

RESULTS AND DISCUSSION

1- Effect of Subsoiling on soil characters:

a. Bulk density and porosity:

Data on the bulk density as influenced by subsoiling are shown in table(2).

Subsoiling operation showed significant decrease on soil bulk density at all sampling in the three successive seasons. On the other hand, the percentage of porosity increased with subsoiling treatment.

The greater effect of subsoiling was found in the 10-20 cm and 20-30 cm layers (table 2). These results agree with those obtained by Jamison et al. (1952), Zein El-Abedine et al. (1965) and ^KKoleva (1970).

b- Soil Salinity:

Data shown in Table (3) indicate that seedbed preparation accompanied with subsoiling was more efficient in leaching salt from the tested depth than without subsoiling. This may be attributed to the melioration of soil porosity and consequently water percolation through out the soil profile to the drains. Though seedbed preparation.

Table (2 a) : Effect of Subsoiling on bulk density and porosity of soil.

Treatmensts	Depth of 10 cm				
	bulk density		decrease in bulk density	soil porosity %	
	before	after			
	Season 1980				
1. Without subsoiling	1.47	1.38	0.09 a	45	48
2. With subsoiling	1.49	1.28	0.21 b	44	52
Season 1981					
1. Without subsoiling	1.46	1.36	0.10 a	45	49
2. With subsoiling	1.47	1.29	0.18 b	45	51
Season 1982					
1. Without subsoiling	1.47	1.36	0.11 a	45	49
2. With subsoiling	1.49	1.24	0.25 b	44	52

Table (2 b) : Effect of subsoiling on bulk density and porosity of soil

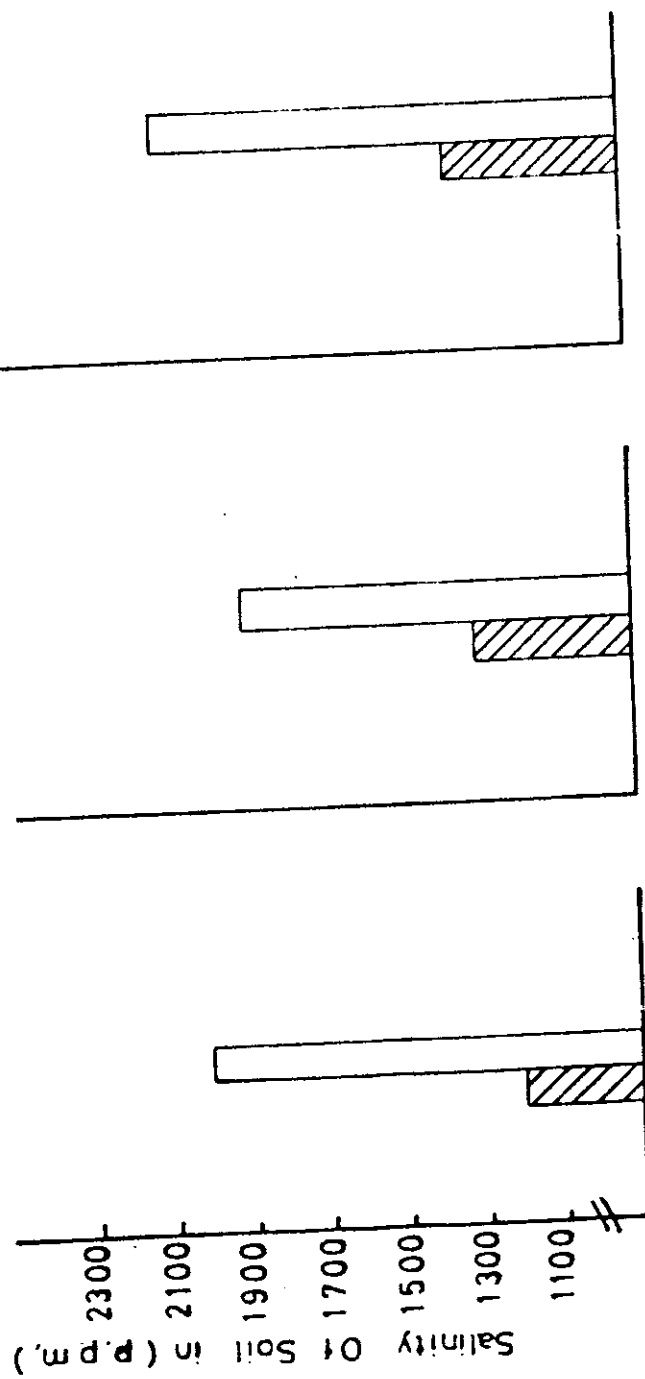
Treatments	Depth of 20 cm			
	bulk density		decrease in bulk density	soil porosity %
	before	after		
Season 1980				
1. Without subsoiling	1.48	1.42	0.06 a	44 46
2. With subsoiling	1.56	1.33	0.23 b	41 50
Season 1981				
1. Without subsoiling	1.50	1.42	0.08 a	44 46
2. With subsoiling	1.50	1.28	0.22 b	43 52
Season 1982				
1. Without subsoiling	1.52	1.51	0.01 a	45 49
2. With subsoiling	1.52	1.32	0.20 b	44 52

Table (2 c) : Effect of subsoiling on bulk density and porosity of soil.

Treatments	Depth of 30 cm			
	bulk density		decrease in bulk density	soil porosity %
	before	after		
Season 1980				
1. Without subsoiling	1.46	1.41	0.05 a	45 46
2. With subsoiling	1.47	1.33	0.14 b	44 50
Season 1981				
1. Without subsoiling	1.56	1.37	0.19 a	42 48
2. With subsoiling	1.57	1.20	0.37 b	42 54
Season 1982				
1. Without subsoiling	1.58	1.36	0.22 a	41 44
2. With subsoiling	1.59	1.32	0.27 b	41 50

Table (3) Effect of subsoiling on salinity of soil in part per million (p.p.m)

Treatments	Salinity of soil in p.p.m
<u>Season 1980</u>	
1-Without subsoiling	2080 b
2-With subsoiling	1270 a
<u>Season 1981</u>	
1-Without subsoiling	1925 b
2-With subsoiling	1325 a
<u>Season 1982</u>	
1-Without subsoiling	2100 b
2-With subsoiling	1340 a



Fig(7) Effect Of Subsoiling On Salinity Of Soil

11. Effect of subsoiling on growth characters at different growth stages :-

a. Dry weight of roots/plant :-

The average of dry weight of cotton roots (gm/plant) was affected by subsoiling treatment at different stages of growth in the three successive seasons are shown in table (4).

Subsoiling operation showed significant effect on the dry matter weight of roots. The dry weight of cotton roots increased significantly due to the subsoiling treatment in 1980, 1981 and 1982 seasons. These results are expected since subsoiling treatment improved soil properties which allowed better root development. Similar results were obtained by Patric *et al.* (1959) and Rasmussen (1967). They reported that deep tillage encouraged root development in the sub-soil.

b. Dry weight of leaves/plant :-

Data presented in table (4) showed clearly that dry weight of leaves increased with subsoiling operation in 1981 season.

However at the end of the season, at picking time, the results indicate that there is a significant increase of the leaves weight in the three successive seasons. Similar result was obtained by Hamad (1964), who found that there was an increase in the fresh and the dry matter content of the different cotton plant organs with increasing the depth of ploughing (45 cm) treatment.

c. Dry weight of stems/plant :-

Subsoiling treatments increased the dry weight of stems/plant. This increase was significant in the first season, while

Table (4) Effect of subsoiling on growth characters of cotton plant

Treatments	after 70 days					at the end of the season				
	dry weight of roots	dry weight of leaves	dry weight of stems	plant height	dry weight of roots	dry weight of leaves	dry weight of stems	plant height	dry weight of roots	dry weight of leaves
<u>Season 1980</u>										
1- Without subsoiling	0.80 a	3.11 a	1.0 a	39.67 a	3.50 a	3.10 a	3.80 a	105.29 a		
2- With subsoiling	0.90 a	3.29 b	1.30 b	41.15 b	4.60 b	3.30 b	5.10 b	140.50 b		
<u>Season 1981</u>										
1- Without subsoiling	0.60 a	3.10 a	1.10 a	39.90 a	4.30 a	4.70 a	3.80 a	92.37 a		
2- With subsoiling	0.80 b	3.50 b	1.30 b	41.80 b	5.10 b	6.10 b	4.90 b	128.75 b		
<u>Season 1982</u>										
1- Without subsoiling	0.70 a	3.10 a	1.10 a	38.40 a	8.30 a	7.80 a	8.30 a	121.80 a		
2- With subsoiling	0.80 b	3.40 b	1.30 b	40.70 b	10.30 b	9.80 b	10.30 b	134.50 b		

in the other two seasons it failed to reach the significant level (table 4). These results agree with those reported by Phillips (1962) and Hamad (1964).

d. Plant height :-

Data on plant height of cotton as influenced by subsoiling treatment are shown in table (4). It is clear that plant height increased significantly with subsoiling operation at the different period of growth in the three successive seasons. Similar results were obtained by Phillips (1962), Hamad (1964) and Tompkins et al. (1979).

