RESULTS AND DISCUSSION

4.RESULTS AND DISCUSSION

4.1.Digestibility Coefficient:

The average digestion coefficients of the experimental rations are shown in Table (5). Detailed data of digestibility trial are illustrated in Appendixes (A. 1-5) and statistical analysis of results obtained are presented in Table (6).

Results in Table (5) indicated that all the experimental treatments had no significant effect on DM and NFE digestion coefficients. Similarly, **Chiquette, (1995)** observed that, addition of neither *Aspergillus oryzae* (AO) nor *Saccharomyces cerevisiae* (SC) had significant effect on DM digestibility.

Also, T, recorded the highest ($P<0.05$) CP digestibility value, followed by T_5, T_3, T_4 and T_1. The differences between T_5 and T_3 in CP digestibility were not significant, while those between T_4 and T_1 were significant ($P<0.05$). Moreover, 1 ·2 showed the highest ($P<0.05$) EE digestibility, followed by T_3, T_5, T_4 and T_1 with no significant differences among those treatments. In addition, the T,, T_3 and T_5 had significantly ($P<0.05$) higher OM and CF digestibilities than T_1 and T_4.

The present results are in harmony with those reported by **Galev *et al.,* (1982) and Gomez-Alarcon *et al.,* (1991)** who found significant increase in fiber digestion when steers were fed diet with AO. Also, **Van Horn *et al.,* (1984)** reported that AO supplementation increased of CF and OM digestibility. **Arambel and Wiedmeier (1986)** and **Campos *et al.,* (1990)** noted that CP digestibility was significantly increased by AO addition. **Abdel-Samee *et al.,* (1996)** reported that the digestibility of CP, CF and EE increased significantly by Bospro, while, the digestibility of DM and OM were not significantly affected by Bospro supplementation. **Stallcup, (1979)** found that addition of malic acid significantly increased CP digestibility and slightly improved DM digestibility. Also, **El-Basiony *et al.,* (1998)** reported that, Yea-sacc supplementation significantly improved DM, OM, CP, CF, EE and NFE digestibilities. Similarly, **Ragheb *et al.,* (2003)** observed significant increase in digestion coefficients

Table (5): Averages ± SE of digestibility coefficients of Friesian calves fed the different experimental rations.

Items	Treatments				
Digestibility %	**Ti**	**12**	**T3**	**T4**	**T5**
DM %	70.04 ± 0.20	72.25 ± 0.75	70.89 ± 0.36	70.63 ± 0.25	70.95 ± 0.71
OM "A	7025^{b} ± 0.25	73.85^{a} ± 0.75	72.50* ± 0.37	70.93^{b} ± 0.20	72.93' ± 0.61
CP %	67.11 ^{d} ± 0.39	76.48^{8} ± 0.78	73.71 ^{b} ± 0.51	69.35` ± 0.37	73.88^{b} ± 0.73
CF %	59.67" ± 0.33	69.33* ± 1.07	66.20 ± 0.60	62.65" ± 2.01	66.38* ± 0.83
EE %	72.40" ± 0.32	82.28* ± 0.86	76.89'' ± 3.44	72.99^{b} ± 1.96	75.45^{b} ± 0.48
NFE %	74.88± 0.40	74.62± 0.67	74.46± 0.63	74.37± 0.62	75.15± 0.65

* SE = Standard error

*a, b, c and d: means with different superscripts in the same row are significantly (P < 0.05) different.

Table (6): ANOVA for averages of digestibility coefficients of Friesian calves fed the different experimental rations.

Soy	di	OM		OM		CP		CF		FE		NFE	
		MS	F	MS	F	MS	F	MS	F	MS	F	MS	F
Tr	4	1.96	2.52	6.53	933**	43.03	42.27**	41.99	10.98**	46.97	4.67*	0.31	0.28
Error	10	0.78	-	0.70	-	1.02		3.82	-	10.07		1.09	-

* = (P<0.05) ** = (P<0.01)

of OM, CP and CF of Lacto-sacc supplemented diet, while, digestion coefficients of DM, EE and N FE did not differ significantly.

These improvement in digestibility values may be attributed to that Bospro comprised primarily of an *Aspergillus* source of fungal fiber which allows the complete digestion of the feed in the rumen (Pet-Age, 1993). Also, AO possesses a wide range of enzymatic activities, **(Raper and Fennell 1965)** and including a high fibrolytic enzyme content which improved fiber breakdown **(Fondevila** *et al.,* **1990).** Moreover, the Bospro increased total anaerobic and cellulolytic bacterial numbers in vitro and in vivo **(Frumholtz** *et al.,* **1989** and **Weidmeier** *et al.,* **1987).** Whereas, **Arambel** *et al.,* **(1987), Wiedmeier** *et al.,* (1987). Turnbull **(1989) and Udomprasert** *et A,* **(1992)** reported that, Bospro feeding increased DM digestibility. In contrast with previous studies and despite the increased size of the cellulolytic flora, Bospro had no influence on the extent of DM digestion, **(Frumholtz** *et al.,* **1989).**

Gustor XXI is containing yeast culture which is not cellulolytic, but may provide stimulatory factors for cellulolytic bacteria **(Weidmeier** *et al.,* **1987).** Improvement of nutrient digestibility may be possibly explained on the basis that yeast culture enhanced microbial activity and also due to that some beneficial activities, of lactic acid bacterial in the gastrointestinal tract are its antidiarrheal activities antitumer activities and its ability to alter enzyme activates, **(Dawson, 1988).** However, **Jung and Varel (1987) found** that the increase in the number of cellulolytic bacteria failed to increase fiber digestion with yeast culture, which may explain the little effect of low level of Gustor XXI on the total tract digestion.

To explain the superior increase in CF digestion with Bospro groups as compared with Gustor XXI groups, is that yeast cultures mainly act on hemicellulose while *Aspergillus oryzae* (AO) cultures prefer the tougher lignified fiber, **McCullough, (1990).**

4.2.Nutritive Values :

The nutritive values of the experimental rations are shown in Table (7) and the statistical analysis of the results are presented in Table (8). These results indicated that, T_2, T_3 and T_5 had significant ($P<0.05$) higher TDN and DCP values than T_1 and T_4. Also, T_3 and T_5 had significant ($P<0.05$) higher SV than T_1. Whereas, there were no significant differences between T_1 and T_4 in all nutritive values (TDN, DCP and SV), but T_4 had slightly higher nutritive values than T_1. The improvement in TDN, SV and DCP for Bospro fed groups (T, and T_3) may be due to the addition of fungal cultures (AO). Beharka ***et al.,*** (1991) and Frumholtz ***et al.,*** (1989) reported that, (AO) Bospro fermentation extract supplementation increased rumen microbial activity in-vivo, as evidenced by the increase in VFA's concentration and number of bacteria, particularly fiber-digesting groups. On contrast, Khinizy (1999) found that DCP and TDN percentages were significantly decreased by Bospro supplementation.

