad. markedly increased tops yield/fad. (Table ,14). In combined analysis, fresh yield of tops/fad. increased with about 10.17, 29.61 and 4.33 % by adding 48,96 and 144 kg K_2O /fad.,

respectively as compared with zero level (Fig., 2). In this respect Tyamin (1981) Marie (1984) and Abdel-Aal (1990) showed that potassium application increased the top/yield of fodder beet.

Potassium level with variety interaction had no insignificant effect on top yield in the 1st and 2nd seasons as well as combined analysis under Nobaria region.

B- Fresh yield of roots (tons/fad.) :

Tables (15) and (16) and figures (3) and (4) show the effect of varieties, potassium fertilizer and their interaction on fresh yield of roots /fad. at Abis and Nubaria regions in 1993/94 and 1994/95 seasons as well as combined analysis.

In Abis region, the tabulated data indicate that there were significant differences in root yield/fad. among the studied varieties in both seasons as well as the combined analysis.

Generally, it could be concluded that, Brigadier variety possessed superiority over Monovert and Rossessina varieties in this respect. Therefore, in the combined, analysis the above mentioned varieties could be arrange according to fresh weight of roots yield/fad. in a descending order as follows: Brigadier (50.597), Rossessina (40.552) and Monovert(40.094) without significant difference between Rossessina and Monovert as shown in Table, (15). This result is in harmony with that obtained by Latif and Beshay (1994). They found that Brigadier and Eschodort fodder beet varieties significantly surpassed the Monovex and Monovert variety in root weight/plant.

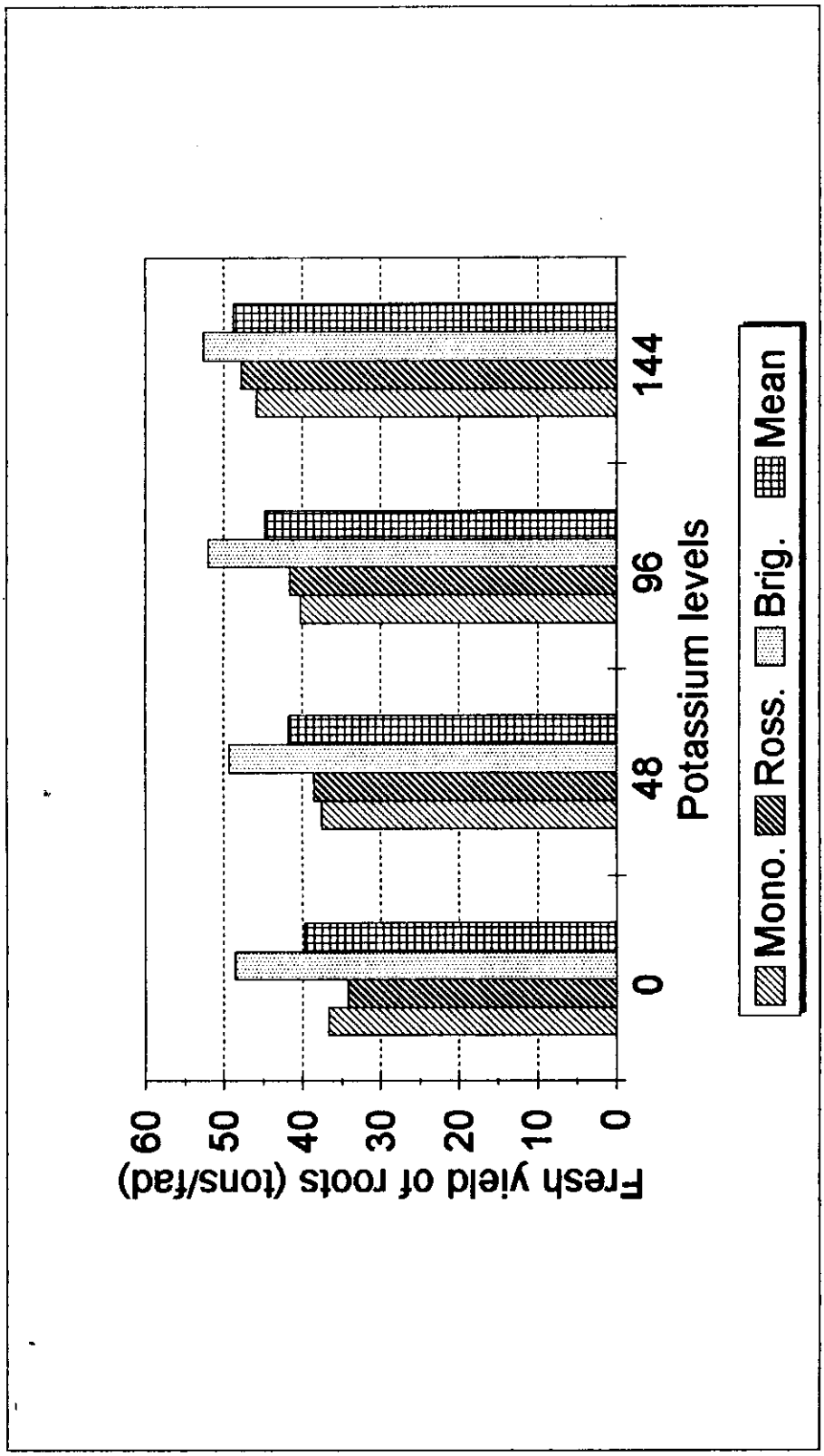
Table (15): Effect of potassium fertilization on fresh yield of roots (tons)/fad. of three fodder beet varieties at Abis region in 1993/94, and 1994/95 seasons as well as combined analysis.

Potassium level	Season 1993/94				Season 1994/95				Combined analysis			
	Varieties				*Varieties*				*Varieties*			
	Mono.	Ross.	Brig.	Mean	Mono.	Ross.	Brig.	Mean	Mono.	Ross.	Brig.	Mean
0	36.952	36.380	46.637	39.990 ^{c}	36.419	32.063	50.270	39.584 ^{c}	36.686	34.22	48.454	39.787 ^{d}
48	38.042	38360	47.608	41.337 ^{bc}	37.051	38.801	50.969	42.274 ^{c}	37.547	38.581	49.289	41.806 ^{c}
96	38.954	40.753	49.290	42.99 ^{b}	41.606	42.505	54.729	46.280 ^{b}	40.280	41.629	52.010	44.640 ^{b}
144	42.237	45.584	49.506	45.776 ^{a}	49.961	49.961	55.763	51.736 ^{a}	45.861	47.775	52.635	48.756 ^{a}
Mean	39.046 ^{b}	40.269 ^{b}	48.260 ^{a}		41.140 ^{b}	40.833 ^{b}	52.933 ^{a}		40.094 ^{b}	40.552 ^{b}	50.597 ^{a}	

Mono. = Monovert

Ross. = Rossessina

Bri. = Brigadier



Figure(3): Effect of potassium fertilization on fresh yield of roots (tons)/fad of three fodder beet varieties at Abis region in combined analysis.

Table (16): Effect of potassium fertilization on fresh yield of roots (tons)/fad. of three fodder beet varieties at Nubaria region in 1993/94 and 1994/95 seasons as well as combined analysis.

Potassium level	Season 1993/94				Season 1994/95				Combined analysis			
	Varieties				*Varieties*				*Varieties*			
	Mono.	Ross.	Brig.	Mean	Mono.	Ross.	Brig.	Mean	Mono.	Ross.	Brig.	Mean
0	35.895	43.113	46.364	41.791 ^{c}	33.574	40.690	47.174	40.479 ^{c}	34.735	41.902	46.769	41.135 ^{c}
48	39.720	44.210	46.590	43.507 ^{c}	43.445	41.619	47.313	44.126 ^{c}	41.583	42.915	46.952	43.817 ^{c}
96	47.769	53.464	53.799	51.677 ^{b}	47.686	46.018	53.107	48.937 ^{b}	47.728	49.741	53.453	50.307 ^{b}
144	51.619	58.175	56.228	55.340 ^{a}	48.457	48.834	56.737	51.343 ^{a}	50.004	53.505	56.483	53.342 ^{a}
Mean	43.751 ^{b}	49.741 ^{a}	50.745 ^{a}		43.291 ^{b}	44.290 ^{b}	51.083 ^{a}		43.513 ^{c}	47.016 ^{b}	50.914 ^{a}	

