4- RESULTS AND DISCUSSION

4.1. Traits of growth parameters:

4.1.1. Body weight .

Data presented in table (8) show the averages of body weight (in g) for experimental groups of Hubbard broiler chicks.

Inspection of data shows that the average initial live body weight is nearly similar , body weight average of chicks of all experimental groups gradually increased from hatch up to the end of the experimental period . This was quite true in chicks of all experimental groups .

Irrespective of the effect of Bio-Tonic , Fermacto , Kemzyme or Zinc bacitracin treatments, supplemented levels showed highly significant effect ($p < 0.001$) on average body weight at 4 th and 7 th weeks of chicks age (ANOVA table 9) .

Average body weight at the 4 th week of chicks age was higher in birds fed Bio-Tonic than those fed either Fermacto , Kemzyme or Zinc bacitracin by 16.0, 5.7 and 25.6 g , respectively . These results agreed with those of Abdel-Malak *et al* . , (1995) who reported that adding Bio-Tonic to broiler starter diets improved live body weight by 6.5 % . Such increase in body weight was observed by Nouroy (1954) ; Boulos (1983) and El - Gendi *et al* . , (1994) which may be attributed to the herbal ingredients for

controlling and buffering the conditions of the stomach and intestine which was clearly observed at the low and higher levels . In addition , Bio - Tonic contains adequate levels from unsaturated fatty acids . As regards to linoleic, linolenic and arachidonic acids , these are the only fatty acids known to be essential for the complete nutrition . Linoleic (W6) or linolenic (W3) acids must be supplied in the diet to accomplish the synthesis of other members of (W6) and (W3) families of polyunsaturated fatty acids . Besides , linoleate may be converted to arachidonate. (Murray *et al* . , 1991) .

Average body weight at the 7 th week of chicks age was higher in birds fed Kemzyme than those fed Zinc bacitracin , Bio-Tonic or Fermacto by 5.9 , 23.2 , and 47.0 g , respectively . However , analysis of variance revealed insignificant effect due to treatments applied on average body weight at 4 th and 7 th wks of chicks age . These results agree with those of El-Husseiny *et al* . , (1995) who observed such increase in body weight by using Kemzyme .

The effectiveness of Kemzyme supplementation to the basal diet could be explained by increasing the energy utilization of diets (Lyons and Jacques , 1987) , or improvement in digestibility of starch , carbohydrates , protein , fat and cellulose (Hashish *et al* .,1992 and Wyatt and Goodman , 1993) , the enzyme supplementation of diets may have a positive effect on energy bioavalability and broiler performance .

Chicks fed 0.5 Kg Bio - Tonic / ton ration had the highest average of body weight at the 4 th (1041.6 g) and 7 th week of age (2048 .3 g) when compared with other levels applied of Bio – Tonic .

Chicks fed 0.5 Kg / ton ration of either Zinc bacitracin (2106.8 g) or Fermacto (2020 .4 g) had the highest averages of body weight at 7 th week only . While chicks fed 1.5 kg / ton ration of Kemzyme had the highest average of body weight at the 4 th and 7 th week of chicks age .

Analysis of variance and Duncan multiple range test showed insignificant differences in average of body weight between chicks of different treatments applied due to supplemented levels at the 4 th and 7 th weeks of age .

Chicks fed 0.5 kg Zinc bacitracin / ton ration had the highest average (2106 . 8 g) of body weight followed by those fed 1.5 kg/ ton Kemzyme (2100 . 3 g) at the end of the experimental period . While , the lowest average was found for chicks fed 1 . 5 kg / ton Fermacto (1819 .6 g) . Similar results were observed by Waldroup *et al* ., (1986) who reported that regression of body weight on dietary levels of Zinc bacitracin indicated that each milligram of Zinc bacitracin in the diet increased the 49 day weight of broiler chicks by 0.92 g .

The results of El – Nagmy (1989) showed that antibiotics may produce one or more of the following effects : 1. they may favour the growth of nutrient - synthesizing and inhibit that of nutrient – destroying micro organisms . 2. Antibiotics may improve availability or absorption of certain nutrients such as calcium , phosphorus and magnesium . 3 . Antibiotics may inhibit the growth of organisms

that produce excessive amounts of ammonia and other toxic nitrogenous waste products in the intestines such as trimethylamine , which may be sufficiently toxic to reduce growth . However , March and Biely (1967) found that growth of chicks may be stimulated when an antibiotic is added to diet deficient in one or more of B - complex vitamins , especially riboflavin , pyridoxine and folacin .

Supplemented levels and the interactions between treatments applied and dietary levels showed highly significant ($P<0.001$) effects on average body weight at 4 th and 7 th weeks of chicks age (ANOVA Table 9) .

Table (8) : Least square means and standard error ($\bar{X} \pm$ S.E) for body weight of experimental groups as affected by dietary supplementation .

Independent variables		Body weight (g) at		
Treatments	Level (kg / ton)	Hatch	4 th week	7 th week
Bio – tonic	0	48.7± 0.7	975.0±19.6	1995.1±37.9
	0.5	49.0±0.7	1041.6±19.6	2048.3±37.9
	1.0	48.1±0.7	799.3±19.6	1838.0±37.9
	1.5	49.2±0.7	941.1±19.6	1999.1±37.9
	Average	48.7±0.4 a	939.2±09.8 a	1970.1±18.8 a
Fermacto	0	48.8±0.7	975.6±19.6	1996.0±37.9
	0.5	48.1±0.7	952.1±19.6	2020.4±37.9
	1.0	48.1±0.7	926.6±19.6	1949.3±37.9
	1.5	47.9±0.7	838.4±19.6	1819.6±37.9
	Average	48.2±0.4 a	923.2±09.8 a	1946.3±18.8 a
Kemzyme	0	48.6±0.7	974.6±19.6	2006.6±37.9
	0.5	48.5±0.7	878.4±19.6	1920.0±37.9
	1.0	48.5±0.7	901.3±19.6	1946.4±37.9
	1.5	48.9±0.7	979.6±19.6	2100.3±37.9
	Average	48.6±0.4 a	933.5±09.8 a	1993.3±18.9 a
Zinc bacitracin	0	48.7±0.7	975.2±19.6	2016.1±37.9
	0.5	49.2±0.7	964.4±19.6	2106.8±37.9
	1.0	48.5±0.7	871.9±19.6	1919.0±37.9
	1.5	48.6±0.7	842.8±19.6	1907.6±37.9
	Average	48.7±0.4 a	913.6±09.8 a	1987.4±18.9 a
Overall mean		48.6±0.2	927.4±4.9	1974.3±9.48

Means with the same letters in each column are not significantly different .

Table (9) : Analysis of variance for data presented in table (8)

S .O .V	D . F	Mean squares at		
		Hatch	4 th week	7th week
Treatments(T)	3	9.428	18544 .9	64031.8
Levels (L)	3	5.576	325217.3 ***	353149.7 ***
Replicates (R)	2	5.965	893.7	49091.0
T X L	9	4.424	144071.8 ***	259867.1 ***
T X R	6	10.178	9821.4	38397.9
L X R	6	2.694	6751.1	24528.6
Remainder	546	17.418	13806.0	51780.9

Whereas : *** = P < 0.001

4.1.2. Body weight gain :

Data concerning the effect of Bio- Tonic , Fermacto , Kemzyme and Zinc bacitracin treatments on body weight gain of Hubbard broiler chicks were presented in table (10).

Results obtained showed that , body weight gain increased in all experimental groups by advancing age .

Average body weight gain at the period from (0 – 4 wks) of chicks age was higher in birds fed Bio - Tonic (890 . 5 g) than those fed either Fermacto (875 . 0 g) , Kemzyme (884 . 9 g) or Zinc bacitracin (864 .9 g) , respectively . Similar results were observed by Abdel - Malak *et al* ., (1995) who observed that adding Bio - Tonic to broiler starter diets improved weight gain. While at the periods from (4 - 7 wks) of chicks age , the highest average of body weight gain was observed in birds fed Zinc bacitracin (1073.8 g) , and the lowest average was noted in birds fed Fermacto (1023.1 g) .

Average body weight gain at the period from (0 - 7 wks) of age was higher in birds fed Kemzyme than those fed either Zinc bacitracin , Bio - Tonic or Fermacto by 6.0 , 23 .3 and 46.6 g , respectively . These results agreed with those of Songailene *et al* ., (1988) and Zatari and Ferket (1990) who reported that addition of Kemzyme to basal diets for broiler chicks improved body weight gain by 6.5 % .

The effectiveness of Kemzyme supplementation to basal diets could be explained by increasing the energy utilization of diets (Lyons and Jacques 1987) or improvement in digestibility of dietary protein in small gut (Hashish *et al* . , 1992) or

Analysis of variance for data obtained (ANOVA table 11) revealed highly significant effect due to supplemented levels on the average body weight gain during the period from (0 – 4) and (0 – 7)weeks only .

Chicks fed 0.5 kg / ton Bio –Tonic had the highest body weight gain averages at the period from (0–4) and (0–7) weeks of age than those fed either 0 , 1.0 , or 1.5 kg / ton ration . While , at the period from (4 – 7) weeks chicks fed 1.5 kg / ton ration had the highest average of body weight gain (1058 .0 g) when compared with other levels of Bio – Tonic and control group .

Chicks fed 0.5 kg Fermacto / ton ration had the highest averages of body weight gain at the period from (4 – 7) and (0 – 7) weeks of age . On the other hand , chicks fed 1.5 kg / ton ration of Kemzyme had the highest average of body weight gain at all periods of chicks age when compared with other levels applied of Kemzyme .

Feeding chicks Zinc baciracin at a level of 0.5 kg / ton ration showed the highest body weight gain at the periods from (4 – 7) and (0 – 7) weeks of age only when compared with other levels of Zinc **bacitracin** .

Regardless the effect of treatments applied , chicks fed 0.5 kg Zinc bacitracin / ton ration had the highest average of body weight gain

(2057.6 g) , followed by those fed 1.5 kg / ton Kemzyme (2051.3 g) during the period from (0 – 7 wks) . While the lowest average was found for chicks fed 1.5 kg / ton Fermacto (1771.6 g). Similar results were observed by El – Faham *et al* . , (1994) who reported that Kemzyme supplementation improved significantly the average body weight gain .

The interaction between treatments applied and supplemented levels had highly significant effect ($P < 0.001$) on body weight gain at the periods from (0 – 4) and (0 – 7 wks) of chicks age (ANOVA table 11) .

