4. RESULTS AND DISCUSSION

4.1. Chemical composition of rabbit manure :

Data of chemical composition of rabbit manure of the present study are illustrated in Table (4) .

Rabbit manure contained 14.22 % crude protein (CP) . In this respect , **Lall et al. (1984)** and **Prada (1985)** showed that rabbit manure contained 14.56 % CP . **Lorente et al. (1988)** reported that rabbit manure had 11.6% CP. In Egypt , **Fatma (1992)** showed that rabbit droppings had 16 % CP. While , **Zaza (1993)** found that the rabbit manure had 12.10 % CP.

The present data and review of literature showed that rabbit manure contained from 11.6 to 16.0 % CP and this was attractive to use rabbit manure as a supplement or source of protein in rabbit diets .

Rabbit manure recorded 21.97 % crude fiber (CF) . In this concern , **Lall et al. (1984) and Prada (1985)** reported that rabbit manure had 18.42 % CF . **Zaza (1993)** cited that rabbit manure had 24.5 % CF. **Fatma (1992)** showed that rabbit manure had 26 % CF while **Lorente et al. (1988)** found that rabbit manure contained 31.1 % CF .

Ether extract (EE) of rabbit manure of the present study was 2.0 % . Similar results were reported by **Lall et al. (1984)** , they recorded that rabbit manure had 1.92 % EE. **Fatma (1992)** showed that rabbit manure contained 2.0 % EE .

Ash content for rabbit manure used in present study scored 14.37 % . In this respect , **Fatma (1992)** showed that the rabbit manure had 12%

ash . While , **Lorente et al. (1988)** reported that rabbit manure had 15.6 % ash .

The composition of rabbit manure of the present study varied little than that cited in the review of literature because it depends on the breed , age and diets of rabbits used in experiments .

Table (4) : Chemical and calculated composition (on DM basis) of rabbit manure .

Items	%
Moisture	09.50
CP	14.22
CF	21.97
EE	02.00
Ash	14.37
NFE	47.44
OM	85.63
DE* (kcal /g)	2231.02
ADF**	29.47
NDF***	43.36

*, **, *** Calculated according to Cheeke (1987)

* DE (kcal /g) = 4.36 - 0.0491 (% NDF) .

** % ADF = 9.432 + 0.912 (% CF) .

*** % NDF = 28.924 + 0.657 (% CF) .

4.2. Body weight :

The effect of rabbit manure on body weight of growing rabbits from 5 to 16 weeks of age is illustrated in Table (5) .

Table (5) : Least squares means ± SE of factors affecting body weight of rabbits at different ages during the experimental period (5-16 weeks of age).

Independent variable	No.	Body weights (in grams) at											
		5 weeks	6 weeks	7 weeks	8 weeks	9 weeks	10 weeks	11weeks	12 weeks	13 weeks	14 weeks	15weeks	16 weeks
		Mean±SE	Mean±SE	Mean±SE	Mean±SE	Mean±SE	Mean±SE	Mean±SE	Mean±SE	Mean±SE	Mean±SE	Mean±SE	Mean±SE
Treatment :													
T_1	24	649.1±19.7 a	796.0±22.5 a	977.2±23.3 a	1113.1±32.9 a	1313.2±28.4 a	1450.5±29.2 a	1577.7±43.1 a	1710.9±77.2 a	1800.2±37.0 a	1902.7±39.7 a	2020.5±43.2 a	2146.4±47.0 a
T_2	24	617.7±20.0 a	728.0±22.9 a	875.5±23.8 b	1005.2±33.5 b	1126.5±28.9 b	1247.7±29.7 b	1377.2±43.9 b	1431.4±76.6 bc	1577.8±37.4 b	1704.1±40.2 b	1804.6±44.9 b	1878.9±49.7 b
T_3	24	626.9±20.0 a	754.0±22.9 a	925.5±23.8 a	1091.1±33.5 a	1238.0±28.9 a	1396.4±29.7 a	1553.9±43.9 a	1690.9±79.9 a	1813.6±38.2 a	1918.4±41.1 a	2025.6±44.7 a	2134.0±48.6 a
T_4	24	609.3±21.4 a	713.9±24.5 a	839.8±25.5 b	951.6±35.9 b	1045.0±31.0 b	1192.0±31.8 b	1290.2±47.0 b	1607.0±82.1 bca	1620.6±40.1 b	1738.6±43.1 b	1823.2± 51.9 b	1952.8±56.4 b
Sex :													
Male	48	623.0±14.1 a	762.2±16.2 a	924.0±16.8 a	1053.4±23.7 a	1205.7±20.5 a	1358.2±21.0 b	1470.9±31.0 a	1675.5±55.3 a	1731.9±27.1 a	1845.2±29.1 a	1938.5±31.7 a	2050.3±34.7 a
Female	48	628.5±14.6 a	733.7±16.7 a	885.0±17.3 a	1027.1±24.4 a	1156.2±21.1 a	1285.1±21.6 a	1428.5±31.9 a	1544.7±56.5 a	1674.2±27.0 a	1786.7±29.0 a	1898.5±33.8 a	2005.8±36.7 a
Group :													
G_1	32	851.4±17.4 a	986.0±19.9 a	1150.8±20.7 a	1296.5±29.2 a	1439.7±25.2 a	1585.0±25.8 a	1670.8±38.2 a	1920.1±66.6 a	1934.3±33.0 a	2021.9±35.5 a	2119.3±40.9 a	2229.6±44.5 a
G_2	32	594.7±17.2 b	713.7±19.6 b	869.2±20.4 b	977.0±28.8 b	1122.6±24.8 b	1260.5±25.5 b	1408.7±37.6 b	1520.6±65.7 b	1637.0±31.5 b	1752.9±33.8 b	1842.8±37.5 b	1944.5±41.3 b
G_2	32	431.2±18.1 c	544.2±20.7 c	693.6±21.5 c	847.3±30.3 c	980.5±26.2 c	1119.5±26.8 c	1269.7±39.6 c	1389.5±72.7 b	1537.8±34.8 c	1673.0±37.4 b	1793.4±40.8 b	1909.9±44.4 b

SE= Standard error .

a , b and c means on the same column with different superscripts are significantly different ($P < 0.05$) .

Table (6) : Least squares analysis of variance of factors affecting body weight of rabbits at different ages during the experimental period (5-16 weeks of age) .

Source Of Variance	df	MS and F values at													
		5 weeks		6 weeks		7 weeks		8 weeks		9 weeks		10 weeks		11 weeks	
		MS	F	MS	F	MS	F	MS	F	MS	F	MS	F	MS	F
Treatment	3	7185.6	0.720 ns	31860.2	2.44 ns	86313.2	6.13***	133853.4	4.8**	335044.5	16.0***	355804.2	16.2***	457726.0	9.54***
Sex	1	742.0	0.074 ns	19667.3	1.50 ns	36723.3	2.61 ns	16797.2	0.599 ns	59240.3	2.83 ns	129544.3	5.89*	43532.4	0.908 ns
Group	2	1432719.1	143.6***	1587293.5	121.5***	1699442.3	120.8***	1717871.4	61.3***	1774159.0	84.9***	1830239.2	83.2***	1328752.6	27.7***
Treat. x sex	3	15515.9	1.56 ns	12085.4	0.925 ns	16799.3	1.19 ns	4166.8	0.149 ns	15453.8	0.739 ns	11571.4	0.526 ns	34396.0	0.717 ns
Remainder	86	9978.4		13066.1		14073.8		28025.9		20900.9		22008.3		47963.3	

ns = Not significant .

* = ($P < 0.05$) .

**= ($P < 0.01$) .

*** = ($P < 0.001$) .

Table (6): Cont.

Source of variance	df	Ms and F values at												
		12 weeks		df	13 weeks		14 weeks		df	15 weeks		df	16 weeks	
		MS	F		MS	F	MS	F		MS	F		MS	F
Treatment	3	398496.3	2.73*	3	343162.7	10.2***	283236.1	7.32***	3	319557.4	6.96 ***	3	391148.3	7.22***
Sex	1	401819.3	2.75^{ns}	1	76422.8	2.28^{ns}	78572.6	2.03^{ns}	1	34376.1	0.749^{ns}	1	42084.7	0.777^{ns}
Group	2	2386477.2	16.3***	2	1270754.0	37.9***	999078.7	25.8***	2	869063.7	18.93***	2	867902.5	16.0***
Treatment x Sex	3	121378.2	0.830^{ns}	3	10147.7	0.303^{ns}	8206.9	0.212^{ns}	3	31242.8	0.681^{ns}	3	39014.3	0.720^{ns}
Remainder	85	146239.4			33525.0		3869.9		79	45902.6		78	54172.8	

ns = Not significant

* = ($P < 0.05$) .

*** = ($P < 0.001$) .

(Table 5) . These results are in a good agreement with those reported by **Ragab and Wanis (1960) ; Mostageer et al. (1970) ; Emara (1982) ; El-Sayaad (1985) ; El-Madhagi (1990) and El-Baz (1996)** on different breed groups of rabbits at different ages .

Data of the present study showed that sex differences were non-significant at all ages of the study except at 10 weeks of age only, Table (6) . These results are in accordance with results of **Afifi et al. (1987) , Khalil (1980) ; Carregal and Nikum (1980) ; Emara (1982) ; El-Sayaad (1985) ; El-Madhagi (1990) and El-Baz (1996)** who showed that the differences in body weight due to sex effect were not significant up to 9 weeks of age .

Results of this work and most of those cited in the literature reveal that sex differences in body weight of rabbits were generally limited and nigligable so that they can be ignord .

Group effect :

Results in Table (5) proved that the body weights of rabbit groups under consideration at all ages in the present study were different due to differences at start of the experimental period . It was heavier for rabbits of G_1 followed by those of G_2 and G_3 at all ages of the study . Group effects on body weight were significant at all ages of the study .

Interaction :

Interaction effect of treatment x sex on body weight of rabbits from 5 to 16 weeks of age was not significant (Table 6) .