Mono. = Monovert

Ross. = Rossessina

Bri. = Brigadier

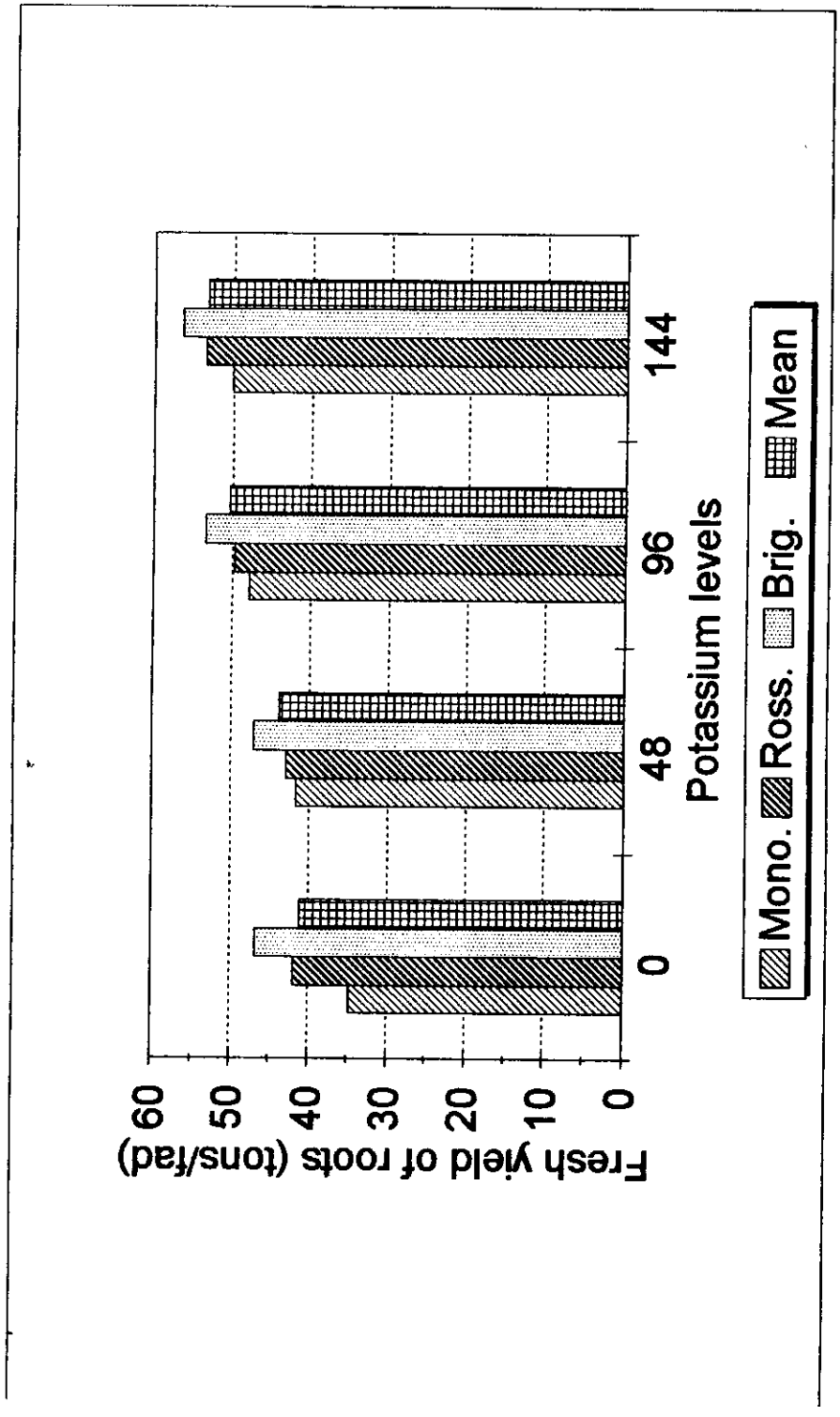


Figure (4): Effect of potassium fertilization on fresh yield of roots (tons)/fad. of three fodder beet varieties at Nubaria region in combined analysis.

A gradual increase in fresh yield of roots /fad. was obtained due to increase the rates of potassium fertilizer levels from zero up to 144 kg K_2O/fad. and this was true in both seasons as well as in the combined analysis (Table, 15). The fresh weight of roots yield/fad increased from 39.990 to 45.770 and from 39.584 to 51.736 in the first and second seasons respectively, by increasing K_2O from zero to 144 kg/fad.

In the combined analysis, increasing potassium fertilizer from Zero to 48, 96 and 144 kg K_2O/fad. increased roots yield/fad. with about 6.512 , 22.297 and 29.675 %, respectively as compared with zero level. The increase in fresh roots yield/ fad. due to potassium application was in harmony with that obtained by Tyamin (1981), Marie (1984) Abdel-Aal (1990), El-Khawaga and Zeiton (1993) and Geweifel and Aly (1996), they concluded that fodder beet root yield/fad. increased with increasing potassium fertilizer.

In respect to the interaction effect of varieties and potassium on roots yield, this character was significantly affected by variety and potassium interaction in the combined analysis only. Brigadier variety with 144 kg K_2O/fad., produced the highest root yield (52.635), whereas the lowest yield of roots/fad. (34.22) was produced by the unfertilized Rossessina variety.

In Nubaria region, the results (in Table 16) indicated that the yield of roots/fad. was significantly affected by varieties and this was true for the first and second seasons as well as the combined analysis. In the first season, Rossessina and Brigadier varieties produced the greatest yield of roots/fad. than Monovert variety. The fresh yield of roots/fad. were 50.745, 49.741 and 43.751 tons/fad for Brigadier, Rossessina and Monovert, respectively, and without significant difference between Brigadier and Rossessina. Meanwhile, in second season Brigadier variety

possessed superiority over Monovert and Rossessina varieties. In this respect the fresh yield of roots/fad. was 51.083, 44.290 and 43.291 tons/fad, Brigadier , Rossessina and Monovert, respectively without significant difference between Rossessina and Monovert. Whereas, the above mentioned varieties in the combined analysis could be arranged according to the fresh yield of roots tons/fad in a descending order as follows Brigadier (50.914) , Rossessina (47.016) and Monovert (43.513).

This result was in general accordance with that obtained by Latif and Beshay (1994), who reported that Brigadier variety significantly surpassed the Monovert variety in roots yield/fad.

With regard to potassium application the fresh yield of roots/fad . was significantly increased by increasing the rates of potassium fertilizer from zero up to 144 kg K_2O /fad. this was true for the two seasons as well as the combined analysis (Table, 16). In this respect the fresh yield of roots yield/fad increased from 41.135 to 43.817, 50.307 and 53.342 tons by increasing K_2O from 0 to 48, 96 and 144 kg/fad. in the combined analysis as shown in Fig, (4). Similar results were obtained by Abdel-Aal (1990), El-Khawaga and Zeiton (1993) and Geweifel and Aly (1996).

C- Total yield (tops + roots) tons/fad.

Tabulated data in Tables (17) and (18) and fig (5) and (6) show the effect of varieties, potassium fertilizer and their interaction on fodder beet yield (total fresh yield) /fad. at Abis and Nubaria regions in 1993/94 and 1994/95 seasons as well as combined analysis.

In Abis region, the obtained results indicate that fodder beet yield/fad. was significantly affected by varieties as shown in Table (17) . This was true in both seasons and in the combined analysis. Brigadier

Table (17): Effect of potassium fertilization on total fresh yield (tons)/fad. of three fodder beet varieties at Abis region in 1993/94, and 1994/95 seasons as well as combined analysis.

Potassium level	Season 1993/94				Season 1994/95				Combined analysis			
	Varieties				*Varieties*				*Varieties*			
	Mono.	Ross.	Brig.	Mean	Mono.	Ross.	Brig.	Mean	Mono.	Ross.	Brig.	Mean
0	47.250	45.475	60.250	50.992 ^{d}	47.562	42.863	63.200	51.202 ^{d}	47.406	44.169	61.725	51.100 ^{d}
48	50.500	49.500	61.950	53.983 ^{c}	48.838	50.000	64.750	54.529 ^{c}	49.669	49.750	63.350	54.250 ^{c}
96	54.300	53.425	65.950	57.892 ^{b}	56.388	55.975	69.700	60.688 ^{b}	55.344	54.700	67.825	59.290 ^{b}
144	60.150	59.000	67.700	62.283 ^{a}	66.275	64.750	71.863	67.629 ^{a}	63.213	61.875	69.782	64.957 ^{a}
Mean	53.050 ^{b}	51.850 ^{b}	63.963 ^{a}		54.766 ^{b}	53.397 ^{b}	67.378 ^{a}		53.908 ^{b}	52.624 ^{b}	65.671 ^{a}	

