4 - RESULTS AND DISCUSSION

4.1. Vegetative growth

4.1.1. Vegetative growth as affected by organic manure :-

Data illustrated in Tables (6-13) and Figures (1-9) show the effect of organic manure levels on the vegetative growth characteristics of onion plants expressed as plant length, number of leaves, fresh and dry weight per plant as well as bulb diameter and bulbing ratio . Such data reveal that all the previously mentioned growth characteristics were increased due to the application of different levels of organic manure during both seasons of study compared with control treatment. In this respect, generally the highest increments in the forementioned characters were obtained due to the application of town refuse at 10 and 20 t/fad. compared with the farmyard manure and control treatments. In this respect, all parameters of growth under study except neck diameter and bulbing ratio were increased significantly with addition of town refuse to onion plants. Such results are true during the two growing seasons of the experiment.

Also, the same data show that all the studied growth aspects were increased with the age of plant from 8 to 20 weeks after transplanting.The only exception is that bulbing ratio, which can be regarded as an assessment of bulb development, decrease with increasing plant age. In this regard, the highest values in all the studied growth parameters were recorded from sample taken at 20 weeks after transplanting. Obtained results may be attributed to the town refuse supplied the plant with more available NPK and organic matter which highly decomposite and release the humic acid which led to decrease the PH value and consequently make the plant nutrient in the soil more available to plant absorption which consequently enhanced plant growth and its

characteristics. Obtained results are in agreement with those reported by Khalaf and Taha (1988)on garlic, Khereba *et al.* (1991)on cucumber, Atef (1992)on cow pea, Saba-El-Regal (1985), Abo -El- Defan (1990) Fattahallah (1992a), Hilman and Suwandi (1989), Jana and Jahangir (1990), Soubich (1998) on tomato, Shehata (1992), Abo-Hussein (1995), Taalab (1999) on potato, Abdel-Aty (1997), Hassnien (1996) on pepper, Lima *et al* . (1984) and Singh *et al.* (1997)on onion,. The Significant response of growth parameters of onion plants at 20 weeks age from transplanting may be due to the great release of minerals and nutrients from town refuse which decreased the harmful effect of calcareous soil on plant growth (El-Sersawy *et al.* 1992).

Also, town refuse has a positive effect on plant growth, may be due to the conclusion of Sotomayor (1979) and Anid *et al.* (1983) that town refuse decreased osmotic pressure in soil solution and improved the uptake of soil nutrients required by plants. In general, organic manure exhibited increase in growth parameters of onion plants grown under calcareous soil condition.

4.1.2. Vegetative growth as affected by NPK fertilizers :-

Obtained data concerned with different growth parameters of onion plants at different ages as affected by NPK application are illustrated in Tables (6-13) and Figures (10-18). During the four periodical samples, from 8-20 weeks after transplanting, there were significant increments in growth characters of onion plants with the addition of levels when compared with the control treatment except neck diameter and bulbing ratio. The parameters of growth increased with increasing the levels of NPK application. In this respect, the second level of NPK (60N: $45P_2O_5$: 75 K_2O kg/fad) achieved significantly the highest positive effect of plant growth of onion plants.

Table (6) : Effect of organic manure or NPK fertilization levels on vegetative growth characteristics of onion plants [after 8 weeks from transplanting].

Season / Charat. / Treat.	1997-1998				1998-1999			
	Plant length (cm)	Number of leaves / plant	F.W. of leaves (g) / plant	D.W. of leaves (g) / plant	Plant length (cm)	Number of leaves / plant	F.W. of leaves (g) / plant	D.W. of leaves (g) / plant
Effect of Organic manure (ton/fad)								
Control	56.2	4.9	10.3	1.0	49.5	4.3	9.8	1.0
FYM_{10} (ton/ fad)	56.1	4.8	13.3	1.5	49.5	4.4	10.3	1.0
FYM_{20} (ton/ fad)	56.5	5.1	13.7	1.3	48.5	4.6	10.5	1.0
TR 10 (ton/ fad)	59.1	5.2	11.5	1.2	53.4	4.6	11.4	1.1
TR 20 (ton/ fad)	56.9	5.1	11.1	1.2	52.0	4.8	12.0	1.2
L.S.D at 0.05	N.S	N.S	2.1	0.2	N.S	0.2	1.3	N.S
Effect of NPK (Kg fad)								
NPK (0 : 0 : 0)	52.8	4.8	10.1	1.0	46.6	4.3	9.3	0.9
NPK 1 (40:30:50kg/fad)	58.1	5.0	12.3	1.2	51.3	4.5	11.3	1.1
NPK 2(60:45:75 kg/fad)	57.0	5.0	12.4	1.4	53.1	4.6	11.7	1.2
NPK 3 (80:60:100 kg/fad)	60.1	5.2	13.2	1.3	51.4	4.6	10.9	1.2
L.S.D at 0.05	3.3	0.2	1.8	0.2	2.9	0.2	1.2	0.2

Table (7) : Effect of organic manure or NPK fertilization levels on vegetative growth characteristics of onion plants [after 12 weeks from transplanting].

Season / Charat. / Treat.	1997-1998				1998-1999			
	Plant length (cm)	Number of leaves / plant	F.W. of leaves (g) / plant	D.W. of leaves (g) / plant	Plant length (cm)	Number of leaves / plant	F.W. of leaves (g) / plant	D. W of leaves (g) / plant
Effect of Organic manure (ton/fad)								
Control	66.6	5.2	24.3	2.3	56.9	4.2	19.6	2.1
FYM_{10} (ton/ fad)	68.7	5.5	31.5	2.8	56.8	4.2	19.4	2.1
FYM_{20} (ton/ fad)	66.7	5.6	31.6	3.1	53.4	3.8	21.1	2.4
TR 10(ton/ fad)	69.3	5.7	32.5	2.8	58.4	4.3	18.8	2.2
TR 20 (ton/ fad)	69.3	5.5	33.4	3.2	57.6	4.3	22.0	2.6
L.S.D at 0.05	N.S	N.S	2.7	0.3	N.S	0.3	1.3	0.2
Effect of NPK (Kg/fad)								
NPK (0 : 0 : 0)	64.2	5.0	23.8	2.3	52.3	3.9	17.8	1.9
NPK 1 (40:30:50kg/fad)	68.3	5.5	30.3	2.8	56.2	4.2	19.7	2.2
NPK 2(60:45:75 kg/fad)	70.7	5.9	34.8	3.3	58.0	4.3	22.2	2.6
NPK 3 (80:60:100 kg/fad)	70.1	5.6	33.8	3.1	59.8	4.2	21.1	2.5
L.S.D at 0.05	3.6	0.3	3.0	0.3	3.1	3.0	1.1	0.2

Table (8) : Effect of organic manure or NPK fertilization levels on vegetative growth characteristics of onion plants [after 16 weeks from transplanting].

Charat. / Treat.	1997-1998				1998-1999			
	Plant length (cm)	*Number of leaves / plant*	*F.W. of leaves (g) / plant*	*D .W. of leaves (g) / plant*	*Plant length (cm)*	*Number of leaves / plant*	*F.W. of leaves (g) / plant*	*D. W of leaves (g) / plant*
Effect of Organic manure (ton/fad)								
Control	67.6	5.8	53.4	6.1	60.8	5.2	32.7	3.6
FYM_{10} (ton/ fad)	73.5	6.0	61.1	6.9	66.0	5.6	41.2	4.8
FYM_{20} (ton/ fad)	76.3	6.6	66.2	7.6	63.4	5.5	47.8	5.1
TR 10(ton/ fad)	73.9	6.1	63.8	7.3	65.8	5.6	46.0	5.1
TR 20 (ton/ fad)	75.5	6.2	66.9	7.9	64.0	5.9	47.9	5.5
L.S.D at 0.05	1.7	0.4	10.4	0.8	3.3	0.4	7.5	0.7
Effect of NPK (Kg/fad)								
NPK (0 : 0 : 0)	67.2	5.7	49.1	5.5	61.9	5.2	34.3	3.9
NPK 1 (40:30:50kg/fad)	73.6	6.1	57.0	6.5	64.9	5.6	42.2	4.8
NPK 2(60:45:75 kg/fad)	76.9	6.4	73.9	8.6	66.7	5.7	48.5	5.3
NPK 3 (80:60:100 kg/fad)	74.8	6.2	69.1	8.1	62.5	5.7	47.4	5.4
L.S.D at 0.05	1.3	0.3	6.8	0.7	2.8	0.3	3.8	0.5

Table (9) : Effect of organic manure or NPK fertilization levels on vegetative growth characteristics of onion plants [after 20 weeks from transplanting].

Season / Charat. / Treat.	1997-1998				1998-1999			
	Plant length (cm)	Number of leaves / plant	F.W. of leaves (g) / plant	D.W. of leaves (g) / plant	Plant length (cm)	Number of leaves / plant	F.W. of leaves (g) / plant	D. W of leaves (g) / plant
Effect of Organic manure(ton/fad)								
Control	70.5	7.2	73.9	9.0	60.9	6.4	49.4	4.0
FYM_{10} (ton/ fad)	77.9	7.6	84.7	11.1	67.1	6.9	64.0	5.0
FYM_{20} (ton/ fad)	79.9	7.3	98.3	11.3	65.7	6.8	58.0	5.2
TR 10(ton/ fad)	80.9	7.8	101.1	11.1	70.6	7.1	80.9	6.7
TR 20 (ton/ fad)	82.5	8.4	109.9	12.6	70.5	7.4	75.5	5.8
L.S.D at 0.05	1.0	0.7	16.0	1.9	2.8	0.6	11.7	1.4
Effect of NPK (Kg/fad)								
NPK (0 : 0 : 0)	72.0	6.6	81.2	9.3	65.0	6.4	57.3	4.2
NPK 1 (40:30:50kg/fad)	76.8	7.3	92.2	10.9	66.0	7.0	64.8	5.4
NPK 2(60:45:75 kg/fad)	82.2	8.2	102.3	12.3	69.5	7.2	69.2	6.1
NPK 3 (80:60:100 kkkg/fad)	82.0	8.6	98.6	11.6	67.3	7.1	71.0	5.7
L.S.D at 0.05	1.2	0.5	10.0	1.1	2.9	0.4	7.4	0.7

Table (10) : Effect of organic manure or NPK fertilization levels on bulbing characteristics of onion plants [after 8 weeks from transplanting].

Season / Charat. / Treat.	1997-1998					1998-1999				
	F.W. of bulb/ plant (g)	D.W. of bulb/ plant (g)	neck diamet.	bulb diamet.	bulbing ratio	F.W. of bulb/ plant (g)	D.W. of bulb/ plant (g)	neck diamet.	bulb diamet.	bulbing ratio
Effect of Organic manure (ton/fad)										
Control	3.6	0.5	0.8	1.1	0.7	3.3	0.4	1.0	1.1	0.8
$FYM_{10\ (ton/\ fad)}$	4.2	0.6	0.8	1.1	0.8	3.3	0.4	0.8	1.0	0.8
$FYM_{20\ (ton/\ fad)}$	3.9	0.5	0.8	1.0	0.8	4.1	0.5	0.8	1.1	0.8
$TR_{\ 10(\ ton/\ fad)}$	4.4	0.5	0.8	1.1	0.7	4.3	0.5	1.0	1.1	0.8
$TR_{\ 20\ (\ ton/\ fad)}$	4.2	0.5	0.8	1.1	0.8	4.1	0.5	1.1	1.3	0.8
L.S.D at 0.05	N.S	N.S	N.S	N.S	0.1	N.S	0.1	0.2	0.2	N.S
Effect of NPK (Kg/fad)										
$NPK_{\ (0:0:0)}$	3.7	0.5	0.8	1.1	0.7	3.5	0.4	0.9	1.1	0.8
$NPK_{\ 1\ (40:30:50kg/fad)}$	3.7	0.5	0.8	1.0	0.8	3.9	0.5	1.0	1.2	0.8
$NPK_{\ 2(\ 60:45:75\ \ kg/fad)}$	4.3	0.5	0.8	1.0	0.8	4.0	0.6	0.9	1.1	0.8
$NPK_{\ 3\ (80:60:100\ kg/fad)}$	4.5	0.6	0.8	1.1	0.7	3.8	0.5	0.9	1.1	0.8
L.S.D at 0.05	N.S	N.S	N.S	N.S	N.S	N.S	N.S	0.1	0.1	N.S

Table (11) : Effect of organic manure or NPK fertilization levels on bulbing characteristics of onion plants [after 12 weeks from transplanting].

Season / Charat. / Treat.	1997-1998					1998-1999				
	F.W. of bulb/ plant (g)	D.W. of bulb/ plant (g)	neck diamet.	bulb diamet.	bulbing ratio	F.W. of bulb/ plant (g)	D.W. of bulb/ plant (g)	neck diamet.	bulb diamet.	bulbing ratio
Effect of Organic manure (ton/fed										
Control	7.9	1.0	1.2	1.5	0.8	5.5	0.8	1.0	1.4	0.7
FYM_{10} (ton/ fad)	9.5	1.3	1.3	1.6	0.8	5.6	0.8	1..0	1.4	0.7
FYM_{20} (ton/ fad)	10.1	1.4	1.3	1.7	0.8	5.3	0.8	1.0	1.5	0.7
TR 10(ton/ fad)	10.1	1.4	1.3	1.6	1.0	6.0	0.9	1.4	1.1	0.8
TR 20 (ton/ fad)	9.9	1.5	1.3	1.7	0.8	6.6	1.0.	1.5	1.0	0.7
L.S.D at 0.05	1.6	0.2	N.S	N.S	N.S	0.4	0.1	N.S	N.S	N.S
Effect of N.P.K (K.g/fad)										
NPK (0 : 0 : 0)	7.8	1.5	1.2	1.5	0.8	4.7	0.6	1.3	0.9	0.7
NPK 1 (40:30:50kg/fad)	9.2	1.6	1.3	1.6	0.8	5.5	0.8	1.4	1.1	0.8
NPK 2(60:45:75 kg/fad)	10.2	1.7	1.3	1.7	0.8	6.4	1.0	1.5	1.0	0.7
NPK 3 (80:60:100 kg/fad)	10.8	1.6	1.3	1.6	0..9	6.5	1.0	1.5	1.0	0.7
L.S.D at 0.05	1.2	0.1	0.1	0..1	N.S	0.4	0.1	0.9	0.1	0.1

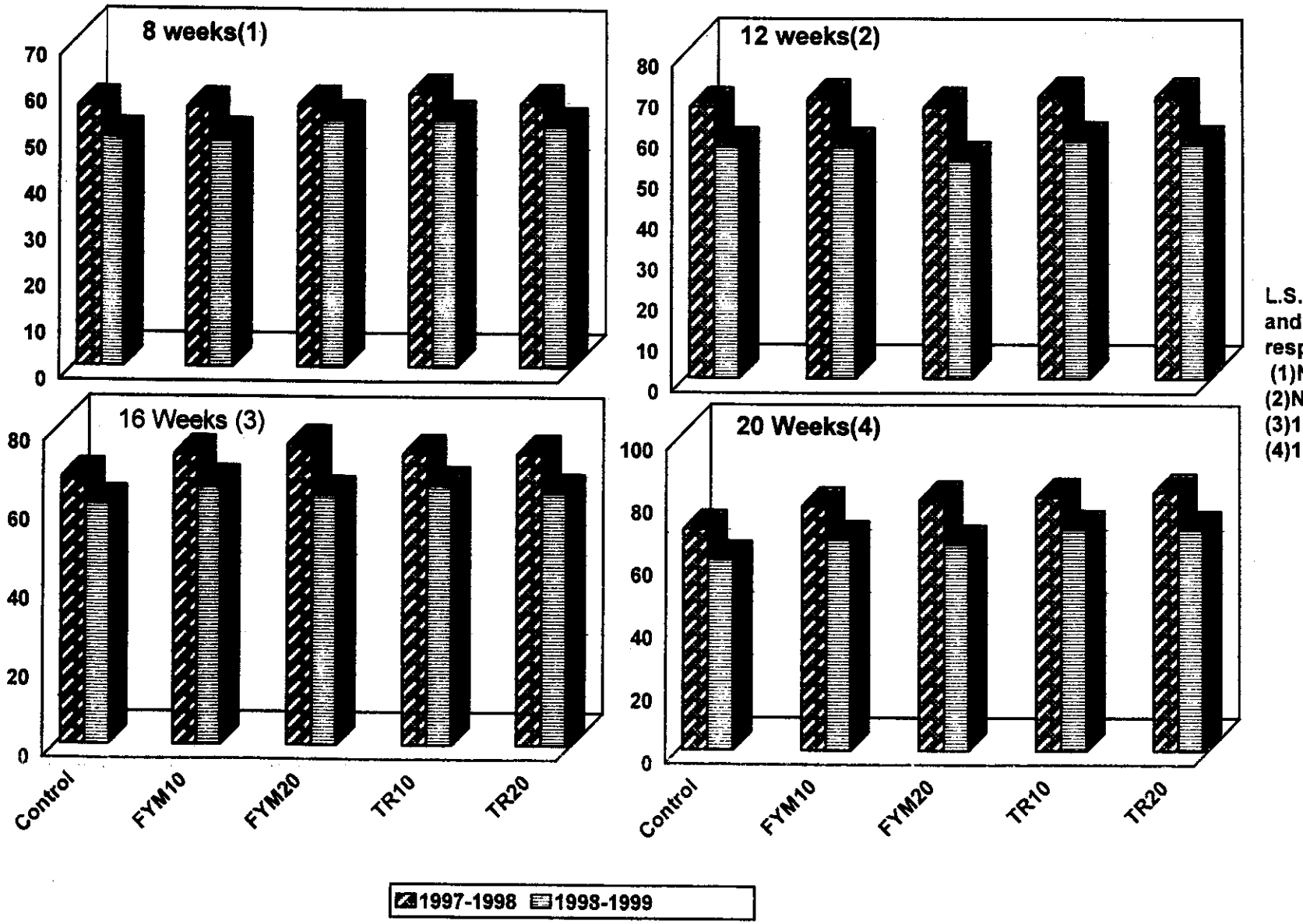
Table (12) : Effect of organic manure or NPK fertilization levels on bulbing characteristics of onion plants [after 16 weeks from transplanting].

Season / Charat. / Treat.	1997-1998					1998-1999				
	F.W. of bulb/ plant (g)	D.W. of bulb/ plant (g)	neck diamet.	bulb diamet.	bulbing ratio	F.W. of bulb/ plant (g)	D.W. of bulb/ plant (g)	neck diamet.	bulb diamet.	bulbing ratio
Effect of Organic manure (ton/fad)										
Control	15.3	2.2	1.6	2.3	0.7	14.2	2.0	1.4	2.3	0.6
$FYM_{10\ (ton/fad)}$	17.5	2.6	1.7	2.3	0.8	21.0	2.9	1.6	2.6	0.6
$FYM_{20\ (ton/fad)}$	20.0	3.2	1.9	2.6	0.7	21.2	3.2	1.6	2.6	0.6
$TR_{10(ton/fad)}$	17.4	2.9	1.8	2.4	0.8	16.1	2.6	1.5	2.3	0.6
$TR_{20(ton/fad)}$	19.2	3.2	1.7	2.3	0.8	20.9	3.2	1.5	2.4	0.6
L.S.D at 0.05	3.0	0.2	N.S	N.S	0.04	3.4	0.4	N.S	N.S	N.S
Effect of NPK(Kg/fad)										
$NPK_{(0:0:0)}$	15.1	2.3	1.6	2.1	0.7	15.9	2.3	1.4	2.2	0.7
$NPK_{1\ (40:30:50kg/fad)}$	16.2	2.5	1.7	2.2	0.8	17.2	2.5	1.5	2.4	0.6
$NPK_{2(60:45:75\ kg/fad)}$	21.0	3.4	1.9	2.5	0.8	21.4	3.3	1.5	2.6	0.6
$NPK_{3\ (80:60:100\ kg/fad)}$	19.2	3.1	1.9	2.7	0.7	20.1	3.0	1.6	2.7	0.6
L.S.D at 0.05	2.2	0.2	0.2	0.3	0.04	2.8	0.3	N.S	0.2	N.S

Table (13) : Effect of organic manure or NPK fertilization levels on bulbing characteristics of onion plants [after 20 weeks from transplanting].