It could be concluded that subsoiling treatment had significant effect on some growth characters namely, weight of roots, leaves, stems and plant height of cotton. These results are expected since subsoiling has improved soil properties which allowed better root development.

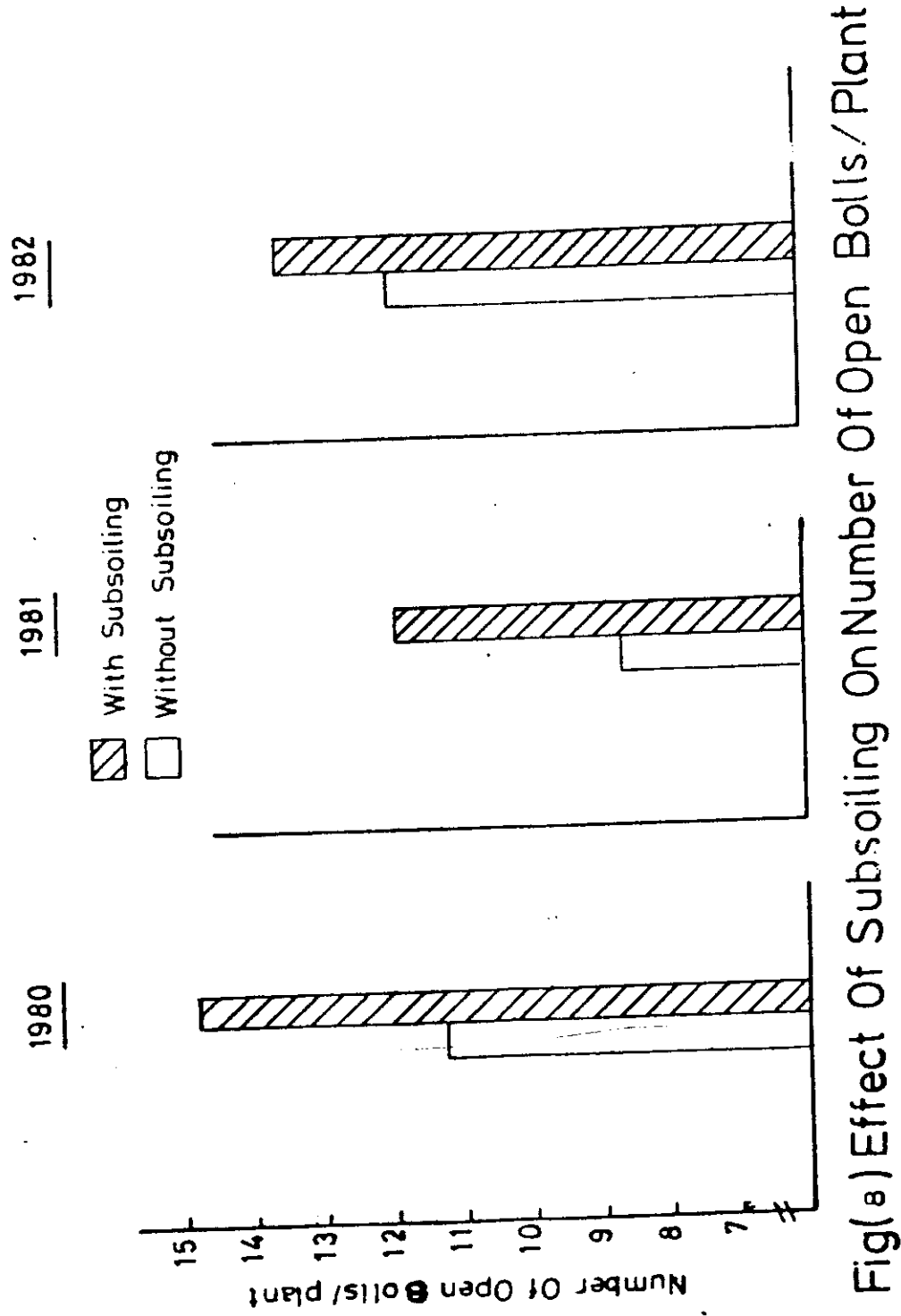
III. Effect of subsoiling operation on yield and yield components :-

a. Number of bolls/plant :-

Data for the number of open and unopen bolls/plant as influenced by subsoiling treatment are shown in table (5). Number of open bolls/plant increased significantly by using subsoiling operation. On the other hand, subsoiling treatment decreased significantly the number of unopen bolls/plant as compared the other treatment (without subsoiling). The same result was obtained by Patrio et al. (1959), Phillips (1962), and Tompkins et al. (1979).

b. Weight of boll :-

The result in table (5) show the effect of subsoiling



Fig(a) Effect Of Subsoiling On Number Of Open Bolls/Plant

treayment on the boll weight of cotton plant.

Boll weight of cotton plant inoreased significantly by using subsoiling operation in the three successive seasons. Similar result was obtained Pillips(1962)and Hamad(1964).

c- Seed cotton yield/plant:

Data presented in table(5)showed clearly that using subsoiling had significant effect on seed cotton yield/plant in the three successive seasons.The highest seed cotton yield/plant was obtained by using subsoiling and the lowest was obtained without subsoiling.This result might be attributed to the previously mentioned significant increase in number of open bolls/plant as well as boll weight due to subsoiling action.

These results are in general agreement with obtained by Russel(1957),Tamison and Thornton (1960)and Hamad(1964).

d- Seed cotton yield/Faddon:

Results of the yield of seed cotton,in kg/fad.as influenced by subsoiling treatment are shown in table(5).

Seed ootton yield/fad.increased with using subsoiling operation in the three successive seasons.The highest yield was obtained by subsoiling(8.15,5.42 and 9.25 kentar/fad in 1986,1981 and 1982 respectively While the lowest yield was obtained without subsoiling(7.18,4.94 and 8.0 kentar / fad).These results are expected since subsoiling treatment increased significantly,the dry weight of different plant organs,i.e.,plant height,number of open bolls/plant,weight of boll,yield of seed ootton/plant and decreased significantly un-open bolls/plant.These results agree with those obtained

Table (5) : Effect of subsoiling on yield and yield components of cotton.

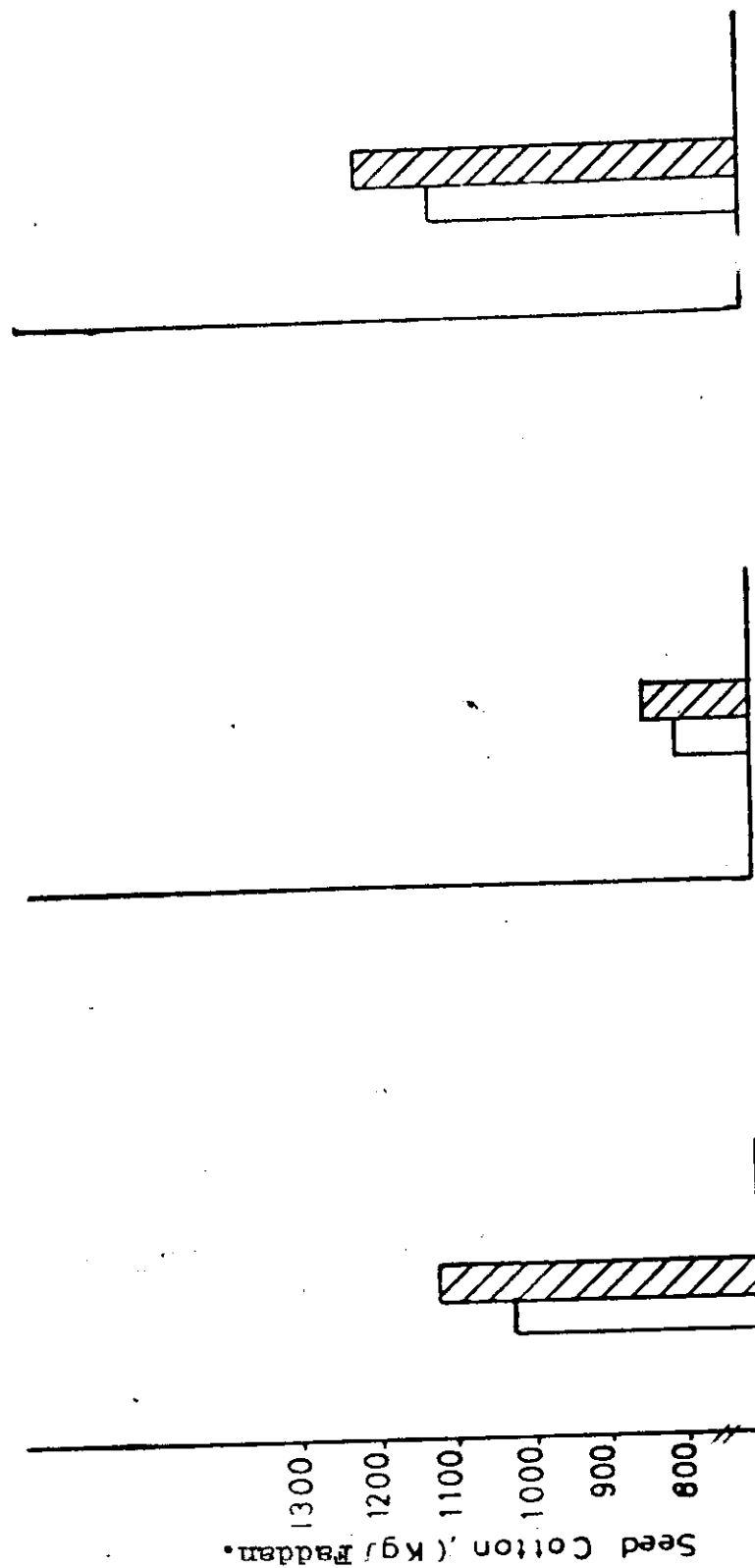
Treatments	number of open bolls/ plant	number of unopen bolls/ plant	seed cotton yield in gm/ plant	seed cotton yield in kg/ fadden	Relative yield	weight of boll
Season 1980						
1. Without subsoiling	11.24 a	4.51 b	15.73 a	1130.90 a	100	2.30 a
2. With subsoiling	14.84 b	3.37 a	23.96 b	1283.60 b	114	2.50 b
Season 1981						
1. Without subsoiling	8.65 a	3.64 b	14.17 a	778.10 a	100	2.0 a
2. With subsoiling	11.95 b	2.67 a	17.04 b	853.70 b	110	2.30 b
Season 1982						
1. Without subsoiling	11.91 a	3.24 b	20.61 a	1260 a	100	2.20 a
2. With subsoiling	13.55 b	2.26 a	28.99 b	1456.70 b	116	2.40 b