4.3. Daily gain :

Treatment effect :

Data of the present study showed that rabbits received diets containing 0 or 15 % rabbit manure recorded almost higher daily gains than those fed either 5% or 25% rabbit manure at the different age intervals except at 12-16 weeks of age , Tables (7 and App. 1) . This trend is nearly similar to that observed when dealing with body weight of rabbits at different ages .

Differences in daily gain due to treatment effects were highly significant ($P < 0.001$) at 5 -16 , 5-8 and 8 -12 weeks of age intervals (Tables 8 and App. 2) .

Daily gains of rabbits fed 0 % and 15 % rabbit manure were almost similar at all ages of the study without any significant differences due to the treatment effect (Table 7) . This proved that 15% rabbit manure in the diet had no adverse effect on daily gain of growing rabbits . In other words ,15% rabbit manure could be used successfully in rabbit diets .

Sex effect :

Data in Table (7) showed that male rabbits gained more than females at all age intervales studied except at 12-16 weeks of age interval.

Differences in daily gain due to sex effect were significant ($P<0.05$ and $P<0.01$) at 5-8 , 8-12 and 12 - 16 weeks of age (Table 7) . In this respect , **Mohamed (1983)** showed that sex had a great influence on growth rate of Giant Flander and Balady Red rabbits . These results are in good agreement with those reported by **Mostageer et al. (1970)** ; **Nosseir (1970)** ; **Emara (1982)** ; **Abdella et al. (1987)** and **El-Baz (1996)** on different breeds of rabbits at different ages .

Table (7) : Least squares means ± SE of factors affecting daily gain of rabbits at different age intervals .

Independent variable	NO.	Average daily gain (in grams) at			
		5-8 weeks	8-12 weeks	12-16 weeks	5-16 weeks
		Mean + SE	Mean + SE	Mean + SE	Mean + SE
Treatment:					
T_1	24	23.9±0.876 a	20.3±0.743 a	16.2±0.649 a	19.8±0.554 a
T_2	24	18.4± 0.891 b	16.2±0.756 b	17.6±0.661 a	17.3±0.564 b
T_3	24	22.1±0.891 a	20.8±0.756 a	16.2±0.661 a	19.4±0.564 a
T_4	24	16.5±0.955 b	19.1±0.810 a	17.4±0.708 a	17.4±0.605 b
Sex :					
Male	48	21.5±0.630 a	19.9±0.534 a	16.2±0.467 b	18.8 ± 0.399 a
Female	48	18.9±0.649 b	18.4±0.550 b	17.6±0.481 a	18.2 ± 0.411 a
Group :					
G_1	32	21.2±0.776 a	19.3±0.658 a	14.8±0.575 a	18.2 ± 0.491 a
G_2	32	19.5±0.765 a	18.7±0.648 a	16.7±0.567 b	17.8 ± 0.484 a
G_3	32	20.0± 0.805 a	19.3±0.683a	19.1±0.597 c	19.4 ± 0.510 a

a , b and c means on the same column with different superscripts are significantly different ($P < 0.05$) .

Table (8) : Least squares analysis of variance of factors affecting daily gain of rabbits at different age intervals .

Source of variance	d.f	MS and F values at							
		5-8 weeks		8-12 weeks		12-16weeks		5-16 weeks	
		MS	F	MS	F	MS	F	MS	F
Treatment	3	270.6	13.7***	110.0	7.7***	14.2	1.3 ns	43.5	5.5***
Sex	1	163.8	8.3 **	54.0	3.8 *	46.6	4.3 *	8.2	1.0 ns
Group	2	24.8	1.3 ns	4.2	0.3 ns	147.9	13.6 ***	21.8	2.8 ns
Treat. x sex	3	64.6	3.3 *	3.0	0.2 ns	18.1	1.7 ns	7.1	0.9 ns
Remainder	86	19.8		14.2		10.9		7.9	

ns = Not significant

* = ($P < 0.05$) .

** = ($P < 0.01$) .

*** = ($P < 0.001$) .

Fig (1):Effect of treatment on daily gain of rabbits at different age intervals.

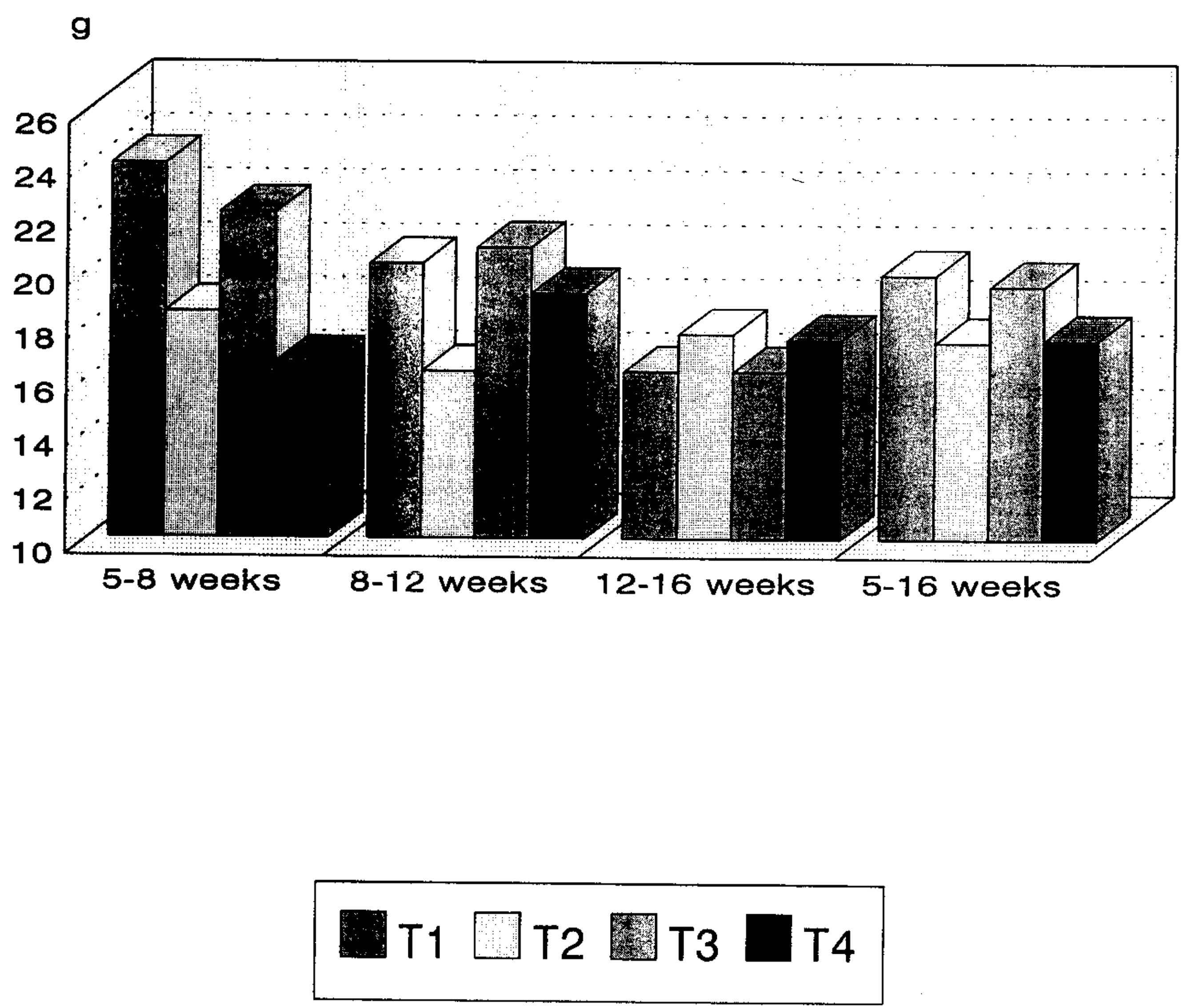


Fig (2):Effect of sex on daily gain of rabbits at different age intervals.