In agreement with results obtained, Berchielli ***et aL,*** (1989) found that steers fed on diets containing dry yeast showed higher TDN values than the control. Also, El-Ashry ***et al.,*** (2001b) reported that dried baker's yeast and Diamond V"XP" yeast culture supplementation significantly improved TDN and DCP values of growing buffalo calves. Similarly, El-Mekass (2002) concluded the Baker's yeast addition increased insignificantly TDN, SV and DCP values.

4.3.Daily Feed Intake:

Mean values of feed intake of the different treatments are shown in Table (9). Statistical analysis of results obtained are presented in Table (10).

Comparison between different treatments indicated that, Bospro and Gustor XXI addition to the experimental rations increased insignificantly DM, TDN and SV intakes per head per day. T_2 insignificantly highest values of DMI, TDNI and SVI as kg / h / d, while T_1 achieved the lowest once.

Table (7): Averages ± SE of nutritive values of Friesian calves fed the different experimental rations.

Items	Treatments				
Nutritive values %	T_1	**T2**	**T3**	**T4**	**T5**
TDN	64.37^{b} ± 0.21	67.86' ± 0.66	66.47' ± 0.42	64.97^{b} ± 0.23	66.80*± 0.56
DCP	**8.18`**± 0.06	9.33'± 0.12	8.94^{b} ± 0.08	8.41` ± 0.02	8.95^{4} ± 0.09
SV	51.97' ± 0.19	55.38' ± 0.09	53.94'' ± 0.39	52.51^{6c} ± 0.21	54.27' ± 0.58

* SE = Standard error
*a, b and c: means with different superscripts in the same row are significantly (P < 0.05) different.

Table (8): ANOVA for averages of nutritive values of Friesian calves fed the different experimental rations.

SOV	df	Nutritive values					
		TDN		DCP		SV	
		MS	F	MS	F	MS	F
Treatment	4	6.00	9.80**	0.64	3l.69**	5.68	9.10**
Error	10	0.61	-	0.02	-	0.62	-

** = (P<0.01)

These results are agreement with those **Mutsvangwa, (1992), Shamsudin *et al.,* (1994), Chiquette (1995), Robinson (1997), *Martin et al.,* (1999), Soder and Holden (1999)** and **Humphry *et al.,* (2002)** who reported that, DMI was not affected by the addition of Bospro or Gustor XXI.

The DCP intake kg / h / d was almost significantly (P<0.05) increased by the addition of both Bospro and Gustor XXI compared with the control. Calves received diets supplemented with 30 g Bospro /h/d (T2) had significantly higher DCPI (0.773 kg / d) than control group (0.663 kg/h/d) and T4 (0.686 kg /h /d).

Data in Table (9) showed that the averages DMI, TDNI, SVI and DCPI / h /d increased gradually as period progress.

The effect of interaction between period and treatments on feed intake (DMI, TDNI, DCP and SVI) were not significant, (Table 9).

4.4.Feed Conversion:

Data presented in Table (11) showed the feed conversion values of calves fed the experimental rations during the feeding trial. Statistical analysis are presented in Table (12).

Calves fed rations supplemented with Bospro and Gustor XXI were more efficient insignificantly (P>0.05) in DM conversion than control group. There were no significant differences in feed conversion values between **all** treatments and the control group.

Results of feed conversion indicated that, calves of T2 were more efficient in DM1, TDNI and SVI conversion than T_i, T3, 14 and T5, while, T5 treated animals were more efficient in DCP conversion than Ti, T2, T3 and T4.

Pooled data are in agreement with those obtained by, Rush *et al.,* **(1994), Shamsudin *et* at., (1994)** who found **that,** the feed efficiency was insignificantly affected by Bospro addition in buffalo bull calves rations. Also, **Sanson and Stallcup (1984)** found that, supplemental feeding of malate to Holstein bull calves improved

Table (9): Averages ± SE of feed intake of Friesian calves fed the different ex erimental rations at different periods of the experimental trial.

Items		Traits			
Treatment		DM1 (kg / d)	TDN intake (kg / d)	DCP intake (kg / d)	SV intake (kg / d)
T_1		8.10 ± 0.22	5.21 ±0.14	0.663' ± 0.02	4.21 ±0.11
12		8.28 ± 0.18	5.62 ± 0.12	0.773' ± 0.02	4.59 ± 0.10
T3		8.20 ± 0.20	5.45 ± 0.13	0.734^{8} ± 0.02	4.43 ± 0.11
T4		8.17 ± 0.18	5.31 ±0.12	0.686^{6} ± 0.02	4.29 ± 0.09
T5		8.17 ± 0.19	5.46 ± 0.13	0.733^{ab} ± 0.02	4.44 ±0.10
Period					
0-time		7.22^{d} ± 0.12	4.77^{d} ± 0.08	0.631^{4} ± 0.01	3.87^{d} ± 0.07
2-months		7.94' ± 0.12	5.25' ± 0.08	0.695' ± 0.01	4.26' ± 0.07
4-months		8.52^{6} ± 0.10	5.63^{6} ± 0.07	0348^{b} ± 0.01	4.57^{6} ± 0.06
6-monshs		9.0e ± 0.07	5.99' ± 0.05	0.796^{a} ± 0.01	4.86^{a} ± 0.05
Interaction					
Period	Treat.				
	T_1	7.15 ± 0.38	4.60 ± 0.24	0.584 ± 0.03	3.72 ± 0.19
0-time	T2	7.31 ±0.29	4.96 ± 0.20	0.682 ± 0.03	4.05 ± 0.16
	T3	7.29 ± 0.31	4.84 ± 0.21	0.650 ± 0.03	3.93 ± 0.17
	14	7.20 ± 0.25	4.68 ± 0.16	0.602 ± 0.02	3.78 ± 0.13
	T5	7.15 ± 0.22	4.77 ± 0.15	0.638 ± 0.02	3.88 ± 0.12
2-months	T,	7.87 ± 0.43	5.06 ± 028	0.642 ± 0.04	4.09 ± 0.22
	T2	8.12 ± 0.21	5.51 ± 0.14	0.758 ± 0.02	4.50 ± 0.12
	13	7.94 ± 0.32	5.28 ± 0.21	0.708 ± 0.03	4.28 ± 0.17
	14	7.94 ± 0.18	5.16 ± 0.12	0.666 ± 0.02	4.17 ± 0.09
	T5	7.82 ± 0.17	5.23 ± 0.11	0.700 ± 0.02	4.25 ± 0.09
4-months	T_1	8.42 ± 0.31	5.42 ± 0.20	0.690 ± 0.03	4.38 ± 0.16
	12	8.54 ± 0.20	5.80 ± 0.14	0796 ± 0.02	4.73 ± 0.11
	T3	8.52 ± 0.26	5.66 ± 0.18	0.764 ± 0.03	4.59 ± 0.14
	14	8.56 ± 0.23	5.56 ± 0.15	0.720 ± 0.02	4.50 ± 0.12
	T5	8.58 ± 0.16	5.73 ± 0.11	0.772 ± 0.01	4.66 ± 0.08
6-monshs	T_1	8.95 ± 0.25	5.76 ± 0.16	0.734 ± 0.02	4.65 ± 0.13
	T2	9.16 ± 0.14	622 ± 0.10	0.854 ± 0.01	5.07 ± 0.08
	T3	9.07 ± 0.17	6.03 ± 0.11	0.814 ± 0.02	4.89 ± 0.09
		8.98 ± 0.13	5.83 ± 0.09	0.756 ± 0.01	4.71 ± 0.07
	T5	9.14 ± 0.04	6.10 ± 0.02	0.820± 0.00	4.96 ± 0.02