- 45 -

1982
With Subsoiling
Without Subsoiling

1981

1980



Fig(9)Effect Of Subsoiling On Yield Of Seed Cotton

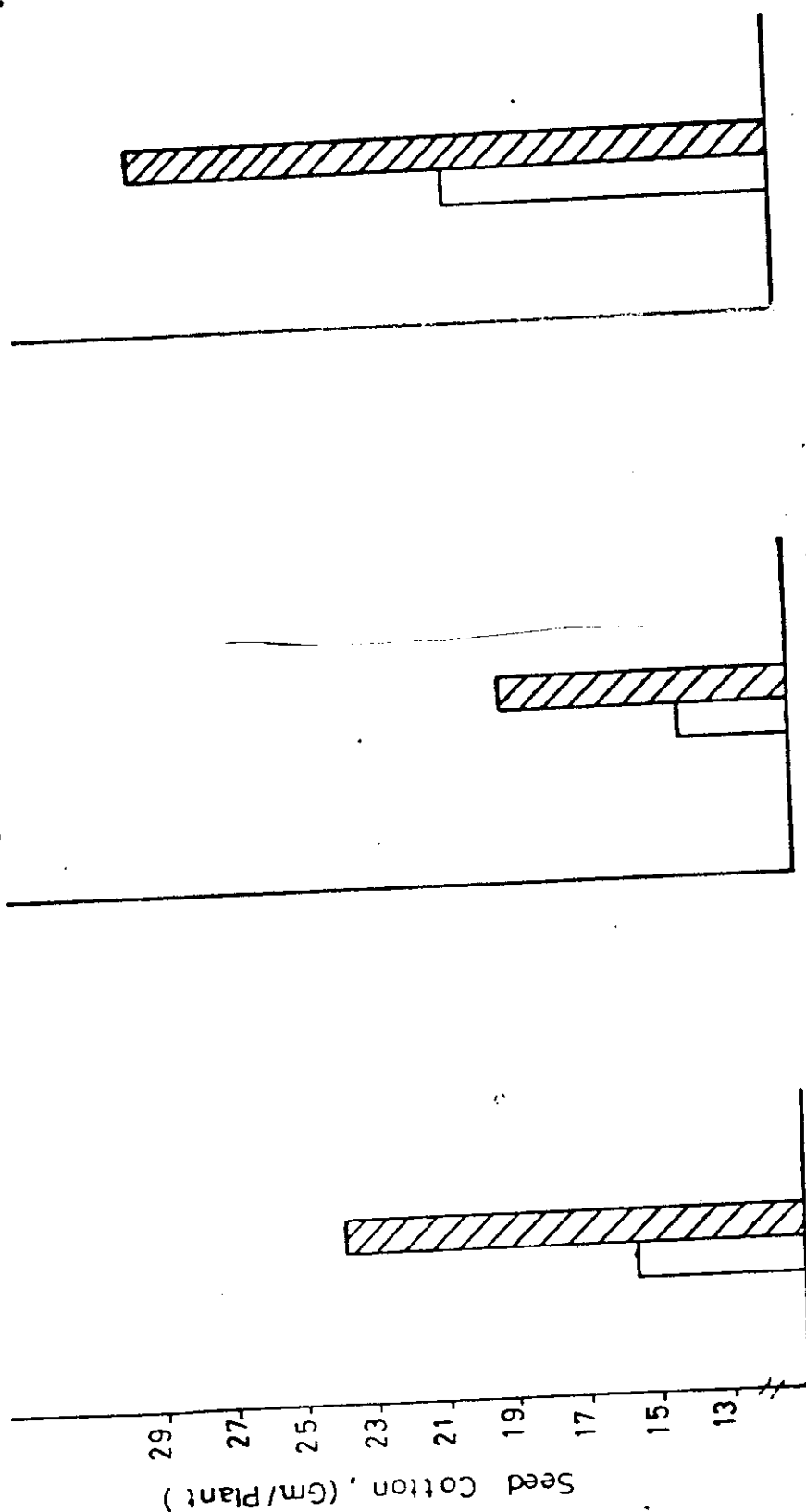
1982

With Subsoiling

Without Subsoiling

1981

1980



Fig(10)Effect Of Subsoiling On Seed Cotton.

by Grissom (1955), Patric et al. (1959), Bishai (1961), and Tompkins et al. (1979).

IV. Effect of seedbed preparation on soil characters:

a- Bulk density and porosity:

Data presented in table (6) showed clearly that soil bulk density and soil porosity was significantly influenced by seedbed preparation in the three successive seasons.

The highest decrease of bulk density and consequently the increase in soil porosity are obtained with two chisel ploughing and 2 harrowing, while the lowest decrease are obtained with Baladi. It can be observed that one chiselling followed by one harrowing has a significant effect on soil bulk density compared with the treatment of one Baladi ploughing. On the other hand one ploughing either with Baladi or chisel showed no significant effect on the bulk density in all seasons.

Similar trends were reported by Flocker et al. (1958), Bishai (1961), El-Hattab (1962) and Bhagat and Tamboli (1966). who found that the chisel ploughings are more effective than with Baladi for both deep and shallow ploughing.

b- Soil salinity:

The effect of seedbed preparation on salinity of soil was not significant (table 7 and fig. 11). There is no evidence of variation due to the different treatments in the three successive seasons. It could be concluded that all the studied tillage operation did not affect salt movement down-ward the soil profile.

Table (6a) : Effect of seedbed preparation on bulk density and porosity of soil.

Treatments	Depth of 10 cm				
	bulk density		decrease in bulk density	soil porosity %	
	before	after		before	after
1. One way Ploughing with Baladi	1.42	1.35	0.07 a	47	49
2. One way chiselling	1.47	1.37	0.10 ab	48	51
3. One way chiselling followed by one harrowing.	1.49	1.32	0.17 bc	50	53
4. Two ways chiselling	1.54	1.33	0.21 c	49	54
5. Two ways chiselling followed by two harrowing.	1.48	1.27	0.21 c	51	59
Season 1981					
1. One way ploughing with Baladi	1.44	1.35	0.09 a	48	52
2. One way chiselling	1.48	1.38	0.10 ab	47	51
3. One way chiselling followed by one harrowing.	1.47	1.34	0.13 b	49	53
4. Two ways chiselling	1.48	1.31	0.17 c	50	57
5. Two ways chiselling followed by two harrowing.	1.48	1.26	0.22 d	53	61
Season 1982					
1. One way ploughing with Baladi	1.41	1.38	0.03 a	48	51
2. One way chiselling	1.44	1.31	0.13 ab	49	53
3. One way chiselling followed by one harrowing.	1.47	1.29	0.18 b	50	54
4. Two ways chiselling	1.52	1.22	0.30 c	51	57
5. Two ways chiselling followed by two harrowing.	1.57	1.06	0.51 d	53	61

Table (6b) : Effect of seedbed preparation on bulk density and porosity of soil.