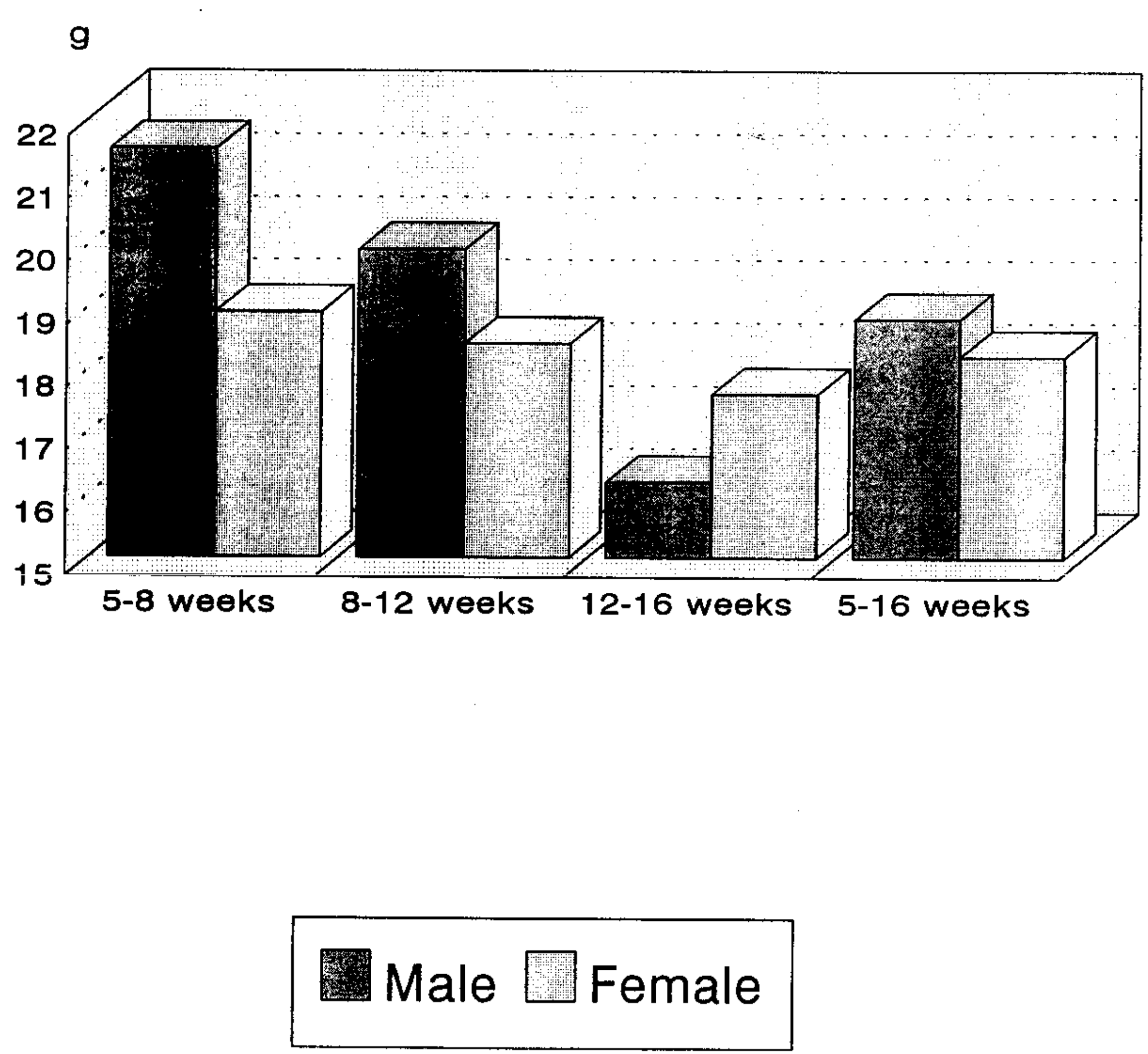


Fig (3):Effect of group on daily gain of rabbits at different age intervals.

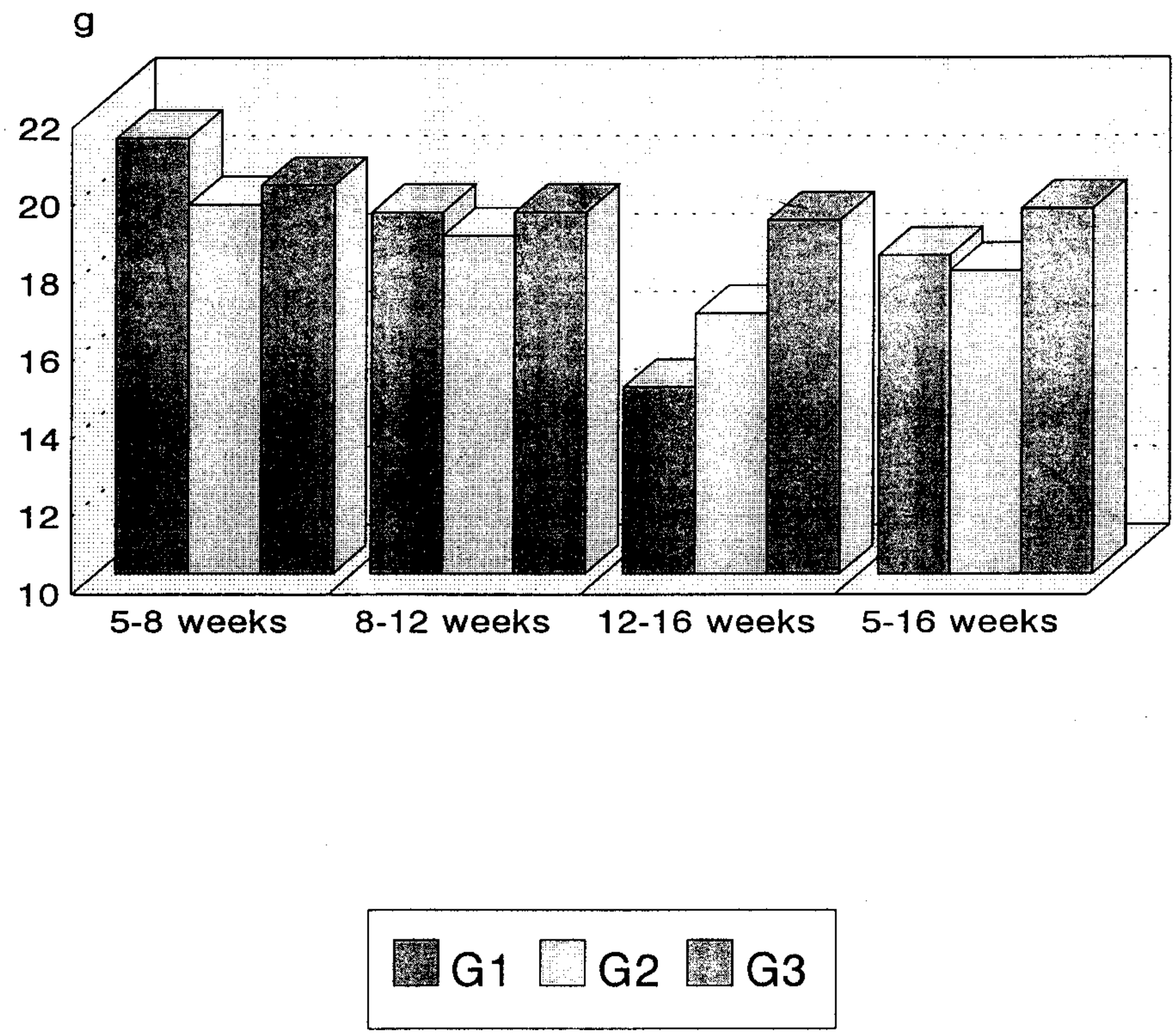


Table (9) : Least squares means ± SE of factors affecting daily feed intake of rabbits at different age intervals .

Independent variable	No.	Average daily feed intake (gm) at 5-8 wks	8-12 wks	12-16 wks	5-16 wks
		Mean ±SE	Mean ± SE	Mean ± SE	Mean ± SE
Treatment :					
T_1	24	82.1 ±2.18 a	97.4 ±2.94 a	95.0 ±5.68 a	93.5±1.43 a
T_2	24	80.5± 2.18 a	91.6±2.94 a	93.4±5.68 b	90.8 ± 1.43 a
T_3	24	74.3±2.18 b	101.0±2.94 b	97.1±5.68a	94.6±1.43 a
T_4	24	82.8±2.18 a	98.2±2.94 ab	95.2±5.68 a	98.1 ±1.43 b
Sex :					
Male	48	81.4±1.54 a	99.7±2.08 a	91.9±4.01 a	94.6±1.01a
Female	48	78.4± 1.54 b	94.4±2.08 a	98.4±4.01 a	93.9±1.01 a
Group :					
G_1	32	94.7 ±1.89 a	106.1±2.55a	100.9± 4.92 a	103.4±1.24 a
G_2	32	77.1±1.89 a	97.5± 2.55 a	100.1± 4.92 a	92.9 ±1.24 a
G_3	32	68.0 ±1.89 a	87.5 ± 2.55 a	84.5 ± 4.92 a	86.4 ± 1.24 a

a , b means on the same column with different superscripts are significantly different (P < 0.05) .

Table (10) : Least squares analysis of variance of factors affecting daily feed intake of rabbits at different age intervals .

Source of variance	d.f.	MS and F values at							
		5-8 weeks		8-12 weeks		12-16weeks		5-16 weeks	
		M.S.	F	M.S.	F	M.S.	F	M.S.	F
Treatment	3	362.1	3.2 ***	378.2	1.82***	55.8	0.072*	218.0	4.43***
Sex	1	212.8	1.9 *	666.2	3.2 ns	999.6	1.29 ns	9.66	0.196ns
Group	2	5876.4	51.5 ns	2753.6	13.2 ns	2712.8	3.51 ns	2361.7	48.0 ns
Treat.x sex	3	371.3	3.3*	660.9	3.18*	311.9	0.403 ns	55.9	1.14 ns
Remainder	86	114.2		208.0		773.7		49.2	

ns = Not significant .

* = (P < 0.05) .

*** = (P < 0.001) .

Fig (4):Effect of treatment on daily feed intake of rabbits at different age intervals.