* SE = Standard error

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

Table (10): ANOVA for averages of feed intake of Friesian calves fed the different rations at different riods of the experimental trial.

SOV	df	DMI		TDNI		DCPI		SVI	
		MS	F	MS	F	MS	F	MS	F
Treatment	4	0.09	0.08	0.49	0.99	0.04	4.27*	0.42	1.30
An (Tr.)	20	1.15	-	0.50	-	0.01	-	0.33	-
Period	3	15.60	497.31**	6.83	502.74**	0.13	524.72**	4.49	494.35**
P x Tr.	12	0.02	0.74	0.01	0.84	0.0003	1.23	0.01	0.89
Error	60	0.03	-	0.01	-	0.0002	-	0.01	-

* = (P < 0.05) ** = (P <0.01)

feed efficiency. Caja ***et al., (2003)*** reported that, malate supplementation significantly decrease feed conversion rate with corn, and with non-significantly with barley. Moreover, Nagah (2002) and **Salem** ***et al.,*** (2002) reported that, the feed conversion values as DM, TDN, SV and DCP were insignificantly decreased, when fed lambs on yeast culture.

4.5.Economical Feed Efficiency:

Averages of feed cost / kg WG and economical feed efficiency for the experimental diets used during the feeding trial are illustrated in Table (13).

Values of feed cost / kg WG indicated that, T2 and T5 recorded the lowest values being 6.63 and 6.64 LE, respectively, whereas, T3 and T4 showed almost nearly the same values being 7.15 and 7.13 LE, respectively, and they were higher than that of T1.

Pooled data in Table (13) demonstrated that the T, and T5 recorded higher economical efficiency values than the control, however, T3 and 14 had lower economical efficiency values. The economical efficiency may be related to the relatively high prices of Bospro and Gustor XXI.

Data in Table (13) showed that, calves received T, recorded the lowest feed cost / kg WG values and achieved the highest (best) economic efficiency values followed by T5. This observation may be due to the higher BWG recorded by these two treatments as compared with other ones.

In this respect, **Khattab** ***a al.,*** **(1997a)** with buffalo calves and **Ragheb** ***et al.,*** **(2003)** with weaned Friesian calves recorded higher economical efficiency values for Lacto-sacc treatments than those of controls. Also, **EI-Ashry** ***et al.,*** **(2001b)** with growing buffalo calves and ***Salem et aL,*** **(2002)** with growing sheep reported that, the economical efficiency was improved with yeast culture supplementation.

Table (1 1):Averages ± SE of daily feed intake and feed conversion of Friesian calves fed the different experimental rations during the experimental trial.

Items	Treatments				
Feed intake:	**T1**	**T2**	**T3**	**T4**	**Ts**
DM intake (kg)	8.10	8.28	8.20	8.17	8.17
TDN intake (kg)	5.21	5.62	5.45	5.31	5.46
DCP intake (kg)	0.66	0.77	0.73	0.69	0.73
SV intake (kg)	4.21	4.59	4.43	4.29	4.44
Av, daily gain (kg)	0.887	1.023	0.984	0.898	0.987
Feed conversion:					
Kg DM intake / kg gain	9.15 ± 0.16	8.13 ± 0.33	8.42 ± 0.53	9.13 ± 0.31	8.30 ± 0.27
Kg TDN intake / kg gain	5.89 ± 0.10	5.52 ± 0.22	5.59 ± 035	5.93 ± 0.20	5.55 ± 0.18
Kg DCP intake / kg gain	0.75 ± 0.01	0.76 ± 0.03	0.75 ± 0.05	0.77 ± 0.03	0.74± 0.02
Kg SV intake / kg gain	4.75± 0.08	4.50± 0.18	4.54± 0.29	4.79± 0.16	4.51 ± 0.14

* SE = Standard error

Table (12): ANOVA for averages of feed conversion of Friesian calves fed the different experimental rations during the experimental trial.

SOV	df	Kg DM intake / kg gain		Kg TDN intake / kg gain		Kg DCP intake / **kggain**		Kg SV intake / **kg gain**	
		MS	F	MS	F	MS	F	**MS**	F
Treatment	4	1.15	1.98	0.19	0.76	0.0005	0.10	0.10	0.60
Error	20	0.58	-	0.25	-	0.0045	-	0.17	

Table (13): Average of feed cost/kg weight gain and economical feed efficiency of the different experimental rations used during the experimental trial.