Mono. = Monovert

Ross. = Rossessina

Bri. = Brigadier

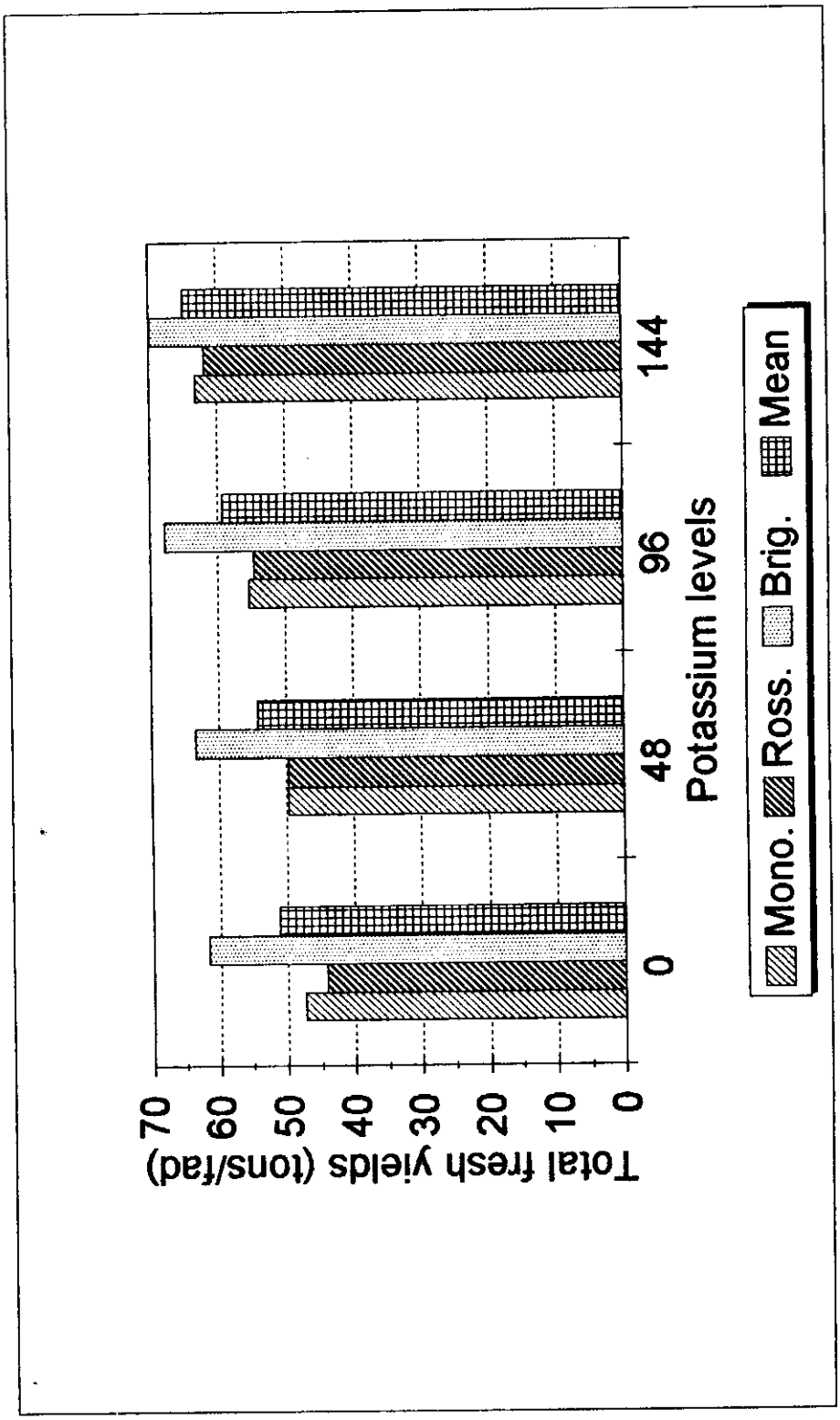


Figure (5): Effect of potassium fertilization on total fresh yield (tons)/fad. of three fodder beet varieties at Abis region in combined analysis.

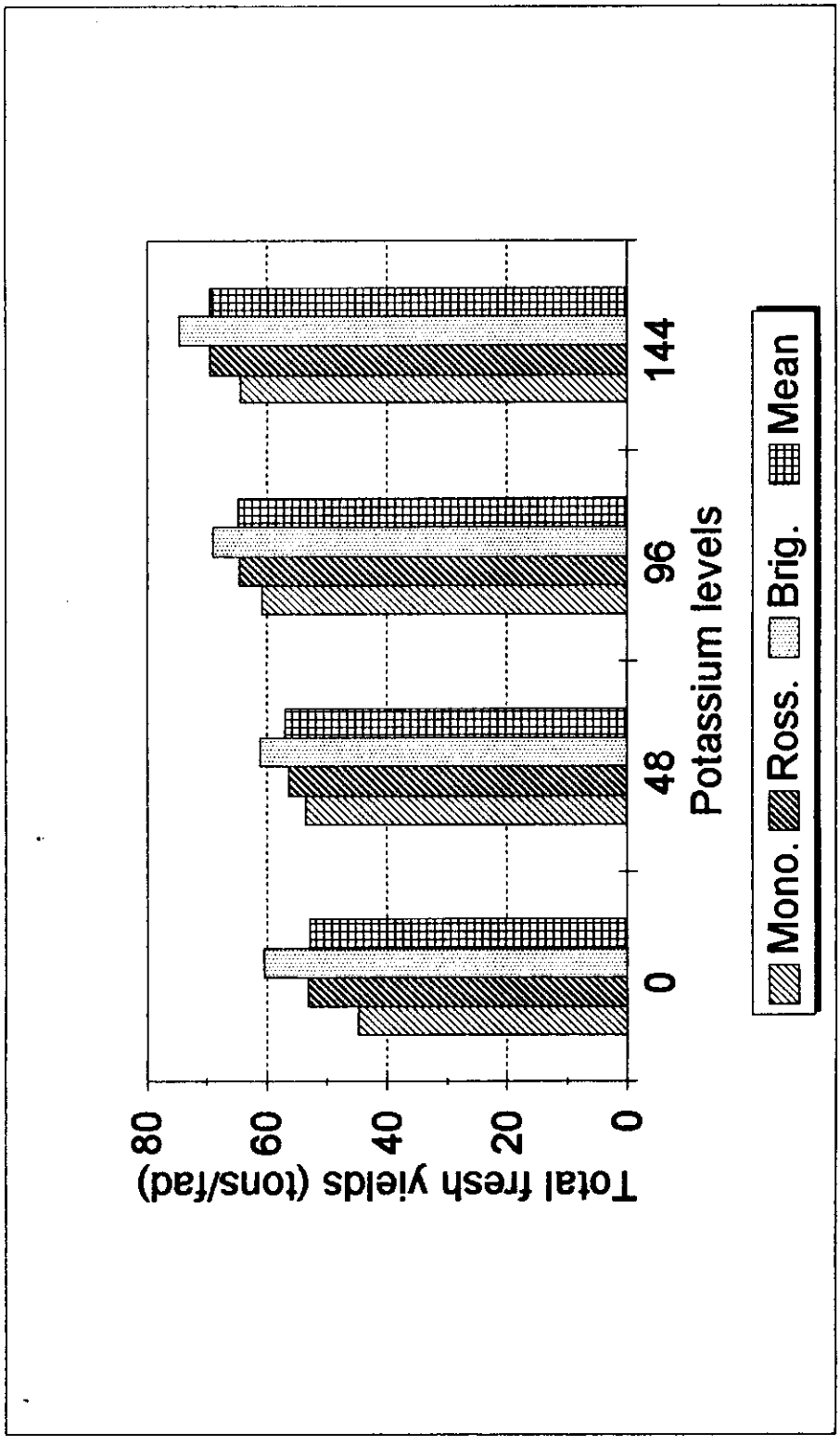


Figure (6): Effect of potassium fertilization on total fresh yield (tons)/fad. of three fodder beet varieties at Nubaria region in combined analysis.

variety produced greater fresh yield of fodder beet/fad, than Monovert and Rossessina varieties in the first and second seasons as well as combined analysis. The fresh yield of fodder beet was 53.908, 52.624 and 65.671 tons/fad. for Monovert, Rossessina and Brigadier, respectively as shown in the combined analysis without significant difference between Monovert and Rossessina varieties.

Concerning Potassium fertilizer, results revealed that there were a significant differences among potassium fertilization levels 0n total fodder beet yield/fad. in both seasons as well as the combined analysis. Each potassium increment over zero kg/fad. was accompanied by a marked increase in total yield. This was true in both seasons and in the combined analysis as shown in Table (17). These increases were 3.150 (6.17%), 8.190 (16.03%) and 13.857 (27.13%) tons/fad. for 48,96 and 144 kg K_2O/fad., respectively, as compared with the unfertilized treatment, in the combined analysis (Fig, 5). Thus, reflecting the important role of potassium in the function of enzyme needed for vital processes and its beneficial effect in the translocation of carbohydrate to the storage organs (Hartt, 1969 and Hear, 1981). Also, supporting results obtained by Tyamin (1981) , Marie (1984) and Abdel- Aal (1990) who reported that potassium application increased the yield of tops and roots of fodder beet.

The interaction between the levels of potassium and fodder beet varieties was found to be significant for total fresh yield/fad, in 2nd season and combined analysis. Generally, it could be noticed that the maximum values of total fresh yield/fad. (71.86 and 69.782 tons) were obtained by the Brigadier variety with application of 144 kg K_2O/fad., and the lowest yield (42.863 and 44.169 tons) resulted from Rossessina variety cultivated without any application of potassium fertilizer in 2nd season and combined analysis, respectively.

yield of tops and roots /fad. and total fresh yield/fad. at Abis and Nubaria regions.

Increasing potassium fertilizer up to 144 kg K_2O/fad. increased significantly total fresh yield/fad (tops + roots.)

D- Dry yield of tops (tons)/fad.

Data presented in Tables (19) and (20) and fig (7) and(8) show the effect of varieties, potassium fertilizer and their interaction on dry yield of tops (tons)/fad. at Abis and Nubaria regions in 1993/94 and 1994/95 seasons as well as combined analysis.

In Abis region, the tabulated data in Table, (19) indicated clearly that there are significant difference in dry tops yield/fad. among the tested varieties in both seasons and their combined analysis. In first season, dry yield of tops of Brigadier (1.808 tons/fad) and Rossessina (1.736 tons/fad) recorded the highest yield than Monovert (1.370 tons/fad). Meanwhile, in the second season, dry yield/ fad of Brigadier variety possessed superiority over Monovert and Rossessina varieties, The dry yield of tops/fad were 1.662, 1.484 and 1.452 for Brigadier, Rossessina and Monovert varieties, respectively without significant difference between Monovert and Rossessina varieties. In combined analysis, it could be arranged beet varieties according to the dry yield of tops/fad in a descending order as follows: Brigadier, Rossessina and Monovert. The differentes fodder beet varieties were previously reported by Rammah *et al.* (1984), Ramadan *et al.* (1988) Abdel-Aal *et al.* (1989) and Abdel-Aal *et al.* (1990).