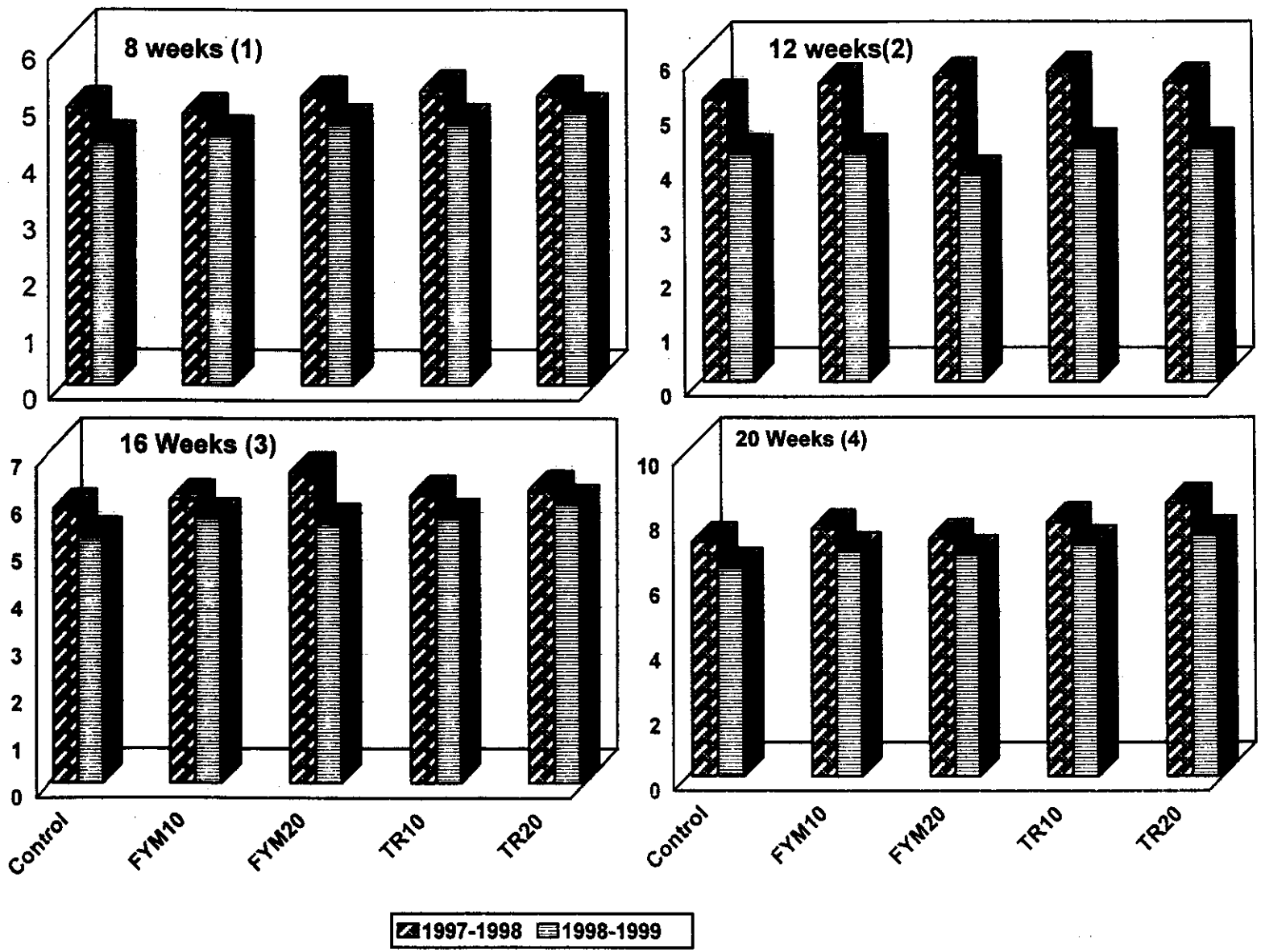
Season / Charat. / Treat.	1997-1998					1998-1999				
	F.W. of bulb/ plant (g)	D.W. of bulb/ plant (g)	neck diamet.	bulb diamet.	bulbing ratio	F.W. of bulb/ plant (g)	D.W. of bulb/ plant (g)	neck diamet.	bulb diamet.	bulbing ratio
Effect of Organic manure (ton/fad)										
Control	63.3	6.6	2.0	4.2	0.5	64.7	7.9	1.8	4.9	0.4
FYM_{10} (ton/ fad)	68.3	9.5	2.2	4.4	0.5	72.0	10.5	1.9	5.3	0.4
FYM_{20} (ton/ fad)	67.0	9.7	2.3	4.9	0.5	73.2	9.6	1.8	5.3	0.3
TR 10(ton/ fad)	74.1	9.6	2.5	4.5	0.6	76.5	10.7	1.9	5.4	0.3
TR 20 (ton/ fad)	82.6	10.7	2.3	5.1	0.5	90.1	13.0	2.0	5.6	0.4
L.S.D at 0.05	12.1	2.0	N.S	0.7	N.S	13.1	2.2	N.S	0.4	N.S
Effect of NPK (Kg/fad)										
NPK (0 : 0 : 0)	63.9	7.6	1.9	4.0	0.5	61.4	8.2	1.8	4.9	0.4
NPK 1 (40:30:50kg/fad)	68.9	8.9	2.1	4.3	0.5	75.2	10.5	1.9	5.3	0.4
NPK 2(60:45:75 kg/fad)	77.1	9.8	2.4	5.0	0.5	87.6	11.8	1.9	5.6	0.3
NPK 3 (80:60:100 kg/fad)	74.3	10.5	2.5	5.1	0.5	77.1	10.8	1.9	5.4	0.4
L.S.D at 0.05	8.8	1.1	0.3	0.4	N.S	11.6	1.6	N.S	0.4	N.S

Fig (1) : Effect of organic manure fertilization levels on plant length (cm)
[8,12,16 and 20 weeks after transplanting during 1997-1998 and 1998-1999]



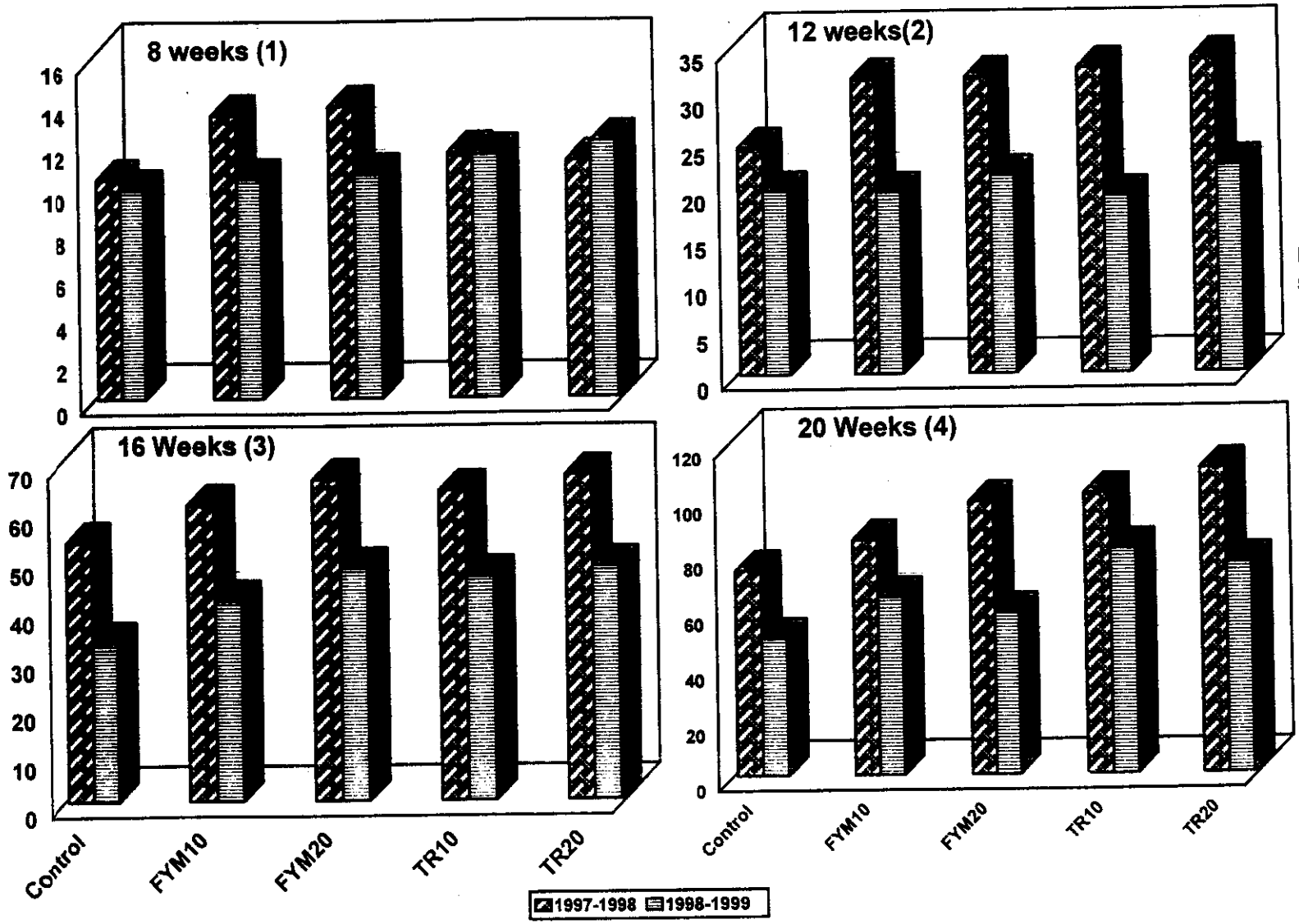
L.S.D. at 0.05 in first and second seasons respect.
(1)N.S and N.S
(2)N.S andN.S
(3)1.7 and 3.3
(4)1.0 and 2.8

Fig (2) : Effect of organic manure fertilization levels on number of leaves /plant [8,12,16 and 20 weeks after transplanting during 1997-1998 and 1998-1999]



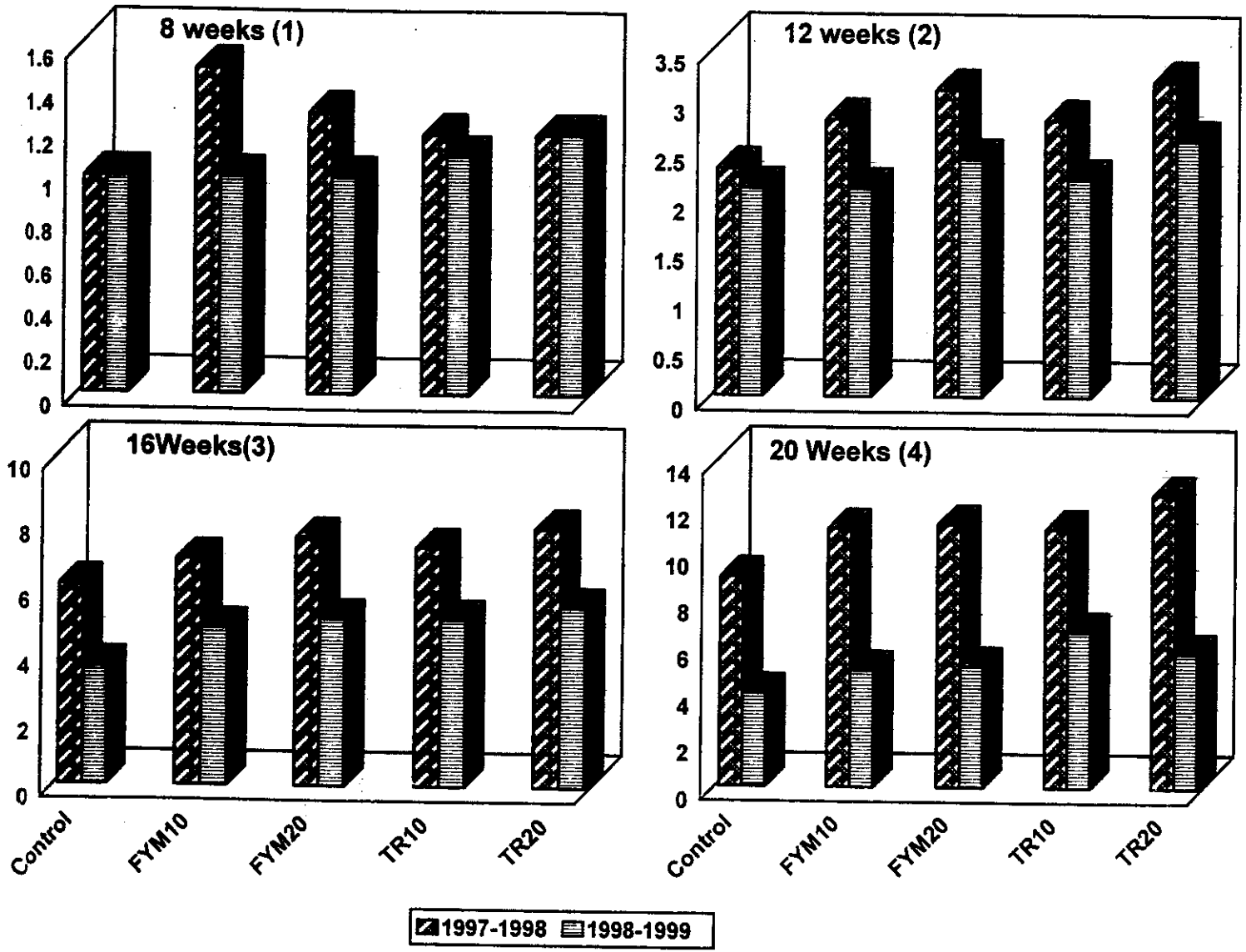
L.S.D. at 0.05 in first and second seasons respect.
(1)N.Sand 0.2
(2)N.S and 0.3
(3)0.4 and 0.4
(4)0.7and 0.6

Fig (3) : Effect of organic manure fertilization levels on fresh weight of leaves/plant (g)[8,12,16 and 20 weeks after transplanting during 1997-1998 and 1998-1999]



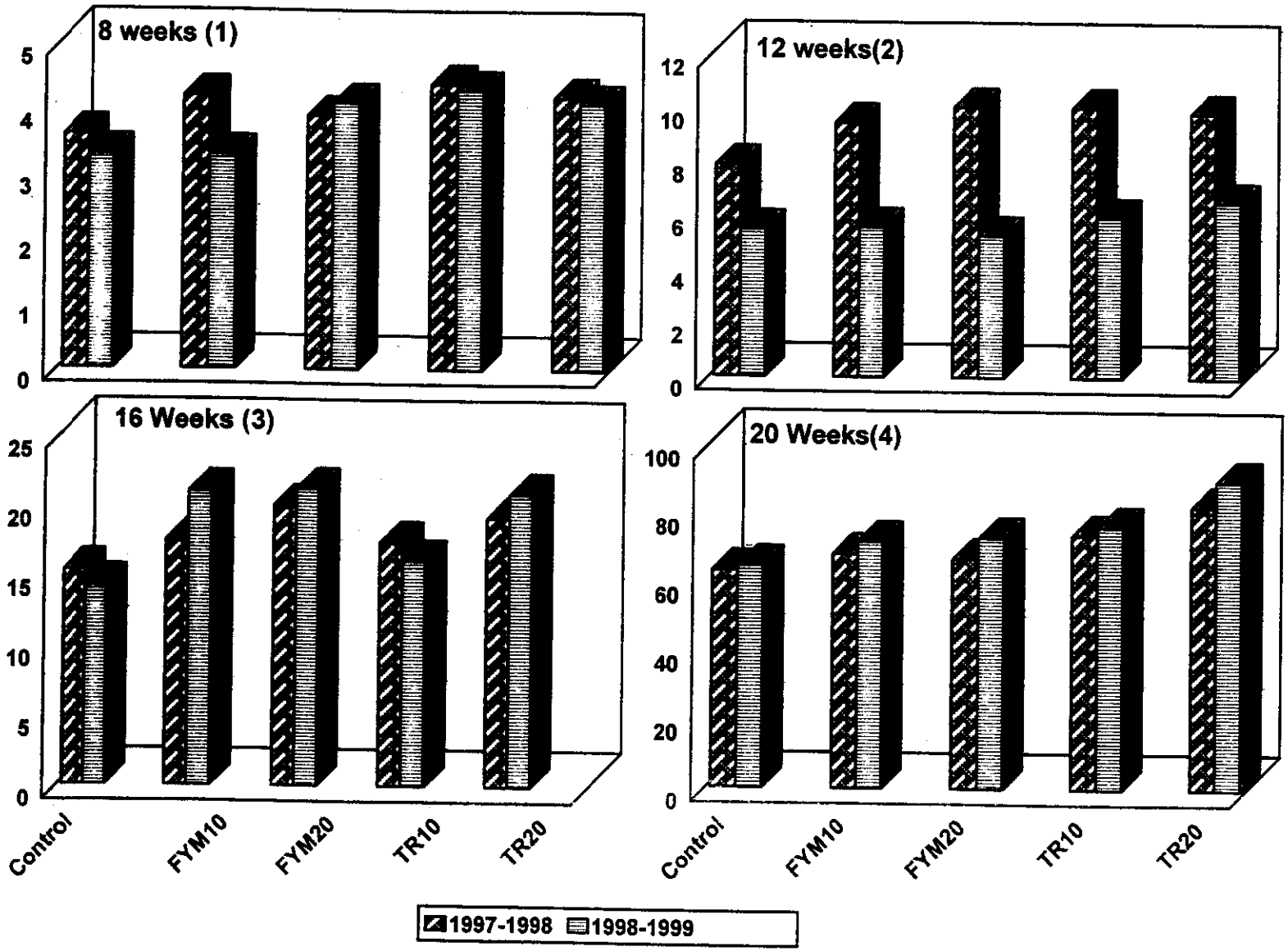
L.S.D. at 0.05 in first and second seasons respect.
(1)2.1 and 1.3
(2)2.7 and 1.3
(3)10.4 and 7.5
(4)16.0 and 11.7

Fig (4) : Effect of organic manure fertilization levels on dry weight of leaves /plant(g)
[8,12,16 and 20 weeks after transplanting during 1997-1998 and 1998-1999]



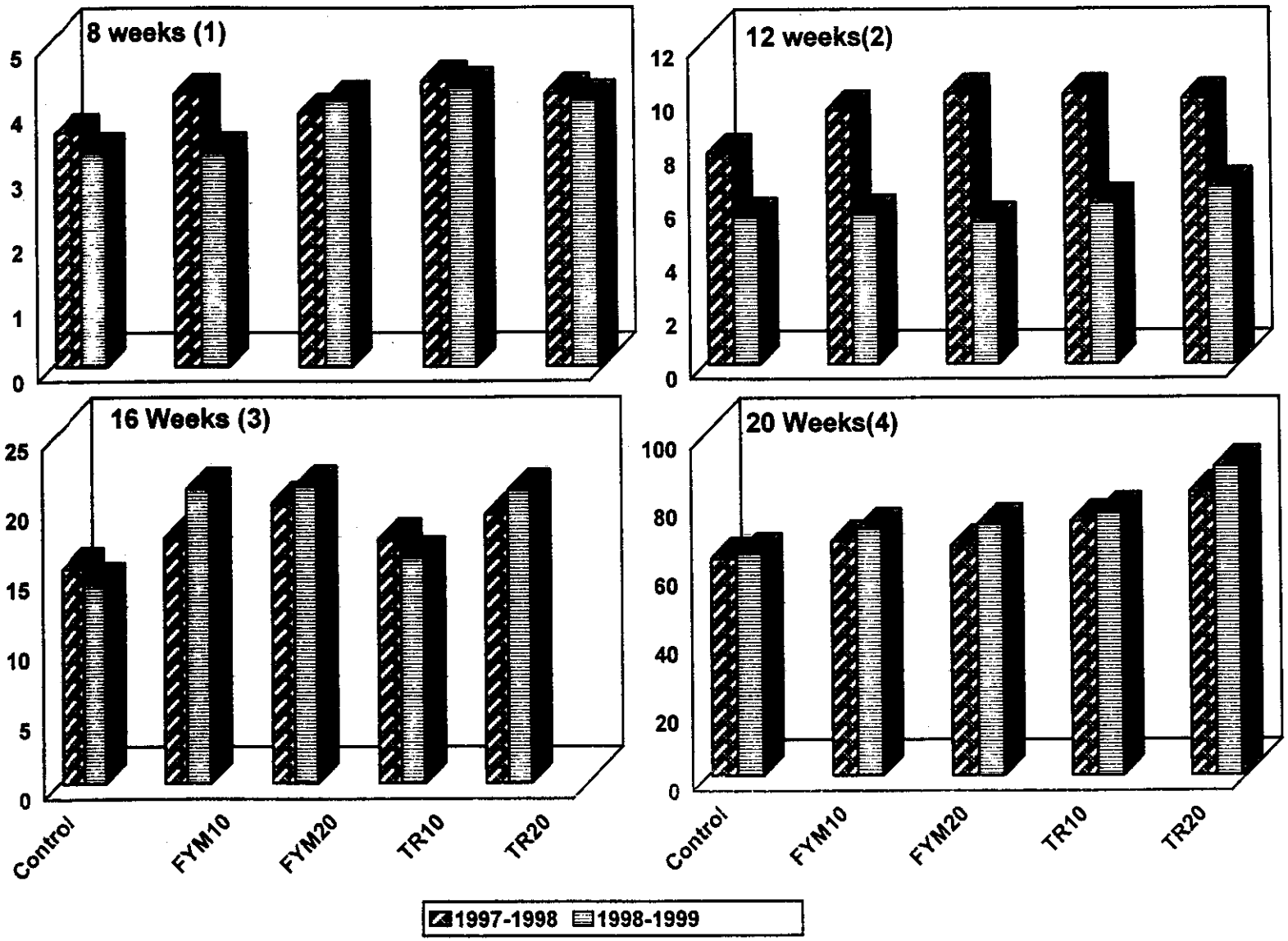
L.S.D. at 0.05 in first and second seasons respect.
(1)0.2 and N.S
(2)0.3 and 0.2
(3)0.8 and 0.7
(4)1.9 and 1.4

Fig (5) : Effect of organic manure fertilization levels on fresh weight of bulb/plant (g)
[8,12,16 and 20 weeks after transplanting during 1997-19and1998-1999]



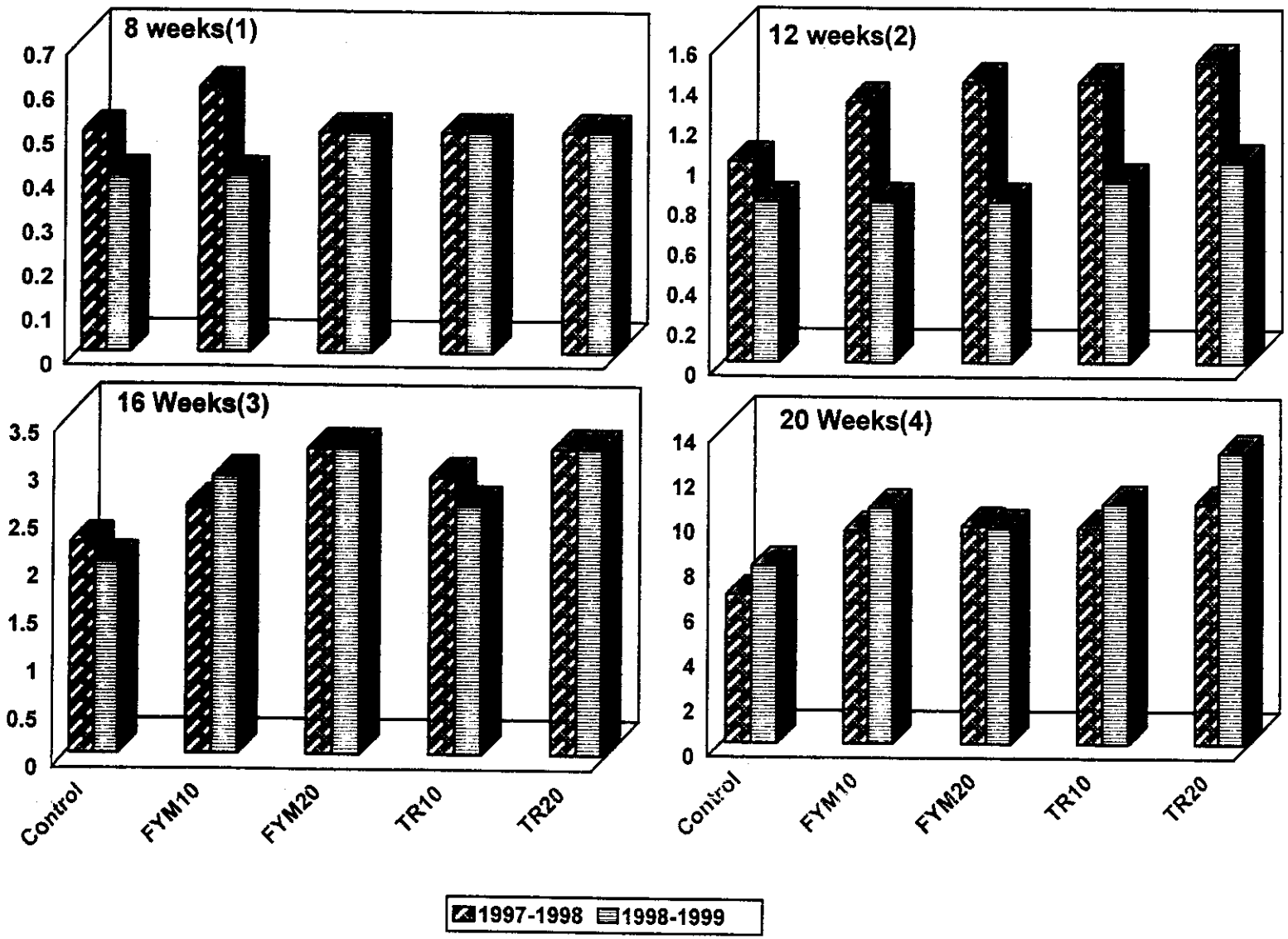
L.S.D. at 0.05 in first and second seasons respect.
(1)N.S and N.S
(2)1.6 and 0.4
(3)3.0 and 3.4
(4)12.1 and 13.1