Items	Treatments				
Economical feed efficiency	T_1	T2	**T3**	**T4**	**T5**
Av. daily Fl. as fed, kg/h/d					
Concentrate, kg	5.73	5.84	5.79	5.76	5.75
Berseem hay. kg	1.30	1.34	1.33	1.31	1.33
Rise straw, kg	1.73	1.78	1.75	1.75	1.75
Vit. A, **D3,** E. ml	0.27	0.27	0.27	0.27	0.27
Supplements, g	0.00	30.00	45.00	26.48	39.74
Av. daily WG, kg	0.89	1.02	0.98	0.90	0.99
Cost of feed consumed, LE	6.06	6.79	7.03	6.41	6.56
Price of WG, LE	8.87	10.23	9.84	8.98	9.87
Feed cost/kg WG, LE (1)	6.83	6.63	7.15	7.13	6.64
Economical feed efficiency (2)	1.46	1.51	1.40	1.40	1.51

(I) Based on price of the ingredients in the market during the experimental period (2002 - 2003). The prices were: concentrate feed mixture 900 (LE) / ton, berseem hay 550 (LE) / ton, rice straw 80 (LE) / ton, Bospro 20 (LE) / kg, Gustor XXI 11.50 (LE) / kg and Vit. A, **D3,** E 20 (LE) / 100 ml.

(2) Economical efficiency = price of WG, LE / cost of feed consumed, LE.

4.6.Ruminal Liquor Parameters:

4.6.1.Ruminal pH value:

Mean values of ruminal pH of Friesian calves fed the experimental rations at different periods of the feeding trial are presented in Table (14). Statistical analysis are shown in Table (15).

Results obtained showed that ruminal pH values tended to decrease insignificantly ruminal pH gradually as period progress for all treatments.

Pooled data indicated that, the maximum pH values (P<0.05) throughout all the different periods of the feeding trial were shown at 0 hrs of feeding, whereas the lowest values (P<0.05) were stated at 3 hrs post feeding and increase (P<0.05) after that at 6 hrs post feeding. This can be attributed to fermentation process by rumen microorganisms which took place on the soluble carbohydrate very soon producing more propionate, decreasing pH value, while fermentation of the structural carbohydrates needs more time producing more acetate delaying the decrease of pH value **(Nagah, 2002).**

Results in Table (14) showed that there were no significant differences between treatments at the start of the experiment.

After 2 months, T7, T3 and T5 recorded significantly (P<0.05) lower ruminal pH values as compared with T i and 14.

After 4 months, 12, T3 and T5 groups showed also significantly (P<0.05) lower ruminal pH as compared with T i . While, T4 showed an intermediate value without significant different between other treatments.

After 6 months, all supplemented groups with either Bospro and Gustor XXI had lower ruminal pH values than the control group, but the differences were not significant among all treatments.

The overall means indicated that the same trend observed after 4 months, as T2, T3 and T5 recorded significantly (P<0.05) lower ruminal pH values as compared with T| . Whereas, 14 (3 g Gustor XXI /kg as feed/h/d) showed an intermediate value without significant differences between treatments.

Table (14):Averages ± SE of ruminal pH of Friesian calves fed the different experimental rations at different periods of the experimental trial.

Items		Ruminal p1-1 values through the experimental feedin! leriods				
Treatments		0-time	2-months	4-months	6-months	Overall means
T_1		6.42±0.11	6.44" ± 0.12	6.45' ± 0.12	6.41 ±0.10	$6.43^{°}$ ± 0.05
12		6.41 ±0.11	6.36" ± 0.12	6.35^{6}±0.14	6.28 ± 0.15	6.35" ± 0.06
T3		6.43 ± 0.11	6.35" ± 0.13	6.33" ± 0.14	6.28 ± 0.12	6.35" ± 0.06
T4		6.38 ± 0.11	6.41' ± 0.12	6.41^{k} ± 0.13	6.37 ± 0.11	6.39^{k} ± 0.06
T5		6.40 ± 0.11	6.37" ± 0.12	6.37" ± 0.13	6.32 ± 0.11	6.36" ± 0.06
Overall means		6.41 ± 0.05	6.38 ± 0.05	6.38 ± 0.06	6.33 ± 0.05	6.38
Time of sampling						
0-hrs		6.84' ± 0.01	6.86' ± 0.01	6.89' ± 0.01	6.76' ± 0.01	6.84' ± 0.01
3-hrs		6.12' ± 0.01	6.07' ± 0.02	6.04' ± 0.02	6.03' ± 0.02	6.06' ± 0.01
6-hrs		6.26" ± 0.01	6.22" ± 0.01	6.21" ± 0.03	6.21" ± 0.06	6.23" ± 0.01
Interaction						
Treat	Time					
T,	0-hrs	6.86' ± 0.02	6.91' ± 0.01	6.93' ± 0.03	6.81' ± 0.03	6.88' ± 0.02
	3-hrs	6.12© ± 0.01	6.13^{d} ± 0.01	$6.14^{ed`}$ ± 0.03	6.15^{kde} ±0.01	6.13' ± 0.01
	6-hrs	6.28^{k} ± 0.01	6.27 ± 0.02	6.27" ± 0.01	6.29" ± 0.03	6.27" ± 0.01
T2	0-his	6.83' ± 0.01	6.85^{th} ± 0.01	6.89' ± 0.01	6.74' ± 0.02	6.83' ± 0.02
	3-his	6.13` ± 0.02	6.05^{8} ± 0.03	6.02^{18} ± 0.03	5.99^{dc} ± 0.02	6.05^{d} ± 0.02
	6-hrs	$6.27^{6`}$ ± 0.01	6.19^{de} ± 0.03	$6.15^{6,d}$ ±0.03	6.13^{6th} ±0.04	6.19' ± 0.07
13	0-hrs	6.86' ± 0.01	6.83" ± 0.03	6.86' ± 0.02	6.73' ± 0.02	6.82' ± 0.02
	3-hrs	6.14' ± 0.02	5.99" ± 0.04	5.94^{8} ± 0.01	5.92' ± 0.03	5.99' ± 0.03
	6-hrs	6.29" ± 0.02	$6.22^{`d}$ ± 0.02	$6.19^{6`}$ ± 0.01	$6.20^{6,d}$ ± 0.03	6.23^{k} ± 0.01
T4	0-hrs	$6.83^{°}$ ± 0.01	6.87^{6} ± 0.01	$6.91^{°}$ ± 0.03	$6.78^{°}$ ± 0.01	6.85' ± 0.02
	3-hrs	6.10'± 0.03	6.11^{18} ± 0.02	6.07^{da} ± 0.03	$6.05^{6"k}$ ±0.02	6.08^{d} ± 0.01
	6-hrs	6.22' ± 0.03	$6.24^{"l}$ ± 0.03	$6.23^{6`}$ ± 0.14	$6.28^{6`}$ ± 0.01	6.24^{k} ± 0.03
T5	0-hrs	6.84' ± 0.02	6.84^{6} ±0.01	6.88' ± 0.03	6.75a ± 0.01	6.83'±0.02
	3-hrs	6.12' ± 0.02	6.06^{8} ± 0.03	$6.04^{'18}$ ± 0.02	$6.03^{"k}$ ± 0.02	6.06^{d} ± 0.01
	6-hrs	6.24^{k} ± 0.03	$6.20^{`d}$ ± 0.02	$6.18^{6,d}$ ±0.01	$6.18^{6,d}$ ± 0.03	6.20' ± 0.01

* SE = Standard error

*a, b, c, d, e, f, g and h: means with different superscripts in the same column are significantly (P < 0.05) different.