Potassium fertilization rates, zero, 48, 96 and 144 Kg K_2O/fad affected dry yield of tops/fad in both seasons as well as the combined analysis. The dry yield of tops was significantly increased by increasing

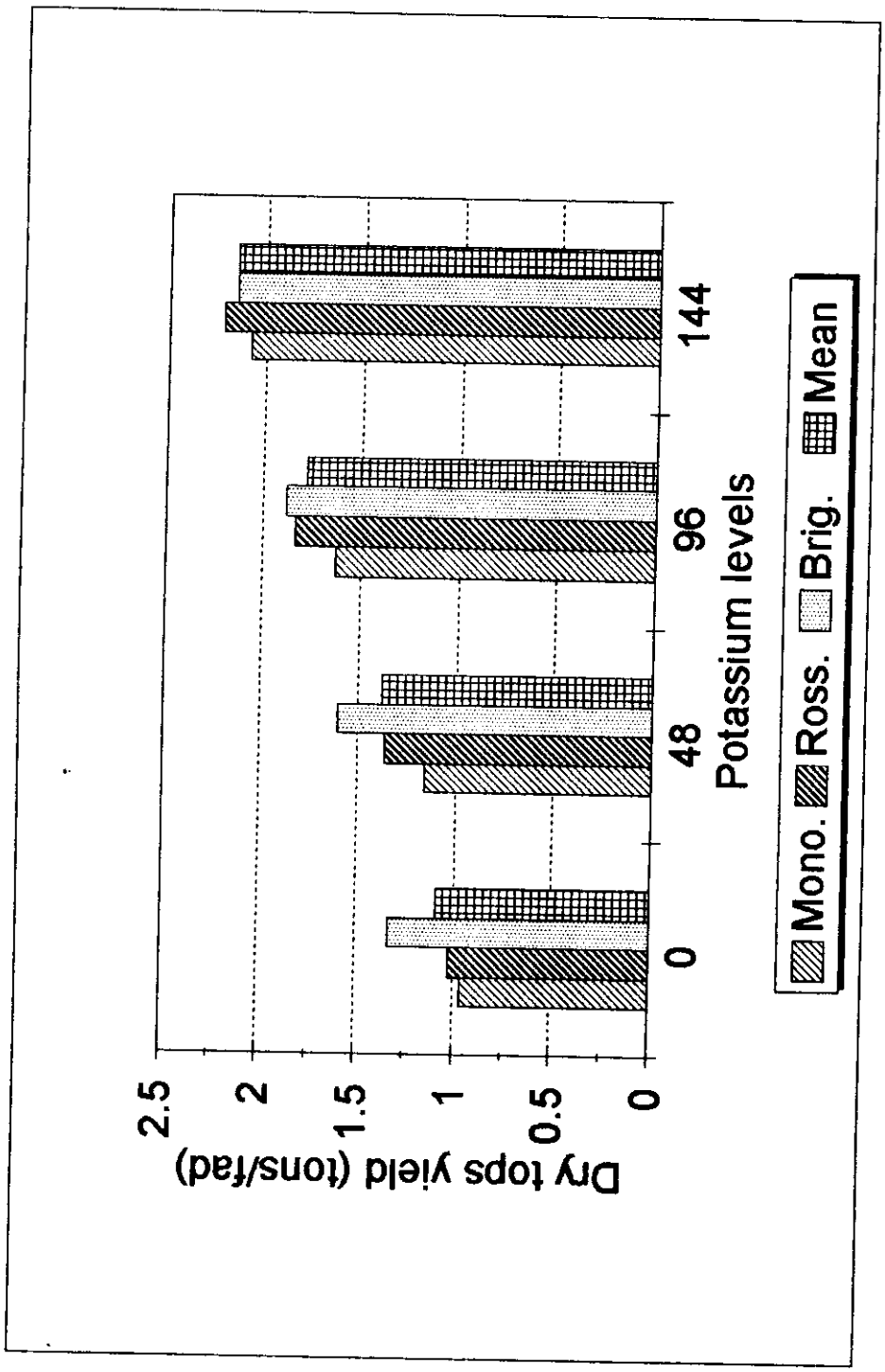
Table (19): Effect of potassium fertilization on dry yield of tops (tons /fad) of three fodder beet varieties at Abis region in 1993/94, and 1994/95 seasons as well as combined analysis.

Potassium level	Season 1993/94				Season 1994/95				Combined analysis			
	Varieties				*Varieties*				*Varieties*			
	Mono.	Ross.	Brig.	Mean	Mono.	Ross.	Brig.	Mean	Mono.	Ross.	Brig.	Mean
0	0.845	0.970	1.315	1.043 ^{d}	1.076	1.069	1.276	1.140 ^{d}	0.961	1.020	1.330	1.092 ^{d}
48	1.034	1.357	1.550	1.314 ^{c}	1.274	1.370	1.665	1.436 ^{c}	1.154	1.364	1.605	1.375 ^{c}
96	1.578	2.044	19.54	1.859 ^{b}	1.679	1.631	1.813	1.708 ^{b}	1.629	1.838	1.884	1.783 ^{b}
144	2.021	2.572	2.414	2.336 ^{a}	2.144	1.865	1.893	1.967 ^{a}	2.083	2.219	2.154	2.152 ^{a}
Mean	1.370 ^{b}	1.736 ^{a}	1.808^{a}		1.543 ^{b}	1.484 ^{b}	1.662 ^{a}		1.457 ^{c}	1.610 ^{b}	1.737 ^{a}	

Mono. = Monovert

Ross. = Rossessina

Bri. = Brigadier



Figure(7): Effect of potassium fertilization on dry tops yield/fad of three fodder beet varieties at Abis region in combined analysis.

Table (20): Effect of potassium fertilization on dry yield of tops (tons)/fad of three fodder beet varieties at Nubaria region in 1993/94, and 1994/1995 seasons as well as combined analysis.

Potassium level	Season 1993/94				Season 1994/95				Combined analysis			
	Varieties				*Varieties*				*Varieties*			
	Mono.	Ross.	Brig.	Mean	Mono.	Ross.	Brig.	Mean	Mono.	Ross.	Brig.	Mean
0	0.906	0.939	1.380	1.075 ^{d}	0.995	0.939	1.572	1.169 ^{d}	0.951	0.939	1.476	1.122 ^{d}
48	1.061	1.474	1.50	1.345 ^{c}	1.247	1.800	1.716	1.588 ^{c}	1.54	1.637	1.608	1.595 ^{c}
96	1.211	1.698	2.098	1.669 ^{b}	1.537	1.908	2.361	1.935 ^{b}	1.374	1.803	2.230	1.802 ^{b}
144	1.474	2.174	2.383	2.01 ^{a}	2.115	2.257	2.656	2.343 ^{a}	1.795	2.216	2.520	2.177 ^{a}
Mean	1.163 ^{c}	1.571 ^{b}	1.841 ^{a}		1.473 ^{c}	1.726 ^{b}	2.076 ^{a}		1.319 ^{c}	1.649 ^{b}	1.959 ^{a}	