Treatments	Depth of 20 cm				
	bulk density before	bulk density after	decrease in bulk density	soil porosity % befor	soil porosity % after
Season 1980					
1. One way Ploughing with Baladi	1.47	1.37	0.10 a	48	50
2. One way chiselling	1.51	1.42	0.09 a	46	49
3. One way chiselling followed by one harrowing.	1.52	1.37	0.15 ab	48	52
4. Two ways chiselling	1.56	1.38	0.18 b	47	54
5. Two ways chiselling followed by two harrowing.	1.56	1.35	0.21 b	49	57
Season 1981					
1. One way ploughing with Baladi	1.47	1.40	0.07 a	47	50
2. One way chiselling	1.52	1.42	0.10 a	46	50
3. One way chiselling followed by one harrowing.	1.53	1.39	0.14 ab	47	51
4. Two ways chiselling	1.50	1.28	0.22 c	51	58
5. Two ways chiselling followed by two harrowing.	1.51	1.29	0.22 c	51	60
Season 1982					
1. One way ploughing with Baladi	1.45	1.43	0.02 a	46	49
2. One way chiselling	1.56	1.53	0.03 a	45	49
3. One way chiselling followed by one harrowing.	1.52	1.46	0.06 a	47	51
4. Two ways chiselling	1.57	1.20	0.37 b	52	59
5. Two ways chiselling followed by two harrowing.	1.51	1.24	0.48 b	53	61

Table (6c) : Effect of seedbed preparation on bulk density and porosity of soil.

Treatments	Depth of 30 cm				
	bulk density before	bulk density after	decrease in bulk density	soil porosity % before	soil porosity % after
1. One way ploughing with Baladi	1.47	1.43	0.04 a	45	50
2. One way chiselling	1.47	1.40	0.07 ab	47	53
3. One way chiselling followed by one harrowing.	1.45	1.38	0.07 ab	48	58
4. Two ways chiselling	1.48	1.36	0.12 b	48	59
5. Two ways chiselling followed by two harrowing.	1.46	1.28	0.18 c	51	63
Season 1981					
1. One way ploughing with Baladi	1.51	1.37	0.14 a	47	49
2. One way chiselling	1.55	1.36	0.19 a	47	53
3. One way chiselling followed by one harrowing.	1.57	1.41	0.16 a	51	61
4. Two ways chiselling	1.62	1.12	0.50 b	50	61
5. Two ways chiselling followed by two harrowing.	1.60	1.17	0.43 b	48	60
Season 1982					
1. One way ploughing with Baladi	1.53	1.51	0.02 a	43	46
2. One way chiselling	1.54	1.51	0.03 a	43	45
3. One way chiselling followed by one harrowing.	1.56	1.46	0.10 a	45	49
4. Two ways chiselling	1.65	1.15	0.50 b	50	58
5. Two ways chiselling followed by two harrowing.	1.63	1.11	0.52 b	51	61

- 51 -

Table (7) Effect of seedbed preparation on salinity of soil in part per million (p.p.m)

Treatments	Salinity of soil in p.p.m
1-One way ploughing with Baladi	Season 1980 1700 a
2-One way chiselling	1725 a
3-One way chiselling followed by one harrowing	1863 a
4-Two ways chiselling	1525 a
5-Two ways chiselling followed by two ways harrowing	1563 a
1-One way ploughing with Baladi	Season 1981 1838 a
2-One way chiselling	1938 a
3-One way chiselling followed by one harrowing	1750 a
4-Two ways chiselling	1250 a
5-Two ways chiselling Followed by two ways harrowing	1350 a
1-One way ploughing with Baladi	Season 1982 1950 a
2-One way chiselling	1800 a
3-One way chiselling followed by one harrowing	1700 a
4-Two ways chiselling	1650 a
5-Two ways chiselling Followed by two ways harrowing	1513 a

- T₁, One way ploughing with Baladi.
- T₂, One way chiselling.
- T₃, One way chiselling followed by one harrowing.
- T₄, Two ways chiselling.
- T₅, Two ways chiselling followed by two ways harrowing.

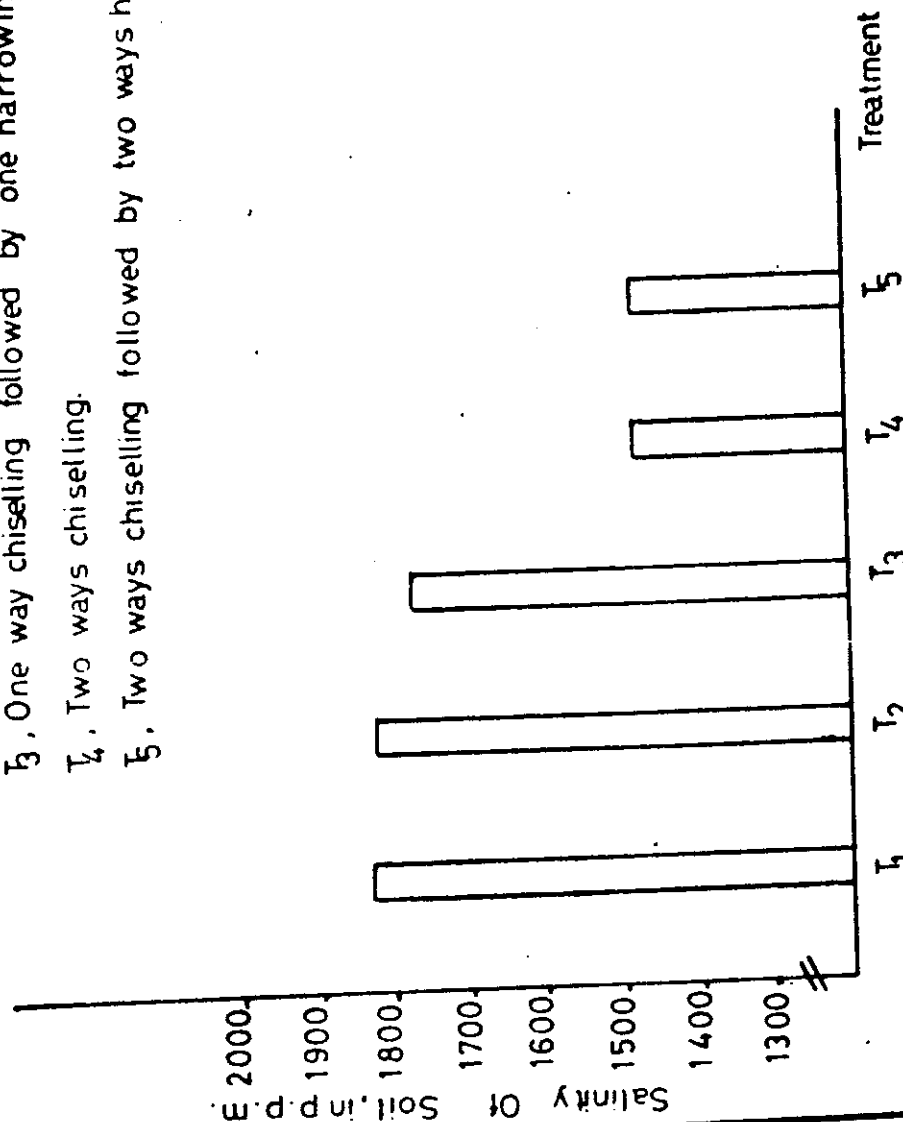


Fig.(11) Effect Of Seedbed Preparation On Salinity Of Soil.

These results might be attributed to the shape of blades. Similar results were obtained by Novikova and Gololobova (1977), Bartenve (1979) and Ismael (1980).

V. Effect of seedbed preparation on growth characters of cotton plant at different growth stages :-

a. Dry weight of roots/plant :-

Data on the dry weight of roots/plant as affected by seedbed preparation are shown in (Table 9). Methods of seedbed preparation shown significant effect on dry weight of roots/plant obtained by two time chiselling and or two time chiselling followed by 2 harrowing one ploughing either with Baladi or chisel no significant effect on the dry matter or roots in 1981 and 1982 seasons. Similar results were obtained by Hamad (1964).

b. Dry weight of leaves/plant :-

Most of methods of seedbed preparation had no significant effect on dry weight of leaves after 70 days from planting in the three successive seasons, while it was a significant effect by using two time chiselling + 2 harrowing. At picking time, the results indicate that there is a significant increase of the weight of leaves/plant in 1980 and 1982 seasons with increasing tillage operations.

Methods including one ploughing with Baladi or chisel showed no effect on the dry matter of leaves/plant in 1980 and 1981 seasons.

Table (8) : Effect of seedbed preparation on growth characters of cotton plant.