Table (15): ANOVA for averages of ruminal pH of Friesian calves fed the different experimental rations at different periods of the experimental trial.

SOV	df	F
Treatment	4	5.67**
Time of sampling	2	1368.89**
Tr. x Time	8	0.77
An (Tr. x Time of sampling)	30	-
Period	3	5.88**
P x Tr.	12	0.98
P x Time of sampling	6	2 71*
P x Tr. X Time of sampling	24	0.17
Error	90	-

* = (P < 0.05) ** = (P < 0.01)

The previous results may depend on higher microbial activity in the fore stomach as also indicated by the total VFA production which increased significantly, **(Andrighetto *et al.,* 1993).**

Reduction ($P<0.05$) of ruminal pH values with Bospro may be a reflection of the significant increase in lactic acid production and subsequently the total acidity, (Samy ***et al.,*** **1994).** This result is supported by, **Oellermann *et al.,* (1990)** and **Chiquette, (1995)** who reported that, ruminal **pH** was decreased ($P<0.05$) with AO addition, while, **Newbold *et al.,* (1991)** and **Varel and Kreikemeier (1994a and b)** found, insignificantly decrease in ruminal pH values with AO addition. In vitro studies suggested that, AO stimulates lactate-utilizing bacteria, which increases propionate production **(Nisbet and Martin, 1991).**

The little reduction with Gustor XXI treatments might be related to the decreasing of ammonia concentration and increasing of VFA's in the rumen **(El-Mekass, 2002).These** results are in harmony with those reported by, **Kung *et al.,* (1982)** and **Garin *et al.,* (2000)** with malic acid, and **Mutsvangwa *et al.,* (1992), Piva *et al.,*** (1993) and **Chiquette (1995)** with yeast culture. They observed that, ruminal pH value of treated animals was insignificantly ($P>0.05$) decreased. Whereas, **Martin *et al.,* (2000)** with malic acid and **Harrison *et al.,* (1988), Hanafy (1997), Khattab *et al.,*** (1997a), Angeles ***et al.,*** **(1998), Abdel-Khalek *et al.,* (2000)** and **Mehany (2000)** with yeast culture noted a significant decrease in ruminal pH values. On the contrary, some researchers ***(Martin et al.,*** **(1999)** and **Montano *et al.,* (1999),** with malic acid and **El-Hassan *et al.,* (1996)** and **Kamra *et al.,* (2002),** with yeast culture suggested that, ruminal pH was higher with treatment.

Malic acid stimulates the uptake and utilization of lactate by *S. ruminantium* **(Nisbet and Martin, 1991, 1993 and 1994)** and CO_2 production by the same bacteria **(Callaway and Martin, (1996)** and **Martin, (1998)),** also, it might be stimulates salivation in ruminants which help buffer in the rumen and alleviate acidosis ***(Martin,*** **1998).**

Also, *Saccharomyces cerevisiae* (SC) may prevent decline the pH in the rumen by decreasing lactic acid by microorganisms **(Martin and Nisbet, 1992, Chaucheyras *et al.,* 1996 and Michalate-Doreau and Morand, 1996)** and enhanced the growth and lactic acid utilization of another lactic acid utilizing ruminal organisms, *Megasphaera elsdenii* **(Oscar *et al.,* 2001). Adams *et al.,* (1981)** reported that, ruminal pH decreased significantly with yeast addition. It has been suggested that, the lower fluid dilution rate allow the fermentation end products to accumulate in the rumen.

Table (14) showed that the ruminal pH values ranged form 5.92 to 6.93. This result is in harmony with that obtained by, **Roa *et al.,* (1997),** who reported that, ruminal environment was improved by yeast culture since average pH was close to 6.38 and the length of time that rumen pH was below 6.2 was much lower.

The present data showed that the interaction between treatment x time was not significant, while period x time was significant ($P<0.05$) effects on ruminal pH of calves, (Table 15).

Finally, **Van Soest (1982)** stated that, the optimal pH value for growth of cellulytic microorganisms was 6.7 and the range for normal condition with about ± 0.5 p1-1 degree.

4.6.2.Ruminal ammonia-nitrogen concentration:

Ruminal ammonia-nitrogen (NH_3-N) concentration values of calves fed the experimental rations at different periods of the feeding trial are illustrated in Table (16). Statistical analysis are shown in Table (17).

Pooled data indicated a gradual decrease in ruminal NH_3-N values as period progress, up to after 4 months. After 6 months ruminal NH3-N values increased. The differences in pooled NH_3-N values were only significant between values at the start of the experiment and those after 4 months.

Results obtained showed that the NH3-N concentration was minimum before feeding, and increased after feeding, it reached the peak at 3 hrs post feeding then decreased at 6 hrs post feeding throughout all the feeding trial periods. The peak

Table(16):Averages ± SE of ruminal NH_3-N concentration (mg/100m1) of Friesian calves fed the different experimental rations at different periods of the experimental trial.