Mono. = Monovert

Ross. = Rossessina

Bri. = Brigadier

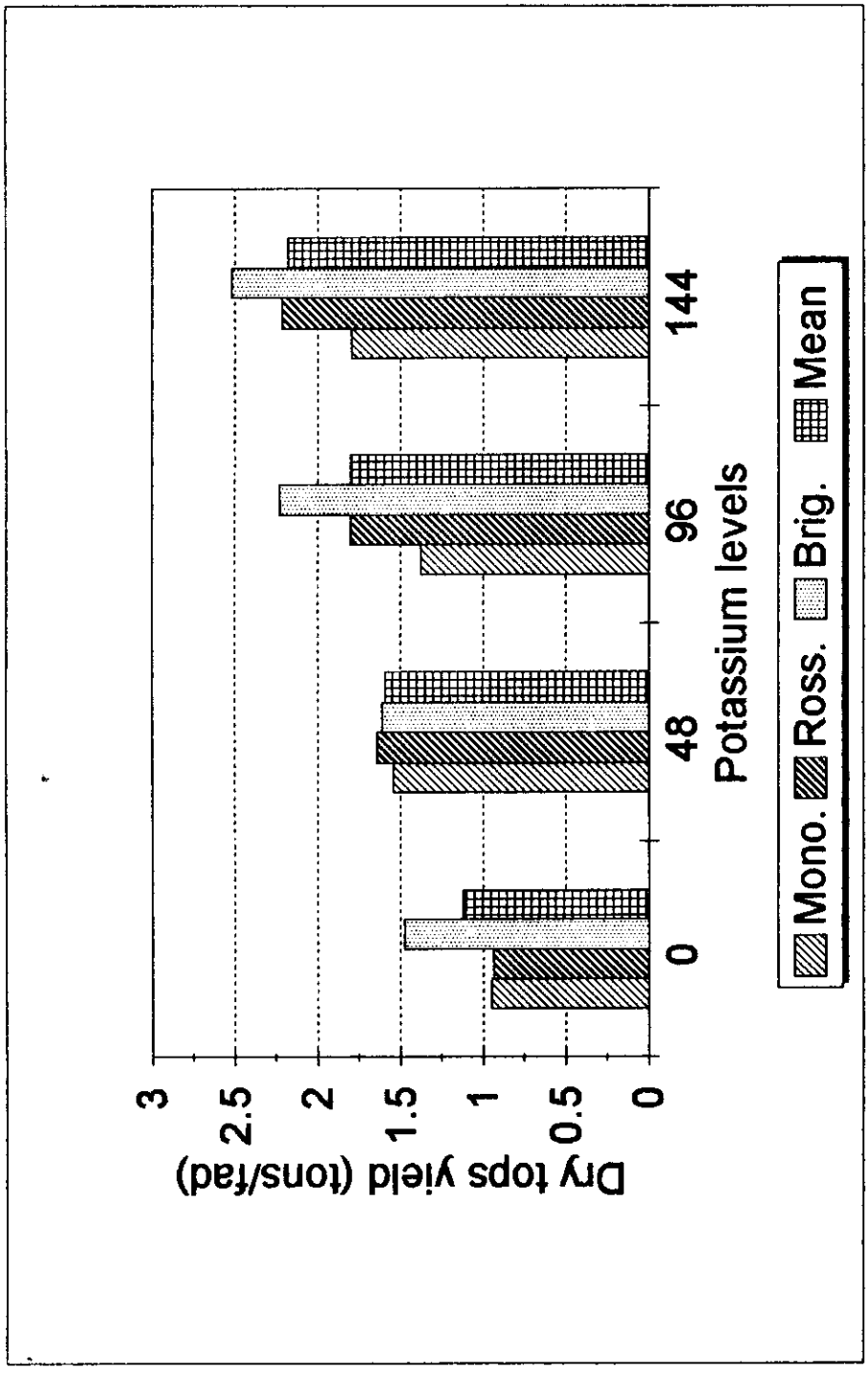


Figure (8): Effect of potassium fertilization on dry tops yield (tons)/fad of three fodder beet varieties at Nubaria region in combined analysis.

the potassium rate as shown in Table 19. The combined analysis indicated that dry yield of Tops/fad. increased with about 25.916, 63.278 and 97.060% by adding 48, 96 and 144 Kg K_2O)/ fad., respectively ascompared with zero level (Fig. 7). A positive association between the rate of applied potassium and yield of dry tops has been reported by Neamat- Alla (1991).

With regard to the effect of interaction between varieties and potassium fertilizer the dry yield of tops/fad. was not significantly affected by varieties X potassium in both seasons and combined analysis.

In Nubaria region, data in Table (20) indicated that the significantly differences among fodder beet varieties in dry yield of tops/ fad. This was true in both seasons as well as combined analysis. Brigadier variety had higher dry tops yield/fad followed by Rossessina and Monovert varieties as shown in Table (20).

The results in the same Table 20 indicated that the dry yield of tops in 1993/94 and 1994/95 seasons as well as combined analysis responded to potassium fertilizer and this was the true in both seasons as well as combined analysis. The dry yield of tops was significantly increased with increasing the potassium rate up to 144 Kg K2O/fad. The combined analysis revealed that adding 48, 96 and 144 Kg K_2O/fad increased the dry yield of tops/fad with about 30.660, 60.606 and 94.029%, respectively over the unfertilized treatment. These results are in agreement with that of Nemat-Alla (1992).

Results revealed that there was significant affect by varieties X potassium fertilizer in the combined analysis. The highest value, of dry tops yield, 2.52 tons, was produced from Brigadier variety given 144 Kg K_2O/fad.

E- Dry yield of roots (tons)/fad.

Data presented in Tables (21) and (22) and figures (9) and (10) show the effect of varieties, potassium fertilizer and their interaction on dry yield of roots (tons)/fad atAbis and Nubaria region in 1993/94 and 1994/95 seasons as well as combined analysis.

At Abis region, the tabulated data in Table, (21) indicated that there were significant differences in dry yield of roots/fad among the studied varieties in both seasons as well as combined analysis. Generally, it could be concluded that, Brigadier variety possessed superiority over Monovert and Rossessina varieties in this respect. Therefore, in the combined analysis, the above mentioned varieties could be arranged according to the dry yield of roots (tons)/fad in a descending order as follows: Brigadier (5.228), Rossessina (4.376) and Monovert (4.184) without significant differences between Rossessina and Monovert.

With regard to potassium application the dry yield of roots (tons)/fad was significantly increased by increasing the rate of potassium fertilizer from zero up to 144 Kg K2O/fad. This was true for the two seasons as well as combined analysis in this respect the dry yield of roots/fad increased from 3.612 to 4.102, 4.745 and 5.926 tons by increasing K_2O) from zero to 48, 96 and 144 Kg/fad in the combined analysis as shown in Table 21 and (Fig. 9). Similar effect was recorded by Magata and Goh (1988) they found the yield of dry roots was increased by increasing K-fertilization as KCl up to 360 Kg/h.

Potassium level with variety interaction on dry yield of roots was insignificant in the first and second seasons as well as combined analysis.

In Nubaria region, the obtained results (Table, 22) indicated that dry yield of roots (tons)/fad was not significantly affected by varieties in the

Table (21): Effect of potassium fertilization on dry yield of roots (ton) /fad of three fodder beet varieties at Abis region in 1993/94, and 1994/95 seasons. as well as combined analysis.

Potassium level	Season 1993/94				Season 1994/95				Combined analysis			
	Varieties				*Varieties*				*Varieties*			
	Mono.	Ross.	Brig.	Mean	Mono.	Ross.	Brig.	Mean	Mono.	Ross.	Brig.	Mean
0	2.550	2.725	4.197	3.157d	3.971	3.458	4.776	4.068 d	3.261	3.092	4.487	3.613 d
48	2.967	2.969	4.790	3.575 c	4.381	4.598	4.903	4.627 c	3.674	3.784	4.847	4.102 c
96	3.214	4.245	5.397	4.289 b	5.132	5.124	5.358	5.204b	4.173	4.685	5.378	4.745 b
144	4.773	5.374	5.777	5308 a	6.487	6.517	6.625	6.543 a	5.630	5.946	6.201	5.926 a
Mean	3.376 b	3.828 b	5.040 a		4.993 b	4.924 b	5.415 a		4.184 b	4.376 b	5.228 a	

Mono. = Monovert

Ross. = Rossessina

Bri. = Brigadier

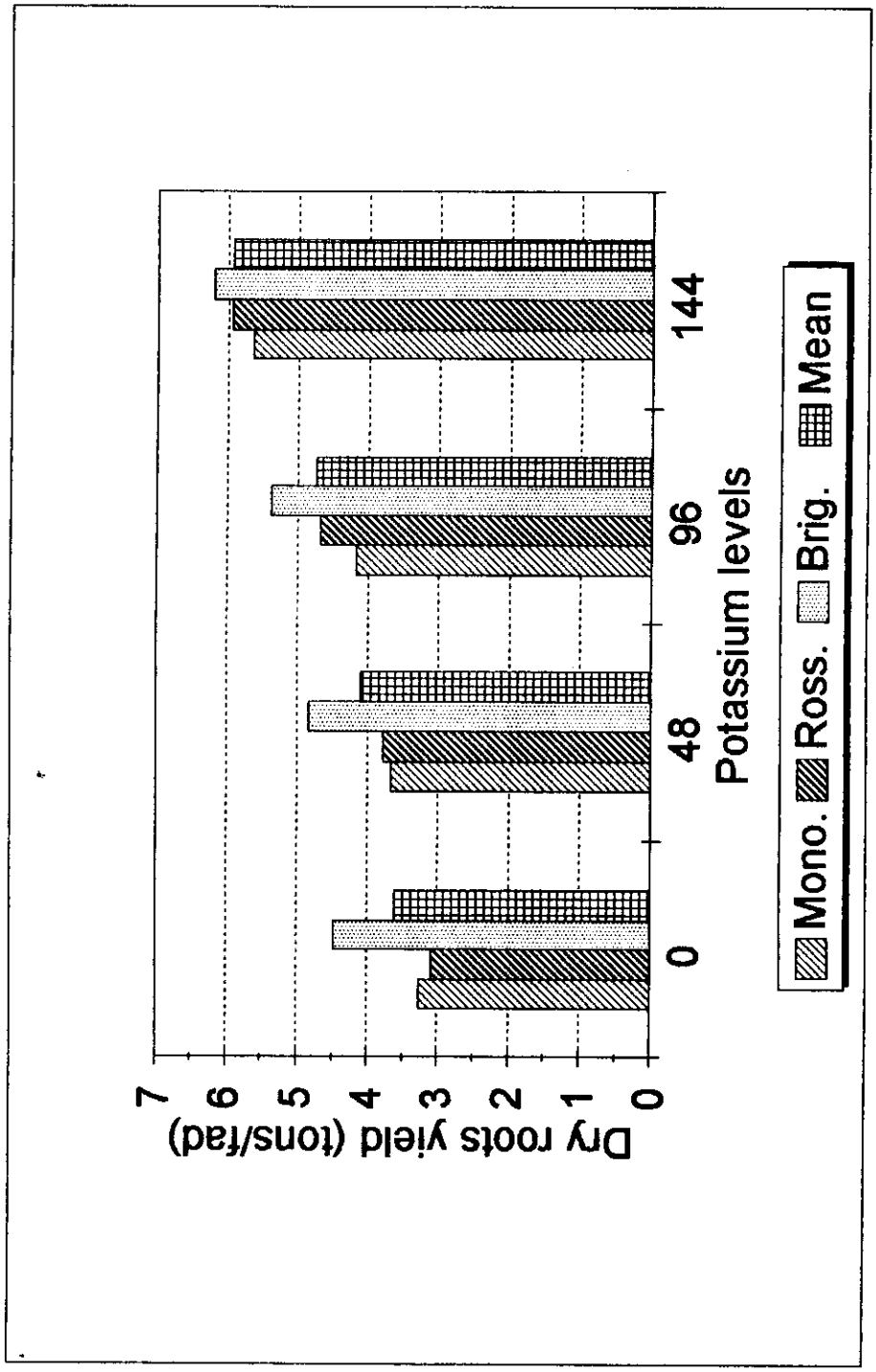


Figure (9): Effect of potassium fertilization on dry roots yield/fad of three fodder beet varieties at Abis region in combined analysis.