Treatments	After 70 days		at the end of the season			
	Dry weight of roots	Dry weight of leaves	Dry weight of stems	Dry weight of roots	Dry weight of leaves	Plant height
Season 1981						
1. One way ploughing with Baladi	0.70 a	2.50 a	0.50 a	37.50a	3.20 a	3.60 a 112.10a
2. One way chiselling	0.60 b	3.10 a	1.10 ab	40.50a	3.70 ab	3.30 a 116.10a
3. One way chiselling followed by one harrowing.	0.60 b	3.10 ab	1.20 b	40.50a	3.80 ab	4.20 b 119.50a
4. Two ways chiselling	1.0 c	3.30 ab	1.30 b	41.50a	4.30 b	5.30 c 132.70b
5. Two ways chiselling followed by two ways harrowing.	1.03 c	3.60 b	1.40 b	41.50a	5.00 c	5.40 c 135.3 b
Season 1982						
1. One way ploughing with Baladi	0.60 a	2.34 a	1.09 a	36.90a	3.70 a	3.60 a 111.10a
2. One way chiselling	0.60 a	3.05 a	1.08 a	37.90a	4.20 ab	4.00 a 125.30b
3. One way chiselling followed by one harrowing.	0.70 a	3.20 a	1.31 a	38.60aa	4.50 b	4.10 a 124.30b
4. Two ways chiselling	0.80 b	3.40 a	1.33 b	40.70b	5.50 c	4.60 b 136.10a
5. Two ways chiselling followed by two ways harrowing.	0.90 b	3.70 b	1.43 b	43.60a	5.60 c	5.0 b 143.90d
1. One way ploughing with Baladi	0.68 a	2.80 a	1.10 a	36.90a	7.2 a	3.60 a 111.10a
2. One way chiselling	0.63 a	3.10 a	1.08 a	37.90a	9.35 b	4.20 a 125.30b
3. One way chiselling followed by one harrowing.	0.73 ab	3.20 a	1.01 a	38.60ab	9.10 b	4.40 a 124.30b
4. Two ways chiselling	0.83 b	3.4 a	1.30 b	40.80b	10.20 b	5.70 b 136.10a
5. Two ways chiselling followed by two ways harrowing.	0.90 b	3.70 b	1.40 b	43.60c	10.40 b	6.10 b 143.90d

These results are in agreement with those obtained by Jamison et al. (1952), El-Hattab (1962) and Shafshak et al. (1975).

c- Dry weight of stems/plant:

Data in table(8) revealed that dry weight of stem/plant at the end of the season was significantly influenced by using intensive or combined tillage in 1980 and 1981 seasons. The highest dry matter content of stems was obtained by two time chiselling followed by 2 harrowing while the lowest dry weight was obtained by one Baladi ploughing. Similar trend was obtained by Hamad (1964). In general it could be concluded that frequency of tillage or combination between primary and secondary tillage (chiseling & harrowing) showed significant effect on the dry matter production in cotton plant. These results are expected since two time chiselling + 2 harrowing increased significantly the dry weight of roots, leaves and stems per cotton plant.

d. Plant height:

Data on plant height of cotton as influenced by seed-bed preparation are shown in table(9). One ploughing either with Baladi or chisel ploughing almost had no significant effect on the plant height of cotton in the three successive seasons. Also, there were no significant effect on plant height due to harrowing in most seasons. The maximum plant height was obtained with 2 ways chiselling + 2 ways harrowing treatment, while the minimum plant height was obtained with

Baladi. In conclusion, using two ways chiselling + 2 harrowing had a better effect on the height of cotton plant than other treatments. These results are expected since soil bulk density and soil porosity was significantly improved by the same operations. This improvement of bulk density and soil porosity reflected on the soil water and air relationships. These relationships are the most important environments need to optimize plant growth.

These results are in agreement with those obtained by Khan (1959), Hamad (1964), Shafshak *et al.* (1975), while El-Hattab (1962), found that frequency of ploughing or kind of plough showed no significant effect on the height of cotton plant.

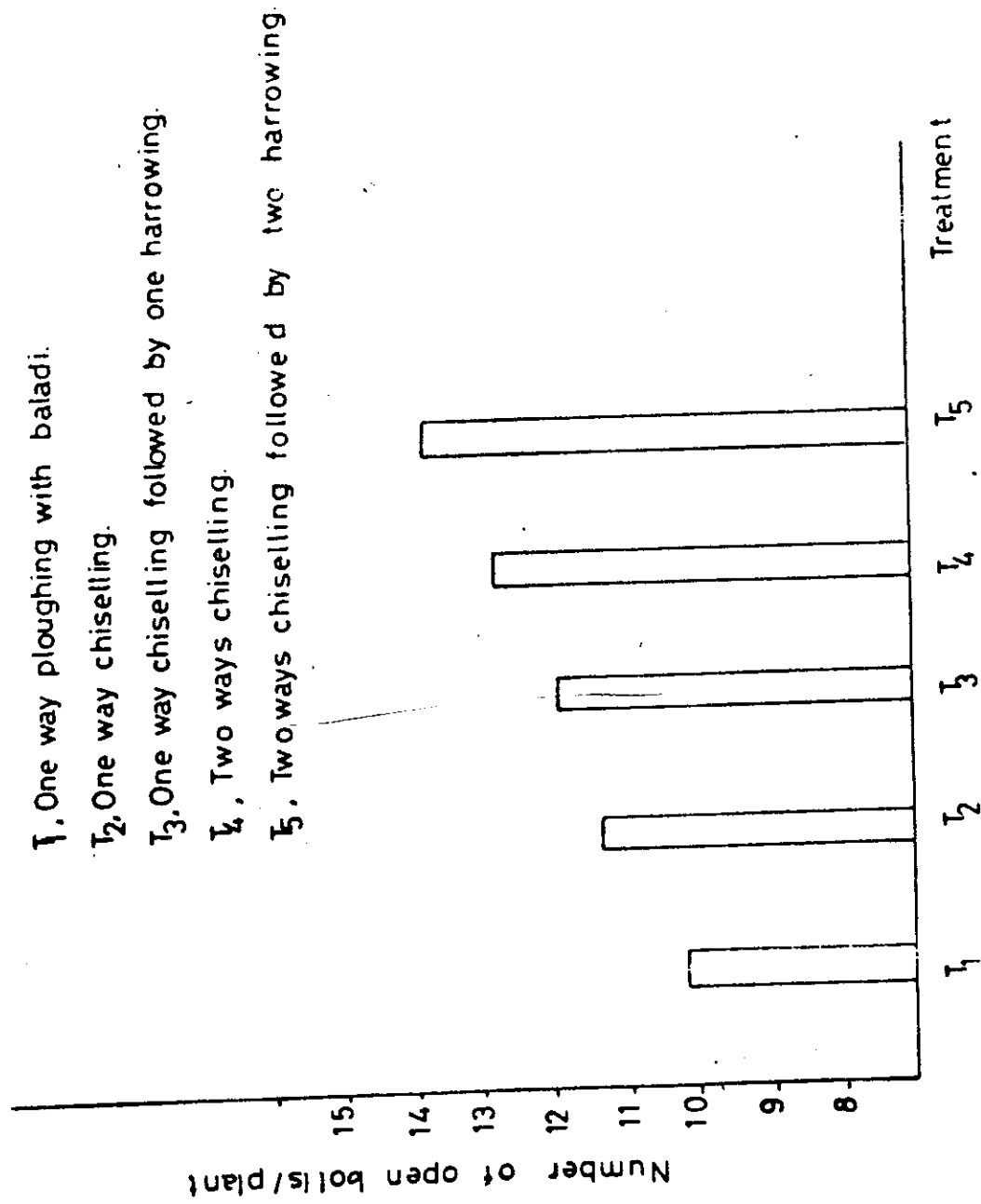
VI .Effect of seedbed preparation on yield and yield components:

a- Number of bolls/plant:

Methods of seedbed preparation showed significant effect on the number of bolls/plant in 1980 and 1981 seasons as shown in table (9) and fig. (11). It was observed that by methods of using two times chiselling followed by two harrowing had better effect on the increase in number of open bolls/plant compared with one way ploughing with Baladi. On the other hand, the lowest number of unopen bolls/plant was obtained by using two chisel ploughing + 2 harrowing while the highest number was obtained by Baladi. Similar results were reported by Jamison *et al.* (1952), Seoudy (1963) and Hamad (1964).

Table (8) : Effect of seed-bed preparation on yield and yield components of cotton.