Table (10):Least square means and standard error ($\bar{X} \pm$ S.E) for Body weight gain of experimental groups as affected by dietary supplementation .

Independent variables		Body weight gain (g)		
Treatments	Level (kg / ton)	0 – 4 weeks	4 - 7 weeks	0 - 7 weeks
Bio – tonic	0	926.3±21.9	1020.1±29.3	1946.4±38.5
	0.5	992.6±21.9	1006.7±29.3	1999.3±38.5
	1.0	751.2±21.9	1038.7±29.3	1789.9±38.5
	1.5	891.9±21.9	1058.0±29.3	1949.9±38.5
	Average	890.5±10.9 a	1030.9±14.6 a	1921.4±19.3 a
Fermacto	0	926.8±21.9	1020.4±29.3	1947.3±38.5
	0.5	904.1±21.9	1068.3±29.3	1972.3±38.5
	1.0	878.5±21.9	1022.7±29.3	1901.2±38.5
	1.5	790.4±21.9	981.1±29.3	1771.6±38.5
	Average	875.0±10.9 a	1023.1±14.6 a	1898.1±19.3 a
Kemzyme	0	925.9±21.9	1032.1±29.3	1957.9±38.5
	0.5	830.0±21.9	1041.6±29.3	1871.5±38.5
	1.0	852.8±21.9	1045.1±29.3	1897.9±38.5
	1.5	930.6±21.9	1120.7±29.3	2051.3±38.5
	Average	884.9±10.9 a	1059.8±14.6 a	1944.7±19.3 a
Zinc bacitracin	0	926.5±21.9	1040.9±29.3	1967.4±38.5
	0.5	915.2±21.9	1142.4±29.3	2057.6±38.5
	1.0	823.4±21.9	1047.1±29.3	1870.5±38.5
	1.5	794.2±21.9	1064.8±29.3	1859.0±38.5
	Average	864.9±10.9 a	1073.8±14.6 a	1938.7±19.3 a
Overall mean		878.8±5.5	1046.9±7.3	1925.7±9.6

Means with the same letters in each column are not significantly different .

Table (11) : Analysis of variance for data presented in table (10)

S .O .V	D . F	Mean squares		
		0 – 4 weeks	4 - 7 weeks	0 - 7 weeks
Treatments(T)	3	18976.7	70409.1	50754.1
Levels (L)	3	270754.5 ***	25829.4	277536.7 **
Replicates (R)	2	13709.3	79896.1	62066.3
T X L	9	168169.2 ***	41289.9	229368.3 ***
T X R	6	18612.1	55791.9	72269.9
L X R	6	7526.9	39878.4	36946.2
Remainder	546	17198.7	30806.6	53473.3

Whereas : ** = P < 0.01 , *** = P < 0.001

4.1.3.Keel and Shank lengths :

Data presented in table (12) show the averages of keel and shank lengths (in cm) for experimental groups of Hubbard broiler chicks.

Feeding the chicks a diet supplemented with Kemzyme or Bio – Tonic , respectively insignificantly increased keel and shank lengths at the 7 th wk of chicks age . While chicks fed diet supplemented with Zinc bacitracin or Kemzyme increased keel and shank lengths at the 4 th wk of chicks age , respectively , when compared with those of other treatments applied . Differences in shank and keel lengths found within ages of different treatments applied were mainly due to differences in body weight. Similar results were observed by Pinchasov *et al* ., (1985) . Analysis of variance showed significant effect ($P<0.05$) on shank length at the 4 th wk only of chicks age due to treatments applied (ANOVA table 13) .

Irrespective to the effect of dietary supplementation of either Bio – Tonic , Fermacto , Kemzyme or Zinc bacitracin , chicks fed 0.5 kg Bio – Tonic / ton ration showed the highest keel length at 7 th wk of chicks age . On the other hand , chicks fed either 0.5 Zinc bacitarcin or 1.5 kg Kemzyme / ton ration , respectively significantly increased shank length at the 7 th wk of chicks age than did applying the other levels of dietary supplementation . These results agreed with those of Mahmoud *et al* ., (1980) who reported that there was high positive correlation **between body weight and keel length .**

Analysis of variance showed highly significant variations on keel length at the 7 th wk and shank length at the 4 th and 7 th wks of chicks age due to supplemented levels applied . Similar results were observed on keel and shank lengths due to the interaction between treatments applied and supplemented levels (ANOVA table 13) .

Table (12) : Least square means and standard error ($\bar{X} \pm$ S.E) for keel and Shank lengths averages (in cm) of experimental groups as affected by dietary supplementation .

Independent variables		Average keel and Shank lengths (cm) ± S .E					
		Keel length at			Shank length at		
Treatments	Level (kg/ton)	1 st Week	4 th Week	7th Week	1 st Week	4 th Week	7 th Week
Bio –Tonic	0	3.71 ± 0.6	8.24 ± 0.4	11.25 ± 0.1	2.48 ± 0.04	3.84 ± 0.06	4.63 ± 0.07
	0.5	3.65 ± 0.6	8.03 ± 0.4	11.45 ± 0.1	2.28 ± 0.04	3.66 ± 0.06	4.75 ± 0.07
	1.0	5.96 ± 0.6	7.71 ± 0.4	10.78 ± 0.1	1.97 ± 0.04	3.38 ± 0.06	4.32 ± 0.07
	1.5	3.23 ± 0.6	7.75 ± 0.4	11.19 ± 0.1	2.23 ± 0.04	3.63 ± 0.06	4.56 ± 0.07
	Average	4.14±0.3 **a**	7.93±0.2 **a**	11.17±0.1 **a**	2.24±0.02 **a**	3.63±0.03**ab**	4.57±0.04 **a**
Fermacto	0	3.77 ± 0.6	8.26 ± 0.4	11.30 ± 0.1	2.47 ± 0.04	3.83 ± 0.06	4.62 ± 0.07
	0.5	3.33 ± 0.6	7.81 ± 0.4	11.17 ± 0.1	2.19 ± 0.04	3.59 ± 0.06	4.50 ± 0.07
	1.0	3.24 ± 0.6	7.75 ± 0.4	11.08 ± 0.1	2.23 ± 0.04	3.64 ± 0.06	4.61 ± 0.07
	1.5	2.90 ± 0.6	7.27 ± 0.4	10.73 ± 0.1	1.97 ± 0.04	3.33 ± 0.06	4.34 ± 0.07
	Average	3.31±0.6 **a**	7.77±0.2 **a**	11.07±0.1 **a**	2.21±0.02 **a**	3.60±0.03 **a**	4.52±0.04 **a**
Kemzyme	0	3.74 ± 0.6	8.24 ± 0.4	11.25 ± 0.1	2.48 ± 0.04	3.84 ± 0.06	4.64 ± 0.07
	0.5	3.06 ± 0.6	7.56 ± 0.4	10.99 ± 0.1	2.11 ± 0.04	3.50 ± 0.06	4.46 ± 0.07
	1.0	3.17 ± 0.6	7.66 ± 0.4	11.01 ± 0.1	2.20 ± 0.04	3.59 ± 0.06	4.57 ± 0.07
	1.5	3.49 ± 0.6	7.96 ± 0.4	11.23 ± 0.1	2.47 ± 0.04	3.88 ± 0.06	4.82 ± 0.07
	Average	3.37±0.6 **a**	7.85±0.2 **a**	11.12±0.1 **a**	2.31± 0.02 **a**	3.70±0.03 **b**	4.62±0.04 **a**
Zinc bacitracin	0	3.74 ± 0.6	8.24 ± 0.4	11.28 ± 0.1	2.47 ± 0.04	3.83 ± 0.06	4.62 ± 0.07
	0.5	3.50 ± 0.6	9.09 ± 0.4	11.18 ± 0.1	2.45 ± 0.04	3.94 ± 0.06	4.88 ± 0.07
	1.0	3.06 ± 0.6	8.39 ± 0.4	10.85 ± 0.1	2.16 ± 0.04	3.48 ± 0.06	4.41 ± 0.07
	1.5	3.03 ± 0.6	7.56 ± 0.4	10.72 ± 0.1	2.11 ± 0.04	3.50 ± 0.06	4.36 ± 0.07
	Average	3.34±0.6 **a**	8.32±0.2 **a**	11.01±0.1 **a**	2.30±0.02 **a**	3.69±0.03 **b**	4.57±0.04 **a**
Overall mean		3.54 ± 0.2	7.97 ± 0.1	11.09 ± 0.1	2.27 ± 0.01	3.65 ± 0.01	4.57 ± 0.02

Means with the same letters in each column are not significantly different .

4.2. Parameters of feed conversion :

4.2.1. Feed consumption.

Feed consumption in grams per bird at the periods from (0–4) , (4–7)and (0 –7) weeks for experimental groups of Hubbard broiler chicks were listed in table (14) .

Results obtained showed that chicks fed Zinc bacitracin and those fed Bio – Tonic significantly decreased feed consumption(1930.9 and 3126.7 g / bird) during the periods from (0 – 4) and (4 –7) wks of age , respectively . Diet supplemented with Zinc bacitracin decreased average of feed consumption (5078.4 g/bird) during the period from (0 – 7 wk) followed by those fed Bio – Tonic (5116.1 g/bird) , respectively when compared with other treatments applied . However , the Kemzyme supplementation to broiler diets significantly increased feed consumed at the period from (4 – 7) and (0 – 7) wks of chicks age . These results disagree with those reported by Ghazalah *et al* ., (1994) , El – Faham *et al* .,(1994) and Mervat (1999) who reported insignificant increases in feed intake due to enzyme supplementation to broiler diets .

Chicks fed 0.5 kg Zinc bacitracin/ton ration had the lowest average (1838.7 g / bird) of feed consumption at the period from 0 – 4 wk . While those fed 0.5 kg Bio – Tonic /ton ration had the lowest averages (2945.3 and 4967.0 g / bird , respectively) at the periods from 4 – 7 and 0 – 7 wks of chicks age , when compared with different levels and control groups . The results of Damron *et al* ., (1991) revealed that feed consumption was not improved by bacitracin methylene disalicylate during the 8 – wk brooding period .

Analysis of variance showed that variations in feed consumption due to treatments applied and supplemented levels were found to be of highly significant at all periods of estimation (ANOVA table 15) . The interaction effect between treatments applied and supplemented levels had highly significant effect ($P < 0.001$) on feed consumption along the experimental periods (ANOVA table 15) .