Table (22): Effect of potassium fertilization on dry yield of roots (tons)/fad of three fodder beet varieties at Nubaria region in 1993/94, and 1994/95 seasons as well as combined analysis.

Potassium level	Season 1993/94				Season 1994/95				Combined analysis			
	Varieties				Varieties				*Varieties*			
	Mono.	Ross.	Brig.	Mean	Mono.	Ross.	Brig.	Mean	Mono.	Ross.	Brig.	Mean
0	2.778	3.014	3.825	3.206 c	2.921	3.662	4.637	3.74 d	2.850	3.338	4.231	3.473 d
48	3.114	3.311	4.216	3.547 c	4.258	4.245	4.689	4.397 c	3.686	3.778	4.453	3.972 c
96	5.231	5.608	5.412	5.417 b	5.198	4.975	5.544	5.239 b	5.215	5.293	5.478	5.329 b
144	5.833	6.859	6.562	6.418 a	5.815	6.007	6.780	6.201 a	5.824	6.433	6.671	6.309 a
Mean	4.239 a	4.698 a	5.004 a		4.538 b	4.722 b	5.413 a		4.394 b	4.711 b	5.208 a	

Mono. = Monovert

Ross. = Rossessina

Bri. = Brigadier

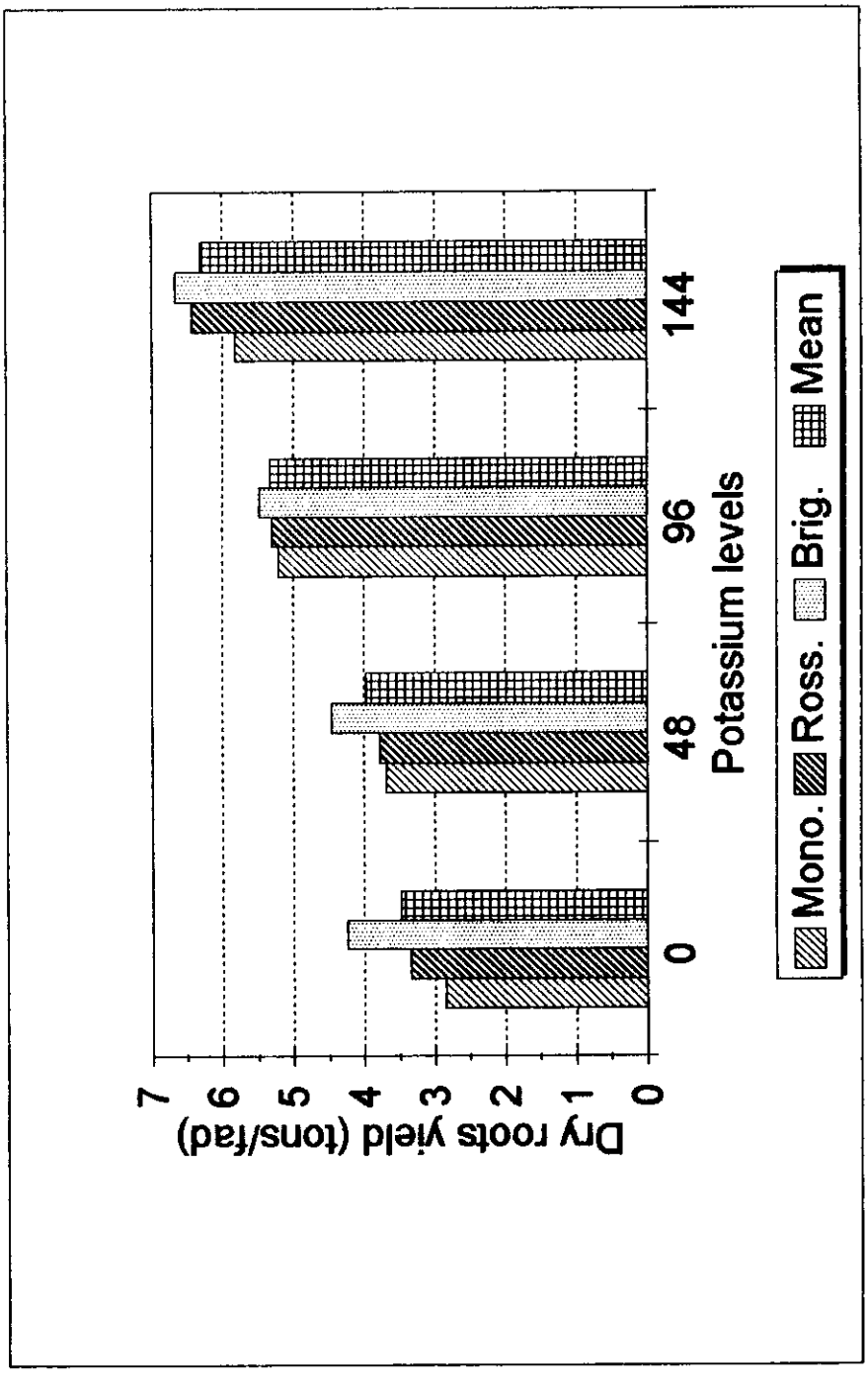


Figure (10): Effect of potassium fertilization on dry roots yield (tons)/fad of three fodder beet varieties at Nubaria region in combined analysis.

1 st season, whereas in 2 nd season and the combined analysis, there were significant differences in the dry yield of roots (tons)/fad among the studied varieties. Brigadier variety produced greater dry yield of roots than Monovert and Rossessina varieties. This result was true in both seasons and the combined analysis. In the combined analysis, the dry roots yield/fad was 4.394, 4.711 and 5.208 tons/ fad for Monovert, Rossessina and Brigadier varieties, respectively without significant difference between Monovert and Rossessina as shown in Table (22).

A gradual increase in dry yield of roots was obtained due to increasing rates of potassium fertilizer from zero to 144 Kg K_2O/ fad and this was true in both seasons as well as in the combined analysis. the increase of dry yield of root in the second season as well as the combined analysis was significant for any increase in potassium fertilizer i.e. the differences between the four rates of potassium used were significant. As shown in Table (22) and Fig, (10), the combined analysis increasing rate of potassium from zero to 48, 96 and 144 Kg K_2O/fad increased dry yield of roots/ fad with about 14.368, 53.412 and 81.659% respectively. Such positive effect of K-fertilization on roots dry yield of fodder beet had been reported by Bringer *et al.* (1986) and Magata and Goh (1988).

Data presented in Table (22) indicated that the interaction of veracities X potassium fertilizer was not significantly affected the dry yield of roots/fad in this study.

F- Total dry yield (tons)/fad.

Tabulated data in Tables (23) and (24) and figures (11) and (12) show the effect of varieties, potassium fertilizer and their interaction on total dry yield (tons)/fad at Abis and Nubaria regions in 1993/94 and 1994/95 seasons as well as combined analysis.

Table (23): Effect of potassium fertilization on total dry yield (ton)/fad of three fodder beet varieties at Abis region in 1993/94, and 1994/95 seasons as well as combined analysis.

Potassium level	Season 1993/94				Season 1994/95				Combined analysis			
	Varieties				*Varieties*				*Varieties*			
	Mono.	Ross.	Brig.	Mean	Mono.	Ross.	Brig.	Mean	Mono.	Ross.	Brig.	Mean
0	3.395	3.695	5.512	4.201 c	5.047	4.527	6.052	5.208 d	4.222	4.112	5.787	4.707 d
48	4.307	4.326	6.34	4.991 c	5.655	5.968	6.568	6.064 c	4.828	5.148	6.455	5.477 c
96	4.792	6.284	7.351	6.142 b	6.818	6.755	7.171	6.915 b	5.802	6.523	7.262	6.529 b
144	6.794	7.946	8.191	7.644 a	8.631	8.382	8.518	8.510 a	7.713	8.165	8.355	8.078 a
Mean	4.746 c	5.564 b	6.848 a		6.537 b	6.408 b	7.077 a		5.641 b	5.987 b	6.964 a	