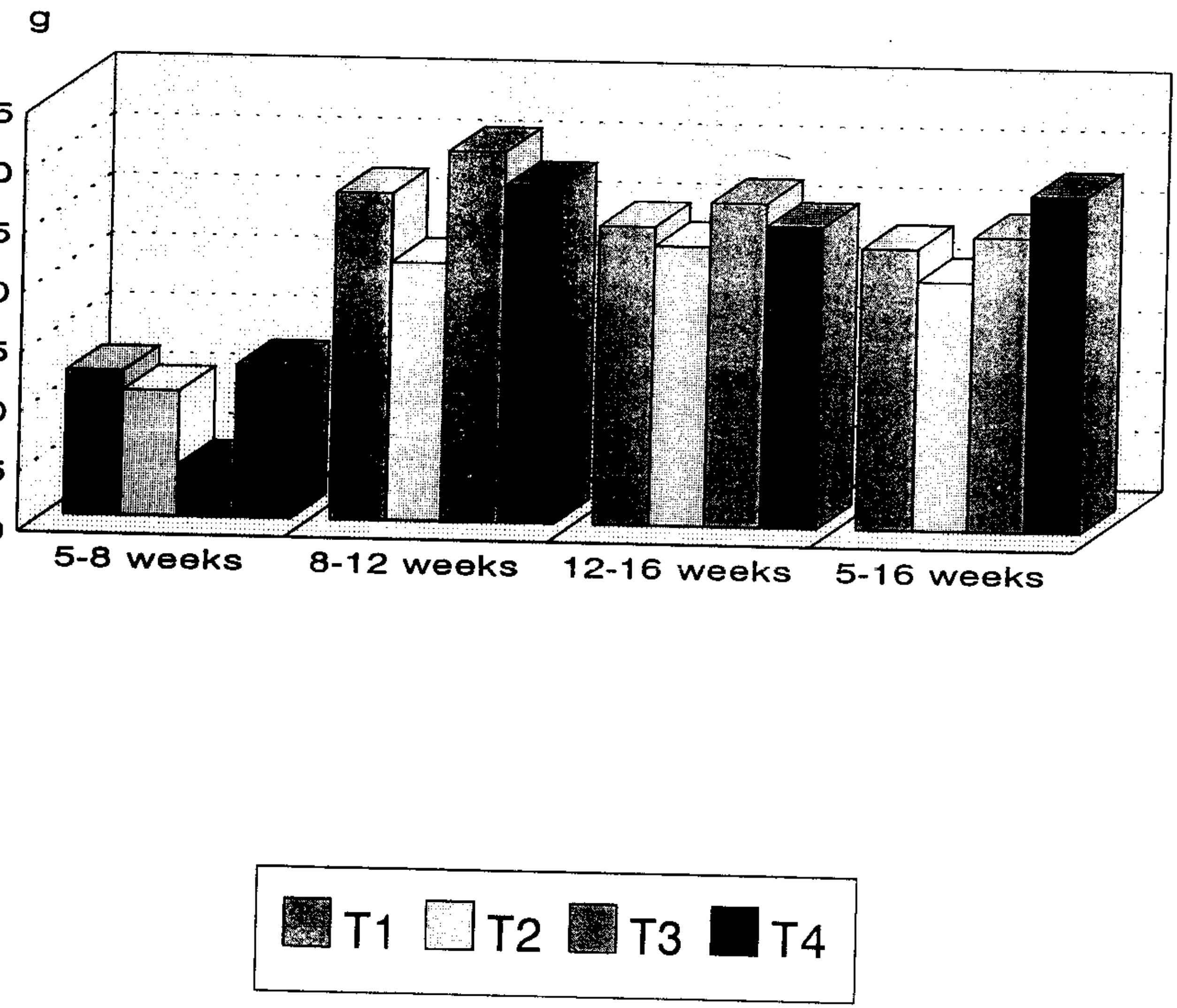


Fig (5):Effect of sex on daily feed intake of rabbits at different age intervals.

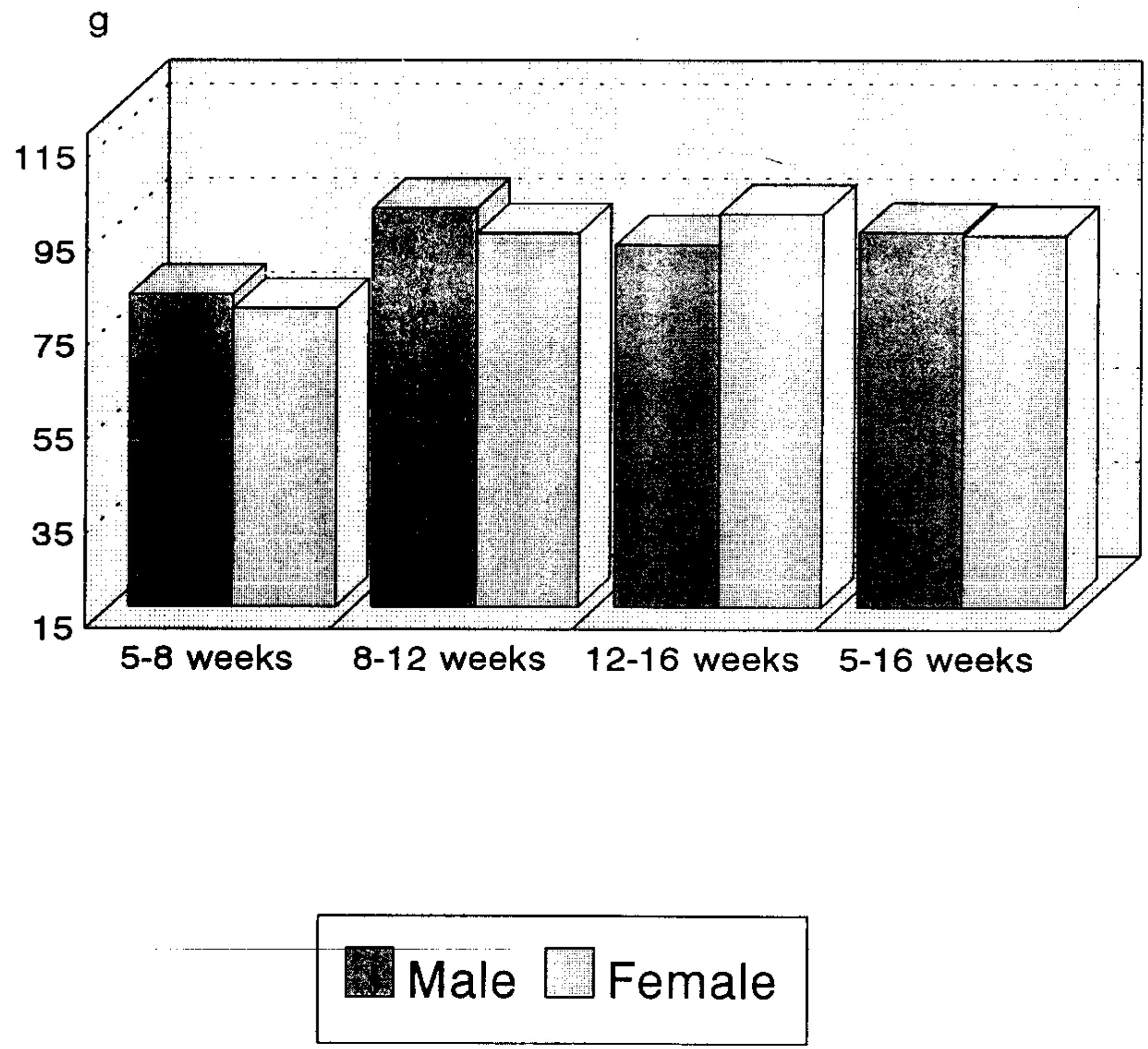
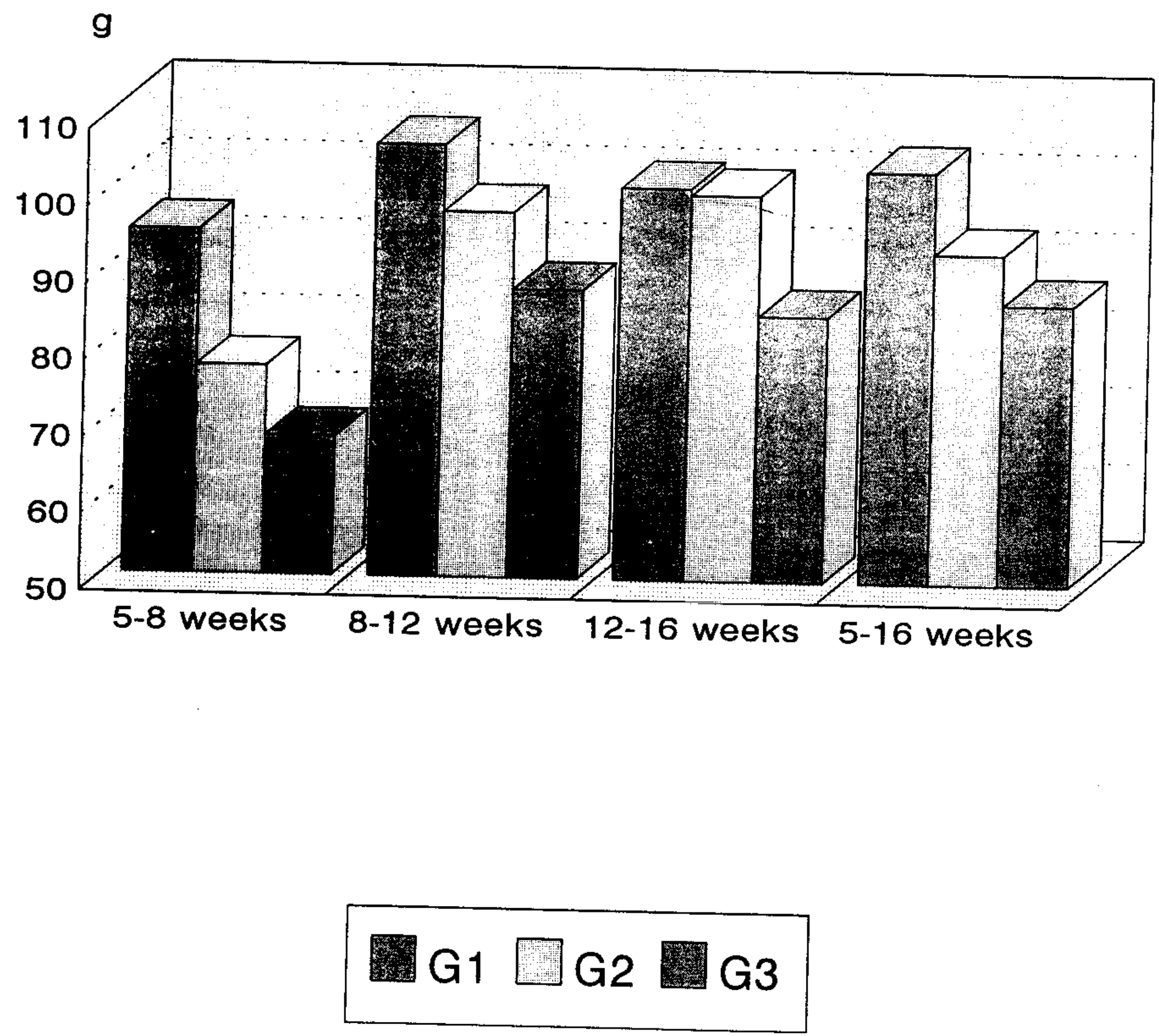


Fig (6):Effect of group on daily feed intake of rabbits at different age intervals.



In general , feed intake increased with increasing rabbit manure in rabbit diets up to 25% .