Table (14) : Least square means and standard error ($\bar{X} \pm$S.E) for feed consumption of experimental groups as affected by dietary supplementation .

Independent variables		Feed consumption (g / bird)		
Treatments	Level (kg / ton)	0 – 4 weeks	4 – 7 weeks	0 – 7 weeks
Bio – tonic	0	1941.0 ± 1.43	3215.0 ± 15.32	5156.1 ± 2.21
	0.5	2021.3 ± 1.43	2945.3 ± 15.32	4967.0 ± 2.21
	1.0	1965.7 ± 1.43	3247.3 ± 15.32	5213.0 ± 2.21
	1.5	2028.3 ± 1.43	3100.0 ± 15.32	5128.3 ± 2.21
	Average	1989.1± 0.71 a	3126.9 ± 7.66b	5116.1 ± 1.10 b
Fermacto	0	1952.0 ± 1.43	3211.0 ± 15.32	5163.3 ± 2.21
	0.5	2067.3 ± 1.43	3164.3 ± 15.32	5231.3 ± 2.21
	1.0	2020.0 ± 1.43	3066.7 ± 15.32	5086.0 ± 2.21
	1.5	1913.0 ± 1.43	3192.3 ± 15.32	5105.3 ± 2.21
	Average	1988.1 ± 0.71 a	3158.6 ± 7.66 a	5146.5 ± 1.10 c
Kemzyme	0	1962.0 ± 1.43	3222.3 ± 15.32	5184.7 ± 2.21
	0.5	2046.3 ± 1.43	3129.3 ± 15.32	5176.0 ± 2.21
	1.0	1947.3 ± 1.43	3259.3 ± 15.32	5207.0 ± 2.21
	1.5	1989.0 ± 1.43	3228.7 ± 15.32	5218.0 ± 2.21
	Average	1986.2 ± 0.71 a	3209.9 ± 7.66 c	5196.4 ± 1.10 d
Zinc bacitracin	0	1963.0 ± 1.43	3228.0 ± 15.32	5191.0 ± 2.21
	0.5	1838.7 ± 1.43	3153.3 ± 15.32	4992.0 ± 2.21
	1.0	1973.0 ± 1.43	3146.0 ± 15.32	5118.0 ± 2.21
	1.5	1949.0 ± 1.43	3063.7 ± 15.32	5012.7 ± 2.21
	Average	1930.9 ± 0.71 b	3147.8 ± 7.66 a	5078.4 ± 1.10 a
Overall mean		1973.6 ± 0.36	3160.8 ± 3.83	5134.4 ± 0.55

Means with the same letters in each column are not significantly different .

Table (15) : Analysis of variance for data presented in table (14)

S.O.V	D.F	Mean squares		
		0 – 4 weeks	4 – 7 weeks	0 – 7 weeks
Treatments(T)	3	116602.27 ***	36840.07 **	358149.82 ***
Levels (L)	3	37432.93 ***	741969.92 ***	200831.32 ***
Replicates (R)	2	222.84 *	256089.80 ***	70.22
T X L	9	135658.94 ***	399186.06 ***	226510.69 ***
T X R	6	275.10 **	240560.94 ***	367.18
L X R	6	8753.33 ***	240268.74 ***	18711.23 ***
Remainder	546	73.49	8450.50	175.13

Whereas : * = P < 0.05 , ** = P < 0.01 , *** = P < 0.001

4.2.2.Feed conversion.

Data presented in table (16) show the averages of feed conversion for experimental groups of Hubbard broiler chicks calculated as a ratio between total feed consumption to total weight gain all over the experimental period .

Results obtained indicated that chicks fed Zinc bacitracin had the best average of feed conversion at the periods from 0 – 4 and 4 – 7 wks when compared with other treatments applied . These results agree with those of Marusich *et al* . , (1978) and Stutz *et al* . , (1983) who reported that supplementing diets with Zinc bacitracin improved feed conversion of broilers . In addition , chicks fed Zinc bacitracin (2.63) or Bio – Tonic (2.66 g feed / g gain) improved feed conversion at the period from (0 – 7 wk) when compared with other treatments applied .

The results obtained agreed with those of El – Gendi *et al* . , (1994) who stated that the effectiveness of herbal products supplementation to the diet in improving feed conversion may be attributed to its effect on improving the digestibility of dietary protein in small gut . Similar results in improving feed conversion by using some herbal products supplemented diets were obtained by (Alishekhov *et al* ., 1986 ; Sabra and Mehta , 1990 and Hashish *et al* ., 1992) .

Chicks fed 0.5 kg Zinc bacitracin / ton ration had the better average of feed conversion at the periods from 0 – 4 wks (2.01) , 4 – 7 wks (2.76) and 0 – 7 wks (2.43 g feed / g gain) , respectively . Followed , are those fed 0.5 kg Bio – Tonic / ton ration during the periods from 0 – 4 and

0 – 7 wks (2.04 and 2.48 g feed / g gain , respectively) when compared with different levels applied and control groups .

It is worthy to observe that chicks fed Fermacto supplemented diets had the worst average of feed conversion values which was inferior significantly at 0 – 4 wks (3.09) and insignificantly at 0 – 7 wks (2.71) when compared with other treatments applied (table 16) .

Analysis of variance for data obtained showed that variation in feed conversion due to treatments applied was highly significant effect ($P < 0.01$) at the period from (4 – 7) week only . While variation due to supplemented levels was found to be of highly significant effect ($P < 0.001$) at all periods of estimation (ANOVA table 17) .

The interaction effect between treatments applied and supplemented levels on feed conversion was significant at all periods of estimation (ANOVA table 17) .

Table (17) : Analysis of variance for data presented in table (16)

S .O .V	D . F	Mean squares		
		0 – 4 weeks	4 – 7 weeks	0 – 7 weeks
Treatments(T)	3	0.013	1.632 **	0.094
Levels (L)	3	2.047 ***	2.160 ***	0.664 ***
Replicates (R)	2	0.069	1.280 *	0.117
T X L	9	1.260 ***	0.811 *	0.544 ***
T X R	6	0.130	0.504	0.170
L X R	6	0.059	0.646	0.075
Remainder	546	0.116	0.343	0.114

Whereas : * = P < 0.05 , ** = P < 0.01 , *** = P < 0.001

4. 3. Performance index .

Data concerning the effect of either Bio – Tonic , Fermacto , Kemzyme or Zinc bacitracin treatments on performance index of Hubbard broiler chicks were presented in table (18) .

Results obtained showed that chicks fed diet with Bio – Tonic improved performance index (42.04 %) at 4 th wk of chicks age , followed by those fed Kemzyme (41.69 %) . On the other hand , chicks fed Zinc bacitracin improved performance index (75.87 %) at 7 th week of chicks age , followed by those fed either Kemzyme or Bio – Tonic (74.58 and 74.25 % , respectively) .

The results of El – Gendi (1996) reported that Egg – Plus (as herbal growth promoter) supplemented diets improved performance index when compared with non supplemented diet (control) .

Chicks fed 0.5 kg/ton ration of either Bio – Tonic or Zinc bacitracin had the higher averages (51.06 and 47.98 % , respectively) of performance index at 4 th week of chicks age .

Feeding chicks on diets containing 0.5 kg/ton ration of either Zinc bacitrzcin or Bio–Tonic improved performance index (86.70 and 82.59 % , respectively) at the 7 th week of chicks age . Similar results were observed by Hattaba *et al* ., (1997) who reveled that adding Zinc bacitracin to animal protein diets resulted in superior performance index values as compared to control diets .

On the other hand , chicks fed the Fermacto supplemented diets exhibited the worst performance index either at 4 th or 7 th week of chicks age , compared with other treatments applied (table 18) .

Analysis of variance showed highly significant effects due to supplemented levels and the interaction between treatments applied and supplemented levels on performance index at the 4 th and 7 th wks of chicks age (ANOVA table 19) .

Table (18) : Least square means and standard error ($\bar{X} \pm$ S.E) for performance index percentage of experimental groups as affected by dietary supplementation .

Independent variables		Performance index (%) at	
Treatments	Level (kg /ton)	4 week	7 week
Bio – Tonic	0	46.43 ± 1.93	75.29± 3.02
	0.5	51.06± 1.93	82.59± 3.02
	1.0	30.51± 1.93	63.16± 3.02
	1.5	41.46± 1.93	76.01± 3.02
	Average	42.04± 0.97 a	74.25± 1.51 a
Fermacto	0	46.24± 1.93	75.61± 3.02
	0.5	41.58± 1.93	76.24± 3.02
	1.0	40.29± 1.93	72.74± 3.02
	1.5	34.64± 1.93	63.18± 3.02
	Average	40.65± 0.97 a	71.92± 1.51 a
Kemzyme	0	45.97± 1.93	75.72± 3.02
	0.5	35.56± 1.93	69.31± 3.02
	1.0	39.53± 1.93	71.04± 3.02
	1.5	45.78± 1.93	82.36± 3.02
	Average	41.69± 0.97 a	74.58± 1.51 a
Zinc bacitracin	0	46.00± 1.93	76.37± 3.02
	0.5	47.98± 1.93	86.70± 3.02
	1.0	36.33± 1.93	70.04± 3.02
	1.5	34.40± 1.93	70.65± 3.02
	Average	41.10± 0.97 a	75.87± 1.51 a
Overall mean		41.32± 0.48	74.14± 0.76

Means with the same letters in each column are not significantly different .

Table (19) : Analysis of variance for data presented in table (18)

S.O.V	D.F	Mean squares at	
		4 week	7 week
Treatments(T)	3	172.8	255.0
Levels (L)	3	3317.7 ***	1666.5 **
Replicates (R)	2	8.80	263.2
T X L	9	1018.0 ***	1343.5 ***
T X R	6	72.0	439.2
L X R	6	124.6	169.6
Error	546	134.3	328.8

Whereas : ** = P < 0.01 , *** = P < 0.001

4. 4. Economical efficiency .

Data presented in table (20) show the economical efficiency for experimental groups at the period from (0 - 7) weeks of chicks age .

Results obtained showed that feeding birds on diets containing Zinc bacitracin resulted in higher economical efficiency and relative economic efficiency (1.275 and 99.7 %) , followed by those fed diet supplemented with Bio – Tonic (1.189 and 94.0 %) then by those fed Fermacto (1.181 and 93.7 %) for economical efficiency and relative economic efficiency , respectively . These results agree with those of Hattaba *et al* ., (1997) who reported that adding Zinc bacitracin to animal protein diets was effective and achieved better economic efficiency values .