Items		Ruminal 1\11-13-N concentraCon through the experimental feeding periods				
Treatments		0-time	2-months	4-months	6-months	Overall means
T,		16.35 ± 0.73	15.82^ab ±0.59	15.68 ± 0.59	15.90 ± 0.63	15.94^4 ± 0.31
12		16.35 ± 0.73	16.23'" ±0.67	16.10 ± 0.72	16.33 ± 0.75	16.25^a° ± 0.34
13		16.33 ± 0.71	16.44' ± 0.72	16.39 ± 0.73	16.54 ± 0.80	16.43° ± 0.35
T4		16.37 ± 0.73	15.78^4 ± 0.55	15.63 ± 0.60	15.80 ± 0.58	15.89^4 ± 0.30
T_5		16.37 ± 0.71	15.74^4 ± 0.51	15.62 ± 0.51	15.75 ± 0.61	15.87° ± 0.29
Overall means		16.35° ± 0.31	16.00^th ± 0.26	15.88^4 ± 0.28	16.07^4 ± 0.29	16.08
Time of sampling						
0-hrs		14.05' ± 0.12	14.01° ± 0.08	13.91` ± 0.12	13.99' ± 0.26	13.99° ± 0.08
3-hrs		18.82' ± 0.20	18.01° ± 0.24	17.98° ± 0.25	18.06° ± 0.33	18.22° ± 0.13
6-hrs		16.19^b ± 0.15	15.99^4 ± 0.15	15.77^4 ± 0.22	16.15^4 ± 0.20	I 6.03° ± 0.09
Interaction						
Treat	Time					
T_i	0-hrs	14.07 ± 0.24	14.00^1 ± 0.31	13.90^1 ± 0.35	13.93° ± 0.44	13.98° ± 0.15
	3-hrs	18.83° ± 0.70	17.77^k ±0.52	I7.73^4` ±0.32	17.8e±0.78	18.03^4 ± 0.29
	6-hrs	16.17 ± 0.41	15.70' ± 0.50	15.40^c ± 0.50	15.97^4 ±0.49	15.81` ± 0.22
T2	0-hrs	14.07 ± 0.35	13.97± 0.20	13.77± 0.35	14.13° ± 0.64	13.98^d ± 0.18
	3-hrs	18.80° ± 0.61	18.5e ±0.35	18.43'^4 ±0.55	18.57. ± 1.07	18.57^4 ± 0.30
	6-hrs	16.20" ± 0.47	16.23^de ±0.30	16.10^d° ±0.64	16.30" ± 0.49	16.21° ± 0.21
13	0-hrs	14.03' ± 0.26	14.07± 0.18	14.10^1 ± 0.25	14.20` ± 1.06	14.10^d ± 0.24
	3-hrs	18.80° ± 0.35	18.90' ± 0.35	18.83° ± 0.64	19.00° ± 0.61	18.88° ±0.22
	6-hrs	16.17" ± 0.44	16.37° ±0.43	16.23^d c ±0.55	16.43^4 ± 0.70	16.30` ± 0.23
T_4	0-hrs	14.03° ± 0.47	14.03^1 ± 0.24	13.87± 0.30	13.87 ± 0.35	13.95^d ± 0.15
	3-hrs	18.83° ± 0.54	17.63^k ±0.53	17.67^4` ±0.52	17.63°^4 ±0.62	17.94^4 ± 0.28
	6-hrs	16.23" ± 0.29	15.67 ± 0.26	15.37 ± 0.58	15.90^k ±0.00	15.79`± 0.18
T_5	0-hrs	14.07 ± 0.23	14.00^1 ± 0.15	13.90^1 ± 0.21	13.80` ± 0.69	13.94^d ± 0.17
	3-hrs	18.83' ± 0.38	17.27d± 0.58	17.23`° ±0.54	17.30°^6 ±0.61	17.66^4 ± 0.31
	6-hrs	16.20^4 ± 0.32	15.97 ± 0.20	15.73° ± 0.27	16.17 ± 0.63	16.02° ± 0.18

* SE = Standard error

* a, b. c. d, e and t means with different superscripts in the same column are significantly (P < 0.05) different.

Table (17): ANOVA for averages of ruminal NH_3-N concentration of Friesian calves fed the experimental rations at different periods of the ex rimental trial.

SOV	df	F
Treatment	4	2.67
Time of sampling	2	319.84**
Ti. x Time of sampling	8	0.85
An (Ti. X Time of sampling)	30	-
Period	3	2.63
P x Tr.	12	0.41
P x Time of sampling	6	0.91
P x Ti. x Time of sampling	24	0.15
Error	90	-

**= (P <0.01)

observed at 3 hrs post feeding may be due to maximum proteolytic and deaminase activities at this period ***(Rai et al.,* 1972).** The decline in the concentration after this time may be due to absorption and / or utilization of NH_3-N in the synthesis activity of the rumen (**McDonald, 1952).**

At the start of the experiment there were no significant differences between treatments.

After 2 months, the rations contained the low and high levels of Gustor XXI (T4 and T_5) recorded the lowest (P<0.05) NH_3-N concentrations, while, those contained the low and high levels of Bospro (T_2 and T3) achieved the highest ones.

The same pattern observed with NH_3-N concentrations after 2 months, but the differences between all treatments were not significant either after 4 or 6 months.

The overall means showed that, T4 and T5 along with T, recorded the lowest NH_3-N concentrations, whereas T2 and T_3 showed the highest ones. The differences in NH_3-N concentrations between T3 and each of T,, T4 and T5 were significant (P<0.05), whereas those between T2 and T_3 were not significant.

The previous results are in good agreement with those obtained by, **Fondevila *et al.,* (1990), Gomez-Alarcon *et al.,* (1990), Oellermann *et al.,* (1990), Sievert and Shaver (1993a and b), Samy *et al.,* (1994), Chiquette (1995)** and **Miranda *et al.,* (1996)** with AO, **Kung *et al.,* (1982) and Martin and Streeter (1995)** with malic acid, and **Khattab *et al.,* (1997a and b), Angeles *et al.,* (1998), El-Mekass (2002), Khattab *et al.,* (2003)** with YC.

Ruminal NH3-N concentration increased with feeding AO could be indicative of proteases active fungal cultures **(Frumholtz *et al.,* 1989 and Fondevila *et al.,* 1990). McKain *et al.,* (1991)** found **that,** AO increased deamination of amino acids, while, **Campos *et al.,* (1990)** found that, AO stimulated ruminal CP digestion in situ. **Boing (1983)** observed that, AO has proteolytic activity. **Merchen, (1988)** reported that, the relatively higher ruminal NH3-N might be related to a relatively low ruminal pH which might inhibit the NH_3-N absorption from the rumen. However, **Van Horn *et al.,* (1979)** reported reduction in rumen NH_3-N with fungal additives.

Lower ammonia concentrations in the rumen of animals fed Gustor XXI may reflect increased transportation of ammonia into microbial protein (Harrison *et ill..* **1988)** and it may be the direct result of stimulated microbial activity (Williams and **Newbold, 1990)** and increasing of bacterial growth **Newbold (1990).** The reduction of ruminal NH_3-N may be probably due to the inhibitory effect of Gustor XXI on proteolysis, amino acid deamination and ruminal urease activity **(Starnes *et al.,* 1984).** However, **Abd EI-Ghani *et al.,* (1995), El-Badawi *et al.,* (1998), Gado *et al.,* (1998)** and **Fayed, (2001),** found that, ruminal NH_3-N was significantly decreased with yeast addition.