Fig (5) : Effect of organic manure fertilization levels on fresh weight of bulb/plant (g)
[8,12,16 and 20 weeks after transplanting during 1997-19and1998-1999]



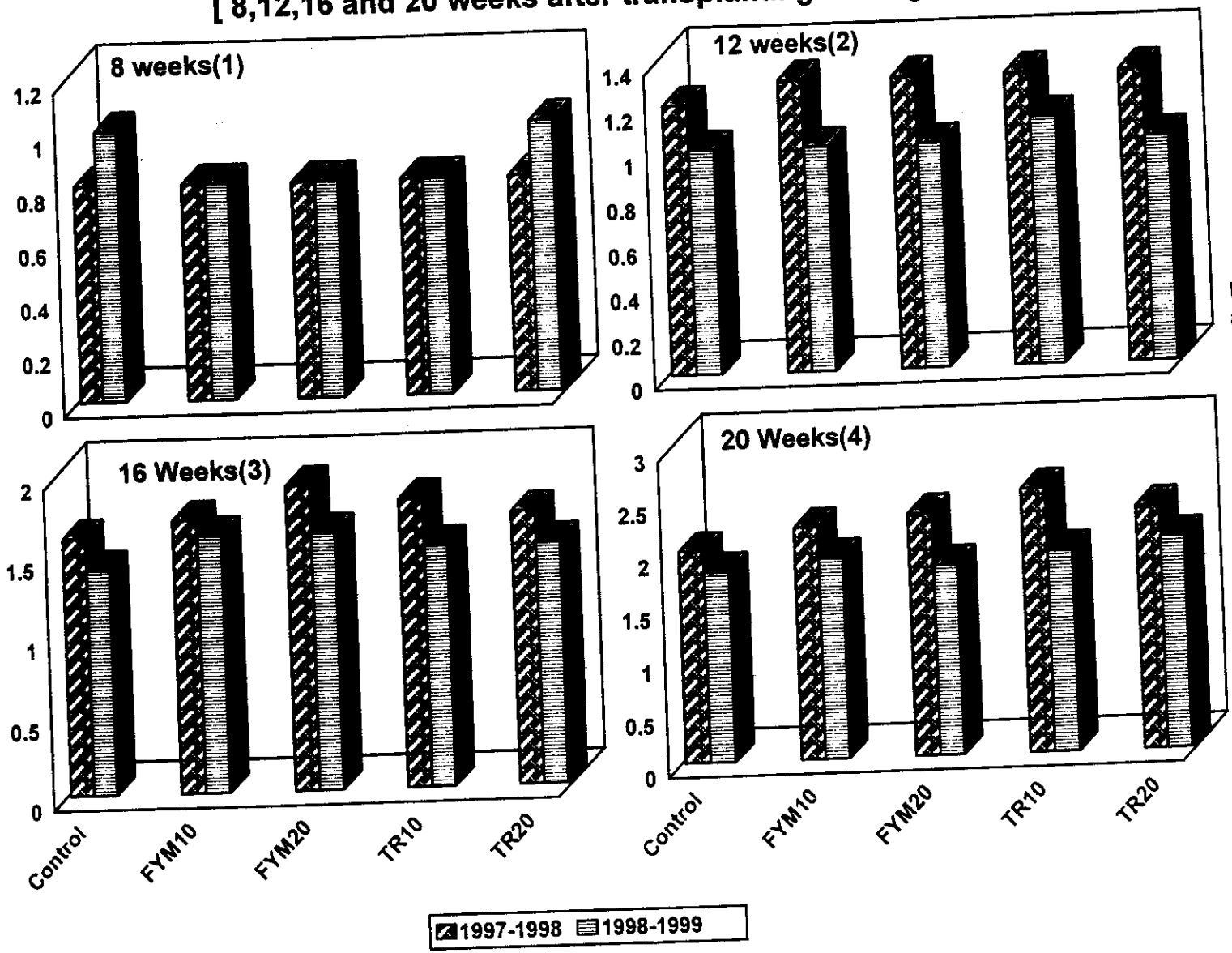
L.S.D. at 0.05 in first and second seasons respect.
(1)N.S and N.S
(2)1.6 and 0.4
(3)3.0 and 3.4
(4)12.1 and 13.1

Fig (6) : Effect of organic manure fertilization levels on dry weight of bulb /plant (g)
[8,12,16 and 20 weeks after transplanting during 1997-1998 and 1998-1999]



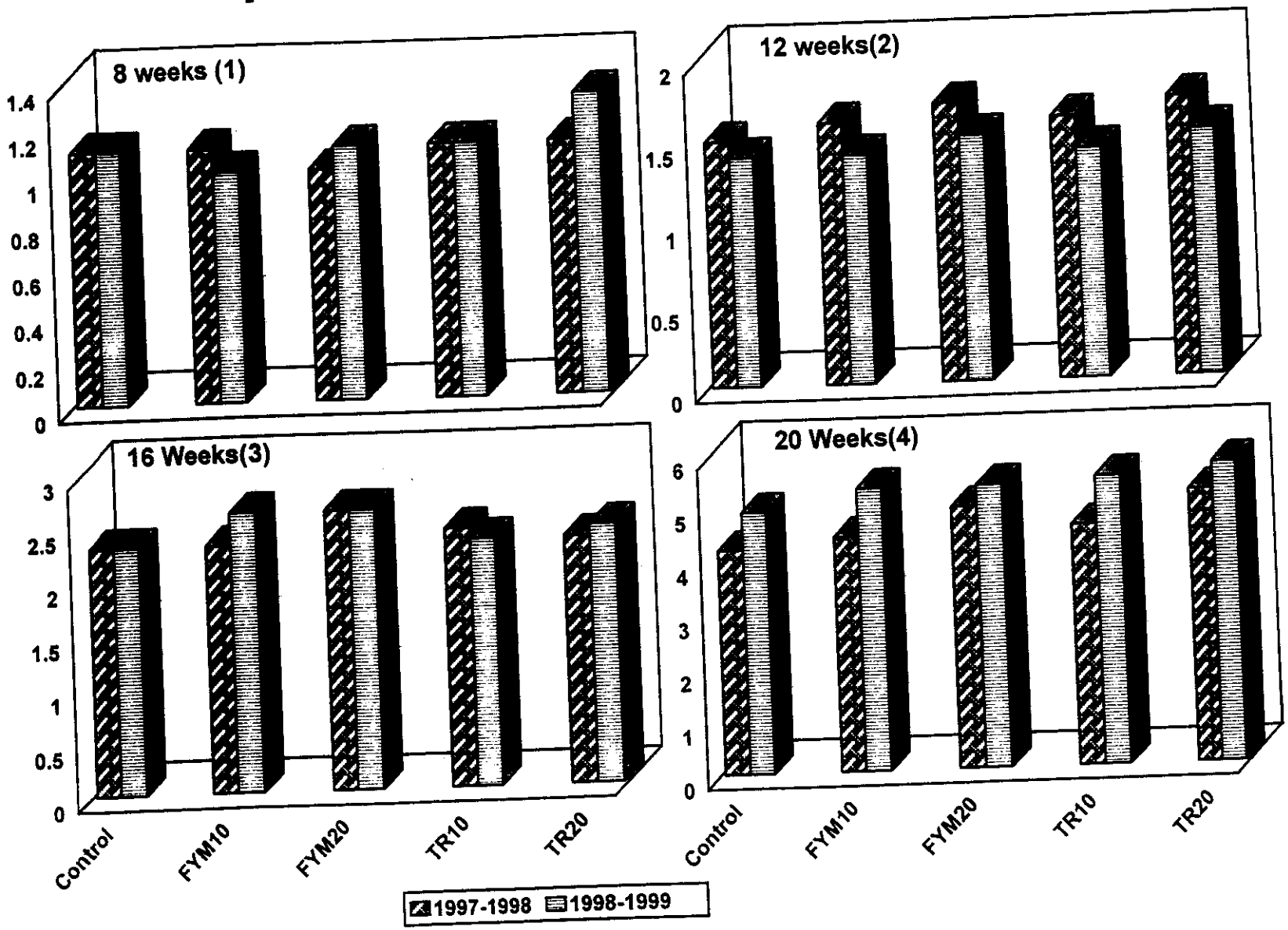
L.S.D. at 0.05 in first and second seasons respect..
(1)N.S and 0.1
(2)0.2 and 0.1
(3)0.2 and 0.4
(4)2.0 and 2.2

Fig (7) : Effect of organic manure fertilization levels on neck diameter /plant (cm)
[8,12,16 and 20 weeks after transplanting during 1997-1998 and 1998-1999]



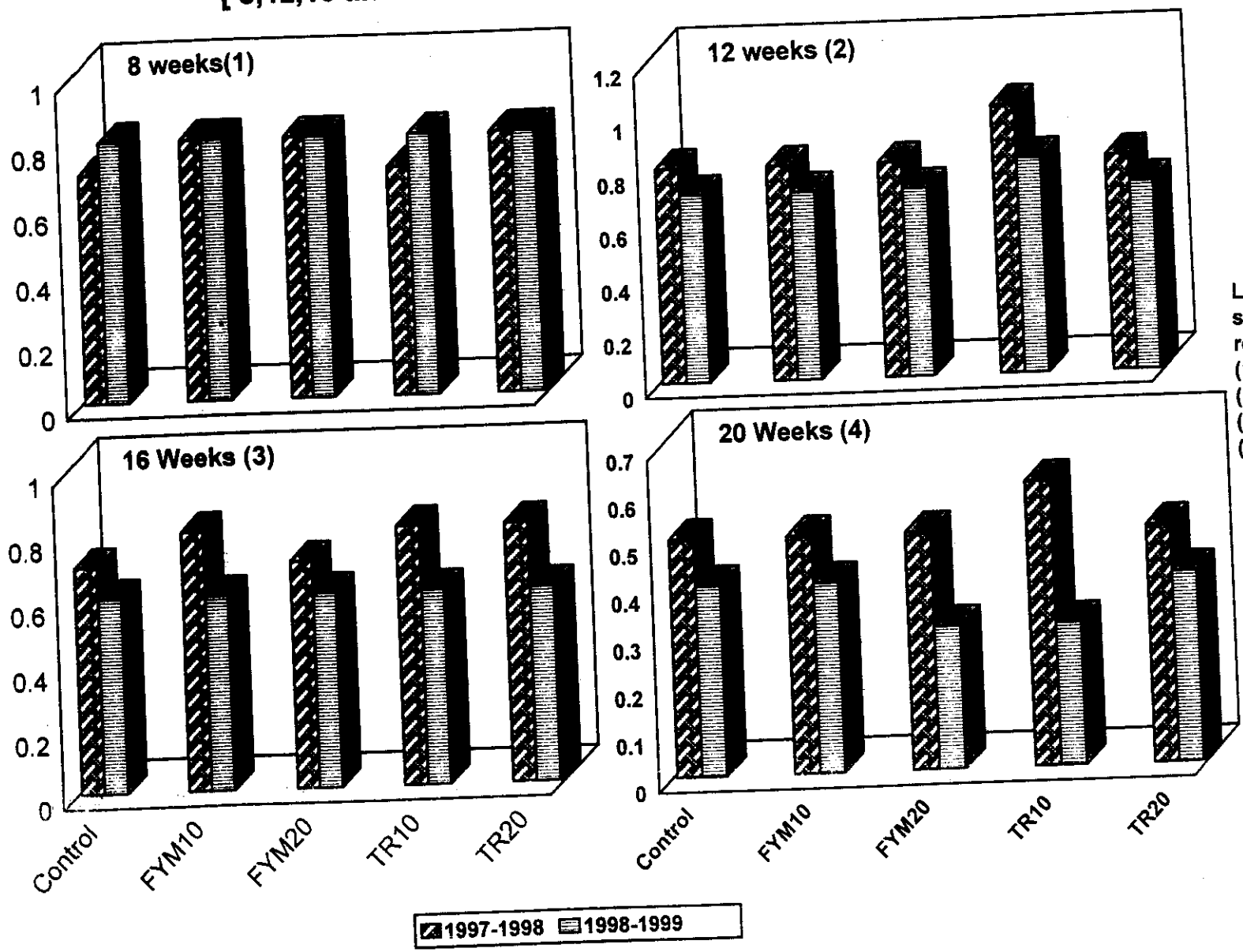
L.S.D. at 0.05 in first and second seasons respect..
(1)N.S and 0.2
(2)N.S and N.S
(3).Sand N.S,
(4)N.S and N.S,

Fig (8) : Effect of organic manure fertilization levels on bulb diameter /plant (cm)
[8,12,16 and 20 weeks after transplanting during 1997-1998 and 1998-1999] .



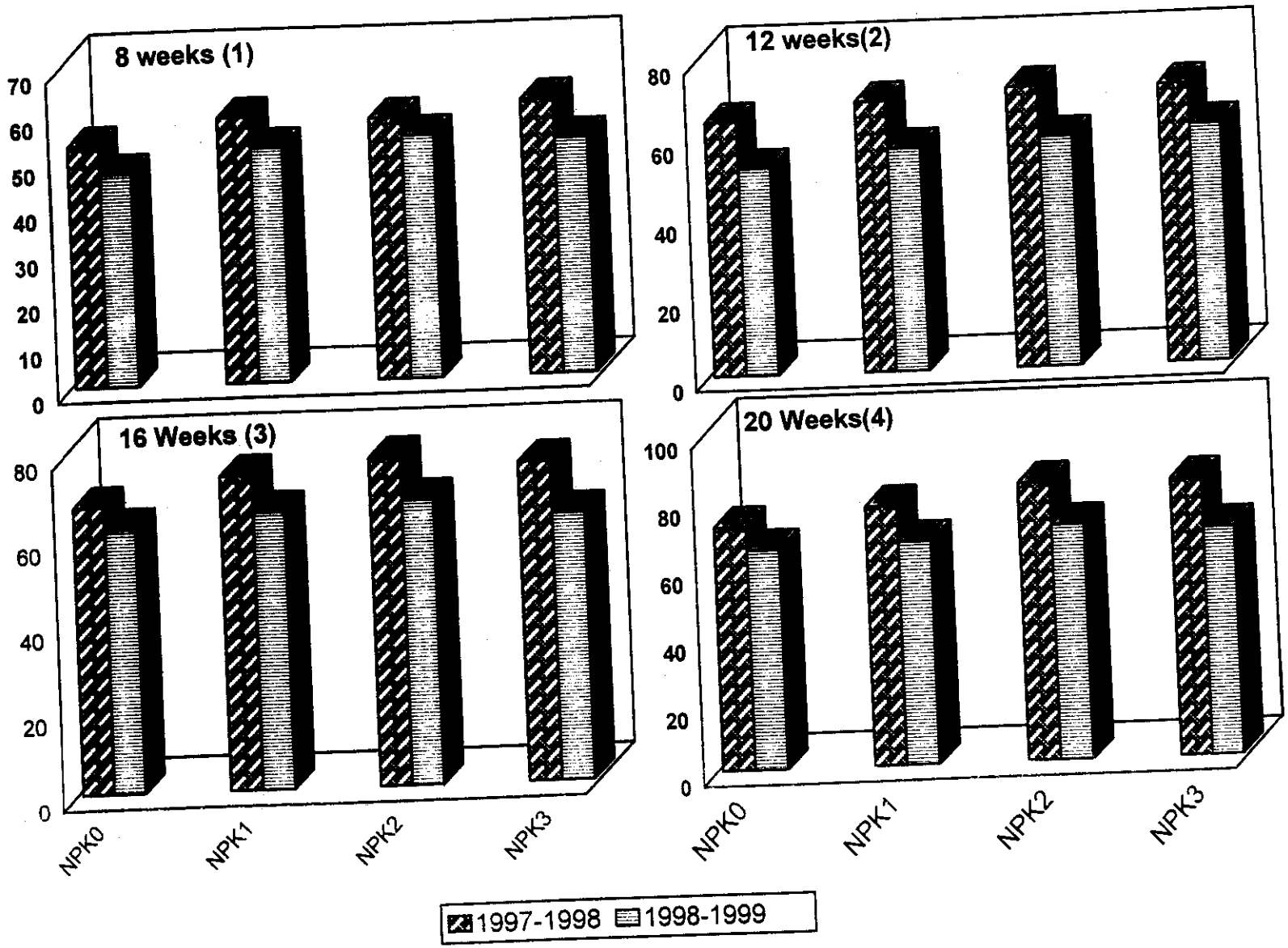
L.S.D. at 0.05 in first and second seasons respect.
(1)N.S and 0.2
(2)N.S and)N.S.
(3)N.S and)N.S
(4)0.7 and 0.4

Fig (9) : Effect of organic manure fertilization levels on bulbing ratio /plant [8,12,16 and 20 weeks after transplanting during 1997-1998 and 1998-1999]



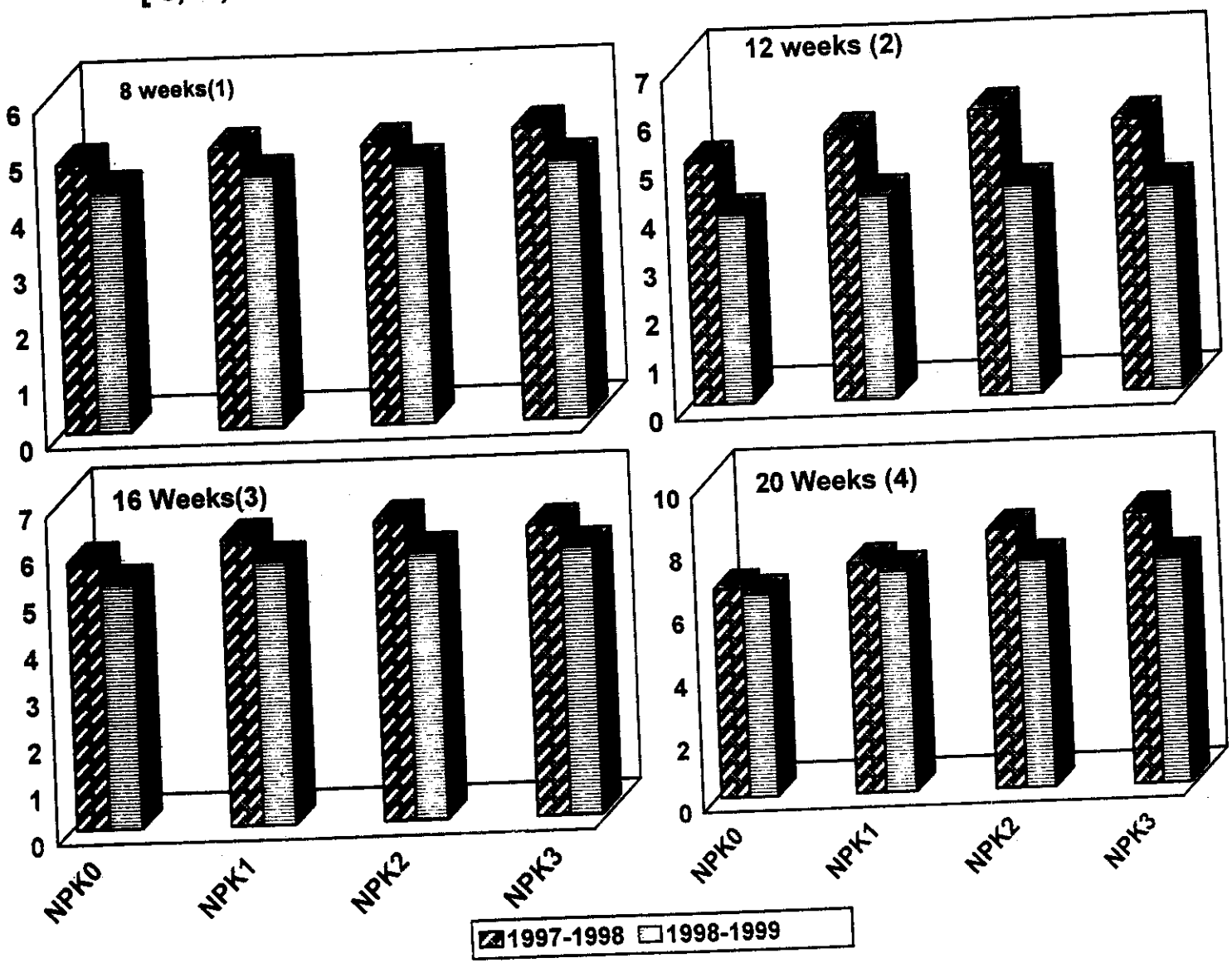
L.S.D. at 0.05 in first and second seasons respect.
(1) 0.1 and N.S
(2) N.S and N.S
(3) 0.04 and N.S
(4) N.S and N.S

Fig (10) : Effect of NPK fertilization levels on plant length (cm) [8, 12, 16 and 20 weeks after transplanting during 1997-1998 and 1998-1999] .