The profitability of using either Bio – Tonic , Fermacto , Kemzyme or Zinc bacitracin as feed additives and growth promoters depend on the price of them and growth performance .

The results of El – Gendi *et al* ., (1994) concluded that feeding chicks on diet supplemented with Lomoton or Cocci – Nel (as herbal growth promoters) showed higher economical efficiency compared to controls . The results of Soad *et al* ., (1994) stated that better values for economic efficiency was attained with Fermacto supplemented diet compared to the non supplemented . Some investigators obtained similar results when they used different probiotics in diet of laying hens (Harmis and Miles , 1988) ; rabbits (Tawfeek and El – Hindawy , 1991) ; ducks (Gippert *et al* ., 1992) and broiler chicks (Rashwan *et al* ., 1993 and Tawfeek *et al* ., 1993) .

Chicks fed 0.5 kg/ton ration of either Zinc bacitracin or Bio – Tonic increased economic efficiency (1.464 and 1.357 % , respectively) when compared with different levels of treatments applied and non supplemented diet (control) . So , it can be advised to supplement broiler diets with 0.5 kg/ton ration of either Zinc bacitracin or Bio – Tonic throughout the growing period in order to get higher relative economic efficiency by about 20.0 and 12.4 % , respectively .

Table (20) : The economical evaluation of broiler chicks as affected by dietary supplementation .

Independent variables		(B)	(A)	E .E	R .E.E (%)
Treatments	Level (kg / ton)				
Bio – tonic	0	3.867	8.759	1.265	100
	0.5	3.817	8.997	1.357	107.3
	1.0	4.052	8.055	0.988	78.1
	1.5	4.071	8.775	1.155	91.3
	Average	3.952	8.646	1.189	94.0
Fermacto	0	3.875	8.763	1.261	100
	0.5	3.973	8.875	1.234	97.9
	1.0	3.896	8.555	1.196	94.8
	1.5	3.925	7.972	1.031	81.8
	Average	3.917	8.541	1.181	93.7
Kemzyme	0	3.891	8.811	1.264	100
	0.5	3.989	8.422	1.111	87.9
	1.0	4.086	8.541	1.090	86.2
	1.5	4.192	9.231	1.202	95.1
	Average	4.039	8.751	1.167	92.3
Zinc bacitracin	0	3.893	8.853	1.274	100
	0.5	3.758	9.259	1.464	114.9
	1.0	3.888	8.417	1.165	91.4
	1.5	3.831	8.366	1.184	92.9
	Average	3.843	8.724	1.270	99.7
Overall mean		3.938	8.666	1.201	94.9

Whereas :

(A) = The selling cost of the obtained gain (the local price of kg live body gain assumed to be 4.5 L.E at sailing time) .

(B) =The feeding cost of this gain and the price of supplemented additives .

Cont. table (20) : The cost of the experimental diets (L.E / ton)*.

Independent variables		Experimental diets	
Treatments	Level (kg /ton)	Starter	Finisher
Bio – Tonic	0	850.00	690.00
	0.5	863.50	703.50
	1.0	877.00	717.00
	1.5	890.50	730.50
	Average	870.25	710.25
Fermacto	0	850.00	690.00
	0.5	856.25	696.25
	1.0	862.50	702.50
	1.5	868.75	708.75
	Average	859.38	699.38
Kemzyme	0	850.00	690.00
	0.5	867.50	707.50
	1.0	885.00	725.00
	1.5	902.50	742.50
	Average	876.25	716.25
Zinc bacitracin	0	850.00	690.00
	0.5	854.00	694.00
	1.0	858.00	698.00
	1.5	862.00	702.00
	Average	856.00	696.00
Overall mean		865.47	705.47

*** including cost of used additives .**

4. 5. mortality rate .

Data concerning the effect of treatments applied and supplemented levels on mortality rate percentage of Hubbard broiler chicks were presented in table (21) .

Results obtained showed that mortality rate average decreased in chicks fed Kemzyme (3.48) and Zinc bacitracin (3.48 %) compared to those fed Bio – Tonic (4.17) or Fermacto (4.86) . The results of Hattaba *et al* ., (1994) showed that Kemzyme supplementation of the experimental diets significantly reduced mortality rate by 20.6 % .

Chicks received diets with either 1.0 kg Bio – Tonic or 0.5 kg Fermacto had the highest value of mortality rate 8.33 % when compared with other levels of different treatments applied .

Table (21) :Mortality rate percentage of experimental groups as affected by dietary supplementation .

Independent variables		Mortality rate
Treatments	Level (kg / ton)	(%)
Bio – Tonic	0	2.78
	0.5	2.78
	1.0	8.33
	1.5	2.78
	Average	4.17
Fermacto	0	5.56
	0.5	8.33
	1.0	3.78
	1.5	2.78
	Average	4.86
Kemzyme	0	2.78
	0.5	2.78
	1.0	5.56
	1.5	2.78
	Average	3.48
Zinc bacitracin	0	2.78
	0.5	5.56
	1.0	2.78
	1.5	2.78
	Average	3.48
Overall mean		3.99

Table(22) : Least square means and standard error ($\bar{X} \pm$ S.E) for absolute and proportional weights of carcass traits as affected by dietary supplementation .

Independent variable		L . B . W	Eviscerated weight		Abdominal fat		Giblets		Total edible meat	
Treatment	L . kg/ton	g	g	%	g	%	g	%	g	%
Bio-Tonic	0	1730±64	1218±48	70.4±1.2	20.0±4.0	1.2±0.2	77.3±3.1	4.5±0.2	1296±50	74.9±1.3
	0.5	1878±64	1310±48	69.7±1.2	31.7±4.0	1.7±0.2	86.0±3.1	4.6±0.2	1396±50	74.3±1.3
	1.0	1735±64	1229±48	70.8±1.2	21.0±4.0	1.2±0.2	79.7±3.1	4.6±0.2	1309±50	75.4±1.3
	1.5	1625±64	1122±48	69.0±1.2	20.3±4.0	1.3±0.2	75.0±3.1	4.6±0.2	1197±50	73.6±1.3
	average	1742±32 a	1220±24 a	70.0±0.6 a	23.3±2.0 a	1.3±0.1bc	79.5±1.5a	4.6±0.1ab	1299±25 a	74.6±0.6 a
Fermacto	0	1732±64	1217±48	70.3±1.2	19.3±4.0	1.1±0.2	78.7±3.1	4.5±0.2	1295±50	74.8±1.3
	0.5	1860±64	1266±48	68.1±1.2	36.0±4.0	1.9±0.2	89.3±3.1	4.8±0.2	1355±50	72.9±1.3
	1.0	1840±64	1296±48	70.5±1.2	23.0±4.0	1.2±0.2	76.0±3.1	4.1±0.2	1359±50	73.9±1.3
	1.5	1868±64	1312±48	70.8±1.2	24.3±4.0	1.3±0.2	81.3±3.1	4.4±0.2	1393±50	75.2±1.3
	average	1825±32 a	1273±24 a	70.0±0.6 a	25.7±2.0 a	1.4±0.1c	81.3±1.5a	4.5±0.1a	1351±25 a	74.2±0.6 a
Kemzyme	0	1735±64	1223±48	70.5±1.2	20.0±4.0	1.2±0.2	79.7±3.1	4.6±0.2	1303±50	75.1±1.3
	0.5	1808±64	1275±48	70.5±1.2	21.7±4.0	1.1±0.2	92.7±3.1	5.1±0.2	1368±50	75.6±1.3
	1.0	1945±64	1353±48	69.5±1.2	16.3±4.0	0.8±0.2	96.0±3.1	5.0±0.2	1449±50	74.5±1.3
	1.5	1827±64	1290±48	70.6±1.2	16.0±4.0	0.9±0.2	84.0±3.1	4.6±0.2	1374±50	75.1±1.3
	average	1829±32 a	1285±24 a	70.3±0.6 a	18.5±2.0 a	1.0±0.1a	88.1±1.5b	4.8±0.1b	1374±25 a	75.1±0.6 a
Zinc bacitracin	0	1728±64	1212±48	70.1±1.2	19.3±4.0	1.1±0.2	75.0±3.1	4.3±0.2	1287±50	74.4±1.3
	0.5	1957±64	1378±48	70.3±1.2	26.7±4.0	1.4±0.2	90.7±3.1	4.7±0.2	1469±50	75.0±1.3
	1.0	1663±64	1165±48	70.1±1.2	16.0±4.0	1.0±0.2	76.3±3.1	4.6±0.2	1241±50	74.7±1.3
	1.5	1717±64	1182±48	68.8±1.2	16.7±4.0	1.0±0.2	86.7±3.1	5.1±0.2	1268±50	73.9±1.3
	average	1766±32 a	1234±24 a	69.8±0.6 a	19.7±2.0 a	1.1±0.1ab	82.2±1.5a	4.7±0.1ab	1316±25 a	74.5±0.6 a
Overall mean		1791±16	1253±12	70.0±0.3	21.8±1.0	1.2±0.1	82.2±0.8	4.6±0.04	1335±13	74.6±0.3

Means with the same letters in each column are not significantly different .

Table (23) : Analysis of variance for data presented in table (22)

S.O.V	D.F	Mean squares								
		Live body weight	Eviscerated weight		Abdominal fat		Giblets		Total edible meat	
		g	g	%	g	%	g	%	g	%
Treatments (T)	3	44684	23113	0.84	259.9	0.78*	331 **	0.59**	26765	3.27
Levels (L)	3	94420 *	39987 *	2.20	558.8**	1.08*	602 ** *	0.41 *	49522*	0.59
Replicates (R)	2	34337	9651	3.81	61.8	0.11	61.9	0.31	11022	4.78
TXL	9	47179	27062	4.87	44.1	0.12	143 *	0.38*	28733	3.82
TXR	6	13907	9932	6.26	39.1	0.13	27.4	0.01	10688	5.46
LXR	6	8787	7245	9.03	40.4	0.11	27.1	0.14	7257	8.54
Remainer	66	24603	13989	9.06	95.5	0.25	56.8	0.14	15035	9.67

Whereas : * = $P < 0.05$, ** = $P < 0.01$, *** = $P < 0.001$

4.6. 2. Chemical composition of meat :

Table (24) showed the effect of treatments applied and dietary levels on tissues protein , ether extract , moisture and ash content .