Mono. = Monovert

Ross. = Rossessina

Bri. = Brigadier

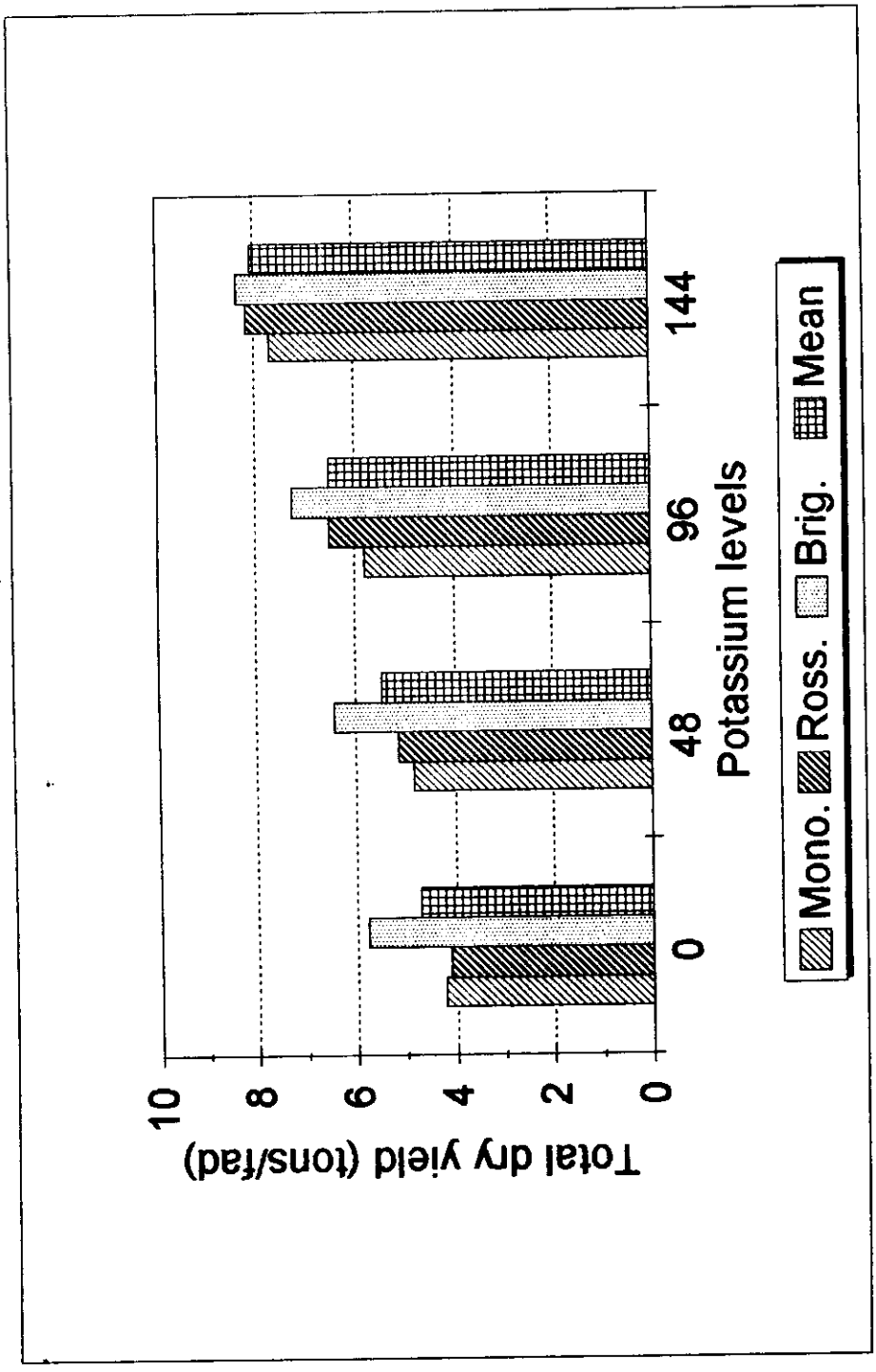


Figure (11): Effect of potassium fertilization on total dry yield/fad of three fodder beet varieties at Abis region in combined analysis..

Table (24): Effect of potassium fertilization on dry total yield (ton)/fad of three fodder beet varieties at Nubaria region in 1993/94, and 1994/95 seasons as well as combined analysis.

Potassium level	Season 1993/94				Season 1994/95				Combined analysis			
	Varieties				*Varieties*				*Varieties*			
	Mono.	Ross.	Brig.	Mean	Mono.	Ross.	Brig.	Mean	Mono.	Ross.	Brig.	Mean
0	3.684	3.953	5.205	4.281^{d}	3.916	4.601	6.209	4.906^{d}	3.801	4.277	5.707	4.595^{d}
48	4.475	4.785	5.717	4.892^{c}	5.505	6.045	6.405	5.985^{c}	4.84	5.415	6.061	5.438^{c}
96	6.442	7.306	7.51	7.086^{b}	6.735	6.883	7.905	7.174^{b}	6.589	7.096	7.708	7.131^{b}
144	7.257	9.033	8.945	8.412^{a}	7.93	8.264	9.436	8.543^{a}	7.619	8.649	9.191	8.486^{a}
Mean	5.390^{c}	6.269^{b}	6.844^{a}		6.022^{b}	6.448^{b}	7.488^{a}		5.712^{c}	6.359^{b}	7.167^{a}	

Mono. = Monovert

Ross. = Rossessina

Bri. = Brigadier

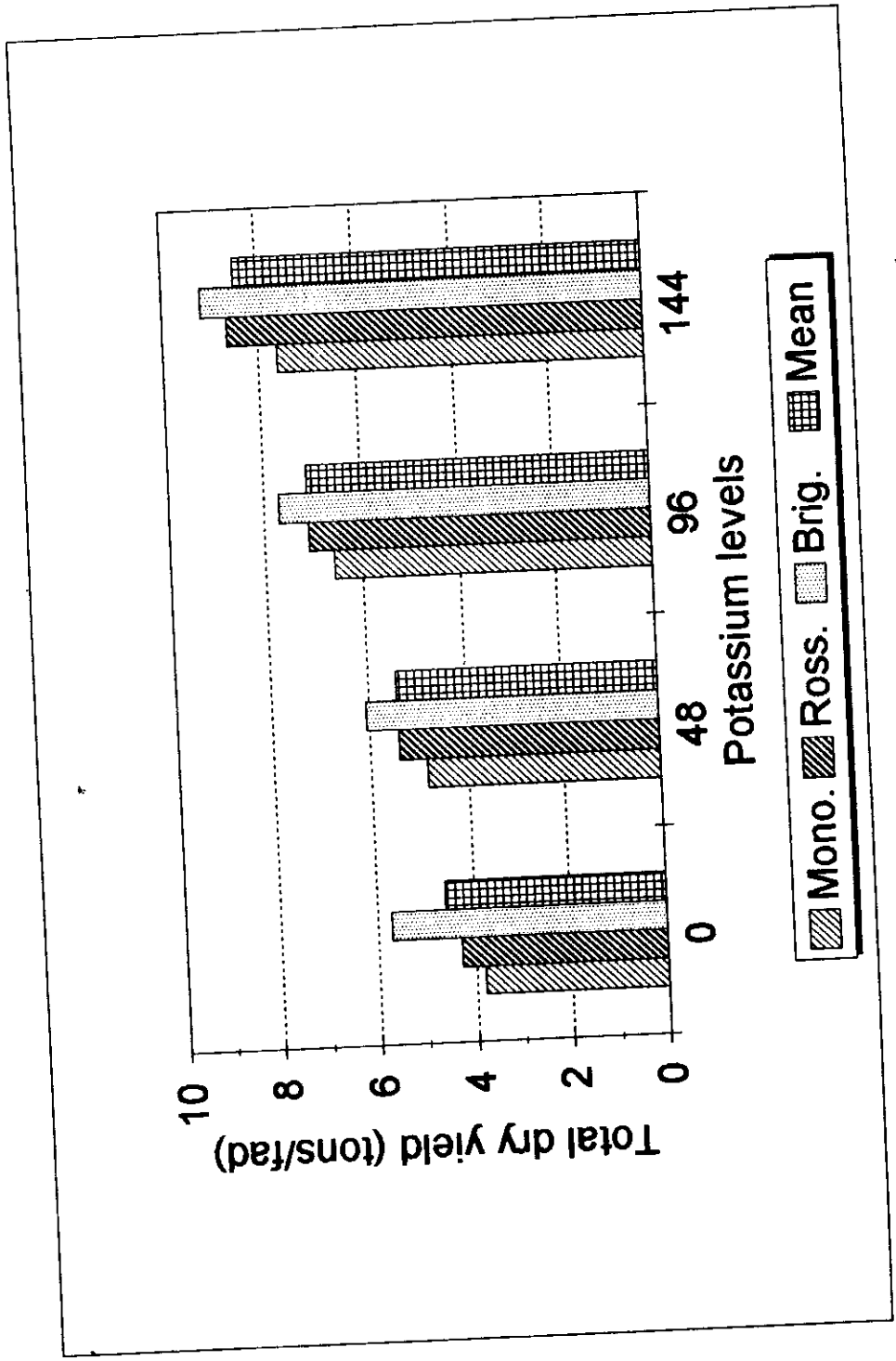


Figure (12): Effect of potassium fertilization on total dry yield/fad of three fodder beet varieties at Nubaria region in combined analysis.

At Abis region, the tabulated data in Table (23) indicated that the total dry yield/fad was significantly affected by varieties and this was true for the first and second seasons as well as the combined analysis. Generally, it could be concluded that, Brigadier possessed superiority over Monovert and Rossessina varieties in this respect. Therefore, in the combined analysis, the above mentioned varieties could be arranged according to total dry yield/fad in a descending order as follows: Brigadier (6.964 tons), Rossessina (5.987 tons) and Monovert (5.64 tons) without significant difference between Rossessina and Monovert. This result is in harmony with that obtained by Rammah *et al.* (1984) they reported that Brigadier variety surpassed the other tested varieties in total dry yield/fad.