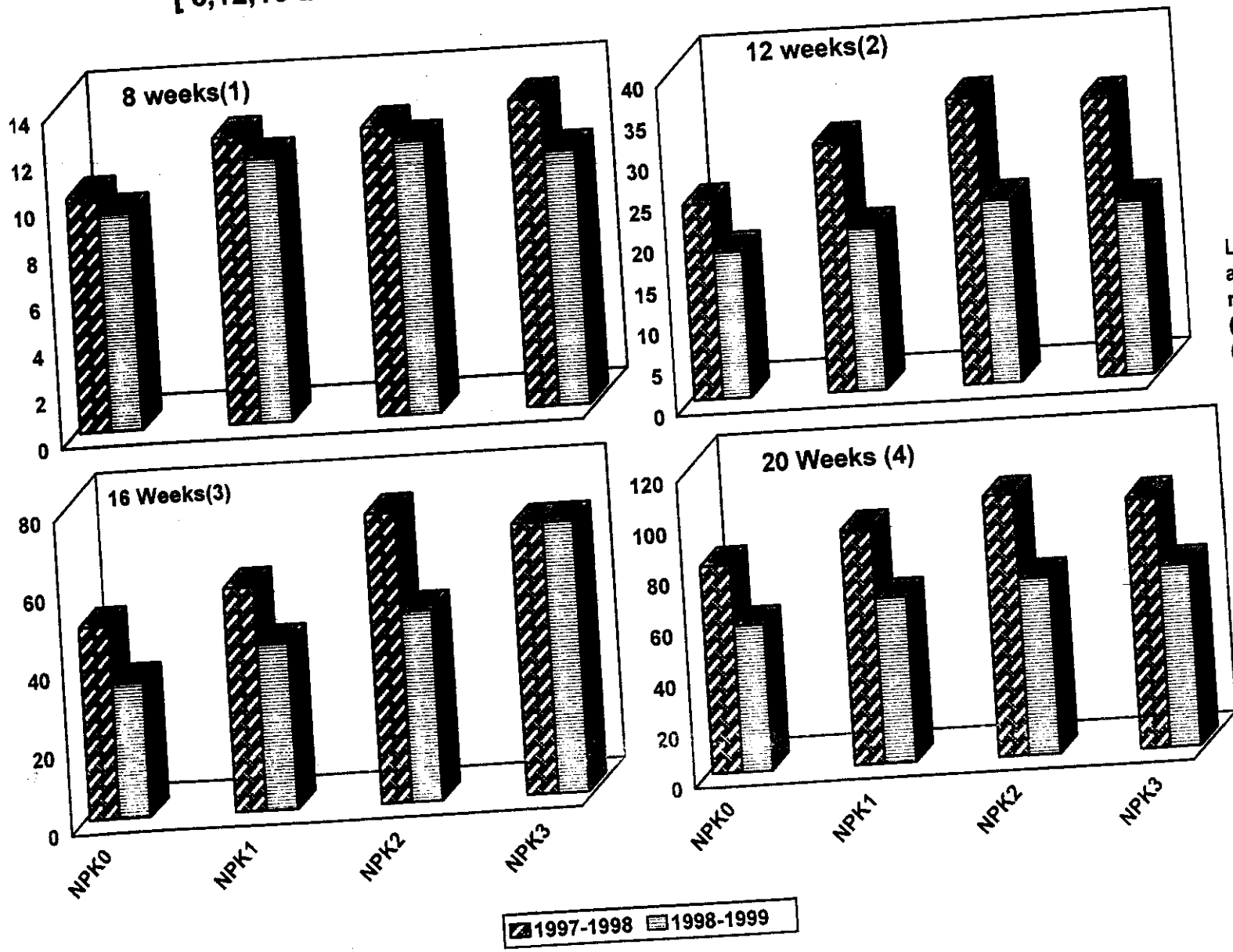
L.S.D. at 0.05 in first and second seasons respect.
(1) N.S and N.S
(2) 1.6 and 0.4
(3) 3.0 and 3.4
(4) 12.1 and 13.1

Fig (11) : Effect of NPK fertilization levels on number of leaves /plant [8,12,16 and 20 weeks after transplanting during 1997-1998 and 1998-1999]



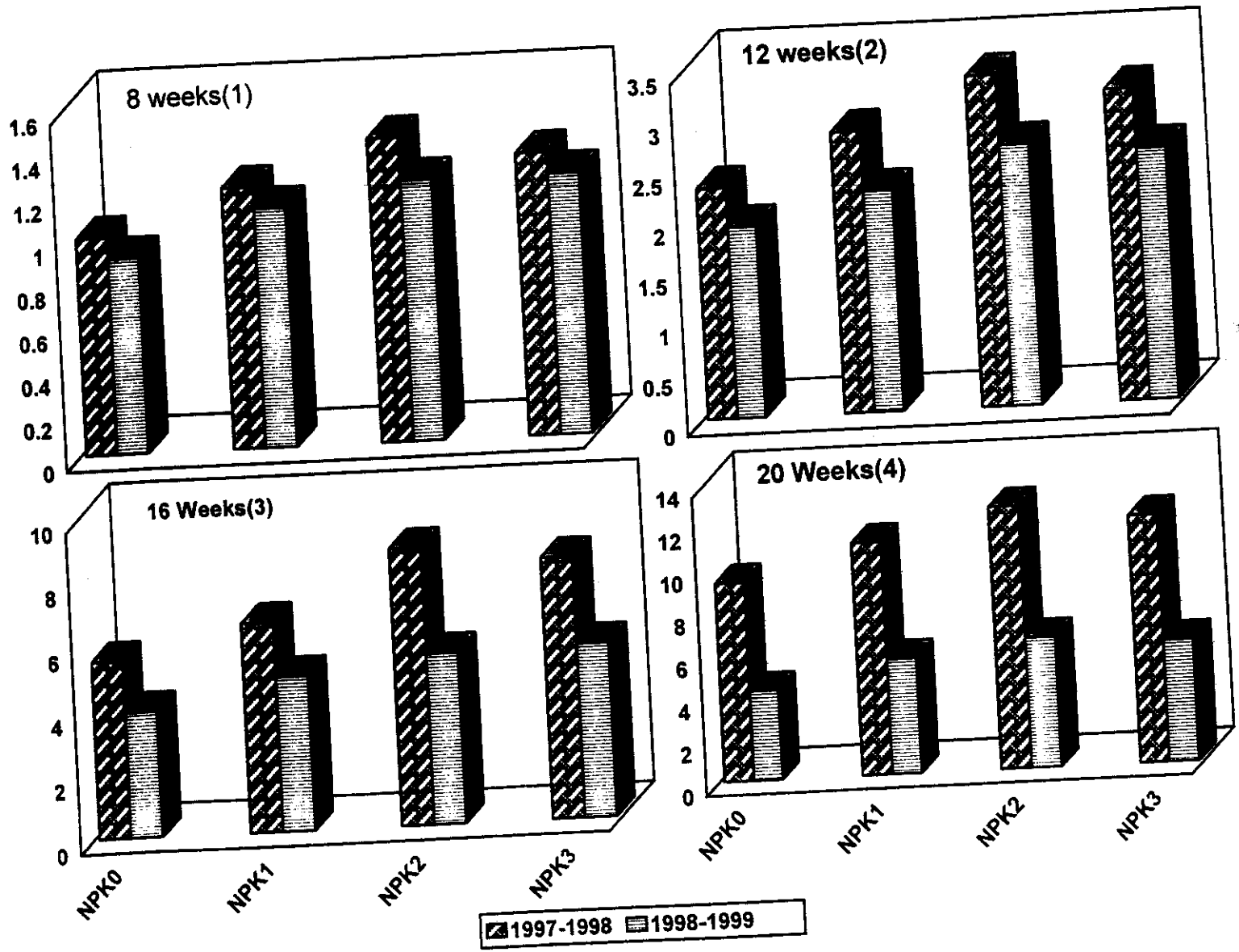
L.S.D. at 0.05 in first and second seasons respect.
(1) 0.3 and 0.3
(2) 0.3 and 0.3
(3) 0.3 and 0.3
(4) 0.5 and 0.4

Fig (12) : Effect of NPK fertilization levels on fresh weight of leaves (g)/plant
[8,12,16 and 20 weeks after transplanting during 1997-1998 and 1998-1999]



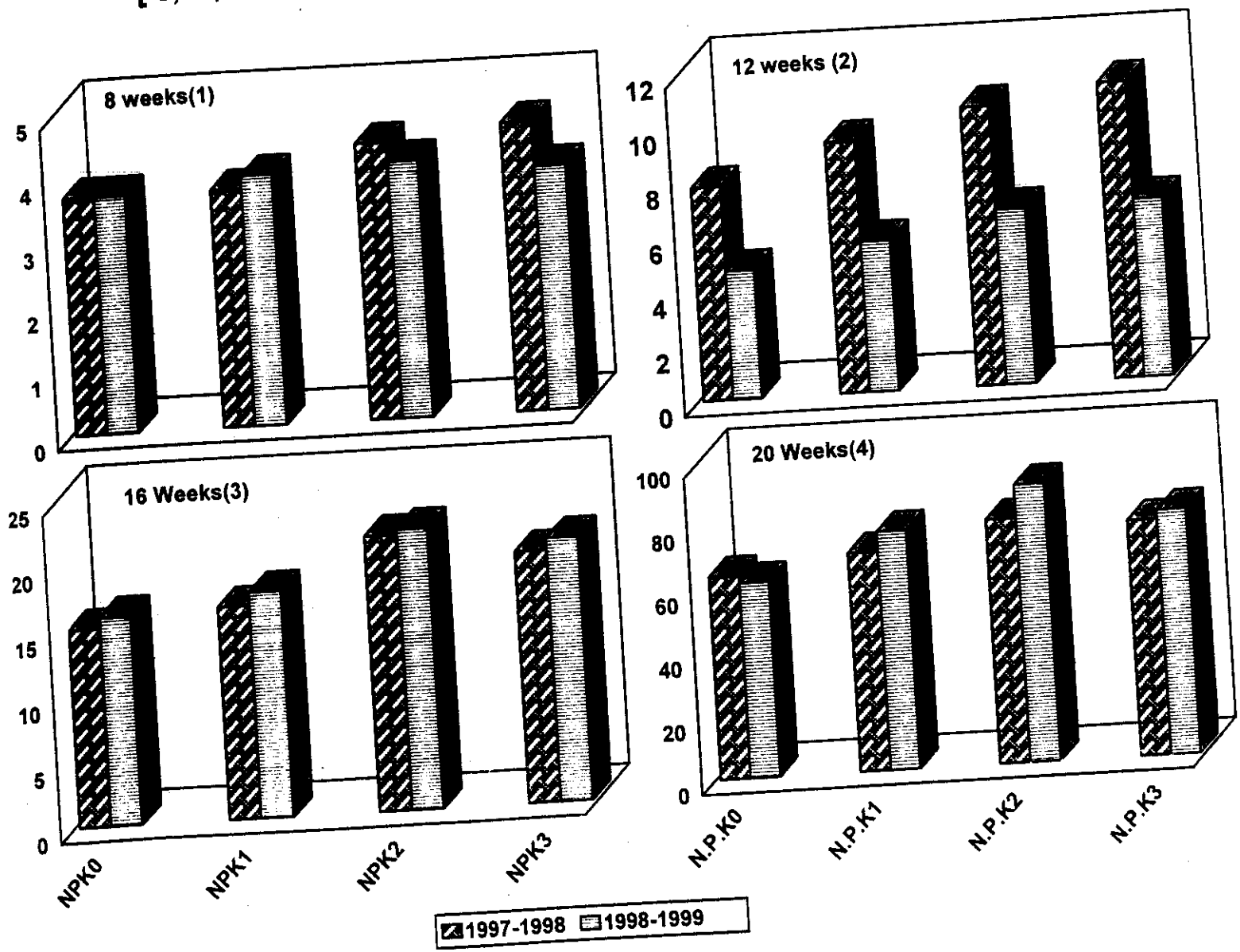
L.S.D. at 0.05 in frist and second seasons respect.
(1)1.8 and 1.2
(2) 3.0 and 1.1
(3) 6.8 and 3.8
(4)10.0 and 7.4

Fig (13) : Effect of NPK fertilization levels on dry weight of leaves (g)/plant [8,12,16 and 20 weeks after transplanting during 1997-1998 and 1998-1999]



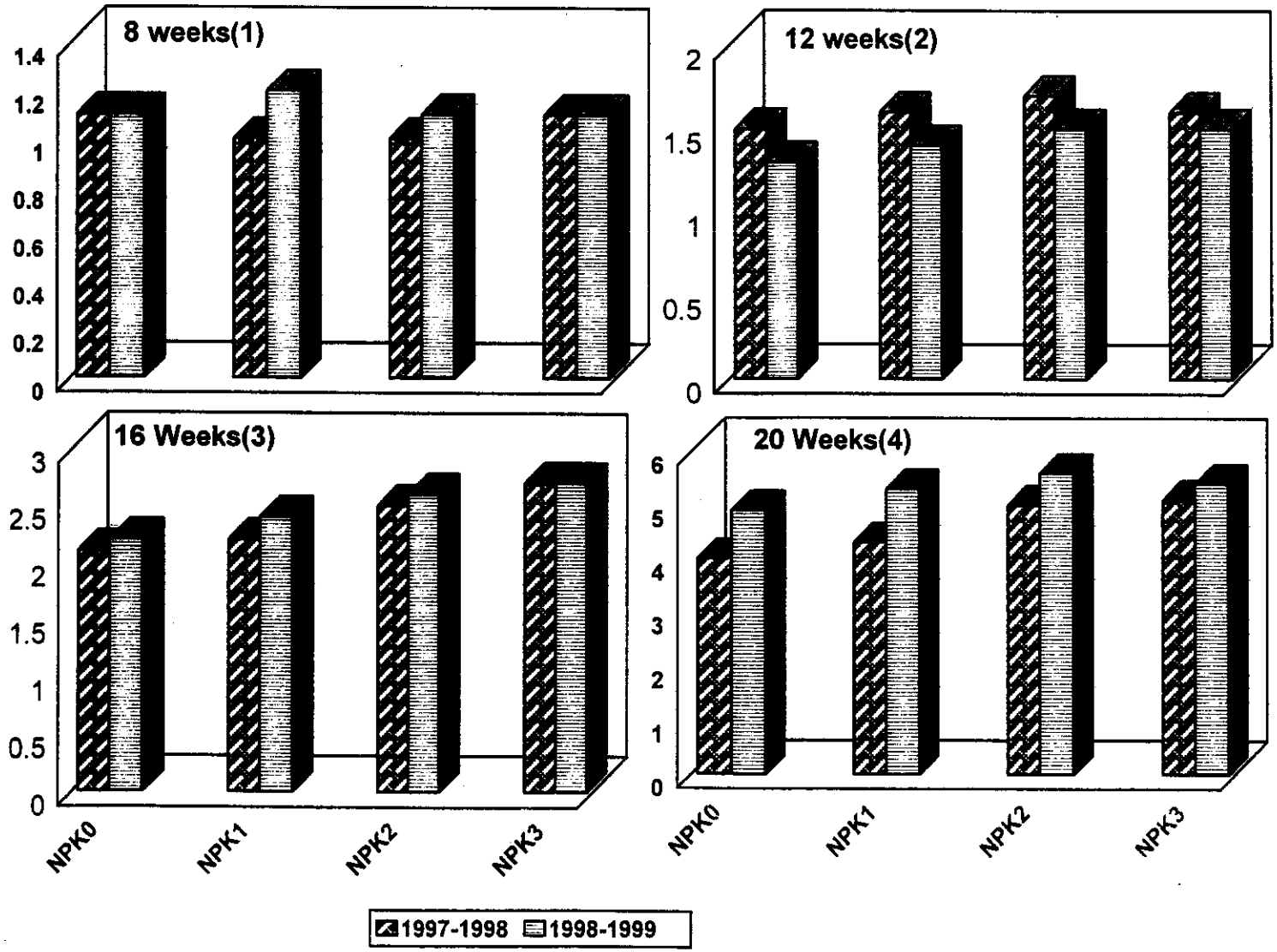
L.S.D. at 0.05 in first and second season =
(1) 0.2 and 0.2
(2) 0.3 and 0.2
(3) 0.7 and 0.5
(4) 1.1 and 0.7

Fig (14) : Effect of NPK fertilization levels on fresh weight of bulb /plant (g) [8,12,16 and 20 weeks after transplanting during 1997-1998 and 1998-1999].



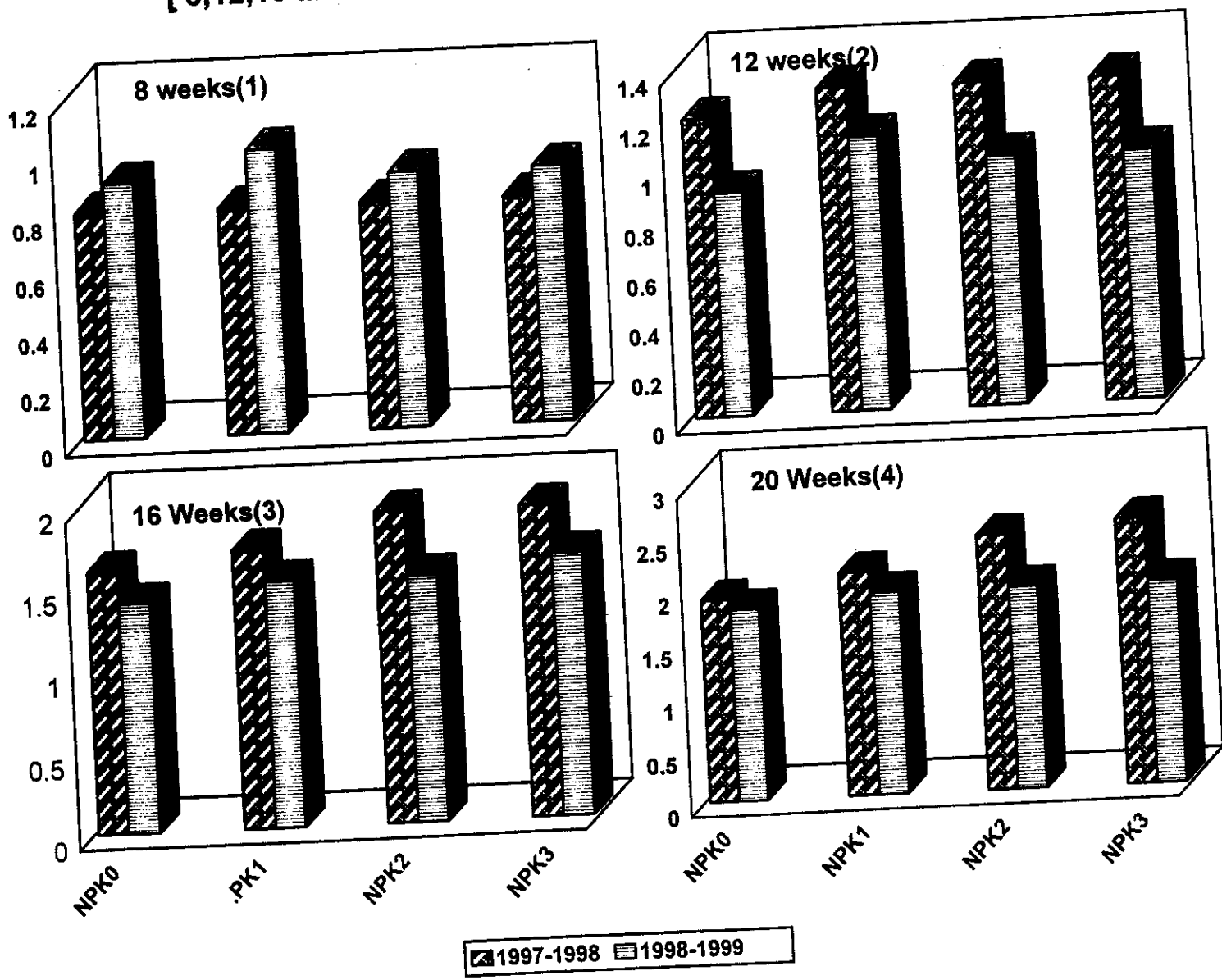
L.S.D. at 0.05 in first and second season =
(1) N.S and N.S
(2) 1.2 and 0.4
(3) 2.2 and 2.8
(4) 8.8 and 11.6

Fig (16) : Effect of NPK fertilization levels on bulb diameter /plant (cm)
[8,12,16 and 20 weeks after transplanting during 1997-1998 and 1998-1999]



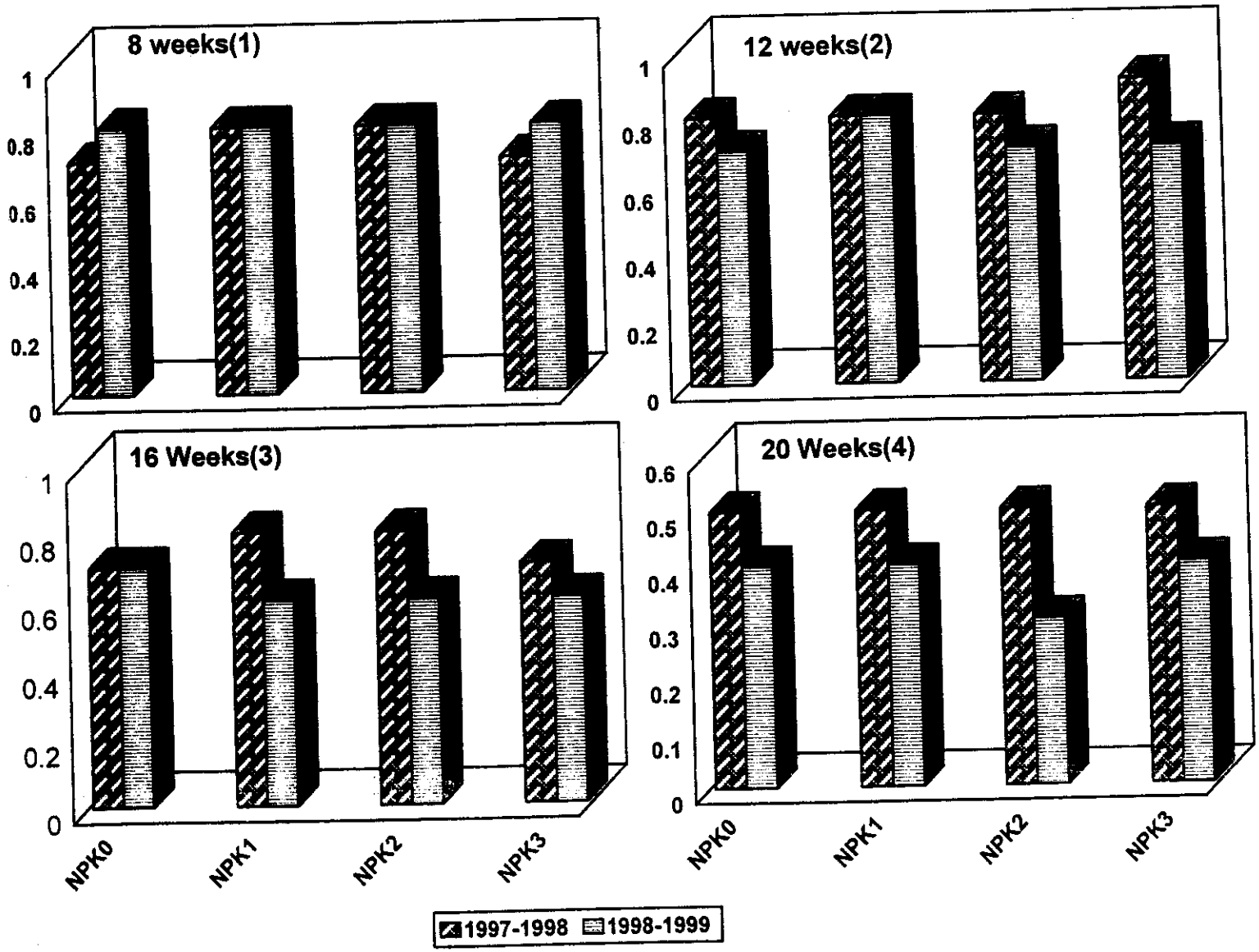
L.S.D. at 0.05 in first and second season =
(1) N.S and 0.1
(2) 0.1 and 0.9
(3) 0.3 and 0.2
(4) 0.4 and 0.4

Fig (17) : Effect of NPK fertilization levels on neck diameter /plant
[8,12,16 and 20 weeks after transplanting during 1997-1998 and 1998-1999]



L.S.D. at 0.05 in first and second seasons respect.
(1) N.Sand 0.1
(2) 0.1 and 0.1
(3) 0.2 and N.S
(4) 0.3 and N.S

Fig (18) : Effect of NPK fertilization levels on bulbing ratio /plant [8,12,16 and 20 weeks after transplanting during 1997-1998 and 1998-1999]



L.S.D. at 0.05 in first and second seasons respect.
(1) N.Sand N.S
(2) N.Sand 0.1
(3) 0.04 and N.S
(4) N.S and N.S

The highest apparent differences in growth parameters due to NPK application were cleared in sample taken after 20 weeks from transplanting, this may be due to onion plants require a certain amount of biological age to be attained in order to response favourably to different NPK treatments.