It was observed that the average of tissues protein content increased in chicks fed Fermacto (23.60 %) when compared with Zinc bacitracin (23.16 %) , Kemzyme (22.98) and Bio – Tonic (22.97) , respectively .

Chicks fed Fermacto at a level of 0.5 and 1.5 kg/ton ration showed the highest average of tissues protein content (24.79 and 24.42 %) , followed by those fed 1.0 kg Zinc bacitracin / ton ration (24.36 %), respectively .

Chicks fed Bio – Tonic had the lowest average of ether extract and moisture (4.65 and 66.63 %) , respectively when compared with other treatments applied . Chicks fed 1.0 kg Bio – Tonic /ton ration decreased ether extract content (3.26 %) , followed by those fed diets containing 0.5 kg Kemzyme / ton ration (4.41 %) , respectively . On the other hand , the lowest values of moisture was observed for chicks fed 0.5 kg/ton ration of Zinc bacitracin (68.40 %) , followed by those fed 0.5 kg/ton Fermacto (68.47 %) , respectively .

Average of ash content was lower in birds fed Fermacto (1.04 %) than those fed either Kemzyme , Zinc bacitracin and Bio – Tonic (1.11, 1.20 and 1.25 % , respectively) .

Analysis of variance showed highly significantly effect on averages of tissues protein , ether extract and ash contents due to either treatments

applied or supplemented levels . These results disagreed with those of Lyons and Jacques (1987) and El – Faham *et al* ., (1994) who found insignificant differences in chemical composition of broiler carcass fed enzyme preparation .

The interaction between treatments applied and supplemented levels had highly significant effects on tissues protein , ether extract , moisture and ash content (ANOVA table 25) .

Table (24) : Least square means and standard error ($\overline{X} \pm$ S.E) for carcass composition of experimental groups as affected by dietary supplementation .

Independent variables		Carcass composition (%)			
Treatments	Level (kg / ton)	Protein	Ether extract	Moisture	Ash
Bio – tonic	0	23.30±0.15	4.75±0.42	70.80±2.43	1.14±0.02
	0.5	22.28±0.15	5.40±0.42	71.00±2.43	1.31±0.02
	1.0	23.16±0.15	3.26±0.42	72.27±2.43	1.31±0.02
	1.5	23.13±0.15	5.18±0.42	70.44±2.43	1.25±0.02
	Average	22.97±0.08 b	4.65±0.21 a	66.63±1.22 a	1.25±0.01 d
Fermacto	0	23.32±0.15	4.77±0.42	70.77±2.43	1.13±0.02
	0.5	24.79±0.15	5.77±0.42	68.47±2.43	0.97±0.02
	1.0	21.86±0.15	7.77±0.42	69.38±2.43	1.00±0.02
	1.5	24.42±0.15	4.52±0.42	69.10±2.43	1.06±0.02
	Average	23.60±0.08 a	5.70±0.21 b	69.66±1.22 a	1.04±0.01 a
Kemzyme	0	23.32±0.15	4.76±0.42	70.78±2.43	1.13±0.02
	0.5	24.18±0.15	4.41±0.42	70.25±2.43	1.16±0.02
	1.0	21.97±0.15	6.69±0.42	70.40±2.43	0.93±0.02
	1.5	22.43±0.15	6.76±0.42	69.59±2.43	1.23±0.02
	Average	22.98±0.08 b	5.66±0.21 b	70.26±1.22 a	1.11±0.01 b
Zinc bacitracin	0	23.29±0.15	4.78±0.42	70.78±2.43	1.14±0.02
	0.5	22.39±0.15	8.05±0.42	68.40±2.43	1.16±0.02
	1.0	24.36±0.15	3.77±0.42	69.01±2.43	1.26±0.02
	1.5	22.60±0.15	6.31±0.42	69.67±2.43	1.25±0.02
	Average	23.16±0.08 b	5.97±0.21 b	69.62±1.22 a	1.20±0.01 c
Overall mean		23.18±0.04	5.50±0.10	69.04±0.61	1.15±0.01

Means with the same letters in each column are not significantly different .

Table (25) : Analysis of variance for data presented in table (24)

S.O.V	D.F	Mean squares			
		Protein	Ether extract	Moisture	Ash
Treatments(T)	3	2.79 ***	8.06 ***	64.19	0.21 ***
Levels (L)	3	1.54 ***	6.13 **	110.64 *	0.02 ***
Replicates (R)	2	29.89 ***	14.02 ***	64.35	0.05 ***
T X L	9	6.91 ***	12.17 ***	103.22 **	0.06 ***
T X R	6	2.17 ***	3.56 **	152.77 ***	0.02 ***
L X R	6	2.04 ***	5.24 ***	122.85 **	0.06 ***
Remainder	66	0.137	1.04	35.43	0.003

Whereas : * = P < 0.05 , ** = P < 0.01 , *** = P < 0.001

4. 7. Serum blood constituents :

4.7.1. Serum total protein , albumin , globulin and A/G ratio .

Average of serum total protein , albumin , globulin levels and A/G ratio for experimental groups of Hubbard broiler chicks were listed in table (26) .

From the results obtained , it could be observed that average serum total protein (5.4 and 3.8 g/dl) and globulin (2.9 and 2.3 g/dl) levels were significantly increased at 28 and 51 day of age , respectively in chicks fed Fermacto . However , chicks fed Zinc bacitracin (3.0 g/dl and 1.3) and Kemzyme (1.6 g/dl and 0.8) had the highest averages of serum albumin and A/G ratio at 28 and 51 day of chicks age , respectively when compared with other treatments applied (table 26) . Similar results were observed by Mervat (1999) who reported that the birds fed on Fermacto supplemented diet had the highest values of plasma total protein , albumin and globulin .

Analysis of variance (table 27) , showed highly significant effect due to treatments applied on serum protein fractions (total , albumin , globulin and A/G ratio) at 28 and 51 day of chicks age . The results of Ghazalah *et al.*,(1994)showed insignificant effect of such supplementation, enzyme preparation (Kemzyme and Energex + Bio – feed) on either total protein , albumin and globulin . El – Sherbiny *et al.*,(1990 a) reported that supplemented Flavomycin or Zinc bacitracin to the diet tended to increase the total plasma protein , albumin , globulin and A/G ratio in broiler chicks over those obtained from the birds receiving the non supplemented control diets .

Chicks received diets containing 1.0 kg Zinc bacitracin /ton had the highest average of serum total protein (6.4) and albumin (3.9 g/dl) at 28 day of age , while chicks fed diets containing 1.5 Fermacto had the highest averages of serum total protein and albumin(4.2 and 1.8 g/dl , respectively) at 51 day of age . On the other hand , chicks received diets containing 1.0 and 0.5 kg/ton Fermacto showed the highest averages of serum globulin (3.3 and 2.5 g/dl) at 28 and 51 day of chicks age , respectively .

Dietary levels of feed additives applied had significant effect on serum protein fractions at all periods of estimation , except serum albumin and A/G ratio at 51 day of age , which showed insignificant values .

The interaction between treatments applied and dietary levels had highly significant ($P<0.001$) effect on serum protein fractions (total , albumin , globulin and A/G ratio) at 28 and 51 day of chicks age (ANOVA table 27) .

Table (26): Least square means and standard error ($\bar{X} \pm$ S.E) for serum protein fraction (g/dl) levels of experimental groups as affected by dietary supplementation .

Independent variables		Serum protein fractions (g /dl)							
		Total protein		Albumin		Globulin		A/G ratio	
Treatments	Level (kg/ton)	28 day	51 day	28 day	51 day	28 day	51 day	28 day	51 day
Bio –Tonic	0	5.4±0.09	3.7±0.10	3.0±0.11	1.5±0.05	2.4±0.08	2.2±0.08	1.25±0.07	0.68±0.05
	0.5	4.5±0.09	3.6±0.10	2.1±0.11	1.5±0.05	2.4±0.08	2.1±0.08	0.88±0.07	0.71±0.05
	1.0	4.6±0.09	3.6±0.10	1.5±0.11	1.6±0.05	3.1±0.08	2.0±0.08	0.48±0.07	0.80±0.05
	1.5	3.7±0.09	3.4±0.10	1.8±0.11	1.5±0.05	1.9±0.08	1.9±0.08	0.95±0.07	0.79±0.05
	Average	4.6±0.04 a	3.6±0.05 b	2.1±0.06 a	1.5±0.05 b	2.5±0.04 b	2.1±0.04 b	0.84±0.04a	0.71±0.03 b
Fermacto	0	5.4±0.09	3.7±0.10	3.1±0.11	1.5±0.05	2.3±0.08	2.2±0.08	1.35±0.07	0.68±0.05
	0.5	5.2±0.09	3.9±0.10	2.3±0.11	1.4±0.05	2.9±0.08	2.5±0.08	0.79±0.07	0.56±0.05
	1.0	5.5±0.09	3.4±0.10	2.2±0.11	1.3±0.05	3.3±0.08	2.1±0.08	0.67±0.07	0.62±0.05
	1.5	5.6±0.09	4.2±0.10	2.5±0.11	1.8±0.05	3.1±0.08	2.4±0.08	0.81±0.07	0.75±0.05
	Average	5.4±0.04 b	3.8±0.05 a	2.5±0.06 b	1.5±0.05 b	2.9±0.04 d	2.3±0.04 a	0.86±0.04ab	0.65±0.03 a
Kemzyme	0	5.4±0.09	3.7±0.10	3.0±0.11	1.5±0.05	2.4±0.08	2.2±0.08	1.25±0.07	0.68±0.05
	0.5	4.2±0.09	3.4±0.10	2.0±0.11	1.7±0.05	2.2±0.08	1.7±0.08	0.91±0.07	1.00±0.05
	1.0	5.5±0.09	3.5±0.10	2.2±0.11	1.6±0.05	3.3±0.08	1.9±0.08	0.67±0.07	0.84±0.05
	1.5	6.0±0.09	3.9±0.10	3.5±0.11	1.7±0.05	2.5±0.08	2.2±0.08	1.40±0.07	0.77±0.05
	Average	5.3±0.04 b	3.6±0.05 b	2.7±0.06 c	1.6±0.05 a	2.6±0.04 b c	2.0±0.04 b	1.04±0.04 c	0.80±0.03 d
Zinc bacitracin	0	5.4±0.09	3.7±0.10	3.1±0.11	1.5±0.05	2.3±0.08	2.2±0.08	1.35±0.07	0.68±0.05
	0.5	4.8±0.09	3.4±0.10	2.9±0.11	1.5±0.05	1.9±0.08	1.9±0.08	1.53±0.07	0.79±0.05
	1.0	6.4±0.09	3.6±0.10	3.9±0.11	1.8±0.05	2.5±0.08	1.8±0.08	1.56±0.07	1.00±0.05
	1.5	4.8±0.09	3.4±0.10	2.3±0.11	1.3±0.05	2.5±0.08	2.4±0.08	0.92±0.07	0.54±0.05
	Average	5.3±0.04 b	3.5±0.05 b	3.0±0.06 d	1.5±0.05 b	2.3±0.04 a	2.0±0.04 b	1.30±0.04 d	0.75±0.03 c
Overall mean		5.2±0.02	3.6±0.02	2.6±0.03	1.5±0.05	2.6±0.02	2.0±0.02	1.00±0.02	0.75±0.01

Means with the same letters in each column are not significantly different .