The present data showed that the interaction between treatment x time and period x time were not significant effects on ruminal NH_3-N of calves, (Table 17).

Finally, ruminal NH_3-N concentrations ranged form 13.77 to 19.00 mg/100m1 at different times. Ammonia concentrations in all treatment groups were above the level (5 mg / 100 ml) indicated by, **Satter and Slyter (1974) as** adequate for microbial protein synthesis.

4.6.3.Ruminal TVFA's concentration:

Data of the effect of treatments, time of sampling and the interactions on TVFA's concentration in the rumen liquor of calves fed the experimental rations at different periods of the feeding trial are illustrated in Table (18). Statistical analysis is shown in Table (19).

The ruminal TVFA's concentration of all diets reached the highest ($P<0.05$) level after 3 hrs post feeding then declined at 6 hrs post feeding. The peak concentration observed at 3 hrs post feeding may be due to ample availability of nutrients and maximum fermentation activity during this time, **(Samy *et a1.,* 1994).**

Pooled data showed a significant ($P<0.05$) increase in ruminal TVFA's concentration in all periods after feeding the experimental rations, also, there is a gradual increase ($P>0.05$) in ruminal TVFA's as period progress.

Table(18): Averages ± SE of ruminal TVFA's concentration (mg/100m1) of Frisian calves fed the different experimental rations at different periods of the experimental trial.

Items		Ruminal TVFA's concentration through the experimental feeding periods				
Treatments		0-time	2-months	4-months	6-months	Overall means
T_1		12.29 ± 0.35	12.29^{b} ± 0.35	12.33' ± 0.38	12.39^{d} ± 0.36	12.33^{d} ± 0.17
T5		12.30 ± 0.36	14.17' ± 0.75	14.20' ± 0.74	14.35' ± 0.77	13.76' ± 0.35
T_3		12.30 ± 0.37	13.92' ± 0.72	13.91' ± 0.70	13.95"^{b} ±0.72	13.52^{4} ± 0.33
T4		12.29 ± 0.36	12.58^{b} ± 0.45	12.95^{b} ± 0.50	13.05` ± 0.51	12.72` ± 0.23
T5		12.29 ± 0.37	13.73^{0} ± 0.68	13.87' ± 0.68	13.91^{b} ± 0.69	13.45^{b} ± 0.32
Overall means		12.29^{b} ± 0.15	13.34' ± 0.29	13.45' ± 0.28	13.53' ± 0.29	13.16
Time of sampling						
0-hrs		10.95^{b} ±0.11	11.08^{6} ±0.12	11.10^{6} ± 0.08	11.15`±0.10	11.07`±0.05
3-hrs		13.01' ± 0.07	14.58' ± 0.33	14.69^{0} ± 0.28	14.90' ± 0.30	14.29' ± 0.16
6-hrs		12.93' ± 0.12	14.35" ± 0.31	14.56' ± 0.28	14.55^{b} ± 0.28	14.09° ± 0.15
Interaction						
Treat	Time					
	0-hrs	10.97^{k} ± 0.18	10.97 ± 0.33	10.97^{d} ± 0.26	11.02' ± 0.29	10.98' ± 0.12
	3-hrs	13.00' ± 0.26	13.02^{6} ± 0.27	13.07' ± 0.48	13.10^{d} ± 0.20	13.05d ± 0.14
	6-hrs	12.90'' ±0.25	12.88^{b} ± 0.14	12.97 ± 0.23	13.07^{d} ± 0.22	12.95^{d} ± 0.09
T2	0-hrs	10.93' ± 0.23	11.23' ± 0.32	11.27^{d} ± 0.15	11.30' ± 0.25	11.18' ± 0.12
	3-hrs	13.03° ± 0.23	15.70^{0} ± 0.23	15.73' ± 0.19	16.07' ± 0.26	15.13' ± 0.38
	6-hrs	12.93' ± 0.23	15.58' ± 0.22	15.60^{0} ± 0.10	15.70^{a6} ±0.11	14.95* ± 0.36
T;	0-hrs	10.97' ± 0.48	11.10`±0.32	11.12^{d} ± 0.21	11.17' ± 0.32	11.09' ± 0.15
	3-hrs	13.00' ± 0.08	15.52' ± 0.34	15.37' ± 0.15	15.67$^{a)}$ ±0.23	14.89^{3b} ± 0.34
	6-hrs	12.93' ± 0.39	15.15' ± 0.24	15.23'± 0.07	15.03^{b} ± 0.34	14.59^{b} ± 0.31
14	0-hrs	10.93' ± 0.15	10.98' ± 0.39	11.02^{d} ± 0.17	11.07' ± 0.25	11.00' ± 0.11
	3-hrs	13.03^{0} ± 0.18	13.48^{b} ± 0.46	14.00^{b} ± 0.15	14.33'' ± 0.32	13.71' ± 0.20
	6-hrs	12.92' ± 0.35	13.27^{4} ± 0.44	13.83^{b} ± 0.35	13.73`^{d} ± 0.12	13.44' ± 0.18
l5	0-hrs	10.97'± 0.33	11.13'± 0.20	11.I5^{d} ± 0.17	11.20'± 0.15	11.11'± 0.10
	3-hrs	12.97' ± 0.18	15.20' ± 0.42	15.30' ± 0.11	15.33^{b} ± 0.26	14.70^{b} ± 0.32
	6-hrs	1 2.95' ± 0.39	14.87' ± 0.52	15.17' ± 0.15	15.20'' ± 0.29	14.55^{b} ± 0.32

* SE = Standard error

*a, b, c, d and e: means with different superscripts in the same column are significantly (P < 0.05) different.

Table (19): ANOVA for averages of ruminal VFA's concentration of Friesian calves fed the different experimental rations at different periods of the experimental trial.

SOV	df	F
Treatment	4	75.39**
Time of sampling	2	1120.15"
Tr. x Time of sampling	8	14.37"
An (Tr. x Time of sampling)	30	-
Period	3	61.41**
P x Tr.	12	6.11"
P x Time of sampling	6	11.52"
P x Tr. x Time of sampling	24	1.21
Error	90	-

** = (P < 0.01)

These averages of TVFA's concentration are in line with their corresponding ruminal pH values at 3 hrs post feeding. These results are in accordance with those obtained by, **Khattab *et al.,* (1997a and b)** and Nagah, (2002).