Obtained results of NPK application on vegetative growth of onion plants, in the same line of those obtained by Ismail *et al.* (1988) and Abo- Sedera *et al.*(1991)on garlic, Tseng (1972), Hanna alla *et al.* (1991), Biemond. (1995), Serrano *et al.*(1995), Anez *et al.* (1996), Vachhani and Patal (1996) Rizk (1997) Abd-El-Latif (1999) and Oukal (1999) on onion. The addition of NPK to calcareous soil had a good effect on growth of plants. This may by due to the beneficial effect of N within the plant. Nitrogen is found in proteins, nucleic acids, and co-enzyme, Devlin (1979). While potassium activate some enzymes and K^+ ions are concerned in targon control stomatal guard cells of leaves and increase photosynthesis processes (Abd-El-Aal 1990 and Said 1997) also phosphorus increased plant height and dry weight of plant, this may be due to phosphorus has a role in N_2 fixation (Pereira and Bliss. 1989), (Abd- El- Aal. 1990 and Said. 1997). The phosphorus enhanced nodulation of plant and increased photosynthesis of plants, Devlin (1979), Abd-El-Aal (1990) and Said (1997) .

4.1.3. Vegetative growth as affected by interaction between organic and NPK fertilizers:-

Data presented in Tables(14-21) indicate the effect of organic manure combined with chemical fertilizers on growth characteristics of onion plants, expressed as plant length, number of leaves per plant, fresh and dry weight of leaves and bulbs per plants, bulb and neck diameter of onion in addition to

bulbing ratio. Such vegetative growth characters were increased with application of organic manure as FYM or town refuse combined with NPK rates under the study on onion plants when compared with control. In this regard, there were no apparent differences in growth parameters in the first age of samples (8 weeks after transplanting) because onion plants require a certain amount of growth to be fulfilled in order to response favourably to different treatments. This may arise from the conclusion of Maksoud and El-Oksh (1983) that 50% of ultimate weight of garlic plants formed during the last 6 weeks of the growing seasons. Some growth characters increased significantly with organic manure and NPK application like fresh and dry weight of bulbs and bulbing ratio in addition to plant length, these results cleared in plants age of 12, 16 and 20 weeks after transplanting. These results in the same trend of those obtained by Reddy (1985), Tashkhodzhaev (1985) Jana and Jahangir (1990), Serrano *et al.* (1995) and Singh *et al.*(1997) on onion, Seno *et al.* (1995)on garlic. This may be due to the effect of organic manure in increasing the water holding capacity and organic matter content in the soil . Moreover, improve its physical properties, also organic manure supply plants with nutrients which plants need (El-Toukhy. 1982, Parr *et al.*. 1982 and Gamal 1992). Also NPK application to soils supply plants with these nutrients which enhance growth of plants, Nitrogen has an essential metabolic processes in plant growth. Phosphorus is an important element as a constituent of ATP and high energy compound, also Phosphorus are found in the meristematic regions of actively growing plants. Also, Potassium effects processes such as respiration, photosynthesis, chlorophyll development and water content of leaves and its role in stomatal opening and closing.

In general, NPK activate growth of plants (Devlin 1979)

Table (14) : Effect of interaction between organic manure and NPK fertilization levels on vegetative growth characteristics of onion plants| 8 weeks aftertransplanting|.

Seaso / Characters / Treatments		1997-1998				1998-1999			
		Plant length (cm)	No.of leaves /plant	F.W of leaves (g)	D.W of leaves (g)	Plant length (cm)	No.of leaves /plant	F.W of leaves (g)	D.W of leaves (g)
Control	NPK 0	51.8	4.6	7.6	0.6	42.4	4.2	7.8	0.7
	NPK 1	52.3	4.7	8.8	0.7	49.0	4.3	10.3	1.1
	NPK 2	56.7	4.9	10.9	1.3	54.2	4.3	10.3	1.1
	NPK 3	64.0	5.3	13.8	1.3	52.4	4.4	10.8	1.1
F.Y.M. 10	NPK 0	52.3	4.8	10.2	1.4	45.2	4.3	9.5	0.9
	NPK 1	59.6	4.9	15.8	1.5	49.7	4.3	9.1	0.9
	NPK 2	54.6	4.8	13.7	1.6	51.9	4.4	11.8	1.1
	NPK 3	57.8	4.8	13.6	1.5	51.4	4.4	10.5	1.1
F.Y.M. 20	NPK 0	54.0	5.0	12.7	1.2	45.4	4.2	9.6	0.9
	NPK 1	58.8	5.2	12.6	1.1	50.2	4.4	11.3	1.0
	NPK 2	53.8	5.0	14.2	1.5	49.8	4.9	11.9	1.1
	NPK 3	59.3	5.2	15.1	1.4	48.5	4.8	9.1	1.1
T.R 10	NPK 0	54.2	4.9	9.7	1.0	50.0	4.5	10.2	0.8
	NPK 1	59.5	5.2	11.8	1.2	53.9	4.4	10.6	1.0
	NPK 2	60.2	5.2	12.2	1.4	56.1	4.7	11.9	1.2
	NPK 3	62.4	5.4	12.3	1.4	53.6	4.7	13.1	1.3
T.R. 20	NPK 0	51.7	4.8	10.1	1.0	49.9	4.4	9.5	1.1
	NPK 1	59.9	5.3	12.3	1.3	53.8	5.0	15.1	1.3
	NPK 2	59.6	5.0	10.9	1.1	53.3	4.8	12.3	1.3
	NPK 3	56.7	5.1	11.3	1.2	51.1	4.8	11.1	1.1
L.S.D. at 0.05		N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S

Table (15) : Effect of interaction between organic manure and NPK fertilization levels on vegetative growth characteristics of onion plants[12 weeks after transplanting]

Treatments		1997-1998				1998-1999			
		Plant length (cm)	No. of leaves /plant	F.Wof leaves (g)	D.Wof leaves (g)	Plant length (cm)	No. of leaves /plant	F.Wof leaves (g)	D.Wof leaves (g)
Control	NPK 0	57.4	4.8	16.5	1.5	51.9	3.8	15.2	1.4
	NPK 1	64.8	5.1	24.8	2.3	56.8	4.1	20.9	2.1
	NPK 2	68.0	5.4	26.9	2.5	56.4	4.5	21.3	2.4
	NPK 3	69.1	5.6	29.2	3.0	62.4	4.3	21.2	2.4
F.Y.M. 10	NPK 0	64.1	5.0	25.5	2.3	54.7	4.1	17.2	1.8
	NPK 1	70.8	5.6	33.8	3.1	54.5	4.0	18.5	2.0
	NPK 2	70.3	5.8	34.2	2.8	58.8	4.4	22.9	2.5
	NPK 3	69.7	5.5	32.5	3.0	59.0	4.2	18.8	2.2
F.Y.M. 20	NPK 0	59.1	5.2	25.2	2.5	47.8	3.6	18.0	2.0
	NPK 1	64.0	5.7	32.8	3.0	53.2	6.9	20.8	2.4
	NPK 2	72.3	5.7	35.6	3.4	53.6	3.8	22.9	2.7
	NPK 3	71.5	5.6	32.7	3.5	59.0	3.8	22.8	2.7
T.R 10	NPK 0	66.6	5.1	25.0	2.3	54.8	4.2	17.7	1.9
	NPK 1	68.9	5.5	30.0	2.5	59.1	4.3	17.5	2.1
	NPK 2	73.8	6.6	40.7	4.0	60.7	4.5	19.9	2.3
	NPK 3	68.0	5.5	34.2	2.4	58.8	4.3	20.2	2.3
T.R. 20	NPK 0	66.0	5.1	26.7	2.6	52.6	4.0	21.0	2.4
	NPK 1	69.7	5.5	30.2	3.0	57.5	4.5	20.6	2.4
	NPK 2	69.1	5.7	36.4	3.7	60.5	4.3	24.1	2.9
	NPK 3	72.3	5.5	40.2	3.7	59.8	4.3	22.2	2.7
L.S.D. at 0.05		N.S	N.S	N.S	0.6	N.S	N.S	2.4	N.S

Table (16) : Effect of interaction between organic manure and NPK fertilization levels on vegetative growth characteristics of onion plants[16 weeksaftertransplanting].

Treatments \ Characters \ Season		1997-1998				1998-1999			
		Plant length (cm)	No. of leaves /plant	F.Wof leaves (g)	D.Wof leaves (g)	Plant length (cm)	No. of leaves /plant	F.Wof leaves (g)	D.Wof leaves (g)
Control	NPK 0	62.6	5.2	36.2	3.5	58.4	4.6	25.9	2.6
	NPK 1	67.1	6.0	44.7	5.4	61.1	5.3	29.6	3.4
	NPK 2	70.1	6.1	63.1	7.5	59.8	5.3	34.8	3.7
	NPK 3	74.1	5.9	69.4	8.1	63.9	5.7	40.5	4.8
F.Y.M. 10	NPK 0	68.8	5.8	46.9	5.4	61.5	5.1	33.3	4.3
	NPK 1	75.4	5.7	53.5	6.1	63.8	5.6	33.2	4.1
	NPK 2	75.2	6.5	72.3	7.7	73.6	6.0	48.1	5.4
	NPK 3	74.7	5.9	71.7	8.5	64.9	5.5	49.9	5.5
F.Y.M. 20	NPK 0	70.6	6.1	50.0	5.6	62.7	5.5	36.3	3.9
	NPK 1	77.0	6.7	61.1	7.0	64.7	5.4	50.1	5.2
	NPK 2	80.2	6.8	82.2	9.3	66.7	5.6	54.3	5.9
	NPK 3	76.7	6.7	71.5	8.3	59.6	5.5	50.3	5.4
T.R 10	NPK 0	68.5	5.8	53.4	6.1	64.9	5.1	37.1	3.7
	NPK 1	73.5	6.0	64.4	7.1	69.7	5.7	48.9	5.4
	NPK 2	80.8	6.5	73.1	8.7	66.3	5.8	50.8	5.4
	NPK 3	72.8	6.0	64.0	7.4	62.3	5.8	47.2	5.7
T.R. 20	NPK 0	70.8	5.7	58.9	6.8	62.0	5.6	38.8	4.7
	NPK 1	77.3	6.2	61.1	7.0	65.3	6.0	49.1	6.1
	NPK 2	78.2	6.3	78.5	9.6	66.9	6.0	54.4	5.9
	NPK3	75.8	6.5	69.0	8.3	61.8	6.0	49.3	5.3
L.S.D. at 0.05		3.0	N.S	N.S	N.S	N.S	N.S	8.6	N.S

Table (17) : Effect of interaction between organic manure and NPK fertilization levels on vegetative growth characteristics of onion plants[20 weeks after transplanting]

Treatments		1997-1998				1998-1999			
Season / Characters		Plant length (cm)	No.of leaves /plant	F.W.of leaves (g)	D.W.of leaves (g)	Plant length (cm)	No.of leaves /plant	F.W.of leaves (g)	D.W.of leaves (g)
Control	NPK 0	65.1	5.9	60.1	5.9	60.5	5.6	42.2	3.4
	NPK 1	68.1	7.1	73.4	8.6	62.3	6.5	52.6	3.1
	NPK 2	75.5	7.9	79.9	10.3	62.8	6.6	46.5	4.4
	NPK 3	76.6	8.1	82.4	11.0	64.4	6.8	56.3	5.1
F.Y.M. 10	NPK 0	71.3	6.5	73.9	8.5	65.7	6.4	55.9	4.5
	NPK 1	75.5	7.0	84.1	11.2	64.2	6.8	64.3	5.7
	NPK 2	83.6	8.4	95.5	12.8	70.4	6.9	67.4	5.2
	NPK 3	81.1	8.4	85.4	12.0	68.2	7.4	68.5	4.6
F.Y.M. 20	NPK 0	71.0	6.6	78.8	9.4	63.1	6.6	49.2	3.4
	NPK 1	83.1	7.1	100.6	11.4	67.9	7.0	59.6	6.0
	NPK 2	83.4	7.6	104.4	12.7	67.7	7.1	61.6	6.4
	NPK 3	81.9	8.0	109.5	11.7	64.2	6.6	61.3	5.1
T.R 10	NPK 0	76.8	6.5	87.8	10.0	67.1	6.5	67.1	4.8
	NPK 1	78.0	7.4	95.5	11.0	70.6	6.9	74.6	7.2
	NPK 2	84.0	8.6	114.5	12.1	75.6	7.6	90.8	7.6
	NPK 3	85.0	8.8	106.4	11.1	69.2	7.4	91.2	7.2
T.R. 20	NPK 0	80.1	7.5	105.3	12.6	68.5	6.8	72.2	4.9
	NPK 1	80.3	7.9	107.6	12.1	69.1	7.7	73.0	4.9
	NPK 2	84.3	8.5	117.4	13.5	74.2	7.7	79.4	6.9
	NPK 3	85.3	9.5	109.4	12.2	70.3	7.5	77.4	6.5
L.S.D. at 0.05		2.7	N.S	N.S	N.S	N.S	N.S	N.S	N.S

Table (18) : Effect of interaction between organic manure and NPK fertilization levels on bulbing characteristics of onion plants[8 weeks after transplanting].

Treatments	Season / Characters	1997-1998					1998-1999				
		F.W(g) b /P.	D.W(g b/P.	N.D. /P.	B.D. /P.	B.R.	F.W(g b /P.	D.W(g b/P.	N.D. /P.	B.D. /P.	B.R.
Control	NPK 0	3.5	0.4	0.7	1.0	0.7	3.1	0.4	1.0	1.0	0.8
	NPK 1	3.3	0.4	0.7	1.0	0.7	3.4	0.4	1.0	1.1	0.8
	NPK 2	3.5	0.5	0.8	1.1	0.7	3.3	0.3	0.9	1.1	0.8
	NPK 3	4.0	0.5	0.8	1.2	0.7	3.5	0.4	1.0	1.2	0.8
F.Y.M 10	NPK 0	4.3	0.6	0.9	1.2	0.8	3.0	0.4	0.7	0.9	0.8
	NPK 1	3.5	0.6	0.8	1.0	0.8	3.6	0.5	0.9	1.1	0.8
	NPK 2	4.4	0.5	0.8	1.0	0.8	3.4	0.4	0.8	1.0	0.8
	NPK 3	4.5	0.5	0.8	1.0	0.8	3.2	0.4	0.8	1.0	0.8
F.Y.M. 20	NPK 0	3.7	0.5	0.8	1.0	0.8	3.5	0.5	0.8	1.1	0.7
	NPK 1	3.9	0.6	0.7	1.0	0.8	3.9	0.5	0.9	1.2	0.8
	NPK 2	3.9	0.5	0.7	0.9	0.8	4.4	0.4	0.8	1.0	0.8
	NPK 3	4.2	0.5	0.8	1.0	0.8	4.5	0.5	0.8	1.1	0.8
T.R.10	NPK 0	3.3	0.5	0.8	1.1	0.7	3.9	0.5	0.9	1.0	0.8
	NPK 1	3.6	0.5	0.9	1.1	0.8	4.0	0.5	1.0	1.2	0.9
	NPK 2	5.0	0.5	0.7	1.1	0.7	5.1	0.6	0.9	1.1	0.8
	NPK 3	5.5	0.8	0.8	1.2	0.7	4.2	0.6	1.0	1.2	0.8
T.R. 20	NPK 0	3.9	0.5	0.8	1.2	0.7	3.9	0.5	1.0	1.3	0.8
	NPK 1	4.3	0.5	0.8	1.1	0.8	4.6	0.6	1.2	1.5	0.8
	NPK 2	4.4	0.6	0.9	1.1	0.8	4.0	0.5	1.0	1.3	0.8
	NPK 3	4.0	0.5	0.7	1.1	0.7	3.7	0.5	1.0	1.2	0.8
L.S.D. at 0.05		N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S

F.W.b./P. = Fresh weight of bulb /plant (g.)

D.W.b./P. = Dry weight of bulb /plant (g.)

B.D./P. = Bulb diameter / plant (cm)

N.D./P. = Neck diameter / plant (cm)

B.R. = Bulbing ratio .

Table (19) : Effect of interaction between organic manure and NPK fertilization levels on bulbing characteristics of onion plants[12 weeks after transplanting].

Season / Characters / Trentments		1997-1998					1998-1999				
		F.W(g)b /P.	D.W(gb/P.	N.D. /P.	B.D. /P.	B.R.	F.W(gb /P.	D.W(gb/P.	N.D. /P.	B.D. /P.	B.R.
Control	NPK 0	6.5	0.6	1.0	1.3	0.8	4.0	0.5	0.8	1.2	0.7
	NPK 1	7.0	0.9	1.2	1.5	0.8	5.6	0.7	1.1	1.4	0.8
	NPK 2	8.2	1.2	1.3	1.6	0.8	5.6	0.8	1.1	1.4	0.8
	NPK 3	9.9	1.4	1.3	1.6	0.9	7.0	1.0	1.0	1.5	0.7
F.Y.M. 10	NPK 0	8.0	1.0	1.2	1.5	0.9	4.7	0.6	1.0	1.3	0.8
	NPK 1	9.3	1.2	1.3	1.6	0.8	4.8	0.7	0.9	1.4	0.6
	NPK 2	9.4	1.3	1.3	1.7	0.8	6.8	1.0	1.1	1.5	0.7
	NPK 3	11.3	1.5	1.3	1.6	0.8	6.0	0.9	1.0	1.5	0.7
F.Y.M. 20	NPK 0	8.4	1.2	1.2	1.6	0.8	4.8	0.7	1.0	1.4	0.7
	NPK 1	9.5	1.3	1.3	1.7	0.8	4.6	0.7	1.0	1.4	0.7
	NPK 2	10.8	1.5	1.3	1.8	0.8	5.8	0.9	1.0	1.6	0.6
	NPK 3	11.8	1.6	1.3	1.6	0.8	5.9	0.9	1.0	1.5	0.7
T.R 10	NPK 0	7.2	0.9	1.2	1.4	0.9	4.6	0.5	1.0	1.3	0.8
	NPK 1	9.8	1.3	1.2	1.6	1.0	5.0	0.7	1.1	1.3	0.8
	NPK 2	12.5	1.8	1.4	1.8	0.8	7.5	1.2	1.0	1.5	0.7
	NPK 3	10.8	1.5	1.3	1.6	1.0	7.0	1.1	1.1	1.4	0.8
T.R. 20	NPK 0	8.9	1.2	1.2	1.6	0.8	5.6	0.7	0.9	1.4	0.6
	NPK 1	10.5	1.5	1.3	1.6	0.8	7.4	1.1	1.2	1.4	0.8
	NPK 2	10.2	1.6	1.2	1.8	0.8	6.4	1.1	1.0	1.6	0.6
	NPK 3	10.1	1.5	1.4	1.7	0.8	6.8	1.1	1.0	1.6	0.6
L.S.D. at 0.05		N.S	N.S	N.S	N.S	N.S	1.0	1.9	N.S	0.2	0.1

F.W.b./P. =Fresh weight of bulb /plant (g.) D.W.b./P. =Dry weight of bulb /plant (g.)

B.D./P. = Bulb diameter / plant (cm) N.D./P. = Neck diameter / plant (cm)

B.R. = Bulbing ratio .

Table (20) : Effect of interaction between organic manure and NPK fertilization levels on bulbing characteristics of onion plants[16 weeks after transplanting].