Treatments	number of unopen bolls per plant	number of open bolls per plant	seed cotton yield in gms/plant	seed cotton yield in kg/faddan	Relative yield	Weight of boll
Season 1980						
1. One way ploughing with Baladi	4.54 a	11.01 a	17.15 a	1113.50 a	100	2.10 a
2. One way chiselling	4.33 a	12.70 ab	17.51 a	1126 a	101	2.30 b
3. One way chiselling followed by one harrowing.	3.86 a	13.23 bc	19.19 a	1214.3 a	109	2.40 b
4. Two ways chiselling	3.74 a	13.50 bc	22.29 b	1277 bc	115	2.50 b
5. Two ways chiselling followed by two ways harrowing.	3.21 a	14.76 c	23.09 b	1304 c	117	2.50 b
Season 1981						
1. One way ploughing with Baladi	3.65 d	7.60 a	14.44 a	907.18 a	100	2.0 a
2. One way chiselling	3.96 d	9.63 b	14.32 a	738.68 a	105	2.11 ab
3. One way chiselling followed by one harrowing.	3.08 bc	9.99 b	14.75 a	787.5 ab	111	2.10 ab
4. Two ways chiselling	2.59 ab	11.85 c	17.07 b	828.73 bc	116	2.20 ab
5. Two ways chiselling followed by two ways harrowing.	2.24 a	12.41 c	17.44 b	885.15 c	125	2.30 b
Season 1982						
1. One way ploughing with Baladi	2.98 a	12.18 a	20.15 a	1195.43 a	100	2.20 a
2. One way chiselling	3.20 a	11.85 a	22.05 a	1234.8 a	103	2.20 a
3. One way chiselling followed by one harrowing.	2.83 a	12.79 a	22.80 a	1393.88 b	117	2.30 ab
4. Two ways chiselling	2.46 a	13.25 a	28.75 b	1475 c	124	2.40 b
5. Two ways chiselling followed by two ways harrowing.	2.28 a	13.61 a	30.27 b	1491.53 c	125	2.40 b



Fig(12) Effect Of Seedbed Preparation On Number Of Open Bolls

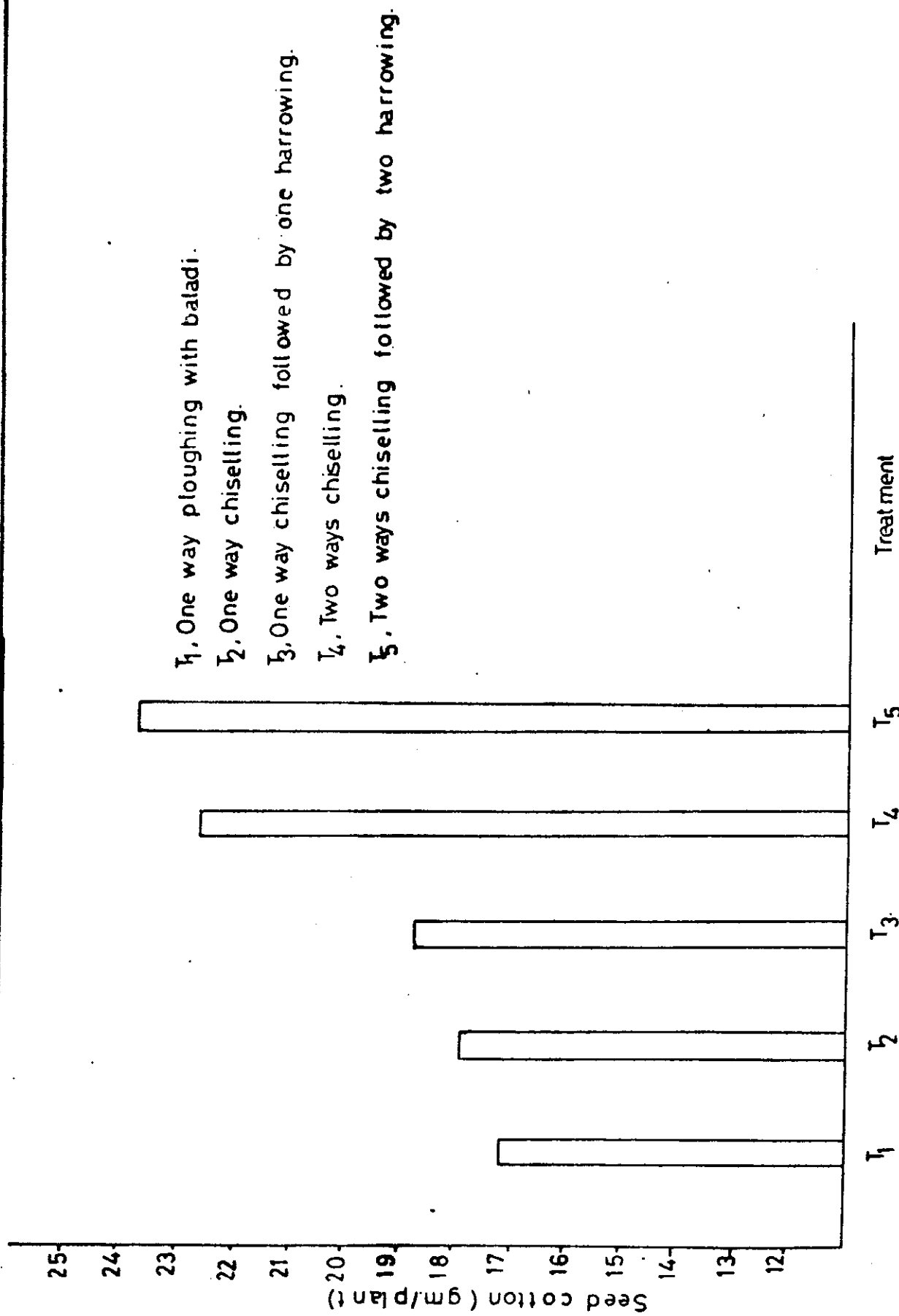
b- Weight of boll:

Data presented in table (9) revealed that seedbed preparation showed significant increase in the weight of boll in the three successive seasons. Using two times chiselling followed by two harrowing had better effect on boll weight compared with other treatments.

On the other hand, one ploughing either with Baladi or chisel had no significant effect on boll weight in 198, 198, seasons. Similar results were obtained by El-Hattab (1962) and Hamad (1964).

c- Seed cotton yield/plant:

Methods of seedbed preparation showed significant effect on the yield/plant as shown in table (9) and fig. (13) seedbed preparation including two times chiselling showed significant increase on seed cotton/plant compared with other treatments. These results are in agreement with those obtained by Jamison et al. (1952). El-Hattab (1962) and Hamad (1964).



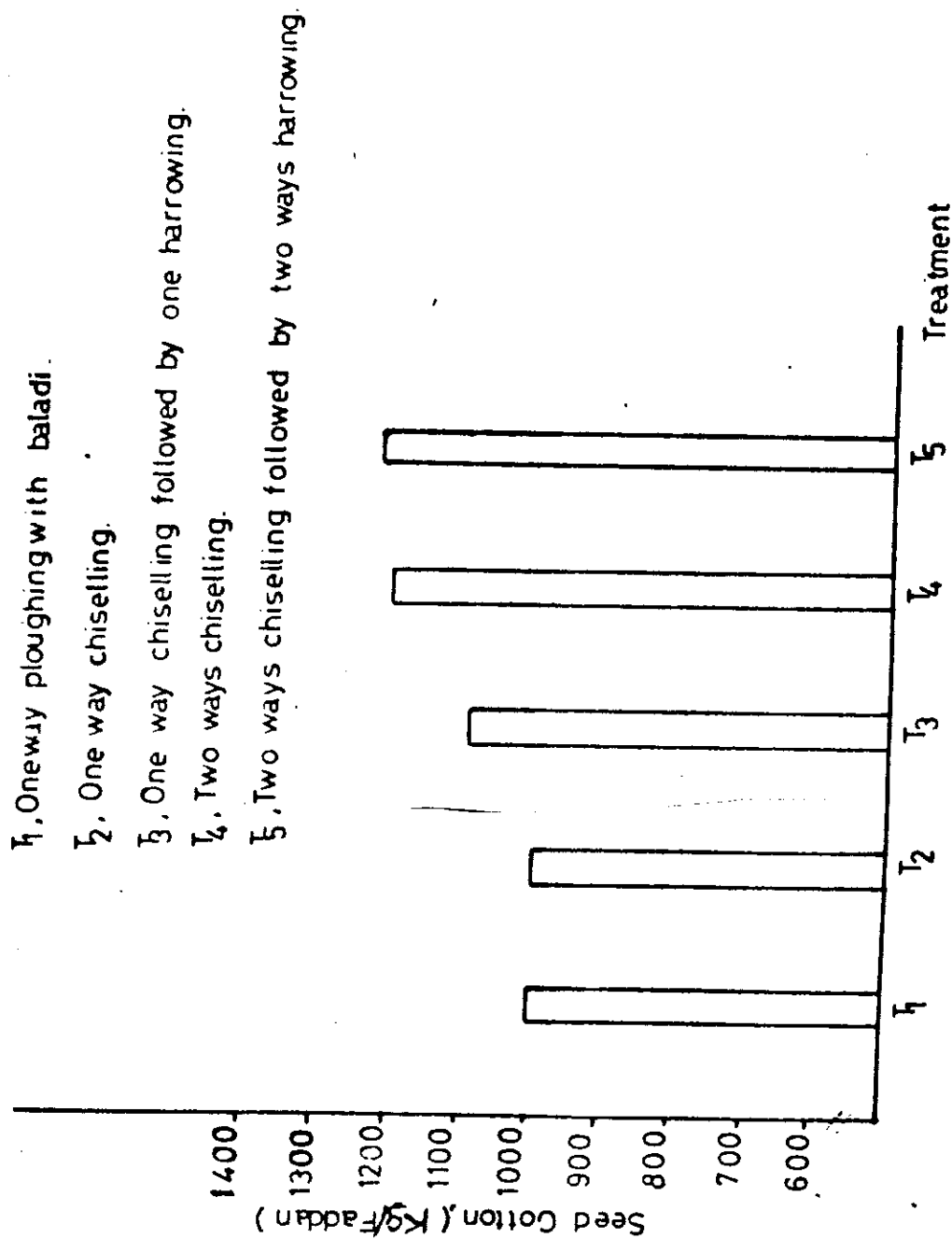
Fig(13) Effect Of Seedbed Preparation On Seed Cotton