Table (27) : Analysis of variance for data presented in table (26).

S.O.V	D.F	Mean squares							
		Total protein		Albumin		Globulin		A/G ratio	
		28 day	51 day	28 day	51 day	28 day	51 day	28 day	51 day
Treatments(T)	3	3.70 ***	0.33 ***	3.71 ***	0.07 **	1.37 ***	0.49 ***	0.95 ***	0.12 ***
Levels (L)	3	3.34 ***	0.18 *	2.14 ***	0.02	2.35 ***	0.20 **	0.70 ***	0.04
Replicates(R)	2	0.13 *	0.17 *	0.13	0.02	0.04	0.11 *	0.03	0.02
TXL	9	2.23 ***	0.36 ***	2.17 ***	0.19 ***	0.67 ***	0.21 ***	0.52 ***	0.10 ***
TXR	6	0.07	0.09	0.05	0.01	0.08 *	0.08	0.03	0.02
LXR	6	0.32	0.09	0.05	0.02	0.02	0.06	0.26	0.01
Remanded	66	0.05	0.06	0.07	0.01	0.04	0.05	0.04	0.02

Whereas : * = P < 0.05 , ** = P < 0.01 , *** = P < 0.001

4. 7. 2. Serum alkaline phosphatase and transaminases .

Data presented in table (28) show averages of serum alkaline phosphatase and transaminases (GOT) and (GPT) levels for experimental groups of Hubbard broiler chicks .

Results obtained showed highly significant ($P<0.001$) effect on averages serum alkaline phosphatase and transaminases due to either treatments applied or dietary levels at 28 and 51 day of chicks age (ANOVA table 29) .

Averages serum alkaline phosphatase and glutamic oxalacetic transaminase (GOT) at 28 (520.3 and 35.9 u/l) and at 51 day (205.9 and 29.3 u/l) of chicks age were higher in birds fed Bio – Tonic than those fed either Fermacto , Kemzyme or Zinc bacitracin , respectively . However , chicks fed Zinc bacitracin and Kemzyme had the highest average of glutamic pyruvic transaminase (GPT) at 28 (18.3 u/l) and 51 day of age (7.51 u/l) , respectively .

Transaminase plays an important role in amino acids metabolism . West *et al* ., (1968) reported that two main types of transaminase (GOT and GPT) have remarkable action in metabolic reactions of amino acids these enzymes have a wide tissue distribution and are normally present in the blood serum in different concentrations . They are used to detect liver and heart functions . Onward , Anges and Genchi (1977) and Blackshaw (1978) , reported that this tranaminases enzymes (GOT and GPT) escape to the serum from the injured cells .

Changes in the serum transaminases level may depend on the rate of protein metabolism which may be a function of birds age rather than any other factor . It is well known that , by the simple process of transamination , an amino radical is transferred to alfa – keto acid , while the keto oxygen is transferred to the donor of the amino radical which is promoted by transaminases (Guyton , 1981) in the presence of vitamin B6 in the form of pyridoxal phosphate as catalyst .

The highest values of alkaline phosphatase and GOT was observed for chicks of non – supplemented diets (574.1 and 39.8 u/l) at 28 day of age , followed by those fed diets containing 1.5 kg Bio – Tonic /ton ration (509.7 and 35.8 u/l) . While at 51 day , chicks fed 0.5 kg/ton Kemzyme had the highest average of alkaline phosphatase (248.7 u/l) . On the other hand , chicks fed 1.5 and 0.5 kg/ton ration of Bio – Tonic had the highest average of GOT at 51 day of age (32.5 and 31.8 u/l),respectively.

Chicks of non – supplemented diets showed the highest average for GPT (21.7 u/l) at 28 day of chicks age , followed by those fed 1.0 kg/ton Zinc bacitracin (18.5 u/l). While , chicks fed 0.5 kg/ton Kemzyme showed the highest average for GPT (8.79 u/l) at 51 day of chicks age , followed by those fed 1.0 kg Kemzyme /ton ration (7.62 u/l), respectively .

The interaction between treatments applied and dietary levels had highly significant effect ($P<0.001$) on serum alkaline phosphatase and transaminases (GOT and GPT) at 28 and 51 day of chicks age (ANOVA table 29) .

Table(28):Least square means and standard error ($\bar{X}\pm$S.E) for serum Alkaline phosphatase and Transaminases (GOT and GPT) (u/l) levels of experimental groups as affected by dietary supplementation .

Independent variables		Alkaline phosphatase (u / l) at		GOT (u / l) at		GPT (u / l) at	
Treatments	Level kg/ton	28 day	51 day	28 day	51 day	28 day	51 day
Bio –Tonic	0	573.0±11.8	138.6±1.27	39.5±0.07	22.6±0.07	21.3±0.07	6.23±0.08
	0.5	501.5±11.8	233.2±1.27	35.6±0.07	31.8±0.07	12.5±0.07	4.52±0.08
	1.0	497.2±11.8	217.0±1.27	32.8±0.07	30.5±0.07	14.7±0.07	5.10±0.08
	1.5	509.7±11.8	235.0±1.27	35.8±0.07	32.5±0.07	14.7±0.07	5.63±0.08
	Average	520.3±5.9 d	205.9±0.63 d	35.9±0.04 d	29.3±0.04 d	15.8±0.04 b	5.37±0.04 a
Fermacto	0	572.9±11.8	138.5±1.27	39.8±0.07	22.5±0.07	21.5±0.07	6.10±0.08
	0.5	449.2±11.8	212.9±1.27	27.6±0.07	24.6±0.07	15.4±0.07	5.21±0.08
	1.0	459.6±11.8	208.8±1.27	27.9±0.07	25.3±0.07	15.6±0.07	5.32±0.08
	1.5	477.8±11.8	224.1±1.27	27.1±0.07	24.7±0.07	17.2±0.07	5.56±0.08
	Average	489.9±5.9 b c	196.1±0.63 b	30.6±0.04 c	24.3±0.04 c	17.4±0.04 c	5.55±0.04 b
Kemzyme	0	573.9±11.8	138.6±1.27	39.2±0.07	22.7±0.07	21.6±0.07	6.08±0.08
	0.5	485.4±11.8	248.7±1.27	26.5±0.07	23.8±0.07	14.5±0.07	8.79±0.08
	1.0	454.4±11.8	189.2±1.27	26.2±0.07	22.6±0.07	13.7±0.07	7.62±0.08
	1.5	422.1±11.8	219.2±1.27	23.5±0.07	21.5±0.07	12.8±0.07	7.53±0.08
	Average	484.0±5.9 b	198.9±0.63 c	28.8±0.04 b	22.6±0.04 b	15.6±0.04 a	7.51±0.04 d
Zinc bacitracin	0	574.1±11.8	138.7±1.27	39.3±0.07	22.6±0.07	21.7±0.07	6.17±0.08
	0.5	424.2±11.8	216.2±1.27	26.4±0.07	18.4±0.07	18.3±0.07	7.53±0.08
	1.0	407.2±11.8	185.3±1.27	23.7±0.07	18.5±0.07	18.5±0.07	7.56±0.08
	1.5	347.9±11.8	220.2±1.27	19.8±0.07	14.7±0.07	14.7±0.07	7.31±0.08
	Average	438.3±5.9 a	190.1±0.63 a	27.3±0.04 a	18.6±0.04 a	18.3±0.04 d	7.14±0.08 c
Overall mean		483.1±3.0	197.8±0.32	30.7±0.02	23.7±0.02	16.8±0.02	6.39±0.02

Means with the same letters in each column are not significantly different .

Table (29) : Analysis of variance for data presented in table (28).

S.O.V	D.F	Mean squares					
		Alkaline phosphatase at		GOT at		GPT at	
		28 day	51 day	28 day	51 day	28 day	51 day
Treatments (T)	3	27506***	1040 ***	333.7 ***	478 ***	40.41 ***	28.46 ***
Levels (L)	3	89739***	41011 ***	842.1 ***	20.58 ***	242.7 ***	0.71 ***
Replicates(R)	2	642	2.57	0.06	0.08	0.06	0.07
TXL	9	6063 ***	773 ***	49.6 ***	60.29 ***	13.41 ***	4.48 ***
TXR	6	969	5.99	0.05	0.04	0.06	0.05
LXR	6	450	3.28	0.03	0.02	0.03	0.02
Remanded	66	837	9.60	0.03	0.03	0.03	0.04

Whereas : *** = $P < 0.001$

4.7.3. Serum and tissues uric acid and creatinine .

Data concerning the average of serum and tissues uric acid and creatinine content of Hubbard broiler chicks were presented in table (30).

Chicks fed Fermacto had lower serum uric acid average (60.6 mg/l) than those fed either Bio – Tonic , Kemzyme or Zinc bacitracin (66.6 , 76.8 or 86.5 mg/l , respectively) at 28 day of chicks age . While , chicks fed Bio – Tonic had lower serum uric acid average (50.5 mg/l) than those fed either Fermacto , Kemzyme or Zinc bacitracin (53.8 , 55.3 or 53.6 mg/l , respectively) at 51 day of chicks age.

Average tissues uric acid content was lower in birds fed Bio –Tonic (7.63 mg/l) than those fed either Fermacto , Kemzyme or Zinc bacitracin (9.16 , 10.33 or 12.22 mg/l , respectively) . Similar results were observed by El – Gendi (1996) who showed that serum and tissues uric acid were decreased when used Egg – Plus (as herbal growth promoter) supplemented diets .