Treatments \ Characters \ Season		1997-1998					1998-1999				
		F.W(g) b /P.	D.W(g b/P.	N.D. /P.	B.D. /P.	B.R.	F.W(g b /P.	D.W(g b/P.	N.D. /P.	B.D. /P.	B.R.
Control	NPK 0	10.6	1.5	0.9	1.5	0.6	10.6	1.4	1.3	2.0	0.7
	NPK 1	12.8	1.8	1.7	2.3	0.7	14.5	1.9	1.4	2.3	0.6
	NPK 2	18.4	2.7	2.1	2.7	0.8	14.7	2.1	1.4	2.4	0.6
	NPK 3	19.1	2.8	1.8	2.7	0.7	17.0	2.5	1.6	2.5	0.6
F.Y.M. 10	NPK 0	14.0	2.0	1.6	2.0	0.8	17.8	2.5	1.6	2.3	0.7
	NPK 1	15.7	2.3	1.6	2.0	0.8	18.9	2.4	1.5	2.4	0.6
	NPK 2	20.6	3.1	1.8	2.4	0.8	24.9	2.8	1.7	2.9	0.6
	NPK 3	19.7	3.1	1.9	2.7	0.7	22.2	2.9	1.6	2.9	0.6
F.Y.M. 20	NPK 0	17.4	2.8	1.8	2.4	0.8	18.7	2.9	1.6	2.5	0.6
	NPK 1	17.8	2.7	2.0	2.6	0.8	18.6	3.8	1.5	2.5	0.6
	NPK 2	23.2	3.8	1.9	2.5	0.8	24.6	3.5	1.6	2.7	0.6
	NPK 3	21.8	3.3	2.0	3.0	0.7	22.8	3.2	1.7	2.7	0.7
T.R 10	NPK 0	15.2	2.4	1.8	2.3	0.8	14.0	2.0	1.4	2.0	0.7
	NPK 1	16.4	2.5	1.7	2.3	0.7	15.4	2.2	1.5	2.3	0.7
	NPK 2	20.9	3.6	1.9	2.6	0.8	17.7	3.5	1.4	2.4	0.6
	NPK 3	17.2	3.2	1.9	2.5	0.8	17.3	2.8	1.5	2.6	0.5
T.R. 20	NPK 0	18.0	2.9	1.7	2.3	0.7	18.5	2.9	2.1	1.3	0.6
	NPK 1	18.4	3.0	1.6	2.0	0.8	18.7	3.0	2.4	1.5	0.6
	NPK 2	21.1	3.7	1.7	2.3	0.8	25.1	3.5	2.4	1.5	0.6
	NPK 3	18.4	3.1	1.7	2.4	0.7	21.1	3.4	2.6	1.6	0.6
L.S.D. at 0.05		N.S	N.S	N.S	0.4	N.	N.	N.S	N.S	N.S	N.S

F.W.b./P. =Fresh weight of bulb /plant (g.)

D.W.b./P. =Dry weight of bulb /plant (g.)

B.D./P. = Bulb diameter / plant (cm)

N.D./P. = Neck diameter / plant (cm)

B.R. = Bulbing ratio .

Table (21) : Effect of interaction between organic manure and NPK fertilization levels on bulbing characteristics of onion plants[20 weeks after transplanting].

Treatments \ Characters \ Season		1997-1998					1998-1999				
		F.W.b. /P.	D.W.b. /P.	N.D. /P.	B.D. /P.	B.R.	F.W.b /P.	D.W.b /P.	N.D. /P.	B.D. /P.	B.R.
Control	NPK 0	52.0	4.4	1.5	3.5	0.4	48.9	5.3	1.8	4.2	0.4
	NPK 1	59.3	5.4	1.9	3.8	0.5	65.6	8.3	1.9	4.7	0.4
	NPK 2	68.6	7.8	2.4	4.2	0.6	73.7	8.9	1.8	5.4	0.3
	NPK 3	73.3	8.7	2.1	5.1	0.4	70.6	9.3	1.8	5.3	0.3
F.Y.M. 10	NPK 0	62.1	8.1	1.8	3.9	0.5	62.8	8.8	1.9	5.0	0.4
	NPK 1	68.1	7.9	2.2	4.1	0.5	71.6	10.7	2.0	5.2	0.4
	NPK 2	71.3	11.2	2.2	4.7	0.5	83.8	12.6	1.9	5.6	0.3
	NPK 3	71.5	10.6	2.4	4.7	0.5	69.9	9.8	1.9	5.4	0.4
F.Y.M. 20	NPK 0	61.4	8.5	1.6	4.4	0.4	62.6	8.3	1.7	5.0	0.3
	NPK 1	66.5	8.9	2.3	4.6	0.5	76.4	9.6	1.8	5.4	0.3
	NPK 2	73.2	10.2	2.4	5.4	0.4	81.6	9.9	1.8	5.5	0.3
	NPK 3	67.0	11.3	2.9	5.3	0.6	72.1	10.4	1.8	5.2	0.4
T.R 10	NPK 0	68.0	7.9	2.3	3.8	0.6	56.0	8.2	1.8	5.3	0.3
	NPK 1	69.8	9.9	2.2	4.2	0.6	74.2	10.7	1.7	5.3	0.3
	NPK 2	85.3	10.5	2.6	5.0	0.5	92.2	12.6	2.0	5.7	0.4
	NPK 3	73.3	9.9	2.7	4.8	0.6	83.7	11.3	2.0	5.6	0.4
T.R. 20	NPK 0	76.0	9.0	2.4	4.6	0.5	76.5	10.4	2.0	5.1	0.4
	NPK 1	80.9	12.2	1.9	4.8	0.4	87.9	13.4	1.9	5.7	0.3
	NPK 2	87.0	9.3	2.3	5.5	0.4	106.9	15.2	2.0	5.9	0.3
	NPK 3	86.4	12.1	2.5	5.4	0.5	89.1	13.0	2.0	5.6	0.4
L.S.D. at 0.05		N.S	N.S	N.S	N.S	0.1	N.S	N.S	N.S	N.S	N.S

F.W.b./P. =Fresh weight of bulb /plant (g.) D.W.b./P. =Dry weight of bulb /plant (g.)

B.D./P. = Bulb diameter / plant (cm) N.D./P. = Neck diameter / plant (cm)

B.R. = Bulbing ratio.

4.2. Yield and its components :-

4.2.1. Yield and its components as affected by organic manure :-

Yield and its components of onions as affected by FYM and town refuse application were expressed as total yield, fresh and dry weight of bulb per plant, bulb and neck diameter in addition to bulbing ratio are presented in Table (22) and Figures (19-20).

Such data reveal that organic manures application either in a form of FYM or TR significantly increased total yield in both growing seasons. As regard, town refuse application at rates 10 or 20 t/fad. surpassed the other treatments in their effects on fresh and dry weight of bulb and bulb diameter per plant and show a positive significant effect on these characters when compared with the control treatment in both growing seasons. Also, application of FYM at 20 t/fad surpassed FYM at 10 t/fad in its effect on fresh and dry weight of bulb and bulb diameter per plant. On the other hand, organic manures application had no effect on neck diameter and bulbing ratio of onions.

The positive effect of organic manure on yield and its components of many vegetables including onion was documented in many reviews, Pereira and Bliss (1989) and Khalaf and Taha (1988) on garlic under calcareous soil conditions. Also, the results agree with those obtained by Haroon and Ramulu (1990), Giardini *et al.*(1992), Seno (1995) ,Serrano *et al.*(1995), Bhattarai and Subedi (1996) and Singh *et al.*(1997), on onion plants.

Obtained results on yield and its components are connected with the effect of O.M on vegetative growth (Tables 6-12)

The positive effect of organic manure application on yield of onion may be due to the addition of different amounts of farmyard manure and town refuse increased organic matter percentage and improve the structure and physical properties of soil (Parr *et al.*1982 and Gamal. 1992) . Also, organic manure supply soil with nutrients which plants need in growth period and consequently improve yield of plants (Kinoshita *et al.* 1986 and Ekbladh 1995). Moreover Khalil *et al.*(1991) found that application of garbage and sheep dung induce proliferation of lateral roots and root hairs and increase the nutrient absorption surface. Application of garbage manure stimulates growth and activity of microorganisms and improve yield of plants.

4.2.2. Yield and its components as affected by NPK fertilizers :-

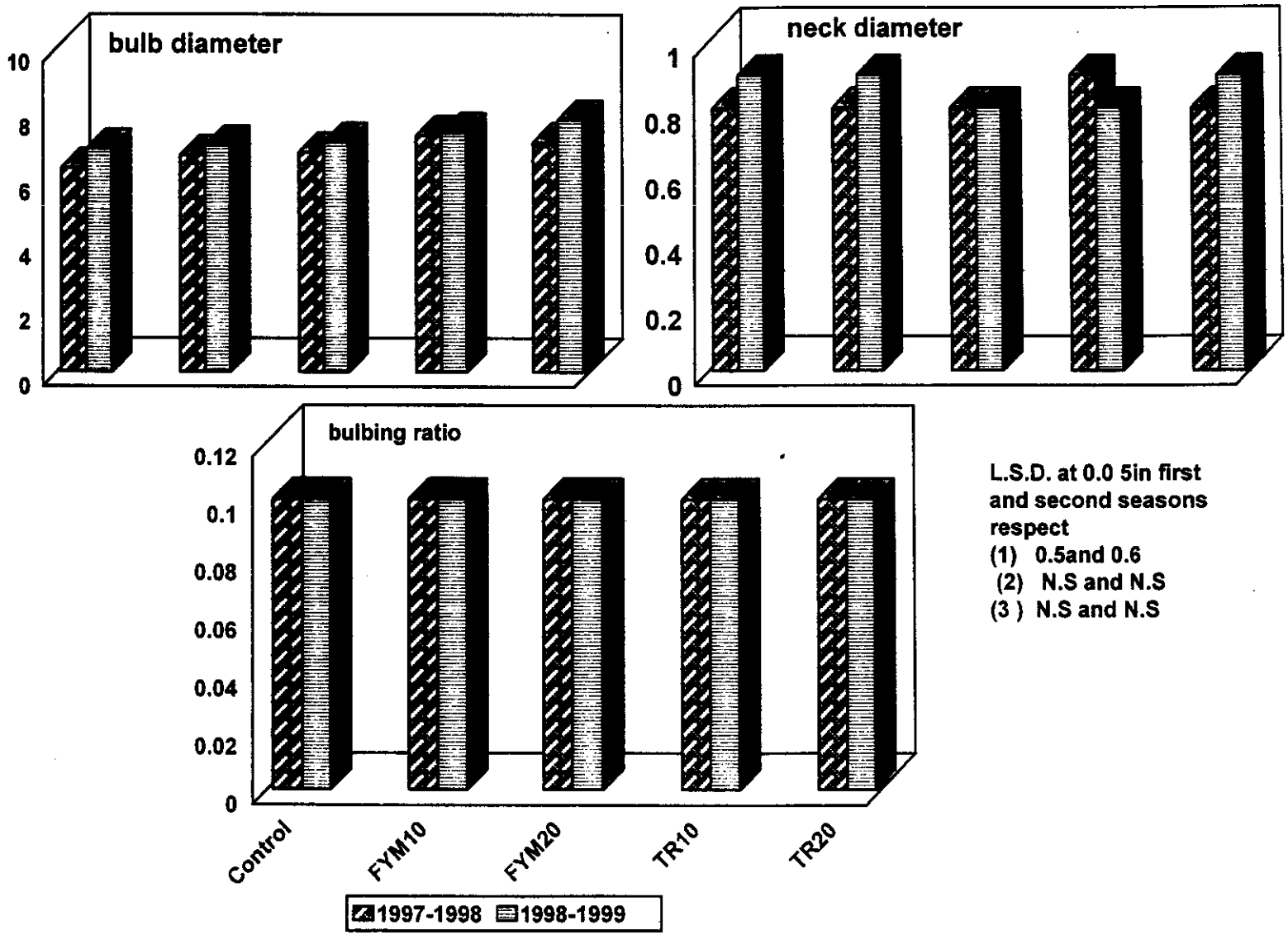
Data illustrated in Table (22) and Figures (21-22) indicate the effect of NPK levels applied as soil fertilizers under calcareous soil conditions on total yield and its components of onions.

Obtained results show that the addition of NPK at different used levels significantly increased total yield, fresh and dry weight of bulb as well as bulb diameter per plant when compared with control treatment during two growing seasons . The second levels of NPK (60: 45: 75 kg/fad) recorded the highest data, when compared with other treatments of NPK application. On the other hand, applying NPK levels had no effect on neck diameter and bulbing ratio of onions.The positive effect of NPK application on yield and its components of onion agree with results obtained by, El-Aweel (1976), Maier *et al.*(1990), Rahim *et al* Casanova *et al.*(1994), Katwale and Saraf.(1994), Anez *et al.*(1996), Serrano *et al.* (1995), Kokoleva and. Kostyrkina.(1993), Sharma *et al* (1994), Wange (1995), Warade *et al.* (1996), Ashak and Singh (1996), Singh (1997), Vachhani and Patel (1996), Dixit (1997), Rizk (1997), and Abd-El- Latif .(1999). The increase of onion yield and its components with NPK

Table (22) : Effect of organic manure or NPK fertilization levels on bulbing characteristics and total yield of onion plants [at harvest].

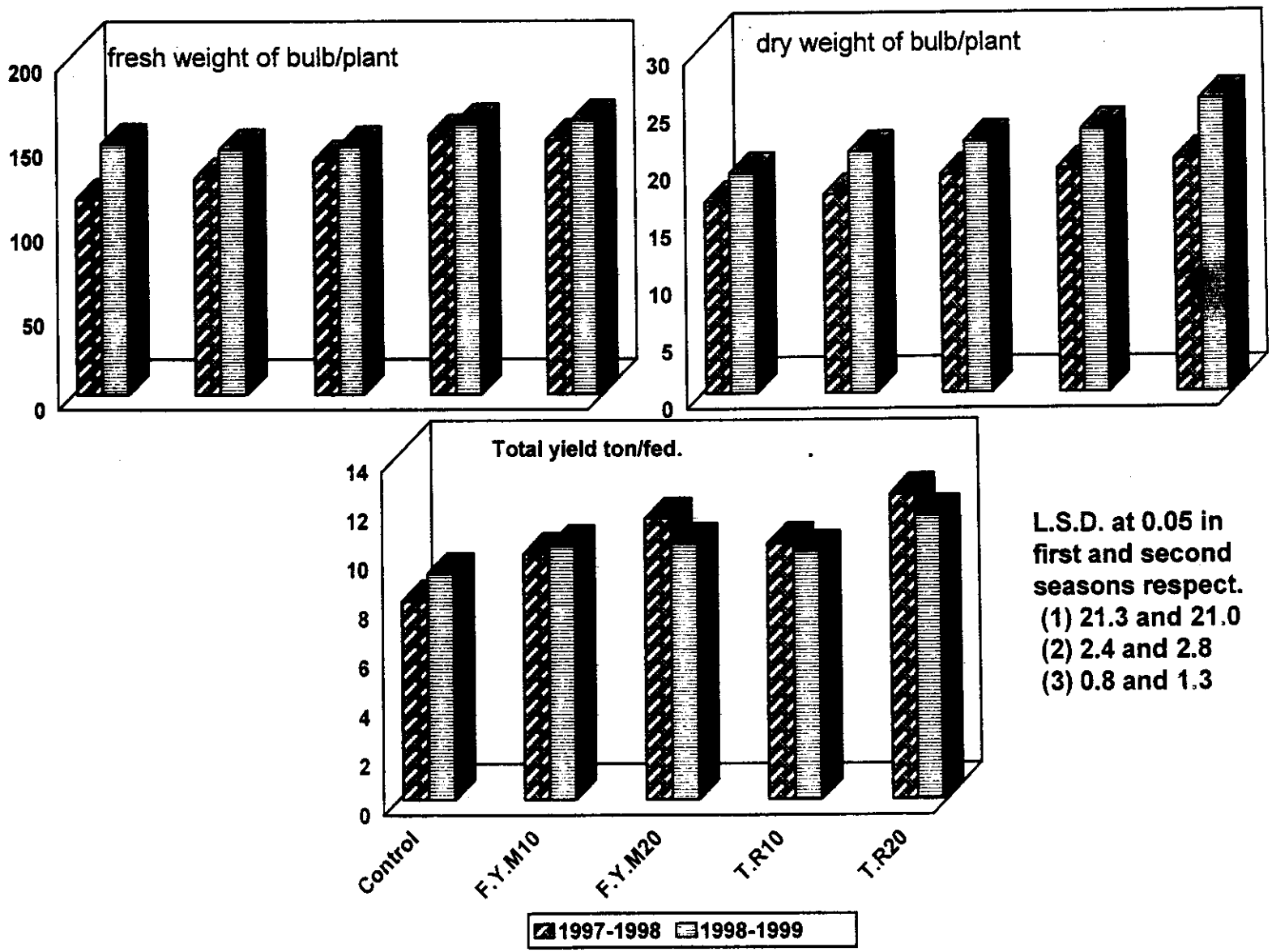
Season / Charat. / Treat.	1997-1998						1998-1999					
	F.W. of bulb/ plant(g)	D.W. of bulb/ plant(g)	neck diameter	bulb diameter	bulbing ratio	Total yield (ton/fed	F.W. of bulb/ plant(g)	D.W. of bulb/ plant(g)	neck diameter	bulb diameter	bulbing ratio	Total yield (ton/fed
Effect of Organic manure (ton/fed												
Control	115.7	16.7	0.8	6.3	0.1	8.080	148.5	19.2	0.9	6.9	0.1	9.200
$FYM_{10\ (ton/\ fad)}$	128.1	17.3	0.8	6.7	0.1	10.000	145.1	21.0	0.9	7.0	0.1	10.320
$FYM_{20\ (ton/\ fad)}$	138.5	19.0	0.8	6.8	0.1h	11.440	146.7	21.9	0.8	7.1	0.1	10.400
$TR_{\ 10(\ ton/\ fad)}$	153.3	19.5	0.9	7.3	0.1	10.400	159.9	22.9	0.8	7.4	0.1	10.080
$TR_{\ 20\ (\ ton/\ fad)}$	150.5	20.3	0.8	7.1	0.1	12.400	162.0	25.5	0.9	7.8	0.1	11.520
L.S.D at 0.05	21.3	2.4	N.S	0.5	N.S	1.7	21.0	2.8	N.S	0.6	N.S	1.1
Effect of NPK (Kg/fad)												
$NPK_{\ (0:0:0)}$	111.7	13.2	0.8	6.1	0.1	9.040	133.1	18.5	0.8	6.9	0.1	9.120
$NPK_{1(40:30:50kg/fad)}$	134.8	18.6	0.8	6.8	0.1	10.240	159.5	22.5	0.8	7.2	0.1	10.160
$NPK_{2(60:45:75kg/fad)}$	150.8	20.7	0.8	7.2	0.1	11.280	152.1	23.7	0.9	7.4	0.1	10.960
$NPK_{3(80:60:100kg/fad}$	149.5	21.7	0.9	7.3	0.1	11.280	165.0	23.6	0.9	7.3	0.1	10.960
L.S.D at 0.05	14.7	2.3	N.S	0.4	N.S	0.9	13.9	2.3	N.S	0.3	N.S	0.8

Fig (19) : Effect of organic manure fertilization levels on bulb , neck diameter (cm) and bulbing ratio [at harvest during 1997-1998 and 1998-1999]



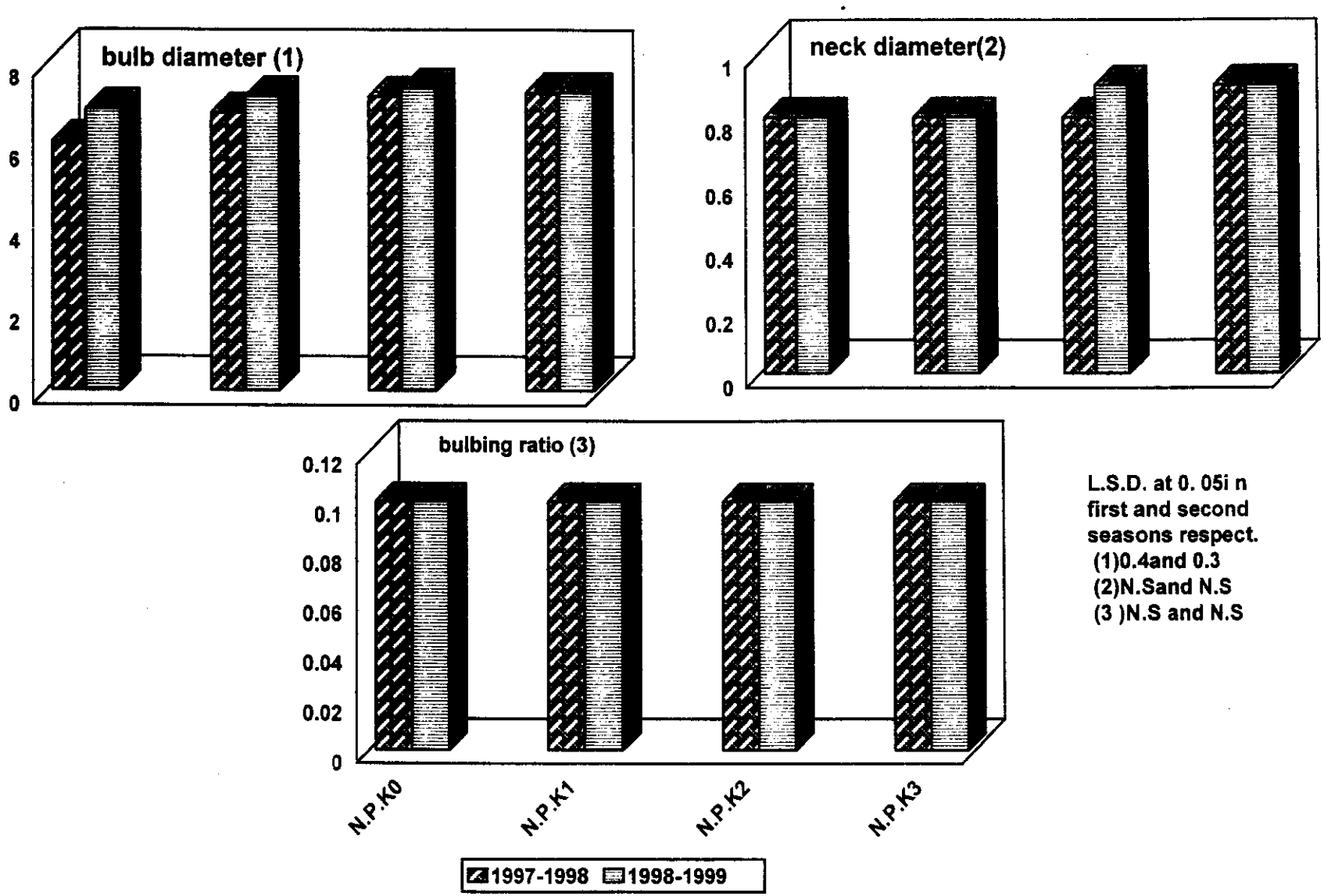
L.S.D. at 0.0 5in first and second seasons respect
(1) 0.5and 0.6
(2) N.S and N.S
(3) N.S and N.S