The results clearly showed that potassium fertilization affect total dry yield tons/fad. This was true in both seasons as well as combined analysis as shown in Table (23).

Potassium fertilization significantly increased total dry yield (tons)/fad in fodder beet as shown in both seasons as well as combined analysis. The combined analysis indicated that, adding 48, 96 and 144 Kg K_2O/fad. increased the total dry yield (tons)/ fad with about 16.359, 38.700 and 71.617%, respectively over the unfertilized treatment as shown in Fig, (11). This results is in agreement with that obtained by Neamat-Alaa (1991). who found that the dry yield of fodder beet increased by increasing potassium level up to 50 Kg K_2O)/fad.

At Nubaria region, the tabulated data in Table, (24) indicate clearly that there were significant differences in total dry yield/ fad. among the studied varieties in both seasons and combined analysis, Brigadier variety possessed superiority over Monovert and Rossessina varieties. Therefore, the above mentioned varieties could be arranged according to the total dry

yield in a descending order as follows, Brigadier (6.844 & 7.167), Rossessina (6.269 & 6.359) and Monovert (5.390 & 5.712) in the first season and combined analysis, respectively. Meanwhile in the second season, Brigadier variety produced the highest total dry yield/ fad than Rossessina and Monovert. The total dry yield was 7.488, 6.448 and 6.022 tons/ fad, respectively without significant difference between Rossessina and Monovert.

It is worthy to mention that the three studied varieties differed in total dry yield/ fad and that Brigadier surpassed Rossessina and Monovert in this respect. This result was in general accordance with that obtained by Rammah *et al.* (1984), who reported that varieties of fodder beet differed significantly in dry yield/ fad.

From Table (24), it could be noticed that in the 1st, 2nd and combined analysis the total dry yield/ fad was significantly affected by increasing the rates of potassium fertilizer from zero up to 144 kg k_2O/ fad. In the combined analysis total dry yield/ fad increased from 4.595 to 5.438, 7.131 and 8.486 tons by increasing K_2O up to 48, 96 and 144 kg, respectively as shown in Table 24 and Figure 12. Similar results were in agreement with those obtained by Beringer *et al.* (1986).

The interaction of fodder beet varieties X potassium fertilizer was not significantly affected the total dry yield (tons)/ fad in this study.

III- Chemical Composition and Nutritive Values:

Data presented in Tables (25) and (26) show the effect of varieties, potassium fertilizer and their interaction on chemical composition and nutritive value of fodder beet plants at Abis and Nubaria regions in 1993/94 and 1994/95 seasons as well as combined analysis.

Table (25): Effect of potassium fertilization on chemical composition and nutritive values of three fodder beet varieties at Abis region.

Potassium level	CP				CF				DCP				TDN			
	Varieties				*Varieties*				*Varieties*				*Varieties*			
	Mono	Ross.	Brig.	Mean	Mono	Ross.	Brig.	Mean	Mono	Ross.	Brig.	Mean	Mono	Ross.	Brig.	Mean
0	9.14	9.36	10.38	9.63 ^{d}	9.63	9.47	9.43	9.51 ^{a}	5.22	5.43	6.41	5.68 ^{d}	79.43	79.50	79.24	79.39 ^{c}
48	10.39	10.17	10.56	10.37 ^{c}	8.82	9.11	8.17	8.70 ^{b}	6.42	6.21	6.58	6.40 ^{c}	79.77	79.58	80.28	79.88 b
96	10.63	10.56	13.79	11.66 ^{b}	8.46	8.56	7.62	8.21 ^{b}	6.65	6.58	9.68	7.63 ^{b}	80.02	79.94	79.83	79.93 b
144	11.28	10.96	14.33	12.19 ^{a}	7.43	8.19	6.94	7.25 ^{c}	7.27	6.96	10.19	8.14 ^{a}	80.71	80.14	80.25	80.37 ^{a}
Mean	10.36 ^{b}	10.26 b	12.27 ^{a}		8.58 ^{a}	8.83 ^{a}	8.04 ^{b}		6.39 ^{b}	6.36 ^{b}	8.22 ^{a}		79.98^{a}	79.79^{a}	79.90^{a}	

Mono. = Monovert

Ross. = Rossessina

Bri. = Brigadier

Table (26): Effect of potassium fertilization on chemical composition and nutritive values of three fodder beet varieties at Nobaria region.

Potassium level	Varieties				Varieties				Varieties				Varieties			
	CP				CF				DCP				TDN			
	Mono	Ross.	Brig.	Mean	Mono	Ross.	Brig.	Mean	Mono	Ross.	Brig.	Mean	Mono.	Ross.	Brig.	Mean
0	9.97	9.37	11.17	10.17 d	10.00	8.00	10.03	9.34 a	6.02	5.44	7.17	6.21 d	78.85	80.77	80.00	79.53 d
48	10.95	10.36	11.81	11.04 c	8.84	7.23	8.79	8.29 b	6.96	6.39	7.59	6.98 c	79.59	81.15	79.37	80.04 c
96	11.31	11.21	13.16	11.89 b	8.84	6.96	7.65	7.82 c	7.30	7.21	9.08	7.86 b	79.76	81.15	79.97	80.29 bc
144	11.60	12.14	14.27	12.67 a	8.04	6.40	6.95	7.13 d	7.58	8.10	10.14	8.61 a	80.09	81.34	79.72	80.38 a
Mean	10.96 b	10.77 b	12.62 a		8.93 a	7.15 c	8.36 b		6.97 b	6.79 b	8.50 a		79.57 b	81.10 a	79.77 b	

Mono. = Monovert

Ross. = Rossessina

Bri. = Brigadier

At Abis region, the varietal differences in chemical composition , nutritive values i.e., crude protein (CP) , crude fiber (CF) and nutritive value i.e., digestible crude protein (DCP) and total digestible nutrients (TDN) are shown in Table (25). The data showed that differences among varieties in CP%, CF% and DCP% were significant. On the contrary there were no statistical significant differences in TDN % among the studied varieties. The highest percentages of CP (12.27%) and DCP (8.22%) were obtained by Brigadier variety followed by Monovert and Rossessina varieties, whereas, Rossessina variety gave the highest value of (CF). On the other hand. TDN% was superior in Monovert variety than that of the other varieties. These results were in agreement with those obtained by Kaoud *et al.* (1993) and Soheir Latif and Maria Beshay (1994) . They found that fodder beet variety, Brigadier surpassed Monovex and Monovert varieties in the percentage of crude protein.

Concerning the effect of potassium fertilizer as shown in Table (25),the data indicated that the application of potassium increased significantly CP,% DCP% and TDN% up to 144 kg K_2O/fad. Application of potassium at a rate of 48,96 and 144 kg K_2O/fad. increased the CP % by (7.68 , and 21.08% and 26.58%) DCP% by (12.68 , 34.33 and 43.31 %) and TDN% by (0.62, 0.68 and 1.23%) respectively than the zero level of K_2O, respectively. The same Table also demonstrated that increasing the rate of potassium fertilizer up to 144 kg K_2O/fad. decreased significantly (CF%) without significant differences between 48 and 96 kg K_2O/fad. The (CF%) decreased from 8.52 to 13.67 and 20.93% by the application of 48,96 and 144 kg K_2O /fad as compared to the control treatment , respectively . similar effects were recorded in Egypt by Aly *et al.* (1984) , Abdel-Aal (1990), El-Khawaga and Zeiton (1993) and Geweifel and Aly (1996) . They found that

application of K-fertilizer up to 5O Kg K_2O/fad significantly increased crude protein % but significantly decreased crud fiber %.

The interaction between varieties and potassium fertilizer levels on the all studied traits was not statistically significant.

In Nubaria region, there were marked differences among the studied varieties in CP%, CF%, DCP%, and TDN%. These differences were significant (Table 26).

The results in Table (26) indicated that Brigadier variety recorded the highest percentages of CP and DCP, while Rossessina variety recorded the lowest ones- However, Monovert variety surpassed Rossessina and Brigadier varieties in CF% , on the other hand TDN% was superior in Rossessina variety than that of the other two varieties. These results are in agreement with that of Kaoud *et al* (1993) and Sohair Latif and Maria Beshay (1994) .

The CP%, CF%, DCP% and TDN% values were significantly affected by potassium fertilization . Increasing potassium rate from 0 to 144 kg K_2O/fad. Tended to increase gradually the CP, DCP and TDN, and decrease gradually CF.

Application of 144 kg K_2O /fad increased CP% by 2.50%, DCP% by 38.65% and TDN% by 0.75% and decreased CF% by 2.31% more than the control (zero kg K_2O /fad). Similar effects were recorded in Egypt by Aly *et al.* (1984) , Abdel-Aal (1990), El-Khawaga and Zeiton (1993) and Geweifel and Aly (1996) .

The interaction between fodder beet varieties and potassium fertilizer levels on the all studied traits was did not reach the 5% levels of significance.

In short from the data of root characters, yield and yield

component and chemical composition and nutritive values. It could be concluded that Brigadier variety is the best variety to grow under Abis and Nubaria regions, under Egyptian conditions as compared with Rossessina and Monovert as it surpassed these two varieties in the fresh and dry yield of tops and roots per plant and per feddan, CP% and DCP% values.

In addition the application of potassium fertilization up to 144 kg K_2O/fad improved the fresh and dry total yield (top + root) / fad and quality of fodder beet crop.