Chicks fed Bio – Tonic significantly decreased averages of serum and tissues creatinine levels followed by those fed Fermacto when compared with other treatments applied . Similar results were observed by El – Gendi (1996) .

Chicks fed 1.5 kg Bio – Tonic / ton ration had the lowest average of serum creatinine at 28 and 51 day (6.23 and 5.63 mg/dl , respectively) and tissues creatinine (5.51 mg/dl) . From the results obtained , it could be concluded that a relation had been observed between the uric acid and

creatinine in the birds tissues which may be affected by the kidney efficiency in uric acid and creatinine clearance and the amount of dietary Bio – Tonic in supplemented diets (El – Gendi , 1996) .

Analysis of variance (table 31) showed highly significant effect ($P<0.001$) on serum and tissues uric acid and creatinine due to treatments applied and supplemented levels .

Significantly variations ($P<0.001$) due to the interaction between treatments applied and dietary levels were found in serum and tissues uric acid and creatinine levels (ANOVA table 31) .

Table (30) : Least square means and standard error ($\bar{X} \pm$ S.E) for serum and tissues uric acid and creatinine levels of experimental groups as affected by dietary supplementation .

Independent variables		Serum uric acid (mg/l) at		Serum creatinine (mg/dl) at		Tissues	
treatments	Level kg/ton	28 day	51 day	28 day	51 day	Uric acid (mg/l)	Creatinine (mg/dl)
Bio –Tonic	0	64.7±0.98	57.3±0.97	11.81±0.13	10.30±0.07	10.0±0.13	9.32±0.12
	0.5	66.9±0.98	41.8±0.97	9.72±0.13	7.81±0.07	7.21±0.13	6.32±0.12
	1.0	58.5±0.98	47.4±0.97	7.45±0.13	6.45±0.07	6.90±0.13	6.13±0.12
	1.5	76.5±0.98	55.6±0.97	6.23±0.13	5.63±0.07	6.42±0.13	5.51±0.12
	Average	66.6±0.49 b	50.5±0.49 a	8.80±0.07 a	7.55±0.04 a	7.63±0.06 a	6.82±0.06 a
Fermacto	0	65.2±0.98	57.4±0.97	11.82±0.13	10.52±0.07	10.10±0.13	9.35±0.12
	0.5	54.1±0.98	52.1±0.97	13.20±0.13	11.06±0.07	10.0±0.13	8.83±0.12
	1.0	57.0±0.98	54.7±0.97	10.14±0.13	9.04±0.07	9.34±0.13	8.45±0.12
	1.5	66.1±0.98	51.1±0.97	6.85±0.13	6.05±0.07	7.20±0.13	5.62±0.12
	Average	60.6±0.49 a	53.8±0.49 bc	10.50±0.07 b	9.17±0.04 b	9.16±0.06 b	8.06±0.06 b
Kemzyme	0	65.4±0.98	58.1±0.97	11.75±0.13	10.55±0.07	10.09±0.13	9.36±0.12
	0.5	87.7±0.98	48.9±0.97	14.15±0.13	11.55±0.07	11.57±0.13	10.40±0.12
	1.0	82.3±0.98	56.0±0.97	12.53±0.13	11.13±0.07	10.50±0.13	9.81±0.12
	1.5	71.9±0.98	58.2±0.97	10.82±0.13	9.62±0.07	9.15±0.13	8.61±0.12
	Average	76.8±0.49 c	55.3±0.49 d	12.31±0.07 c	10.71±0.04 c	10.33±0.06 c	9.55±0.06 c
Zinc bacitracin	0	65.7±0.98	57.9±0.97	11.72±0.13	10.62±0.07	10.10±0.13	9.34±0.12
	0.5	96.1±0.98	43.9±0.97	16.32±0.13	14.30±0.07	13.33±0.13	12.08±0.12
	1.0	97.7±0.98	49.0±0.97	14.33±0.13	12.43±0.07	12.82±0.13	11.32±0.12
	1.5	86.5±0.98	63.6±0.97	13.15±0.13	11.85±0.07	12.61±0.13	10.73±0.12
	Average	86.5±0.49 d	53.6±0.49 b	13.88±0.07 d	12.30±0.04 d	12.22±0.06 d	10.87±0.06 d
Overall mean		72.6±0.24	53.3±0.24	11.37±0.03	9.93±0.02	9.83±0.03	8.82±0.03

Means with the same letters in each column are not significantly different .

Table (31) : Analysis of variance for data presented in table (30)

S.O.V	D.F	Mean squares					
		Serum uric acid		Serum creatinine		Tissues	
		28 day	51 day	28 day	51 day	Uric acid	Creatinine
Treatments (T)	3	3125.4***	97.0 ***	116.2 ***	99.9 ***	87.27 ***	77.65 ***
Levels (L)	3	605.6 ***	643.1 ***	68.7 ***	36.8 ***	12.05 ***	16.55 ***
Replicates(R)	2	15.04 *	12.9	0.44 **	0.06	0.10	0.09
TXL	9	616.0 ***	101.5 ***	15.89 ***	12.24 ***	10.97 ***	9.62 ***
TXR	6	6.79	6.20	0.33 **	0.03	0.09	0.08
LXR	6	2.46	2.95	0.103	0.014	0.56	0.04
Remanded	66	5.71	5.70	0.103	0.032	0.098	0.090

Whereas : * = P < 0.05 , ** = P < 0.01 , *** = P < 0.001

4.7.4. Serum total lipids and cholesterol .

Data presented in table (32) show the averages of serum total lipids and cholesterol (mg/dl) levels for experimental groups of Hubbard broiler chicks .

Chicks fed diets with Bio – Tonic had the lowest average of serum total lipids (144.8 mg/dl) at 28 day of chicks age . While chicks fed Fermacto had the lowest average of serum total lipids (106.5 mg/dl) at 51 day of age .

Feeding chicks diet with Bio – Tonic decreased average serum cholesterol (74.3 and 40.0 mg/dl) at 28 and 51 day of chicks age , respectively . Similar results were observed by El – Gendi (1996) who attributed the decrease observed in serum total lipids and cholesterol levels with Egg – Plus applied as herbal growth promoter to the decrease that may occur in the rate of total lipids and cholesterol absorption through the intestinal villa that may be reflected as a decreased level in the blood serum .

Chicks fed 1.0 kg Bio – Tonic or 0.5 kg Kemzyme / ton ration had the lowest averages of serum total lipids (139.3 and 142.3 mg/dl , respectively) at 28 day of age . While at 51day of age , chicks fed 1.0 and 0.5 kg/ton Fermacto showed the lowest average (100.9 and 103.6 mg/dl , respectively) of serum total lipids when compared to other treatments applied . On the other hand , serum cholesterol level was lower in chicks fed 1.5 kg Bio – Tonic and 0.5 kg Kemzyme / ton ration (54.0 and 58.0 mg/dl , respectively) at 28 day of age . While those fed 0.5 kg Zinc bacitracin or 1.0 kg Bio – Tonic /ton ration significantly decreased serum

cholesterol levels (34.6 and 36.8 mg/dl , respectively) at 51 day of chicks age .

Analysis of variance (table 33) showed highly significant effect ($P<0.001$) on serum total lipids and cholesterol due to treatments applied at 28 and 51 day of chicks age . However , significant variation due to dietary levels were found in serum cholesterol at 28 and 51 day and serum total lipids at 51 day of chicks age only .

Generally , these findings are in agreement with those reported by Pescatore *et al* ., (1990) and Ghazalah *et al* ., (1994) who reported that the numeric variations in serum blood parameters (not significant) could be interpreted due to many factors such as genetics , age , sex , physiological state , rearing conditions, feeding as well as pathological factors .

The interaction between treatments applied and supplemented levels had highly significant effect either on serum total lipids or cholesterol at 28 and 51 days of chicks age (ANOVA table , 33) .

Table (32) : Least square means and standard error ($\bar{X} \pm$ S.E) for total lipids and cholesterol (mg/dl) of experimental groups as affected by dietary supplementation .

Independent variables		Serum total lipid (mg/dl) at		Serum cholesterol (mg/dl) at	
Treatments	Level (kg / ton)	28 day	51 day	28 day	51 day
Bio – tonic	0	149.3±5.1	113.8±1.1	117.2±13.1	47.7±2.42
	0.5	147.4±5.1	120.8±1.1	64.3±13.1	38.1±2.42
	1.0	139.3±5.1	113.0±1.1	61.7±13.1	36.8±2.42
	1.5	143.2±5.1	111.6±1.1	54.0±13.1	37.4±2.42
	Average	144.8±2.6 a	114.8±0.56 b	74.3±6.6 a	40.0±1.21a
Fermacto	0	151.0±5.1	114.0±1.1	117.2±13.1	47.5±2.42
	0.5	162.8±5.1	103.6±1.1	79.1±13.1	38.7±2.42
	1.0	182.4±5.1	100.9±1.1	69.5±13.1	42.5±2.42
	1.5	155.7±5.1	107.6±1.1	72.8±13.1	43.9±2.42
	Average	162.9±2.6cd	106.5±0.56 a	84.6±6.6 bc	43.2±1.21 b
Kemzyme	0	155.2±5.1	113.6±1.1	117.0±13.1	47.5±2.42
	0.5	142.3±5.1	130.2±1.1	58.0±13.1	44.4±2.42
	1.0	163.9±5.1	126.3±1.1	67.3±13.1	42.2±2.42
	1.5	152.8±5.1	126.5±1.1	91.0±13.1	39.0±2.42
	Average	153.5±2.6 b	124.2±0.56d	83.3±6.6 b	43.3±1.21bc
Zinc bacitracin	0	153.4±5.1	113.5±1.1	117.2±13.1	47.7±2.42
	0.5	158.1±5.1	109.3±1.1	73.8±13.1	34.6±2.42
	1.0	153.0±5.1	120.4±1.1	97.2±13.1	47.2±2.42
	1.5	169.5±5.1	132.7±1.1	78.3±13.1	48.9±2.42
	Average	158.5±2.6 bc	119.0±0.56 c	91.6±6.6d	44.6±1.21d
Overall mean		154.9±1.3	116.1±0.28	83.5±3.3	42.8±0.60

Means with the same letters in each column are not significantly different .