Fig (20) : Effect of organic manure fertilization levels on fresh , dry weight of bulb (g)/plant and total yield ton/fed. [at harvest during 1997-1998 and 1998-1999]



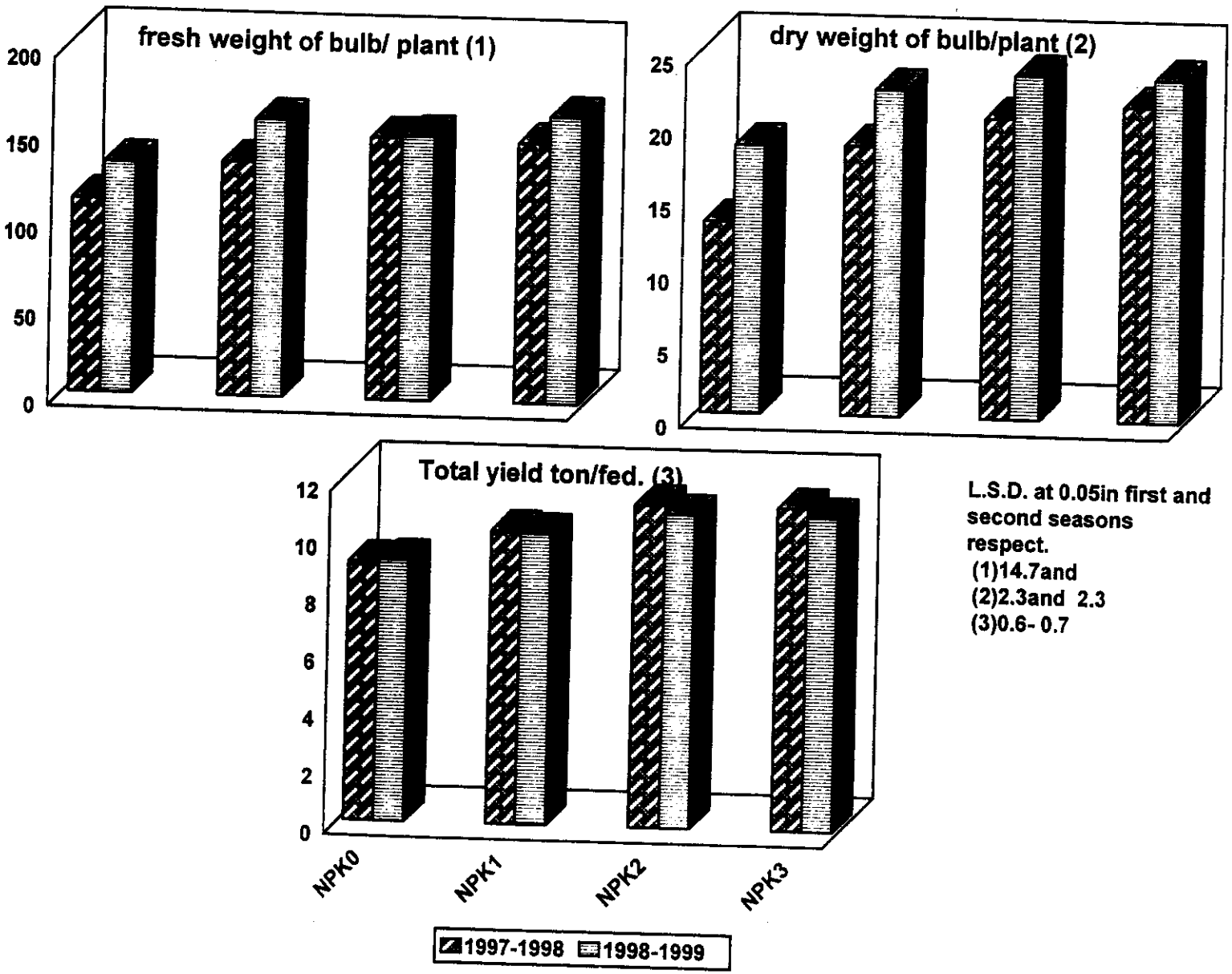
L.S.D. at 0.05 in first and second seasons respect.
(1) 21.3 and 21.0
(2) 2.4 and 2.8
(3) 0.8 and 1.3

Fig (21) : Effect of NPK fertilization levels on bulb , neck diameter (cm) and bulbing ratio [at harvest during 1997-1998 and 1998-1999]



L.S.D. at 0. 05i n first and second seasons respect.
(1)0.4and 0.3
(2)N.Sand N.S
(3)N.S and N.S

Effect of NPK fertilization levels on fresh , dry weight of bulb (g)/plant and total yield ton/fed. [at harvest during 1997-1998 and 1998-1999] .



L.S.D. at 0.05in first and second seasons respect.
(1)14.7and
(2)2.3and 2.3
(3)0.6- 0.7

addition connected with the effect of such macro-nutrients on vegetative growth. Similar results were reported also by Rizk (1997) who mentioned that the highest bulbs yield of onion was obtained with the highest N, P_2O_5 and K_2O fertilizer rates. Application of nitrogen in high concentration increase leaf cell number and cell size and increase leaf production and protein synthesis, which subsequently causes increase in production of crop.

It is worthy to mention that phosphorus is essential for photosynthesis processes, respiration, nitrogen and carbohydrate metabolism and fatty acid synthesis, also potassium is essential for respiration, chlorophyll and photosynthesis development and protien synthesis and metabolism. The previous important roles of NPK in plants were increasing and improving growth and yield of plants (Devlin. 1979).

4.2.3. Yield and its components as affected by interaction between organic and NPK fertilizers :-

Results presented in Table (23-24) reveal the effect of interaction between FYM or town refuse and NPK levels on total yield, fresh and dry weight of bulb, bulb and neck diameter and bulbing ratio.

Obtained data show significant increase of total yield and fresh weight of bulb per plant with organic manures and NPK application when compared with control treatment. The highest values of total yield achieved with treatments, town refuse at 20 t/fad plus $(NPK)_2$ (60 + 45+ 75 kg/ fad), T.R at 20 t/fad+ $(NPK)_3$ (80 + 60+ 100 kg/fad), T.R 10 t/fad + $(NPK)_3$ and FYM at 20 t/fad with $(NPK)_2$ respectively. While the highest values of bulb fresh weight obtained with treatments $(NPK)_3$, FYM at 20 t/fad + $(NPK)_1$,T.R at 10 t/fad + $(NPK)_2$ and T.R at 20 t/fad +($NPK)_1$. In general organic manures and NPK addition exhibited increase in onion yield and its components when compared with control treatment.

Table (23) : Effect of interaction between organic manure and NPK fertilization levels on bulbing characteristics and total yield of onion plants[at harvest].

Treatments	Characters / Season	1997-1998			1998-1999		
		F.W(g) b./P	D.W.(g b/P	T.Y	F.W(g) b./P	D.W.(g b/P	T.Y
Control	NPK 0	73.3	7.7	5.520	113.6	13.5	6.960
	NPK 1	92.0	13.8	7.600	134.7	17.8	9.360
	NPK 2	139.5	20.8	8.480	148.7	21.8	9.760
	NPK 3	158.0	24.4	10.720	197.0	23.5	10.880
F.Y.M. 10	NPK 0	100.5	13.3	8.320	119.3	16.2	9.280
	NPK 1	124.4	17.4	8.320	154.6	19.4	9.760
	NPK 2	136.6	19.3	9.920	139.0	23.5	11.200
	NPK 3	150.8	19.2	10.960	167.6	24.9	11.040
F.Y.M. 20	NPK 0	109.6	14.9	10.160	137.0	17.7	9.520
	NPK 1	150.3	21.1	11.840	180.0	24.7	10.720
	NPK 2	148.4	18.7	12.080	130.0	23.2	10.880
	NPK 3	145.8	21.4	11.600	138.7	21.8	10.800
T.R 10	NPK 0	149.5	13.4	9.200	148.5	20.3	9..280
	NPK 1	149.9	19.9	9.600	157.7	23.6	9.360
	NPK 2	171.5	23.1	11.760	174.5	24.8	11.200
	NPK 3	142.3	21.6	12.480	158.7	22.7	10.640
T.R. 20	NPK 0	135.8	16.7	11.920	146.9	24.8	10.480
	NPK 1	157.5	20.9	12.000	170.2	26.8	11.920
	NPK 2	158.2	21.6	13.200	167.5	25.1	11.760
	NPK 3	150.7	22.1	12.560	163.1	25.2	11.760
L.S.D. at 0.05		N.S	N.S	2.1	31.2	N.S	N.S

F.W.b./P. =Fresh weight of bulb /plant (g.) **D.W.b./P. =Dry weight of bulb /plant (g.)**

T.Y = Total yield (ton /fad).

Table (24) : Effect of interaction between organic manure and NPK fertilization levels on bulbing characteristics of onion plants|at harvest|.

Treatments	Characters / Season	1997-1998			1998-1999		
		B.D. /P.	N.D /P.	B.R.	B.D. /P.	N.D /P.	B.R.
Control	NPK 0	4.7	0.7	0.2	6.3	0.8	0.1
	NPK 1	6.1	0.6	0.1	7.0	0.8	0.1
	NPK 2	7.0	0.9	0.1	6.9	1.0	0.1
	NPK 3	7.3	0.9	0.1	7.2	1.0	0.1
F.Y.M. 10	NPK 0	6.2	0.8	0.1	6.7	0.9	0.1
	NPK 1	6.6	0.8	0.1	7.1	0.9	0.1
	NPK 2	7.0	0.8	0.1	7.0	0.9	0.1
	NPK 3	6.9	0.9	0.1	7.2	0.8	0.1
F.Y.M. 20	NPK 0	6.2	0.8	0.1	6.9	0.8	0.1
	NPK 1	6.8	0.8	0.1	6.6	0.9	0.1
	NPK 2	7.0	0.8	0.1	7.6	0.8	0.1
	NPK 3	7.2	0.9	0.1	7.3	0.8	0.1
T.R 10	NPK 0	7.0	0.8	0.1	7.0	0.8	0.1
	NPK 1	7.3	1.0	0.1	7.5	0.7	0.1
	NPK 2	7.5	0.9	0.2	7.7	0.9	0.1
	NPK 3	7.4	0.9	0.1	7.2	0.8	0.1
T.R. 20	NPK 0	6.5	0.7	0.1	7.5	0.7	0.1
	NPK 1	7.0	0.9	0.1	7.9	0.9	0.1
	NPK 2	7.5	0.8	0.1	7.9	1.0	0.1
	NPK 3	7.5	0.8	0.1	7.9	1.0	0.1
L.S.D. at 0.05		N.S	N.S	N.S	N.S	N.S	N.S

B.D./P. = Bulb diameter / plant (cm) **N.D./P. = Neck diameter / plant (cm)**

B.R. = Bulbing ratio.

These results in the same trend with results obtained by Reddy (1985) and Tashkhodzhaev (1985). Also, Muzika (1986) reported that the best results of onion yield was obtained by addition of 30 ton FYM +N: P_2O_5: K_2O at 120: 90: 90 kg/ha, respectively. The results obtained by Koltunov (1984), Jana and Jahangir (1990), Giardini *et al.*(1992), Casanova *et al.*(1994), Sharama *et al.* (1994), Wange .(1995), Warade *et al.* (1996), Resende *et al.*(1996), Dixit .(1997), Singh *et al.* (1997), and Zhang *et al.*(1998) may be due to the effect of both organic manure and NPK application on yield of onion as mentioned before.

Obtaiend results show that application of 20 t/fad. town refuse with NPK fertilizer at a rate of (60 N+ 45 P_2O_5 + 75 K_2O) in first season and 20 t/fad. town refuse with (40 N+ 30 P_2O_5 + 50 K_2O) on onion plants gave the highest total yield in second season than the other treatments under study.

4.3. Chemical composition

4.3. Chemical composition as affected by organic manure : -

Differences in bulb minerals content in onion in relation to organic manures treatments as FYM andTR under calcareous soil conditions are shown in Tables (25) and Figures (23).

Results indicated that organic manures treatments, in general, were effective to increase significantly nitrogen, phosphorus and potassium contents in bulbs at 26 weeks harvest, when compared with control treatment. The highest values of NPK content were in plants received town refuse at 20 t/fad. in both growing seasons. Town refuse treatments at 20 and 10 t/fad, respectively and FYM treatments at 20 t/fad., significantly increased nitrogen content in bulb when compared with the control. Phosphorus content in bulbs was significantly increased with all treatments of organic manure in both growing seasons. The highest values of phosphorus content obtained with T.R

followed by FYM at 20 and 10 t/fad. respectively. The highest values of potassium content in onions obtained with treatments in descending order were T.R at 20 t/fad, FYM at 20 t/fad, T.R Treatment at 10 t/fad, then FYM at 10 t/fad .

The positive effect of organic manures application on NPK contents in onions agree with results obtained by Kinoshita *et al.* (1986) on onion plants, Haroon and Romulu (1990) Also, Anid *et al.*(1983) Khalaf and Taha (1988) mentioned that organic manure application in calcareous soils increased NPK contents in garlic plants. Many investigators obtained results in the same line on many kinds of vegetables (Abo-El-Defan. 1990, Abo- Hussein,1995 ,Atef . 1992, Shehata, 1992 ,El-Shimi. 1998 and Soliman *et al.* 1991). The favourable effect of organic manure on NPK content may be due to its beneficial effect on soil reaction and the availability of nutrients to plants in addition to supply plants with nutrients already existed in organic manure, similar results were reported by Khalil *et al.*(1991).

Regarding the effect of organic manure on T.S.S of onion bulbs, data in Table (25) and Figure (23) indicated that application of organic manure to onion plants significantly increased T.S.S in onion bulbs in both growing seasons under study. The increase in T.S.S of onion bulbs with application of organic manures may be due to the effective role of organic manure which provides the soil with essential elements, this improve in plant bioprocess leads to improve fruit quality and T.S.S. (Soubeih 1998). Obtained results agree with Midan (1995) who showed that application of organic manure increased pigments, V.C. and T.S.S in pepper fruit.

Concerning, results in Table (25) and figure (25) indicated that organic manure application increased heavy metals content in onion bulbs as cadmuim

(Cd), lead (Pb) and nickel (Ni) when compared with control treatment in both growing seasons. these results agree with those obtained by, Ozores *et al.*(1994) Eissa (1996) and Abdel-Aty (1997) on different kinds of vegetables. This may be due to, existance of heavy metals in organic manure and the release of these elements to the soil after analysis of the compounds of organic manure and insequance plants uptake these elements from solution of soil and increase their contents in plants. This result agree with Duch (1979) and Khalil *et al.* (1991)

4.3.2 Chemical composition as affected byNPK fertilizers : -

Data tabulated in Table (25) and Figures (24)revealed the effect of different NPK rates on the chemical composition of onion bulbs expressed as NPK content, percentage ofT.S.S as well as heavy metals (pb, Cd and Ni)under calcareous soil condition during 1997-1998 and 1998-1999 growing seasons. With increasing rates of NPK application to the soil significantly increased in the NPK content in onion bulbs, when compared to control. The NPK content increased gradually with increasing rate of NPK fertilizers. The highest values obtained with the third rate of NPK (80: 60: 100 kg/fad). Obtained results are in the same harmony with those obtained by Oukal (1999).This may be due to addition of NPK to the soil increased its level in soil solution and with increasing levels of application increase the uptake of NPK within the plant (Patel *et al.* 1992 and Farghali and Zeid, 1995).

Regarding, the effect of NPK fertilizers on T.S.S content , data recorded in Table (25) and Figure (24) show that NPK application to onion plants at different rates under study induced significant increase in T.S.S of onion bulbs, when compared with control treatment, during both growing seasons. The second and third rates of NPK enhanced the chemical compostion of bulbs than other treatments and achieved the highest percentages of T.S.S in onion bulbs.

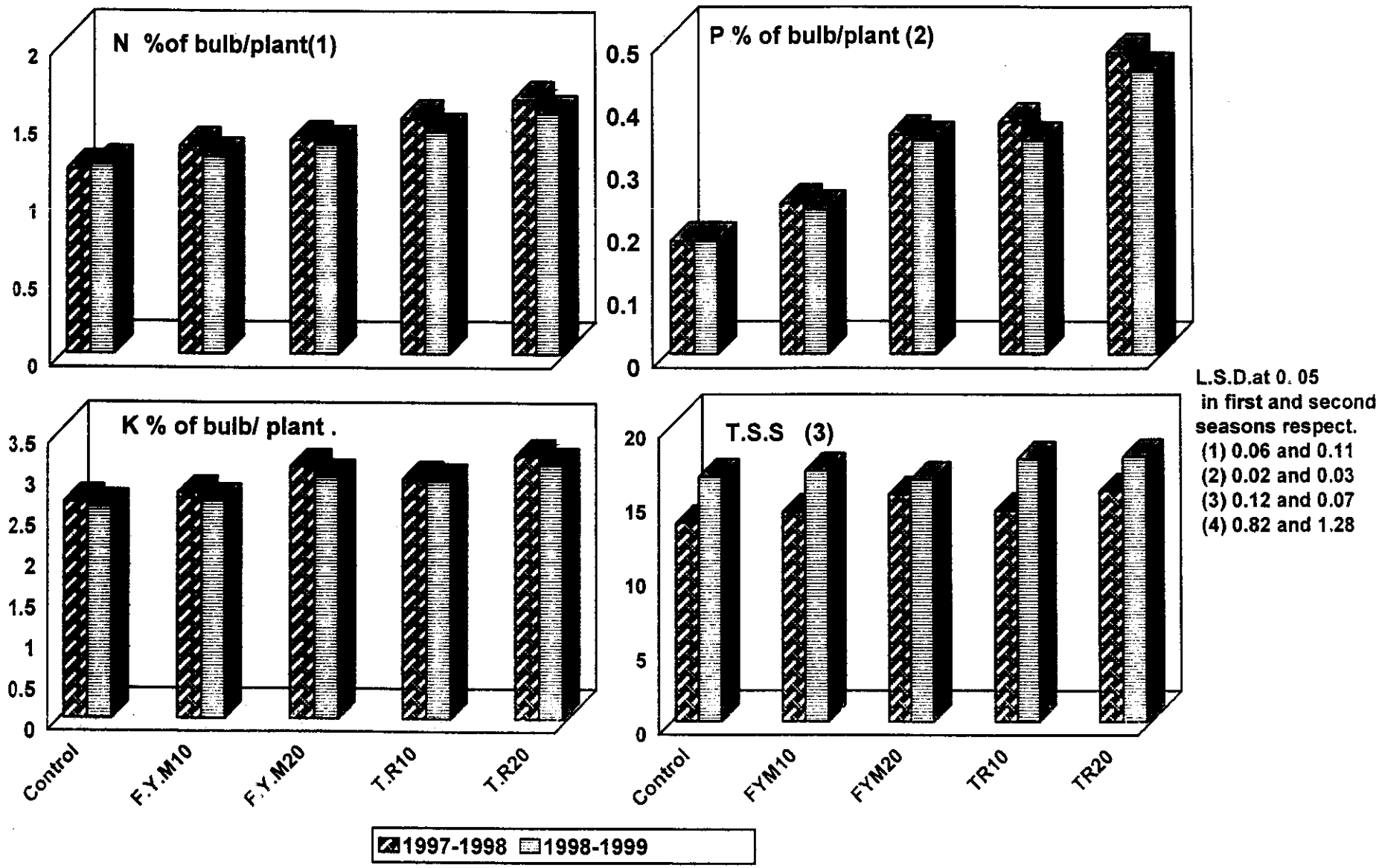
Table (25) : Effect of organic manure or NPK fertilization levels on NPK *Mineral content* and T.S.S of onion.

Season / Charat. / Treat.	1997-1998				1997-1998			
	Mineral content							
	N%	*P%*	*K%*	T.S.S%	*N%*	*P%*	*K%*	T.S.S%
Effect of Organic manure (ton/fad)								
Control	1.19	0.18	2.64	*13.35*	1.22	0.18	2.58	*16.49*
$FYM_{10\ (ton/\ fad)}$	1.34	0.24	2.75	*14.10*	1.27	0.23	2.65	*16.90*
$FYM_{20\ (ton/\ fad)}$	1.38	0.35	3.08	*15.29*	1.35	0.34	2.95	*16.29*
$TR_{\ 10(\ ton/\ fad)}$	1.52	0.37	2.93	*14.19*	1.43	0.34	2.9	*17.69*
$TR_{\ 20\ (\ ton/\ fad)}$	1.64	0.48	3.21	*15.55*	1.55	0.45	3.10	*17.87*
L.S.D at 0.05	0.06	0.02	0.12	*0.82*	0.11	0.03	0.07	*1.28*
Effect of NPK (Kg/fad)								
$NPK_{\ (0:0:0)}$	1.17	0.24	2.70	*13.25*	1.15	0.22	2.63	*15.99*
$NPK_{1(40:30:50kg/fad)}$	1.33	0.26	2.80	*14.00*	1.25	0.25	2.76	*16.91*
$NPK_{2(60:45:75kg/fad)}$	1.45	0.34	2.96	*15.20*	1.39	0.33	2.89	*17.73*
$NPK_{3(80:60:100kg/fad}$	1.71	0.45	3.22	*15.52*	1.65	0.43	3.05	*17.55*
L.S.D at 0.05	0.07	0.26	0.07	*0.63*	0.053	0.02	0.06	*0.72*

Table (26) : Effect of organic manure or NPK fertilization levels on the heavy metals of bulb onion .