Sex effect :

Male rabbits consumed more feed than females at 5-8 , 8-12 and 5-16 weeks of age , but the reverse was observed at 12-16 weeks of age (Table 9) . The differences due to sex effect on daily feed intake was significant at 5-8 week of age (Table 10) .

Group effect :

Data of the present study showed that rabbit of heavier body weight at the start of the experiment consumed more feed than the lighter ones (Table 9) with no significant differences due to group effect of rabbits on daily feed intake (Table 10) .

Interaction :

Data of the present study showed that interaction between treatment and sex was not significant at 12-16 and 5-16 weeks of age intervals (Table 10) .

4-5 Feed conversion :

Treatment effect :

Values of feed conversion of rabbits fed diets containing 0 , 5 , 15 and 25 % rabbit manure at the whole experimental period (5-16 weeks of age) were nearly the same without any significant effect of treatment on feed conversion and feed efficiency values (Tables 11and App. 3) .

Rabbits fed diets containing 0 and 15% rabbit manure recorded the best feed conversion values at 5-8 and 8-12 weeks of age intervals with no significant differences between the two treatments . Whereas , rabbits

Table (11) : Least squares means ± SE of factors affecting feed conversion of rabbits at different age intervals .

Independent vairable	No	Feed conversion (gm feed / gm gain) 5-8 weeks	8-12 weeks	12-16 weeks	5-16 weeks
		Mean ± SE	Mean ± SE	Mean ± SE	Mean ± SE
Treatment :					
T_1	24	3.59± 0.345 a	4.99±0.248 a	6.46±0.266 b	5.54±0.349 a
T_2	24	4.42±0.351 a	5.78±0.253 b	5.70±0.271 a	5.29±0.355 a
T_3	24	3.48±0.351 a	5.02±0.253 a	6.98±0.271 b	5.31± 0.355 a
T_4	24	5.65±0.376 b	5.72±0.271 b	6.51±0.290 b	5.66±0.381 a
Sex :					
Male	48	4.26±0.284 a	5.17±0.179 a	6.40 ±0.192 a	5.23±0.251 a
Female	48	4.31 ± 0.255 a	5.59±0.184 a	6.40 ±0.197 a	5.68±0.259 a
Group :					
G_1	32	4.61±0.305 a	5.78±0.220 b	7.48±0.236 c	5.70±0.309 a
G_2	32	4.56±0.301 a	5.35±0.217 b	6.27±0.232 b	5.71±0.305 a
G_3	32	3.70±0.317 a	5.01±0.228 a	5.49±0.245 a	4.95±0.321 a

a , b and c means on the same column with different superscripts are significantly different (P < 0.05) .

Table (12) : Least squares analysis of vairance of factors affecting feed conversion of rabbits at different age intervals .

Source of variance	d.f	MS and F values at							
		5-8 weeks		8-12 weeks		12-16 weeks		5-16 weeks	
		MS	F	MS	F	MS	F	MS	F
Treatment	3	23.1	7.5***	4.5	2.8 *	6.9	3.8 **	0.765	0.2 ns
Sex	1	0.05	0.02 ns	4.3	2.7 ns	0.02	0.01 ns	4.9	1.6 ns
Group	2	8.2	2.7 ns	4.8	3.0 *	32.0	17.5***	5.9	1.9 ns
Treat.x sex	3	8.5	2.8 *	0.1	0.1 ns	0.7	0.4 ns	6.0	1.9 ns
Remainder	86	3.1		1.6		1.8		3.2	

ns = Not significant .

* = ($P < 0.05$) .

** = ($P < 0.01$) .

*** = ($P < 0.001$) .

fed diet containing 5% rabbit manure had the best feed conversion value at 12-16 weeks of age interval.

The differences due to treatment effects on feed conversion values of rabbit were not significant at 5-16 weeks of age interval, but were significant ($P<0.05$, $P<0.01$ and $P<0.001$) at 5-8, 8-12 and 12-16 weeks of age intervals (Tables 12 and App. 4). Generally, we can say that, feed conversion of rabbits was the best with the diet containing 15% rabbit manure.

Sex effect :

Data illustrated in Table (11) revealed that males converted feed more efficiently than females. But, the differences in feed conversion values due to sex effects were very limited and non - significant (Table 12). In this respect, **Mohamed (1983)** showed that male rabbits fed diet containing manures (rabbit, poultry, sheep and cow) at 10 % level of the diet, utilized feed more efficiently than females. Also, **El-Baz (1996)** showed that males converted feed more efficiently than females, and the differences were significant.

Group effect :

Data of the present study showed that rabbits of G_3 (having the lowest body weight at the start) recorded the lowest feed conversion values (more efficient) at all age intervals (Table 11). The differences in feed conversion values due to group effect were not significant at 5-8 and 5-16 weeks of age intervals (Table 12). The previous results may be explained as rabbits of G_3 consumed less feed intake than the other two groups (G_1 and G_2) as shown in Table (9).

Interaction :

Interaction between treatment and sex was non-significant at all age intervales studied except at 5-8 weeks of age interval (Table 12) .

4.6. Nutrients digestibility :

Treatment effect :

The effect of dietary treatments on nutrients digestibility values are illustrated in Table (13) .

Data obtained showed that digestibilities of DM , CP , CF , EE and NFE for the diet containing 5% rabbit manure were the highest , while those for the diet with 25% rabbit manure were the lowest (Table 13) . However , the differences due to treatment effect were not significant for all nutrients digestibility (Table 14) .

In this respect , **Mohamed (1983)** using 10% of different manure sources (cow , rabbits , sheep and poultry) for Giant Flander and Baladi Red rabbits , found no significant differences in CP , EE , CF , NFE and OM digestibilities due to manure effect for the two breeds . While , **Fatma (1992)** reported that there were significant differences for CP and CF digestibilities and non-significant differences for EE and NFE ones due to the use of 0 , 10 and 20% rabbit droppings in rabbit diets . Whereas , the treated droppings (soaking with NaOH , auotoclaving at 120°C for 45 min and addition of antibiotic) decreased digestibility coefficients for CP , CF and EE with increasing levels of rabbit droppings .

Table (13) : Least squares means for nutrients digestibility in rabbits as affected by treatments and coprophagy status .

Independent variable	No.	Digestibility %				
		DM	CP	CF	EE	NFE
Treatment :						
T1	6	69.2 a	74.1 a	44.3 a	70.7 a	78.6 a
T2	6	72.3 a	76.5 a	44.5 a	84.7 a	79.8 a
T3	6	67.3 a	73.3 a	38.9 a	80.4 a	75.8 a
T4	6	66.1 a	72.4 a	27.2 a	63.5 a	75.8 a
Coprophagy status :						
Uncollared rabbits	12	73.2 a	79.1 a	48.5 a	80.4 a	80.9 a
Collared rabbits	12	64.2 b	68.8 b	29.0 b	69.9 a	73.6 b

a and b means on the same column with different superscripts are significantly different ($P < 0.05$).

Table (14) : Least squares analysis of variance fornutrients digestibility in rabbits as affected by treatments and coprophagy status .

Source of variance	d.f	MS and F values of									
		DM		CP		CF		EE		NFE	
		MS	F	MS	F	MS	F	MS	F	MS	F
Treatment	3	1.674	0.848 ns	8.08	0.495 ns	143.37	1.37 ns	244.5	1.56 ns	9.44	0.870 ns
Coprophgy status	1	185.37	9.39**	274.73	16.84***	793.50	7.59**	289.9	1.85 ns	150.00	13.83**
Treatment x Coprophagy status.	3	24.80	1.26 ns	19.29	1.18 ns	157.21	1.50 ns	373.3	2.38 ns	16.55	1.25 ns
Remainder	16	19.74		16.32		104.50		156.86		10.85	

ns = Not significant .

** = ($P < 0.01$) .

*** = ($P < 0.001$) .

Coprophagy status :

Results of the present study , showed that values of all nutrients digestibility (DM , CP , CF , EE and NFE) for uncollared rabbits were higher than those for collared ones (Table 13) . These results indicated that the prevention of coprophagy in rabbits decreased the digestibility of all nutrients . In agreement with our results , **Thacker and Brandt (1955)** found that prevention of coprophagy in rabbits decreased digestibility of CP, DM and nitrogen retention but increased the digestibility of cellulose. **Yoshida et al. (1968)** cited that the re-ingestion of feacal EE and true protein might improve the quality of the total nutrient intake . **Fraga and De-Blas (1977)** showed that when coprophagy was allowed , digestibility of nitrogen became greater . **Also , El-Serafy et al. (1981) and Hemid (1982)** reported that preventing rabbits from re-cycling their feaces , had reduced the apparent digestibility of all nutrients , in particular that of CP. **El-Sayaad (1985)** showed that the digestion coefficients of DM , OM , CP, EE , CF and NFE for un-collared rabbits were greater than those for collared ones .

Raharjo et al. (1990) showed that cecotrophy may improve the digestibility of most nutrients significantly . Also , **El-Sayaad (1985)** reported that digestibilities of all nutrients for rabbits allowed to re-cycle their feces were higher than for those prevented from coprophagy . The same author showed that the increase in nutrient digestibilities with coprophagy may be due to either increase in absorption of digested material from the recycled feces or the increase of susceptibility of some undigested materials to enzyme attack when re-cycled or both .

The analysis of variance for nutrient digestibilities due to coprophagy status were significant ($P < 0.01$ and $P < 0.001$) except for EE (Table 14) . In this respect , **Hemid (1982)** showed that appearent digestibility of all nutrients were significantly lower with collared rabbits than un-collared rabbits . **El-Sayaad (1985)** reported that differences in all digestion coefficients of rabbits due to coprophagy status were highly significant ($P < 0.01$) except for EE and NFE . On the contrary , **El-Sayaad (1980)** showed that the prevention of coprophagy did not influenced digestibility of all nutrients (DM , CP , EE , CF , NFE and OM) significantly .