Table (33) : Analysis of variance for data presented in table (32)

S.O.V	D.F	Mean squares			
		Total lipid		Cholesterol	
		28 day	51 day	28 day	51 day
Treatments(T)	3	1450.4 ***	1334.3***	19500.0***	1443.9***
Levels (L)	3	281.9	151.1 ***	195934 ***	4930.0 ***
Replicates (R)	2	28.3	4.05	958.2	37.97
T X L	9	60.43 **	36.27 ***	1195.92***	147.70 ***
T X R	6	81.6	4.81	1143.0	51.15
L X R	6	115.1	3.90	1358.1	37.83
Remainder	66	158.51	7.43	1033.4	35.001

Whereas : ** = $P < 0.01$, *** = $P < 0.001$

4.8. Digestibility coefficient :

The mean values of digestion coefficient , nitrogen balance and feeding value (TDN) of the different diets applied are presented in table (34) .

Feed consumed , excreta weight , fecal voided (g/bird/day) and chemical analysis of feed and excreta (as a dry matter) are showed in table (35) .

It was found that the digestion coefficient of crude protein ranged from 86.91 to 91.66 % being the higher in ration containing 1.0 kg/ton Kemzyme (91.66 %) , following by those containing 1.0 kg/ton Fermacto (91.55%) , respectively . However, the lowest digestion coefficient value was observed in control diets (86.91%) . These results agree with those of Friesen *et al.*, (1991) and Hashish *et al.*, (1992) who reported that the apparent protein digestibility of the 60 % wheat control diet improved by enzyme addition .

The positive effect of enzyme and probiotic supplementation to the experimental diets on crude protein digestibility was found by El – Husseiny *et al.*, (1995) . Similar results were observed by Friesen *et al.*, (1991) and Hashish *et al.*, (1992) in respect of enzyme supplementation . However , Wojcik and Plaur (1983) , Boisen *et al.*, (1985) and Hashish *et al.*, (1992) suggested that the positive response in protein digestibility due to growth promoters could be due to the increased activities of proteolytic enzyme in the small intestine .

Results obtained cleared that the digestibility coefficients value of ether extract was higher in diet containing 1.0 kg/ton Fermacto (89.57 %) , followed by those containing 1.0 kg/ton Kemzyme (88.55 %). However , the lowest digestion coefficient value of ether extract was found in diet containing 1.5 kg/ton Bio – Tonic (75.17 %) . The results of Ghazalah *et al.*, (1994) showed that the effect of enzyme preparations on fat digestibility was not evidenced .

The digestion coefficients of crude fiber ranged from(21.99) to (42.44 %) being the higher in ration containing 0.5 kg/ton Bio – Tonic (42.44 %) . On the other hand , the lowest value of crude fiber digestibility was found in diet containing 1.5 kg/ton Fermacto (21.99 %) .

Regarding the nitrogen free extract , it was found that , its digestion coefficient value was markedly higher in control diets (86.82 %) , followed by those containing 1.5 kg/ton Zinc bacitracin (86.79 %) . On the other hand , the digestion coefficient value of organic matter was higher in diet containing 1.5 kg/ton Fermacto (84.96 %) , followed by control diet (84.45) , respectively .

Apart of the growth promoting effect of antibiotics may be attributed to their therapeutic action and it has been suggested that they reduce or eliminate the activity of pathogens , causing subclinical infection , eliminate bacteria which produce toxins that reduce the growth of the animal , stimulate the growth of micro –organisms which synthesize identified or unidentified nutrients , reduce the growth of micro -organisms that compete with the host for the supplies of nutrients and increase the absorptive capacity of the intestine (Mc Donald *et al.*, 1973) .

The mean value of total digestible nutrients (TDN) was higher in control diets (87.14 %) followed by those containing 0.5 kg/ton Kemzyme (85.63 %) when compared with other treatments applied .

The amount of nitrogen intake (g/bird/ day) varied between 4.50 and 6.86 (g/bird/day) . These variations may be due to variations in the palatability of feeds between treatments applied which were accompanied with the variations in feed intake between birds (El –Gazar , 1990) .

Results obtained showed slight differences between the amount of nitrogen excreted (g/bird/day) as it varied between (1.09 and 2.02 g / bird / day) for birds supplemented 0.5 kg / ton Bio – Tonic and Fermacto , respectively . On the other hand , the range of the daily nitrogen retained (g/bird/day) lies between 3.17 and 5.20 g/bird/day for birds supplemented 1.0 kg Bio – Tonic and 0.5 kg Zinc bacitracin / ton ration , respectively .

The amount of daily N – retained as a percent of the daily intake (N – balance %) ranged from 69.94 and 78.98 % being the higher in ration containing 1.5 kg / ton Zinc bacitracin (78.98 %) , followed by those containing 0.5 kg / ton Kemzyme (77.32 %) respectively . However , the lowest N – balance value (69.94 %) was observed in ration containing 0.5 kg / ton Fermacto .

Table(34) : Digestion coefficient , total digestible nutrients and nitrogen balance of experimental diets .

Items	Bio – Tonic (kg / ton)				Fermacto (kg / ton)				Kemzyme (kg / ton)				Zinc bacitracin (kg / ton)			
	0	0.5	1.0	1.5	0	0.5	1.0	1.5	0	0.5	1.0	1.5	0	0.5	1.0	1.5
Digestibility coefficients :																
C.P %	87.26	89.16	90.37	91.01	87.41	89.74	91.55	90.00	87.05	91.44	91.66	90.05	86.91	90.16	88.13	90.81
E.E %	87.84	82.35	82.82	75.17	87.98	84.54	89.57	87.62	87.61	86.92	88.55	87.80	87.45	82.50	87.79	82.41
C.F %	35.60	42.44	32.71	37.26	35.73	24.48	34.35	21.99	33.64	36.81	33.98	36.44	33.97	40.17	31.68	41.23
N.F.E %	86.79	86.26	82.88	82.79	86.82	78.64	83.62	79.79	86.67	83.36	83.70	83.90	86.45	83.44	82.25	86.79
O.M %	84.37	84.27	81.20	81.25	84.45	77.74	82.66	79.05	84.16	82.52	82.73	82.58	83.95	82.11	81.05	84.96
Feeding value :																
TDN %	87.12	85.20	83.07	81.80	87.14	80.39	85.09	81.12	86.90	85.63	85.37	84.12	86.68	83.41	81.95	85.28
Nitrogen balance :																
Daily-N intake (g/bird/day)	5.08	4.58	4.50	4.68	5.03	6.72	5.52	6.28	5.00	5.82	6.26	6.48	5.10	6.86	5.15	5.66
N-excreted (g/bird/day)	1.34	1.09	1.33	1.15	1.31	2.02	1.33	1.60	1.35	1.32	1.44	1.54	1.37	1.66	1.27	1.19
N-retained (g/bird/day)	3.74	3.49	3.17	3.53	3.72	4.70	4.19	4.68	3.65	4.50	4.82	4.94	3.73	5.20	3.88	4.47
N-balance %	73.62	76.20	70.44	75.43	73.96	69.94	75.91	74.52	73.00	77.32	77.00	76.23	73.14	75.80	75.34	78.98

Table (35) : Feed consumed , excreta wt., fecal voided (g/bird/day) and chemical analysis of feed and excreta (as a dry matter) .

Items	Bio – Tonic (kg / ton)				Fermacto (kg / ton)				Kemzyme (kg / ton)				Zinc bacitracin (kg / ton)			
	0	0.5	1.0	1.5	0	0.5	1.0	1.5	0	0.5	1.0	1.5	0	0.5	1.0	1.5
Feed consumed (g/bird/day)	182.5	163.3	160.6	163.3	180.7	226.7	184.2	196.7	179.9	181.7	194.2	202.5	183.0	223.3	165.0	180.8
excreta weight (g/bird/day)	40.0	36.2	41.4	40.9	39.4	64.7	43.4	54.5	40.0	42.7	45.7	48.1	41.0	52.6	42.2	37.8
Fecal voided (g/bird/day)	33.22	30.11	34.90	35.21	32.69	58.37	37.19	48.52	33.17	36.40	39.32	41.61	34.24	46.19	36.11	31.42
Analysis of feed (as a dry matter)																
Ash %	6.15	6.25	6.38	6.39	6.21	6.41	6.35	6.40	6.12	6.00	6.23	5.95	6.17	5.98	6.34	6.51
C.P %	17.40	17.52	17.51	17.89	17.41	18.52	18.73	19.95	17.37	20.01	20.14	20.00	17.42	19.20	19.52	19.57
E.E %	6.63	5.39	5.73	5.15	6.62	5.98	6.00	5.54	6.58	6.57	6.17	5.07	6.62	5.13	4.82	5.02
C.F %	3.44	3.45	3.52	3.55	3.42	3.58	3.62	3.63	3.39	3.70	3.72	3.75	3.46	3.63	3.53	3.51
N.F.E %	66.38	67.39	66.86	67.02	66.34	65.51	65.30	64.48	66.54	63.72	63.74	65.23	66.33	66.06	65.79	65.39
O.M %	93.85	93.75	93.62	93.61	93.79	93.59	93.65	93.60	93.88	94.00	93.77	94.05	93.83	94.02	93.66	93.49
Analysis of excreta(as a dry matter)																
Ash %	19.40	20.00	1900	18.58	19.39	19.10	19.58	20.50	19.37	18.00	20.00	20.27	19.51	18.67	18.92	19.08
F.C.P %	12.18	10.30	7.76	7.46	12.12	7.38	7.84	8.09	12.20	8.55	8.30	9.68	12.19	9.13	10.59	10.35
E.E %	4.43	5.16	4.53	5.93	4.40	3.59	3.10	2.78	4.42	4.29	3.49	3.01	4.44	4.34	2.69	5.08
C.F %	12.17	10.77	10.90	10.33	12.15	10.50	11.77	11.48	12.20	11.67	12.13	11.60	12.21	10.50	11.02	11.87
N.F.E %	48.18	50.22	52.67	53.48	48.34	54.34	52.97	52.83	48.11	52.94	51.32	51.11	48.03	52.90	53.35	49.72
O.M %	80.60	80.00	81.00	81.42	80.61	80.90	80.42	79.50	80.63	82.00	80.00	79.73	80.49	81.33	81.08	80.92
U.O.M %	3.64	3.55	5.14	4.22	3.60	5.09	4.74	4.32	3.70	4.55	4.76	4.33	3.62	4.46	3.43	3.90