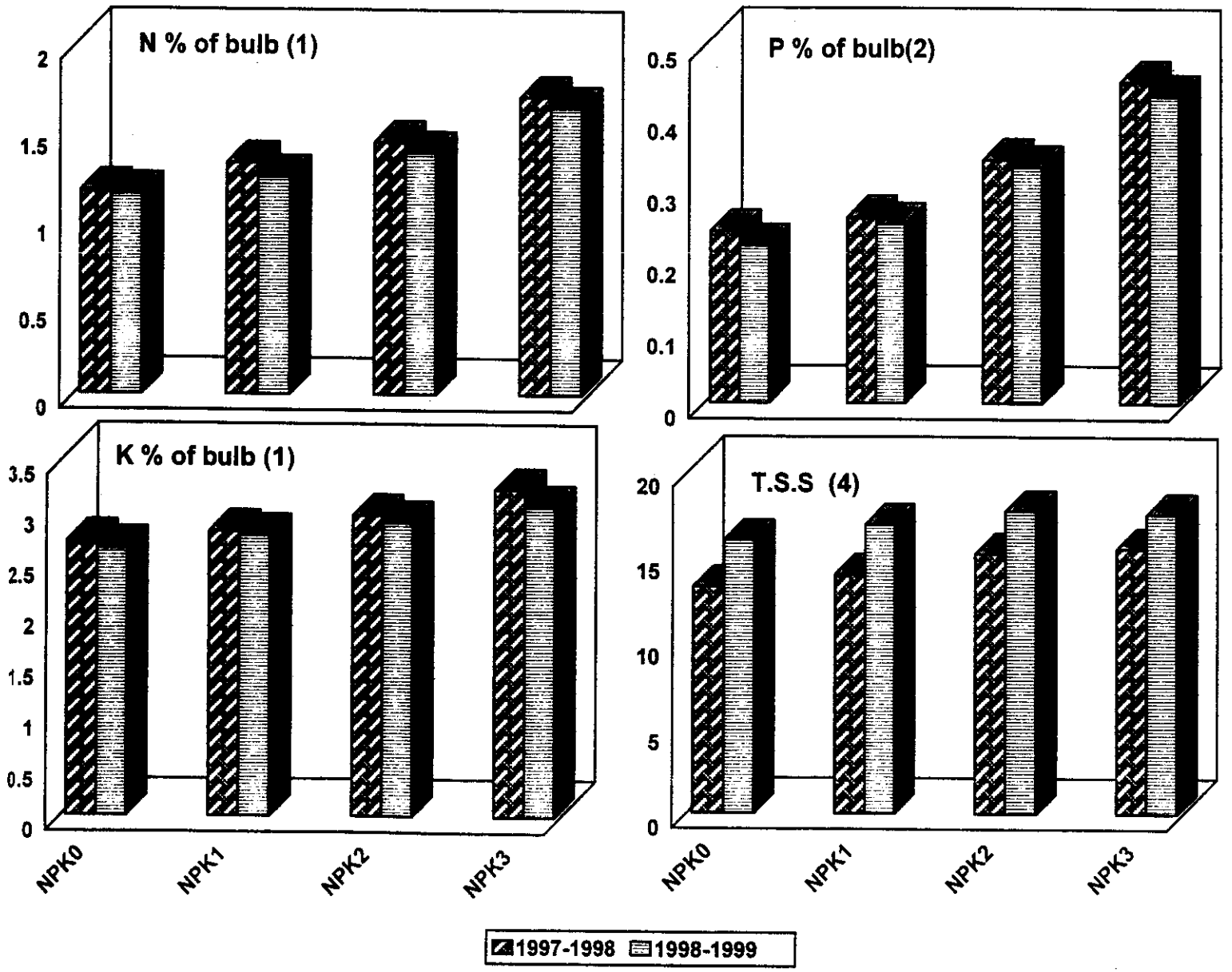
Season / Charat. / Treat.	1997-1998			1997-1998		
	Mineral content					
	Cd ppm	Pb ppm	Ni ppm	Cd ppm	Pb ppm	Ni ppm
Effect of Organic manure (ton/fed						
Control	0.68	2.00	1.25	0.53	1.98	1.00
$FYM_{10\ (ton/\ fad)}$	0.65	3.13	3.13	0.58	1.88	1.15
$FYM_{20\ (ton/\ fad)}$	0.63	3.70	1.33	0.45	3.50	1.20
$TR_{\ 10(\ ton/\ fad)}$	0.53	3.18	1.30	0.48	2.85	0.88
$TR_{\ 20\ (\ ton/\ fad)}$	0.53	3.08	1.33	0.50	2.80	0.98
L.S.D at 0.05	0.07	0.16	0.08	0.02	1.18	0.13
Effect of NPK (Kg/fad)						
$NPK_{\ (0:0:0)}$	0.52	2.54	1.22	0.50	1.76	1.02
$NPK_{1(40:30:50kg/fad)}$	0.56	2.60	1.28	0.52	3.12	1.04
$NPK_{2(60:45:75kg/fad)}$	0.68	3.18	1.26	0.52	2.84	1.14
$NPK_{3(80:60:100kg/fad}$	0.64	3.74	1.34	0.48	2.68	0.96
L.S.D at 0.05	0.04	0.13	0.04	0.02	N.S	0.07

Fig (23) : Effect of organic manure fertilization levels on N, P,K and T.S.S [at harvest during 1997-1998 and 1998-1999]



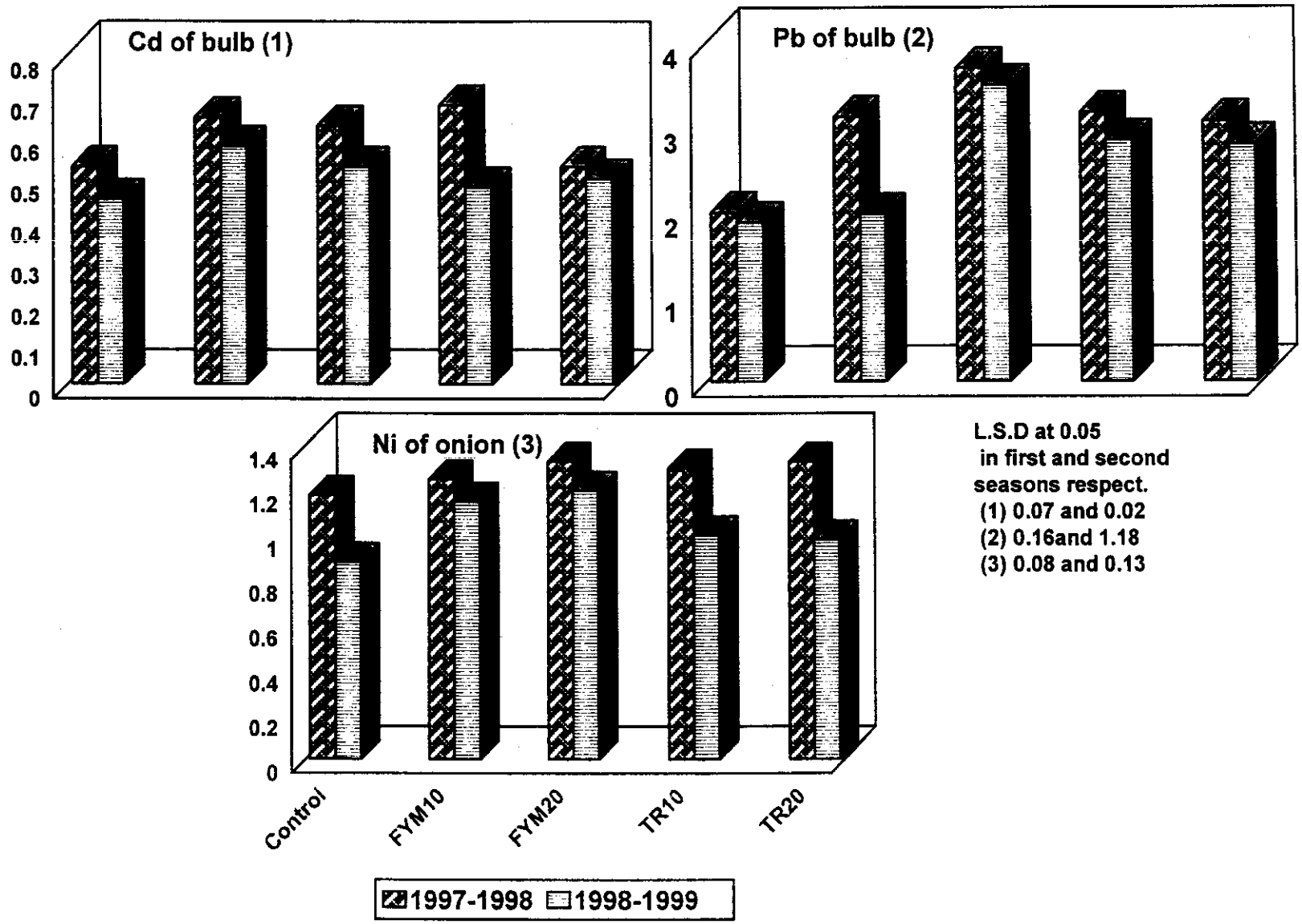
L.S.D.at 0. 05 in first and second seasons respect.
(1) 0.06 and 0.11
(2) 0.02 and 0.03
(3) 0.12 and 0.07
(4) 0.82 and 1.28

Fig (2 4) : Effect of NPK fertilization levels on N, P,K and T.S.S [at harvest during 1997-1998 and 1998-1999]



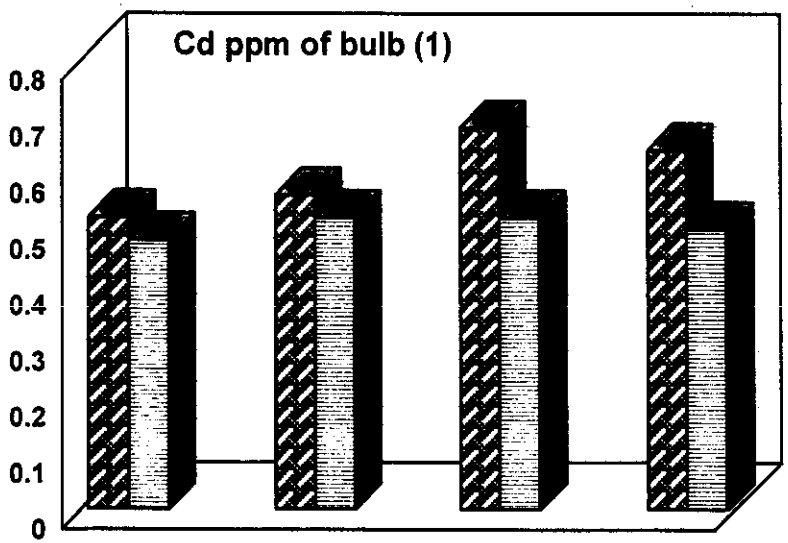
L.S.D. at 0.0 5in first and second seasons respect.
(1) 0.07and 0.05
(2) 0.03and 0.02
(3) 0.07and 0.060
(4) 0.63 and 0.72

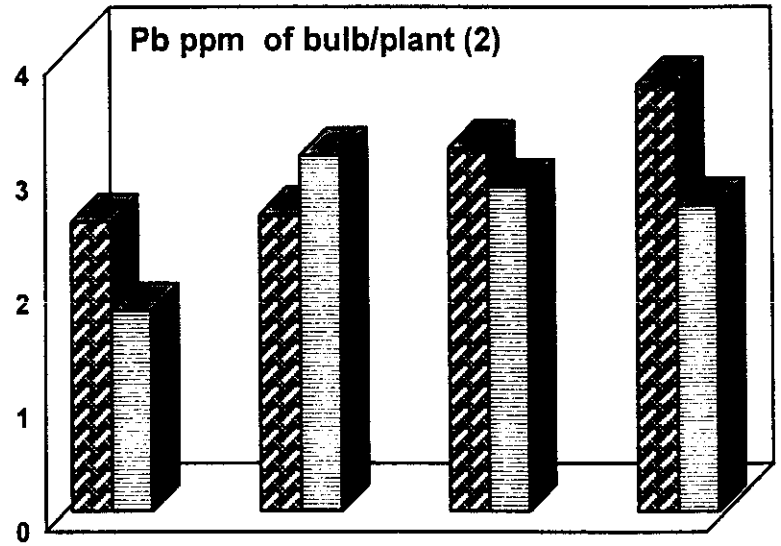
Fig (25) : Effect of organic manure fertilization levels Cd, Pb and Ni of bulb [at harvest during 1997-1998 and 1998-1999]

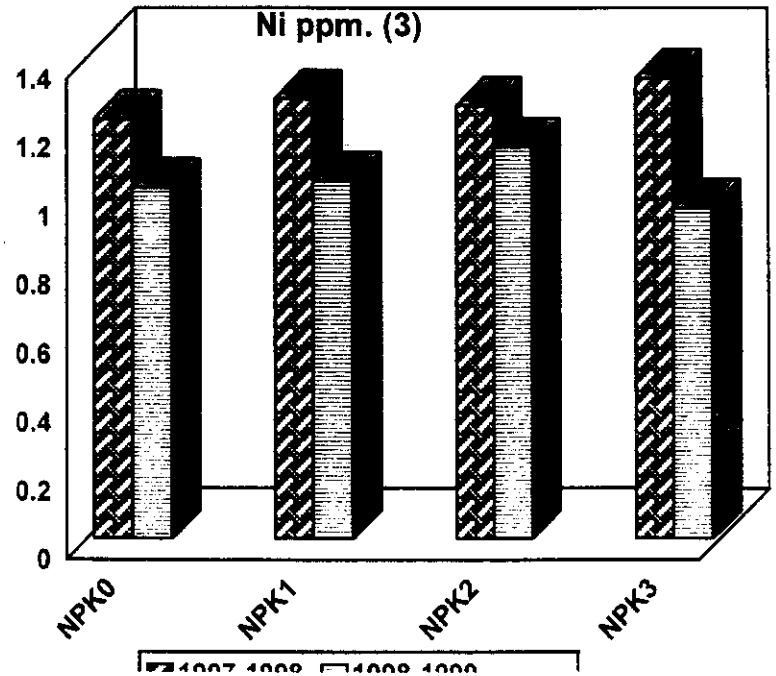


L.S.D at 0.05
in first and second seasons respect.
(1) 0.07 and 0.02
(2) 0.16and 1.18
(3) 0.08 and 0.13

Fig (26) : Effect of NPK fertilization levels on Cd, Pb and Ni ppm. [at harvest during 1997-1998 and 1998-1999] .







L.S.D 0.05in f irst and second seasons respect.
(1) 0.04and 0.02
(2) 0.13and N.S
(3) 0.04and0.07

These results agree with those mentioned by Haggag *et al.* (1986), Singh *et al.* (1994) who found that total soluble solids content of onion bulbs were increased with increasing levels of NPK fertilizers.This increase may be due to the effective role of macro nutrients within the plants and activate metabolism and synthesis of protein and carbohydrates and increasing photosynthesis processes (Devlin 1979).

As for the results of the effect of NPK application on heavy metals content expressed as (Cd, Pb and Ni)in onion bulbs are presented in Table (26) and Figure (26) during two growing seasons under Maryout conditions. In the first seasons,the second and third rates of NPK gave a positive significant increase in heavy metals under study in onion bulbs when compared with control treatment. While, in the second seasons there were no significant increase in heavy metals content in onion bulbs . Many investigators studied the effect of chemical composition on heavy metals of bulbs (Cd, Pb and Ni) and indicated that applying NPK increased Cd, Pb and Ni (Warade *et al.* 1996, Hassnien. 1996 and Abdulla. 1999).

4.3.3. Chemical composition as affected by interaction between organic and NPK fertilizers : -

Obtained results concerning the effect of organic manures as FYM or T.R combined with different rates of NPK on the chemical composition of onion bulbs, during two successive seasons are shown in Tables (27) . The data revealed that nitrogen and potassium content significantly increased in onion bulbs with treatments $(NPK)_2$ (60:45:75kg/fad), $(NPK)_3$ (80:60:100kg/fad),, FYM at 10 t/fad+ $(NPK)_3$, FYM at 20 t/fad+ $(NPK)_2$ or $(NPK)_3$, T.R at 10 t/fad+ $(NPK)_3$ and T.R at 20 t/fad+ $(NPK)_2$. When compared with control

treatment. These results are true in both growing seasons and the treatment and T.R at 20 t/fad+ $(NPK)_3$ enhanced than other treatments in its effect on minerals contents in onion plants under calcareous soil conditions.The increase of phosphorus content in onion bulbs with treatments application had no significant effect when compared with control treatment. The positive effects of interaction between organic manures and NPK fertilizers on NPK content in bulbs agree with the results obtained by Abo-Hussein (1995) and Midan (1995). The effect of interaction between organic and NPK fertilizers on NPK content in onion bulbs may be due to both effects of fertilizers. The favourable effect of town refuse may be due to its beneficial effect on soil reaction and the availability of nutrients to plants, Sotomayor, (1979) and Khalil *et al.*(1991). Also, the addition of NPK to the soil supply plants with these nutrients and increased the uptake and contents of NPK in plants, also the total nitrogen, phosphorus and potassium increased in plants with increasing the level of fertilization (Abo-Sedera *et al.*1991).

Respecting the interaction between organic manures and different rates of NPK fertilizers onT.S.S of onion , data presented in Tables (27) show that the increases of T.S.S in onion bulbs with treatments were not significant when compared with control treatments. These results were cleared in both growing seasons. The results agree with those obtained by Pimpini *et al.* (1992) on onion bulbs. On the other hand, Midan (1995) found that application of organic manure and mineral fertilizers produced pepper fruits of higher T.S.S. content.

Concerning the effect of organic manures combined with different rates of NPK fertilizers on heavy metals content in onions expressed as Pb, Cd and Ni are illustrated in Tables (28). The results show significant increase of heavy metals contents (Cd, Pb and Ni) in onions received organic manures with NPK

fertilizers treatments when compared with control treatments. These results were obtained in the two growing seasons under study. The results agree with those obtained by El-Shimi (1998) on cabbage, Warade *et al.* (1995), Hassnien (1996), on lettuce , onion, cucumber, and pepper plants. this may be due to the addition of organic manures increased amounts of soil heavy metals and increased their uptake in plants (Hassnien. 1996). Also Abdel.-Aty (1997) found that the concentration of heavy metals in plants increased with increasing application of town refuse and chemical fertilizers.The highest values of growth parameters, yield and its components and chemical composition of onion bulbs obtained with application of town refuse at 20 t/fad. and NPK at (60:45:75kg/fad.) on onion plants grown under calcareous soil conditions.

Table (27) : Effect of interaction between organic manure and NPK fertilization levels on Mineral content (NPK) and T.S.S in onion bulbs [at harvest].

Season / Characters / Treatments		1997-1998				1998-1999			
		Mineral content							
		N	P	K	T.S.S	N	P	K	T.S.S
Control	NPK 0	0.85	0.10	2.42	11.75	0.87	0.08	0.87	14.29
	NPK 1	0.98	0.12	2.48	13.00	1.06	0.12	1.06	17.40
	NPK 2	1.33	0.21	2.69	14.13	1.27	0.20	1.27	17.38
	NPK 3	1.61	0.30	2.95	14.50	1.67	0.30	1.67	16.88
F.Y.M. 10	NPK 0	1.07	0.16	2.57	12.88	1.08	0.15	1.08	15.20
	NPK 1	1.29	0.18	2.62	14.88	1.21	0.18	1.21	17.00
	NPK 2	1.38	0.27	2.75	16.25	1.35	0.27	1.35	18.00
	NPK 3	1.61	0.36	3.06	16.13	1.43	0.33	1.43	17.38
F.Y.M. 20	NPK 0	1.15	0.28	2.86	13.25	1.12	0.26	1.12	15.63
	NPK 1	1.31	0.28	3.03	14.00	1.22	0.28	1.22	16.00
	NPK 2	1.38	0.33	3.16	14.13	1.36	0.35	1.36	16.38
	NPK 3	1.68	0.49	3.22	15.38	1.70	0.45	1.70	17.13
T.R 10	NPK 0	1.39	0.26	2.73	14.50	1.35	0.23	1.35	17.50
	NPK 1	1.49	0.32	2.87	15.00	1.35	0.29	1.35	17.00
	NPK 2	1.53	0.39	2.98	16.38	1.43	0.37	1.43	18.00
	NPK 3	1.67	0.51	3.14	16.33	1.58	0.48	1.58	18.25
T.R. 20	NPK 0	1.40	0.40	2.93	13.25	1.34	0.38	1.34	17.33
	NPK 1	1.56	0.42	2.95	14.00	1.43	0.38	1.43	17.13
	NPK 2	1.62	0.50	3.22	15.20	1.53	0.47	1.53	18.88
	NPK 3	1.97	0.61	3.75	15.52	1.89	0.58	1.89	18.13
L.S.D. at 0.05		0.23	N.S	0.09	N.S	0.41	N.S	0.12	N.S

Table (28) : Effect of interaction between organic manure and NPK fertilization levels on heavy metals (ppm) after harvest in onion bulbs .

Treatments \ Characters \ Season		1997-1998			1998-1999		
		Heavy metals (ppm)					
		Cd	Pb	Ni	Cd	Pb	Ni
Control	NPK 0	0.40	1.20	1.20	0.40	1.50	0.80
	NPK 1	0.50	1.30	1.00	0.40	2.80	0.90
	NPK 2	0.60	2.20	1.20	0.60	1.00	1.00
	NPK 3	0.60	3.30	1.30	0.40	2.20	0.80
F.Y.M. 10	NPK 0	0.70	2.50	0.80	0.70	1.50	1.20
	NPK 1	0.60	1.50	1.30	0.50	1.20	1.10
	NPK 2	0.70	3.90	1.30	0.60	2.40	1.10
	NPK 3	0.60	4.60	1.60	0.50	2.80	1.20
F.Y.M. 20	NPK 0	0.50	3.50	1.20	0.50	3.10	0.90
	NPK 1	0.70	2.50	1.50	0.50	3.40	1.00
	NPK 2	0.70	3.30	1.30	0.50	2.90	1.00
	NPK 3	0.60	5.50	1.30	0.60	4.60	1.10
T.R 10	NPK 0	0.50	3.30	1.40	0.50	1.00	0.80
	NPK 1	0.50	4.70	1.30	0.60	3.50	0.90
	NPK 2	0.5	2.50	1.20	0.40	4.50	1.00
	NPK 3	0.60	2.20	1.30	0.40	2.40	0.80
T.R. 20	NPK 0	0.50	2.20	1.50	0.40	1.70	1.00
	NPK 1	0.50	3.00	1.30	0.60	4.70	1.00
	NPK 2	0.90	4.00	1.30	0.50	3.40	1.10
	NPK 3	0.80	3.10	1.20	0.50	1.40	0.80
L.S.D. at 0.05		1.0	0.3	0.9	4.8	2.0	0.2