d- Seed cotton yield/faddan

Results of seed cotton yield, in kg/faddan as influenced by methods of seedbed preparation are shown in table (9) and fig.(14). Highest yield was obtained by two time chiselling followed by 2 harrowing and lowest yield by one. Baladi ploughing. On the other hand, one ploughing either with Baladi or chisel had no significant effect on seed cotton yield.

The relative yield of seed cotton could be arranged in the following order: 100% for one way ploughing with Baladi, 103% for one way chiselling, 113% for one way chiselling followed by one harrowing, 118% for two ways chiselling and 122 for two ways chiselling followed by two ways harrowing.

It is obvious that the seed cotton yield increased gradually with the increase in the intensity of tillage. The low yield occurring from minimum tillage might be due to the high soil bulk density and consequently low soil porosity.



Fig(14) Effect Of Seedbed Preparation On Seed Cotton.

It could be concluded that cotton needs maximum tillage. Frequent ploughing was entirely effective and increased the seed cotton yield. Maximum seed cotton yield was obtained by two ways chiselling followed by two ways harrowing in the three successive seasons. These results are expected since the previous treatment increased significantly the soil porosity, the dry weight of different plant parts, i.e., roots, stems and leaves, plant height, number of open bolls/plant and seed cotton yield/plant and decreased significantly the bulk density of soil and unopen bolls/plant. These results agree with those obtained by Geizler (1957), Khan (1960), Bishai (1961), Seady (1963), Hamad (1964) and Whisler *et al.* (1980). Other investigators suggested frequency of ploughing showed no significant effect on the yield of grain or straw of wheat (El-Hattab 1962), the yield maize grains (Khan 1959, El-Hattab 1962 and Shafshak *et al.* (1974) and the yield of seed cotton (El-Hattab 1962).

VII. Effect of the interaction between subsoiling and seedbed preparation:

Results in table (10) showed that the effect of the interaction between subsoiling and seedbed preparation was not significant on bulk density, soil porosity, salinity of soil, number of open bolls/plant and number of unopen bolls/plant in the three successive seasons. Therefore, interaction data were excluded. These results indicate that subsoiling treatments affected previous treatment regardless the different methods of seedbed preparation.

Table (10): Effect of the interaction between subsoiling and seedbed preparation on some characters of soil and cotton plant in 1980, 1981 and 1982 seasons.

Characters	Seasons		
	1980	1981	1982
1- Bulk density of soil	N.S	N.S	N.S
2- Soil porosity	N.S	N.S	N.S
3- Salinity of soil	N.S	N.S	N.S
4- Dry weight of roots/plant after 70 days	S	S	S
5- Dry w.roots/plant at picking time	S	S	S
6- Dry w.leaves/plant after 70 days	S	S	S
7- Dry w.leaves/plant at picking time	S	S	S
8- Dry w.stems/plant after 70 days	S	S	S
9- Dry w.stems/plant at picking time	S	N.S	S
10- Plant height/plant after 70 days	S	S	S
11- Plant height/plant at picking time	S	S	S
12- No. of open bolls/plant	N.S	N.S	N.S
13- No. of unopen bolls/plant	N.S	N.S	N.S
14- Boll weight	S	S	S
15- Seed cotton yield/plant	S	S	S
16- Seed cotton yield/faddan	S	S	S

S significant at 5%

N.S not significant at 5%

On the other hand, dry weight of different plant organs, plant height, boll weight, seed cotton yield/plant and seed cotton yield/faddan were significantly influenced by subsoiling seedbed preparation interaction. The significant interaction effects are discussed here in detail.

1. Growth characters of cotton plant:

Data on dry weight of roots, stems, leaves and plant height at different stages of growth as affected by subsoiling and seedbed preparation interaction are shown in tables (11, 12, 13 and 14).

The highest values were obtained by two ways chiselling followed by 2 harrowing with subsoiling treatment. On the other hand, the lowest values were obtained by one ploughing either by Baladi or chisel without subsoiling treatment.

2. Seed cotton yield and yield components:

a- Boll weight:

Data on boll weight of cotton plant as affected by subsoiling and seedbed preparation interaction in the three successive seasons are shown in table (15)

It was evident that both experimental factors did not act separately on weight of boll. It could be concluded that the interaction between subsoiling treatments and seedbed preparation had a significant effect on boll weight on the three successive seasons. Table (15)

b- Seed cotton yield/plant:

The effect of the interaction between subsoiling treatment and seedbed preparation on seed cotton yield/plant was

Table (11) : Effect of the interaction between subsoiling and seedbed preparation on dry weight of roots/plant.

Subsoiling	Seedbed preparation	1990 season		1981 season		1982 season	
		after 70 at picking days	time	after 70 at picking days	time	after 70 at picking days	time
Without	1. One way ploughing with Baladi	0.60 a	2.70 a	0.60 ab	3.20 a	0.60 a	3.40 a
	2. One way disselling	0.70 b	3.20 ab	0.60 a	4.0 ab	0.60 a	8.0 b
	3. One way disselling followed by one harrowing.	0.70 b	3.40 a	0.60 a	4.10 abc	0.70 a	8.50 b
	4. Two ways disselling	1.0 c	3.90 bcd	0.70 c	4.90 b	0.70 a	9.4 bcd
	5. Two ways disselling followed by two ways harrowing.	0.90 cd	4.10 b	0.70 c	5.0 c	0.70 a	9.60 bcd
With	1. One way ploughing with Baladi	0.70 b	3.60 abc	0.70 bc	4.20 a	0.70 a	9.0 bc
	2. One way disselling	0.80 b	4.20 cd	0.70 bc	4.50 bc	0.80 a	10.80 cd
	3. One way disselling followed by one harrowing.	0.80 b	4.30 cd	0.70 abc	4.90 bc	0.80 a	9.80 bcd
	4. Two ways disselling	1.0 d	4.70 d	0.90 e	5.20 d	1.0 b	10.9 cd
	5. Two ways disselling followed by two ways harrowing.	1.10 e	6.0 e	1.0 e	5.9 d	1.0 b	11.10 d

Table (12) : Effect of the interaction between subsoiling and seedbed preparation on dry weight of leaves/plant.

		1950 season		1951 season		1952 season	
Subsoiling	Seedbed preparation	after 70 days	time	after 70 days	time	after 70 days	time
Without	1. One way ploughing with Baladi	2.90 a	2.00 a	3.10 a	3.90 a	2.8 a	4.40 a
	2. One way chiselling	3.0 a	3.0 a	3.0 a	4.00 ab	3.0 ab	7.70 b.
	3. One way chiselling followed by one harrowing.	3.10 a	3.10 a	3.0 a	4.30 a	3.10 ab	3.10 bc
	4. Two ways chiselling	3.10 a	3.70 a	3.20 a	2.20 ac	3.20 ab	9.0 ccd
	5. Two ways chiselling followed by two ways harrowing.	3.00 a	4.10 ab	3.20 a	5.10 abc	3.20 ab	9.60 cde
With	1. One way ploughing with Baladi	3.0 a	3.20 a	3.10 a	5.30 abcd	2.90 a	8.9 bd
	2. One way chiselling	3.20 a	3.60 a	3.20 a	6.0 bcd	3.10 ab	9.30 b
	3. One way chiselling followed by one harrowing.	3.20 a	4.10 a	3.20 a	2.9 bcd	3.20 ab	9.30 b
	4. Two ways chiselling	3.40 ab	5.40 bc	3.90 b	6.50 cd	3.60 bc	10.60 de
	5. Two ways chiselling followed by two ways harrowing.	3.70 b	5.80 c	3.90 b	6.80 d	4.10 c	11. e

Table (13) : Effect of the interaction between subsoiling and seedbed preparation on dry weight of stems/plant.