The differences between our results and those of **El-Sayaad (1980)** may be due to system of metabolic cages , form and ingredients of diets , breed and age of rabbits . It is clear that , results of the present study are in agreement with those reported by several investigators , indicating that the prevention of coprophagy in rabbits reduced the nutrients digestibility of feed . Also , findings of the results indicated the importance of coprophagy as a biological process which may improve the performance of rabbits .

Interaction :

Interaction effect of treatment x coprophagy status on digestibility of all nutrients was non-significant (Table 14) .

4.7. Carcass traits :

Treatment effect :

Data illustrated in Table (15) indicated that rabbits received the diet containing 15% rabbit manure showed the heaviest fasted weight , dressed weight and dressing percentage , while those received the diet containing 25% rabbit manure recorded the lightest fasted weight, dressed weight and total meat weight. However, no significant differences were detected in fasted weight, dressed weight, dressing percentage and bonless meat percentage between 0% level and 15 % level of rabbit manure (Table 15). Moreover, no significant differences were observed due to treatment effects on fasted weight, dressing percentage and bonless meat % (Table 16).

Weights of different organs (liver, kidney, heart, head, filled intestine, empty intestine and coat) and carcass cuts percentages (fore quarters, chest, loin and hind quarters relative to fasted weight) varied slightly with treatment effect but without any constant trend. The differences were very small and statistically non-significant (Tables 15, 16, App. 5 and 6).

Sex effect :

Results presented in Table (15) showed that fasted weight, dressed weight, dressing percentage, total meat weight and bonless meat % of male rabbits were almost higher than those of females without any significant differences due to sex effect (Table 16). Also, data of different organs weights and carcass cuts percentages showed that sex had no significant effect on all txaits studied (Tables 15 and 16).

In this respect **Mohamed (1983)** showed that the dressing percentage in males surpassed that in females. Also, **Anber (1986)** found that dressed carcass weight in males was higher than in females.

Interaction :

Data illustrated in Table (16) showed that interaction effects between treatment and sex for all carcass traits studied were non-significant.

Table (15) : Least squares means ± SE of factors affecting carcass traits of rabbits .

Independent variable	No	Fasted weight(gm) Mean ± SE	Dressed weight (gm) Mean ± SE	Dressing * percentage Mean	Total meat weight (gm) Mean ± SE	Bonless ** meat % Mean
Treatment :						
T_1	6	2084.2±73.0 a	1128.2 ± 42.8 a	54.13 a	857.3± 30.6 a	75.99 a
T_2	6	1928.8±73.0 a	996.5 ± 42.8 b	51.66 a	741.5± 30.6 b	74.41 a
T_3	6	2128.2±73.0 a	1154.5 ± 42.8 a	54.25 a	842.8±30.6 a	73.00 a
T_4	6	1886.0±73.0 a	976.0 ± 42.8 b	51.75 a	727.4±30.6 b	74.53 a
Sex :						
Male	12	2012.0±51.6 a	1067.3±30.2 a	53.05 a	793.9±21.7 a	74.07 a
Female	12	2001.6±51.6 a	1060.3 ± 30.2 a	52.97 a	790.5±21.7 a	74.88 a

a and b means on the same column with different superscripts are significantly different ($P < 0.05$) .

$$* = \frac{\textit{Dressed}\ \text{WT.}}{\textit{Fasted}\ \text{WT.}}$$

$$** = \frac{\text{Meat WT.}}{\textit{Dressed}\ \text{WT.}}$$

Table (15) : Cont.

Independent variable	NO.	Coat wt.	Head wt.	Filled intestine wt.	Empty intestine wt.	liver wt.	kidney wt .	Heart wt.
		Mean ± SE	Mean ± SE	Mean ± SE	Mean ± SE	Mean ± SE	Mean ± SE	Mean ± SE
Treatment :								
T_1	6	356.0 ± 14.0 a	132.0 ± 3.30 a	326.7 ± 19.1 a	77.0 ± 4.99 a	55.0 ± 4.10 a	18.5 ± 0.697 a	10.5 ± 0.186 a
T_2	6	334.0 ± 14.0 a	121.7 ± 3.30 a	299.0 ± 19.1 a	73.0 ± 4.99 a	57.0 ± 4.10 a	16.5 ± 0.697 a	10.3 ± 0.186 a
T_3	6	363.3 ± 14.0 a	129.7 ± 19.1 a	321.7 ± 19.1 a	78.2 ± 4.99 a	61.2 ± 4.10 a	17.0 ± 0.697 a	10.3 ± 0.186 a
T_4	6	313.7 ± 14.0 a	122.2 ± 3.30 a	307.0 ± 19.1 a	76.8 ± 4.99	52.7 ± 4.10 a	17.8 ± 0.697 a	10.0 ± 0.186 a
Sex :								
Male	12	338.3 ± 9.87 a	132.3 ± 2.33 a	308.6 ± 13.5 a	75.6 ± 3.53 a	55.4 ± 2.90 a	17.4 ± 0.493 a	10.4 ± 0.132 a
Female	12	345.3 ± 9.87 a	120.4 ± 2.33 b	318.6 ± 13.5 a	76.9 ± 3.53 a	57.5 ± 2.90 a	17.5 ± 0.493 a	10.2 ± 0.132 a

All weights to nearest gram .

a and b means on the same column with different superscripts are significantly different ($P < 0.05$) .

Table (15) : Cont.

Independent variable	No	Fore-quarters* %	Chest* %	loin weight* %	Hind- quarters* %
		Mean	Mean	Mean	Mean
Treatment :					
T_1	6	9.0 a	10.6 a	12.9 a	21.0 a
T_2	6	8.9 a	9.9 a	13.4 a	20.6 a
T_3	6	8.5 a	11.1 a	12.7 a	20.3 a
T_4	6	8.7 a	9.4 a	11.6 a	20.9 a
Sex :					
Male	12	8.8 a	10.7 a	12.3 a	20.3 a
Female	12	8.8 a	9.8 a	13.0 a	21.0 a

a means on the same column with different superscripts are significanly different ($P < 0.05$) .

* On fasted weight .

Table (16) : Least squares analysis of variance of factors affecting carcass traits of rabbits .

Source of variance	**df**	**MS and F values of**									
		Fasted weight		Dressed weight		Dressing percentage		Total meat weight		Bonless meat %	
		MS	**F**	**MS**	**F**	**MS**	**F**	**MS**	**F**	**MS**	**F**
Treatment	3	82773.8	2.59^{ns}	49215.4	4.48 **	3.18	0.645^{ns}	27155.56	4.827**	4.91	2.042^{ns}
Sex	1	651.0	0.020^{ns}	301.0	0.027^{ns}	1.31	0.265^{ns}	69.70	0.012^{ns}	1.22	0.505^{ns}
Treatment x Sex	3	8727.6	0.273^{ns}	13465.4	1.23^{ns}	3.83	0.776^{ns}	2397.31	0.426^{ns}	2.24	0.929^{ns}
Remainder	16	31961.9		10979.9		4.934		5625.62		2.406	

ns = Not significant .

** = ($P < 0.01$) .

Table (16) : Cont.

Source of variance	df	MS and F values of													
		Coat wt.		Head wt.		Filled intestine wt.		Empty intestine wt.		Liver wt.		Kidneys wt.		Heart wt.	
		MS	F	MS	F	MS	F	MS	F	MS	F	MS	F	MS	F
Treatment	3	3035.3	2.60 ^{ns}	164.7	2.52 ^{ns}	985.1	0.449 ^{ns}	30.28	0.202 ^{ns}	77.93	0.773 ^{ns}	4.71	1.61 ^{ns}	0.264	1.27 ^{ns}
Sex	1	294.0	0.251 ^{ns}	852.0	13.06**	600.0	0.273 ^{ns}	10.67	0.071 ^{ns}	26.04	0.258 ^{ns}	0.042	0.014 ^{ns}	0.375	1.80 ^{ns}
Treat.x Sex	3	1815.3	1.55 ^{ns}	15.8	0.242 ^{ns}	460.0	0.210 ^{ns}	230.3	1.54 ^{ns}	106.3 ^{ns}	1.05 ^{ns}	0.375 ^{ns}	0.129 ^{ns}	0.153 ^{ns}	0.733 ^{ns}
Remainder	16	1169.2		65.3		2195.7		149.6		100.8		2.917		0.208	

ns = Not significant .

** = ($P < 0.01$) .

Table (16) : Cont.

Source of variance	d.f	MS and F values of							
		Fore-quarters %.		Chest %		Loin %		Hind-quarters %	
		M.S.	F	M.S.	F	M.S.	F	M.S.	F
Treatment	3	0.358	1.06 ns	2.83	2.18 ns	2.87	2.96 ns	0.258	0.372 ns
Sex	1	0.015	0.045 ns	5.04	3.88 ns	1.98	2.04 ns	1.98	2.86 ns
Treat.x Sex	3	0.419	1.25 ns	1.14	0.878 ns	0.235	0.242 ns	0.507	0.731 ns
Remainder	16	0.337		1.30		0.971		0.694	

ns = Not significant .

4.8. Correlations :

Data of Table (17) showed that the correlations between fasted weight or dressed % and different cuts were mostly non-significant .Also , correlations between fasted weight and other traits were mostly non-significant .

4.9. Meat composition :

Treatment effect :

Results presented in Table (18) showed that CP, EE and ash contents of rabbit meat differed slightly with treatments and the differences were not significant except for ash content (Table 19) .

In this respect , **Mohamed (1983)** showed that protein , ether extract and calorific values of the thigh muscles for rabbits receiving the basal ration (without manure) were less than those receiving manure containing diets . Also , the thigh muscles containing more protein but less EE and calorific values than the breast muscles , except the group of rabbit receiving sheep manure containing diets .

Sex effect :

Data of the present study showed that CP of male rabbit meat was slightly higher than that of female ones . (82.8 vs 81.6), while the reverse was observed for EE content . Whereas , ash content of meat was nearly the same for both sexs of rabbit in the present study .