Subsoiling	Seedbed preparation	1980 season		1981 season		1982 season	
		after 70 at picking days	time	after 70 at picking days	time	after 70 at picking days	time
Without	1. One way ploughing with Baladi	0.50 a	3.0 a	1.0 ab	3.0 a	1.10 a	3.0 a
	2. One way chiselling	1.0 ab	3.20 a	1.0 a	3.50 a	1.0 a	3.70 ab
	3. One way chiselling followed by one harrowing	1.0 ab	4.0 a	1.0 a	3.90 a	1.0 a	3.90 ac
	4. Two ways chiselling	1.10 b	4.30 a	1.30 ab	4.0 a	1.20 a	5.50 cde
	5. Two ways chiselling followed by two ways harrowing.	1.20 bc	4.50 a	1.30 ab	4.20 a	1.30 a	5.80 d
With	1. One way ploughing with Baladi	1.10 b	4.30 a	1.10 ab	4.40 a	1.10 a	4.10 ab
	2. One way chiselling	1.20 bc	4.30 a	1.30 ab	4.50 a	1.20 a	4.60 ab
	3. One way chiselling followed by one harrowing.	1.30 bc	4.40 a	1.30 ab	4.40 a	1.20 a	4.8 bcd
	4. Two ways chiselling	1.50 c	6.30 b	1.40 ab	5.20 a	1.50 b	6.0 de
	5. Two ways chiselling followed by two ways harrowing.	1.50 c	6.30 b	1.40 ab	5.50 a	1.60 b	6.40 e

Table (14) : Effect of t. interaction between subsoiling and seeded preparation

on plant height/plant

Subsoiling	Seedbed preparation	1960 season		1961 season		1962 season	
		after 70 at picking days	time	after 70 at picking days	time	after 70 at picking days	time
Without	1. One way ploughing with Baladi	37.3 a	72.50 a	36.80 a	103.30 a	36.0 a	93.90 a
	2. One way chiselling	40.10 ab	97.50 ab	39.30 ab	11.4.0 ab	36.50 a	119.0 b
	3. One way chiselling followed by one harrowing.	40.0 ab	97.50 ab	40.4 bc	116.0 ab	37.80 a	116.40 b
	4. Two ways chiselling	40.60 ab	130.0 bc	4/.0 bc	122.30 ab	38.90 a	139.20 d
	5. Two ways chiselling followed by two ways harrowing.	40.60 ab	129.0 bc	4/.90bce	127.0 b	42.7 b	140.40 e
With	1. One way ploughing w/ Baladi	37.50 a	95.00 ab	40.90 bc	116.0 a	37.80 a	128.30 c
	2. One way chiselling	41.10 ab	145.5 ce	40.70 bc	118.30 ab	39.40 a	131.60 c
	3. One way chiselling followed by one harrowing.	41.20 ab	120.0 b	41.30bce	123.0 ab	39.40 a	132.2 cd
	4. Two ways chiselling	42.70 b	169.0 e	42.30 ce	143.0 c	42.60 b	133.10 c
	5. Two ways chiselling followed by two ways harrowing.	43.0 b	169.0 e	44.0 e	143.50 c	44.50 b	147.3 e

Table (15) Effect of the interaction between subsoiling and seedbed preparation on soil weight/plant

Sub-soiling	Seedbed preparation	1980 season	1981 season	1982 season
Without	1. One way ploughing with Baladi	2.0 a	2.0 ab	2.20 a
	2. One way chiselling	2.20 ab	2.0 ab	2.20 a
	3. One way chiselling followed by one harrowing.	2.30 bc	2.0 ab	2.20 ab
	4. Two ways chiselling	2.40 bcd	2.0 ab	2.30 abc
	5. Two ways chiselling followed by two ways harrowing	2.50 bcd	2.20abc	2.30 abc
With	1. One way ploughing with Baladi	2.30 bc	2.10 abc	2.20 a
	2. One way chiselling	2.50 c	2.2 bcd	2.30 abc
	3. One way chiselling followed by one harrowing.	2.50 cd	2.20 bcd	2.30 abc
	4. Two ways chiselling	2.60 d	2.30 cd	2.30 bc
	5. Two ways chiselling followed by two ways harrowing.	2.60 d	2.40 d	2.30 c

significant in the three successive seasons.

Highest values for the seed cotton yield/plant were obtained by two ways chiselling+2 harrowing with subsoiling treatment and lowest value was obtained by are ploughing without subsoiling treatment.

c-Seed cotton yield/faddan:

Data on seed cotton yield/faddon as affected by subsoiling seedbed preparation interaction in the three successive seasons are shown in Table(16).

Results showed that the response of seed cotton yield to subsoiling treatments was significantly affected by seedbed preparation. On the other hand, the response of seed cotton yield/fad to seedbed preparation was also affected by subsoiling treatments. It was evident that both experimental factors did not act separately on seed cotton yield/faddan in the three successive seasons. Highest seed cotton yield was obtained by two time chiselling followed by 2 harrowing and subsoiling treatment and lowest value was for one ploughing without subsoiling.

It could be concluded that the interaction between subsoiling treatment and seedbed preparation had a significant effect on boll weight in all seasons.

Table (16) : Effect of the interaction between subsoiling and seedbed preparation on seed cotton yield.

		1980 season			1981 season			1982 season		
Subsoiling	Seedbed preparation	seed cotton per plant	seed cotton per faddan	seed cotton per plant	seed cotton per faddan	seed cotton per plant	seed cotton per faddan	seed cotton per plant	seed cotton per faddan	seed cotton per faddan
Without	1. One way ploughing with Baladi	14.40 a	1067.9 a	13.40 a	652.10 a	17.30 a	1102.5 a			
	2. One way chiselling	14.30	1075.7 a	13.20 a	708.8 ab	20.30 ab	1179.7 ab			
	3. One way chiselling followed by one harrowing.	15.80 b	1107.20ab	13.30 a	711.9 ab	21.0 bc	1294.7 c			
	4. Two ways chiselling	16.60 b	1190.7 bcd	15.50 ab	748.10 ab	21.40 ab	1360.8 c			
	5. Two ways chiselling followed by two ways harrowing.	17.60 c	1219.10 cd	15.50 ab	795.40bcd	23 bcd	1365.50c			
With	1. One way ploughing with Baladi	19.90 d	1160.80abc	15.50 ab	762.30 abc	23.0 c	1286.80bc			
	2. One way chiselling	20.70 e	1176.5 abc	15.50 ab	770.20 bc	23.80 c	1289.90bc			
	3. One way chiselling followed by one harrowing.	22.00 f	1323 de	16.2 bc	864.70 cde	24.5 d	1491.5 d			
	4. Two ways chiselling	28.0 g	1364. e	18.70 cd	897.8 de	36.10 e	1597.10de			
	5. Two ways chiselling followed by two ways harrowing.	28.6 g	1392.30 e	19.30 d	976.50 e	37.60 e	1619.10 e			

Tillage operations cost per faddan :-

Data obtained in table (17) indicated that when the chisel plough was implemented two ways in perpendicular direction the cost of operation increased by 200 % compared to one way chiselling. The performance of two ways chiselling considered profitable method where it increased cotton yield by 337 %. Saving operation cost and rendering more profit.

It will be more economical if the tooth harrow is ceperated after one way chiselling where it produced 207 % in yield and cost 142 % per faddan.

As to the performance of subsoiler plough under one way, two ways chiselling, one way chiselling + one way harrowing and two ways chiselling + Two ways harrowing the increase of cost was 281%,190%,182% and 141% , respectively considering the resulted yield, the highest percentage of increase was recorded and the above treatments was. 293 %, 218 %, 294 %, and 209 % respectively.

Table (17) : Effect of tillage operations on cost per faddan.

Treatments	Total cost per faddan	Mean seed cotton yield/ faddan	increase in yield in kentar	increase in yield L.E.
Without subsoiling				
1. One way ploughing with Baladi	14.0 L.E.	5.97	-	
2. One way chiselling	4.80 L.E.	6.27	0.30	21.60
3. One way chiselling followed by one harrowing.	10.50 L.E.	6.59	0.62	44.64
4. Two ways chiselling	9.60 L.E.	6.98	1.01	72.72
5. Two ways chiselling followed by two ways harrowing.	21.0 L.E.	7.15	1.18	84.96
With subsoiling				
1. One way ploughing With Baladi	22.70 L.E.	6.79	0.82	59.04
2. One way chiselling	13.50 L.E.	6.85	0.88	63.36
3. One way chiselling followed by one harrowing.	19.20 L.E.	7.79	1.82	131.04
4. Two ways chiselling	18.30 L.E.	8.17	2.20	158.46
5. Two ways chiselling followed by two ways harrowing.	29.70 L.E.	8.44	2.47	170.84