In good agreement with the present study , **El-Madhagi (1990)** showed that males at either 8 or 12 weeks of age tended to have higher CP content than females while the reverse was true for EE content . But , DM and ash contents were nearly the same for both sexes at 8 and 12

Table (17) : Correlations

Independent variables	Fasted wt.	Slaughtered wt.	Dressed %	Total meat	Total fat	Total bone	Bonless meat %	Meat : Fat	Meat : Bone
Fasted wt.	1.000	0.9954 **	0.843 **	0.879 **	0.371 ns	0.759 **	0.049 ns	- 0.201 ns	0.197 ns
Salughtered wt.		1.000	0.854 **	0.897 **	0.419 ns	0.748 **	0.053 ns	- 0.234 ns	0.227 ns
Dressed %			1.000	0.870 **	0.356 ns	0.670 **	-0.073 ns	-0.131 ns	0.449 ns
Total meat				1.000	0.303 ns	0.719 **	0.322 ns	- 0.069 ns	0.396 ns
Total fat					1.000	-0.060 ns	-0.367 ns	-0.917 ns	0.418 ns
Total bone						1.000	0.245 ns	0.199 ns	-0.263 ns
Bonless meat %							1.000	0.444 ns	0.061 ns
Meat : Fat								1.000	-0.267 ns
Meat : Bone									1.000

ns = Not significant

** = ($P < 0.01$)

Table (17) : Cont .

Independent variable	Dressing percentage	Fore - quarter wt.	Fore - quarter wt.	Chest wt.	Chest wt.	Loin wt.	Loin wt.	Hind- quarter wt.	Hind-quarter wt.
Dressing percentage	1.000	0.277^{ns}	-0.029^{ns}	0.282^{ns}	0.163^{ns}	0.005^{ns}	-0.244^{ns}	0.394^{ns}	0.112^{ns}
Fore-quarter wt [1]		1.000	0.694**	-0.053^{ns}	-0.220^{ns}	0.423^{ns}	0.157^{ns}	0.447^{ns}	0.037^{ns}
Fore-quarter wt [2]			1.000	-0.213^{ns}	-0.139^{ns}	0.144^{ns}	-0.094^{ns}	0.084^{ns}	0.263^{ns}
Chest weight [1]				1.000	0.948**	-0.110^{ns}	-0.193^{ns}	-0.385^{ns}	-0.558^{ns}
Chest weight [2]					1.000	-0.269^{ns}	-0.310^{ns}	-0.533^{ns}	-0.452^{ns}
Loin weight [1]						1.000	0.527^{ns}	0.447^{ns}	0.037^{ns}
Loin weight [2]							1.000	0.084^{ns}	0.263^{ns}
Hind- quarter wt [1]								1.000	0.685**
Hind- quarter wt [2]									1.000

1= On fasted weight

2= On Dressed weight

ns = Not significant

** = ($P < 0.01$)

Table (18) : Least squares means of factors affecting chemical composition of rabbit meat (on DM basis) .

Independent variable	No	CP %	EE%	Ash %
Treatment :				
T_1	6	82.4 a	13.2 a	4.4 a
T_2	6	81.6 a	12.4 a	4.5 a
T_3	6	81.5 a	13.2 a	4.1 b
T_4	6	83.3 a	10.9 a	4.2 b
Sex :				
Male	12	82.8 a	11.5 a	4.3 a
Female	12	81.6 a	13.3 b	4.3 a

a and b means on the same column with different superscripts are significantly different ($P < 0.05$) .

Table (19) : Least squares analysis of variance of factors affecting chemical composition of rabbit meat .

Source of variance	df	Ms and F values of					
		CP		EE		Ash	
		MS	F	MS	F	MS	F
Treatment	3	2.42	1.17^{ns}	5.25	1.87^{ns}	0.486	8.04**
Sex	1	4.59	2.22^{ns}	15.5	5.52*	0.042	0.690^{ns}
Treatment x Sex	3	0.227	0.110^{ns}	5.02	1.78^{ns}	0.069	1.15^{ns}
Remainder	16	2.07		2.81		0.060	

ns = Not significant .

* = ($P < 0.05$) .

**= ($P < 0.01$) .

weeks of age . On the contrary , results of **Mohamed (1983)** showed that sex had a great influence on the proximate analysis of the rabbits muscles , the female Giant Flander rabbits recorded higher values than did the males . Also , **El-Baz (1996)** revealed that chemical composition of female meat tended to have higher CP and ash contents than males , while the reverse was true when considering EE contents .

The differences due to sex effect on chemical analysis of meat were non-significant for CP and ash contents, while the opisite was observed for EE content (Table 19) . In this respect , **El-Madhagi (1990)** showed that the differences in meat composition due to sex effects were significant ($P < 0.01$) for EE at 12 weeks of age and non-significant for DM , CP and ash contents at 8 and 12 weeks of age . Also, **El-Baz (1996)** indicated that the differences in meat composition due to sex effects were not significant .

The Data of the present study and previous literature revealed that sex effect on meat composition was very limited and negligable up to 16 weeks of age .

Interaction :

Data of the present study , showed that interaction effect of treatment x sex on chemical composition of meat was not significant (Table 19) .

4.10. Blood components :

Averages of total protein , albumin , globulin , albumin / globulin ratio , total lipids , cholesterol , alk. phosphatase , GPT , uric acid and creatinine of New Zealand White rabbits blood as affected by treatments and sex are presented in Tables (20 and App. 7).

Treatment effect :

Results obtained indicated that total protein, albumin and globulin contents of blood for rabbits fed different levels of rabbit manure almost surpassed those of blood for rabbits fed the control diet. The highest albumin / globulin ratio was recorded with 25% rabbit manure, while the lowest value was achieved with 15% rabbit manure (Table 20). However, the differences in total protein, albumin and albumin / globulin ratio due to treatment effect were not significant (Tables 21 and App. 8). This may be explained on the basis that the body tend to act againest. different stress factors.

In this concern, **Mohamed (1983)** using 10% of different sources of manure (cow, poultry, rabbits and sheep) in rabbit diets, recorded higher values for total protein, albumin, globulin and albumin / globulin ratio in blood of rabbits than those obtained in this study. However, the differences between results obtained in this study and those of **Mohamed (1983)** may be due to biological status, age, breed of rabbits, form and ingredients of diets. **Martina et al. (1983) and Aly et al. (1990a)** did not notice any differences in some blood metabolities of growing rabbits with feeding diets containing 10 or 15 % poultry manure.

Data in Table (20) showed that increasing rabbit manure from 5 to 15 and 25% in diets decreased total lipids and cholesterol in blood from 400.5 to 301.0 and 268.6 mg / 100 ml and from 267.8 to 256.4 and 248.3 mg /dl, respectively.

Table (20): Least squares means ± SE of factors affecting blood analysis of rabbits at 16 weeks of age .

Independent variable	Treatments				Sex	
	0%	5%	15%	25%	Males	Females
	Mean± SE	Mean ±SE	Mean±SE	Mean±SE	Mean±SE	Mean±SE
Total protein (g/dl)	7.55±0.584 a	8.82 ± 0.584 a	8.78 ± 0.584 a	7.75±0.584 a	7.40 ± 0.413 a	9.05±0.413 b
Albumin (g/dl)	5.00±0.421 a	5.75 ± 0.421 a	5.10±0.421a	5.40±0.421 a	4.47 ± 0.298 a	6.16±0.298 b
Globulin (g/dl)	2.55±0.379 a	3.07±0.379 b	3.68±0.379 b	2.35 ± 0.379a	2.94 ± 0.300 a	2.89±0.300 a
Alb / Globulin ratio	1.96 ± 0.331 a	1.87 ± 0.331 a	1.39±0.331a	2.30 ± 0.331 a	1.52 ± 0.234 a	2.13±0.234 a
Total lipids (mg/100ml)	339.0 ± 20.4 b	400.5 ± 20.4 b	301.0.5±20.4a	268.6± 20.4 a	330.9 ± 14.4 a	323.6±14.4 a
Cholesterol (mg/dl)	241.2 ± 32.7 a	267.8 ± 32.7 a	256.4±32.7a	248.3 ± 32.7 a	253.2±23.10 a	253.6±23.10 a
Alk. phosphatase (U/1)	47.4 ± 8.12 a	70.7 ± 8.12 a	41.6±8.12 a	44.3±8.12 a	59.0 ± 5.74 a	43.1 ± 5.74 a
GPT (U / 1)	20.0 ± 3.00 a	10.8 ± 3.00 a	19.2± 3.00a	13.7 ± 3.00a	10.8 ± 2.12 a	21.0 ± 2.12 b
Uric acid (mg/l)	31.6 ± 4.48 a	26.8 ± 4.48 a	29.5±4.48 a	15.6 ± 4.48 a	24.9 ± 3.17 a	26.8 ±3.17 a
Creatinine (mg/d)	1.12 ± 0.057 a	1.48 ± 0.057 b	1.30±0.057 b	1.20±0.057 a	1.34 ± 0.040 b	1.21 ± 0.040 a

a and b means on the same row with different superscripts are significantly different ($P < 0.05$) .

In this respect , **Mohamed (1983)** showed that total cholesterol in serum blood of Giant Flander and Baladi Red were 78.22 , 90.62 ; 72.8, 86.70 ; 123.6, 137.80 ; 76.50 , 93.70 and 100 , 107.2 mg / 100 ml , for rabbits fed basal , 10% manure from diet containing 10 % cow , poultry , rabbit and sheep, respectively .

Means of alk. phosphatase , GPT, uric acid and creatinine of blood varied with treatment without any consistent trend and the differences were almost not significant (Tables 20 and 21) . It is worth to note that GPT values decreased with increasing the level of rabbit manure in the diet , this may be due to a dub function in liver according to increasing manure level . Therefore , rabbit manure should not be increased in rabbit diet more then 15% .

However , the differences in blood components between results of this study and those reported in the literature may be due to biological status , age , breed of rabbits form and ingredients of diets .

Sex effect :

Data in Table (20) showed that female rabbits recorded higher total protein , albumin , albumin / globulin ratio , cholesterol , GPT and uric acid contents than males with significant differences ($P < 0.05$, $P < 0.01$ or $P < 0.001$) for total protein , albumin , GPT and creatinine only (Table 21) .

In good agreement with the present results , **Mohamed (1983)** showed that sex had a clear influence on serum protein fractions , since , female rabbits recorded higher total protein , albumin fractions and albumin / globulin ratio with little change in the globulin fraction did the males .

Interaction :

The results of the present study showed that interaction effect of treatment x sex on globulin , albumin / globulin ratio , alk. phosphatase and creatinine of blood was significant (Table 21) .

4.11. Cecum activity :

Results of cecum activity are illustrated in Tables (22 and 23) .

Treatment effect :

Means of total count ; E.Coli count and pH values of cecum contents for rabbits fed the diet containing 25% rabbit manure were higher than those for rabbits fed 0,5 and 15% rabbit manure , with no significant differences between treatments (Tables 22 and 23) . While , ammonia of cecum content for rabbits fed the diet containing 15 % rabbit manure was higher ($P < 0.05$) than that for rabbits on other rabbit manure levels . Whereas , rabbits fed the control diet (0% rabbit manure)recorded the highest TVFA values , but without any significant differences between the control and all rabbit manure levels used in the study (Tables 22 and 23) .

In this repect , **Warner (1966)** suggested that the rate of protozoal growth is affected mainly by the species of protozoa and the type of diet had little effect on cecum activity . **Fatma (1992)** reported that the significant differences in cecum activity may be due to the individual differences between experimental rabbits or to the change in protozoa population as mentioned by **Warner (1966)** . Also , **El-Sayaad et al. (1995)** showed that E.Coli and / or total count of bacteria in cecum content of rabbits increased with increasing the dietary level of artichoke

Table (22) : Least squares means ± SE of factors affecting cecum activity of rabbits .

Independent variable	No.	Cecum activity					
		Total count * mean +	E. Coli total * count mean +	Ammonia (mg/ 100 ml)	TVFA (ml eq / 100 ml)	pH	Salmonella and * shigella
		Mean±SE	Mean±SE	Mean±SE	Mean±SE	Mean±SE	
Treatment :							
T_1	6	295.7±38.6 a	203.0 ± 86.9 a	54.4 ± 4.18 b	2.20±0.133a	6.22± 0.093 a	ND
T_2	6	239.5±38.6a	273.3 ± 86.9 a	50.4±4.18 b	1.95±0.133 a	6.28±0.093 a	ND
T_3	6	238.5±38.6a	361.0 ± 86.9 a	66.3±4.18 a	2.17±0.133 a	5.98±0.093 a	ND
T_4	6	379.3±38.6 a	451.7 ± 86.9 a	35.2±4.18 c	1.75±0.133 a	6.30±0.093 a	ND
Sex :							
Male	12	257.9 ± 27.3 a	251.3 ± 61.5 a	52.5 ± 2.96 a	2.03±0.094 a	6.28±0.066 a	ND
Female	12	318.6 ± 27.3 a	343.3 ± 61.5 a	50.6± 2.96 a	2.01±0.094 a	6.11±0.066 a	ND

* After APHA (1960) ; Difco Manual (1977) and Mackie and Me-Carteny (1953).

\+ Number of bacterial cells per gram of cecum content (Total count x 10^5 and E. Coli total count x 10^4) .

a , b and c means on the same column with different superscripts are significantly different ($P < 0.05$) .

ND = Not detected .

Table (23) : Least squares analysis of variance of factors affecting cecum activity of rabbits .

Source of variance	d.f	Ms and F values of									
		Total count mean		E. Coli total count mean		Ammonia		TVFA		pH	
		MS	F	MS	F	MS	F	MS	F	MS	F
Treatment	3	26405.6	2.96 ns	69227.3	1.53 ns	988.5	9.43 ***	0.263	2.48 ns	0.128	2.48 ns
Sex	1	22082.7	2.47 ns	50784.0	1.12 ns	20.2	0.192 ns	0.002	0.016 ns	0.184	2.56 ns
Treat.x sex	3	9940.3	1.11 ns	59752.0	1.32 ns	362.0	3.45 ns	0.481	4.52 ns	0.052	0.997 ns
Remainder	16	8928.6		45330.9		104.9		0.1063		0.052	

ns = Not significant .

*** = ($P < 0.001$) .

bracts which stimulated growth and number of bacteria in cecum content .

Sex effect :

Data of the present study showed that total count and E.coli count in cecum content of female rabbits surpassed those of male ones , while ammonia ,TVFA and pH values showed a reverse trend (Tables 22 and 23) . However , the differences in all cecum traits studied due to sex effect were not significant (Table 23) .

Interaction :

The interaction effect of treatment x sex on all cecum traits studied was not significant (Table 23) .

4.12. Economical efficiency :

The feed cost and economical efficiency of using rabbit manure in rabbit diets are shown in Table (24) . The economical efficiency values were calculated according to the official prices of different feed ingredients used for formulating the experimental diets prevailed in the Egyptian market throughout the experimental period in 1994 . The economical efficiency values of the control diet (T_1 , 0% rabbit manure) was taken as standard for comparing between treatments .

Results in Table (24) showed that , at 5-8 weeks of age interval the highest feed cost for male rabbits was shown by T_2 (5% rabbit manure) being 4.3 PT followed by that of T_1 (0% rabbit manure , control) being 4.1 PT , while the lowest value (3.5 PT) was recorded by T_3 (15% rabbit manure) and T_4 (25% rabbit manure) . Whereas , for female rabbits , T_1 (control) showed the highest feed cost value , while T_3 recorded the lowest one . However at 8-12 and 5-16 weeks of age intervals , T_1 almost showed the highest feed cost values for both males and females , while T_4 achieved the lowest ones .

The highest (best) average economical efficiency (net revenue , PT / feed cost , PT) values were almost shown by rabbits of T_3 (15% rabbit manure) at all age intervals of the study , while the lowest (poorest) values were recorded by those of T_2 (5 % rabbit manure) or T_4 (25% rabbit manure) . Assuming that the average economical efficiency values of the control (T_1) equals 100 , rabbits of T_3 (15% rabbit manure) recorded the highest values at 5-8 , 8-12 and 5-16 weeks of age intervals being 120 , 113 and 104 , respectively .

The previous results indicated that , from the economical point of view , rabbit manure could be incorporated in rabbit diets up to 15% of the diet .

Table (24) : Economical efficiency of experimental diets used at 5-8 , 8-12 , 12-16 and 5-16 weeks of age intervals .

Independent variable		5-8 weeks				8-12 weeks				12-16 weeks				5-16 weeks			
		T_1	T_2	T_3	T_4	T_1	T_2	T_3	T_4	T_1	T_2	T_3	T_4	T_1	T_2	T_3	T_4
Price / kg diet (PT) *		50.7	48.5	46.9	43.2	50.7	48.5	46.9	43.2	50.7	48.5	46.9	43.2	50.7	48.5	46.9	43.2
Average daily feed intake as fed (gm) :	Male	81.7	87.7	75.2	81.1	98.2	90.2	101.8	108.5	98.7	96.7	99.5	107.2	93.9	91.9	93.7	100.6
	Female	82.5	73.4	73.3	84.5	96.5	93.0	100.3	103.2	99.3	98.9	112.1	111.3	93.7	89.8	97.2	101.0
Feed cost (PT) :	Male	4.1	4.3	3.5	3..5	5.0	4.4	4.8	4.7	5.0	4.7	4.7	4.6	4.8	4.5	4.4	4.3
	Female	4.2	3.6	3.4	3.7	4.9	4.5	4.7	4.5	5.0	4.8	5.3	4.8	4.7	4.4	4.6	4.4
Average daily gain (gm) :	Male	24.9	20.0	24.8	15.5	21.2	16.9	22.1	20.4	16.2	18.0	14.3	17.7	20.9	18.2	20.2	18.1
	Female	21.3	16.9	19.6	17.3	19.8	15.9	19.9	18.2	16.9	17.7	17.8	17.7	19.3	16.9	18.7	18.0
Total revenue (PT) :	Male	19.9	16.0	19.8	12.4	17.0	13.5	17.7	16.3	13.0	14.4	11.4	14.2	16.7	14.6	16.2	14.5
	Female	17.0	13.5	15.7	13.8	15.8	12.7	15.9	14.6	13.5	14.2	14.2	14.2	15.4	13.5	15.0	14.4
Net revenue (PT) :	Male	15.8	11.7	16.3	8.9	12.0	9.1	12.9	11.6	8.0	9.7	6.7	9.6	11.9	10.1	11.8	10.2
	Female	12.8	9.9	12.3	10.1	10.9	8.2	11.2	10.1	8.5	9.4	8.9	9.4	10.7	9.1	10.4	10.0
Economical efficiency :	Male	3.9	2.7	4.7	2.5	2.4	2.1	2.7	2.5	1.6	2.1	1.4	2.1	2.5	2.2	2.7	2.4
	Female	3.0	2.8	3.6	2.7	2.2	1.8	2.4	2.2	1.7	2.0	1.7	2.0	2.3	2.1	2.3	2.3
	Average	3.5	2.8	4.2	2.6	2.3	2.0	2.6	2.4	1.7	2.1	1.6	2.1	2.4	2.2	2.5	2.4
Relative economical efficiency %		100	80	120	74	100	87	113	104	100	124	94	124	100	92	104	100

* Based on prices of the Egyptian market during the experimental period (1994) . The price of one ton of rabbit manure , barley , soyabean meal (44% CP) , wheat bran , alfalfa meal (14% CP) , molasses , vitamins & minerals mix . , salt , lime stone , methionine were , 50 , 700 , 950 , 300 , 400 , 150 , 6000, 100 , 20 and 12000 LE , respectively . The price of one kg body weight on selling was 8.00 LE .

$$\text{Economical efficiency} = \frac{\text{Net revenue (PT)}}{\text{Feed cost (PT)}}$$