Concerning the effect of treatments on TVFA's concentration, overall means showed that, T, recorded the highest (P<0.05) concentration and T1 showed the lowest (P<0.05) one. Moreover, the differences in TVFA's concentrations between all treatments were significant (P<0.05) except those between T3 and T5 were not significant.

These present results are in good agreement with those obtained by, **Frumholtz *et al.,* (1989), Beharka *et al.,* (1991), Samy *et al.,* (1994)** and **Varel and Kreikemeier (1994b)** with AO, **Kung *et al.,* (1982)** and **Martin and Streeter (1995)** with malic acid, **Andrighetto *et al.,* (1993), Sommart *et al.,* (1993), Hanafy, (1997), Abdel-Khalek *et al.,* (2000), Arcos-Garcia *et al.,* (2000)** and **Salem *et al.,* (2002)** with YC, and **Chiquette, (1995)** with AO and YC.

The higher TVFA's concentrations recorded with Bospro treatments (T-, and T3) might be due to that Bospro including *Aspergillus* helps the gut microflora to grow and alter the rumen microflora to favour the increase of VFA production, **(Akin and Borneman, 1989)** and the ability of AO and YC to stimulate the ruminal bacteria and rapid utilization of the fermentable carbohydrates **(Wali, 1994). Kung *et al.,* (1982)** suggested that, the increase in concentration of VFA due to the addition of malic acid was enhancing in ration energy utilization. Moreover, the concentration of total VFA increased as DL-malate concentration increased **(Martin and Streeter, 1995).** Reduced rumen outflow rates could also explain this increase in ruminal VFA concentration, **(Chiquette, 1995).**

The present data showed that the interaction between treatment x time and period x time were significant (P<0.01) effects on ruminal TVFA's of calves, (Table 19).

4.7. Blood Plasma Parameters:

Means values of total protein (TP), albumin (Al), globulin (G), Al / G ratio in blood plasma of calves fed the experimental rations at different periods of the feeding trial are summarized in Table (20). Statistical analysis are presented in Table (21).

Results obtained revealed that TP concentration in blood plasma of calves of **T2** was significantly higher than the other groups. Also, TP concentration for T_3, **T4** and **T5** were significantly higher than that for After 4 and 6 months, values of TP concentration were higher than at the start of the experiment and after 2 months. Also, after 2 months, values were higher than at the start of the experiment.

Plasma total protein concentrations of calves were within the normal range reported by, **(Kaneko, 1989)** being 6 — 8 g / dl.

In agreement with the previous results, Abdel-Samee ***et al.,* (1996)** found, a significant increase in serum TP concentration by about 9.6 % for supplemented Bospro group as compared with control, values were 7.2 and 6.9 (g /dl), respectively. Also, **Samy *et al.,* (1994)** observed that, the TP was significantly increased in supplemented group (3 g / h / d Bospro). The same trend was observed by, **El-Maghawry *et al.,* (1993)** in rabbits when they added 2.5 g Bospro/ kg ration.

Sanson and Stallcup (1984) reported that, supplementing the diets of Holstein bulls calves with 27.2 g of malate per day had a little effect on serum TP. Also, **Abdel-Khalek *et al.,* (2000)** found that, Lacto-sacc addition significantly improved plasma TP by about 4.5 % as compared with control. The same trend was observed by, **Yousef *et al.,* (1996).**

Results in Table (20) revealed that Al concentration in blood plasma of calves of T, was significantly higher than that of T_1 and **T4.** Whereas, there were no significant differences in Al concentration between **T1, T3, T4** and **T5.** Values of Al concentration after 2, 4 and 6 months were significantly higher than that at the start of the experiment. Moreover, no significant differences in Al concentration were detected between the values after 2, 4 and 6 months, but the highest value was obtained after 2

Table (20):Averages ± SE of blood parameters of Friesian calves fed the different experimental rations at different periods of the experimental trial.

Items		Total protein (p/ 100m1)	Albumin (g/100 ml)	Globulin (g/100 ml)	Al/G ratio	Urea-N (mg/100m1)
Treatment						
T1		7.21' ± 0.04	4.33^{6} ± 0.04	2.88 ± 0.07	1.52 ± 0.05	28.71^{d} ±0.14
T2		7.57' ± 0.09	4.63' ± 0.07	2.93 ± 0.06	1.56 ± 0.03	32.67° ± 0.74
T3		7.35^{6} ± 0.05	$4.45^{4'}$ ± 0.05	2.90 ± 0.05	1.53 ± 0.02	31.90^{6} ± 0.56
T4		7.35^{b} ± 0.07	4.40^{6} ± 0.07	2.95 ± 0.09	1.54 ± 0.06	30.60' ± 0.42
T5		7.36^{6} ± 0.06	$4.44^{\circ'}$ ± 0.07	2.92 ± 0.07	1.53 ± 0.05	31.33^{6} ± 0.68
Period						
0-time		7.07' ± 0.02	4.31^{6} ± 0.02	2.76^{6} ± 0.03	1.56 ± 0.02	28.84^{d} ± 0.11
2-months		$7.40^{l'}$ ± 0.04	4.52' ± 0.06	$2.91'^{6}$ ± 0.06	1.56 ± 0.04	31.23° ± 0.49
4-months		7.48' ± 0.05	4.51' ± 0.05	$2.94'^{b}$ ± 0.04	1.54 ± 0.04	31.77^{b} ± 0.46
6-monshs		7.52' ± 0.06	4.46' ± 0.08	3.06' ± 0.08	1.48 ± 0.05	32.32' ± 0.71
Interaction						
Period	Treat.					
0-time	T1	7.07 ± 0.03	4.31 ± 0.05	2.76 ± 0.08	1.56 ± 0.06	28.86 ± 0.37
	T2	7.11 ± 0.02	4.33 ± 0.02	2.77 ± 0.03	1.57 ± 0.02	28.84 ± 0.31
	T3	7.08 ± 0.02	4.33 ± 0.01	2.75 ± 0.03	1.57 ± 0.02	28.84 ± 0.27
		7.05 ± 0.06	4.29 ± 0.04	2.77 ± 0.03	1.55 ± 0.02	28.85 ± 0.23
	T5	7.03 ± 0.05	4.28 ± 0.07	2.75 ± 0.12	1.56 ± 0.09	28.84 ± 0.29
2-months	T1	7.25^{6} ± 0.05	4.41 ± 0.06	2.84 ± 0.10	1.57 ± 0.10	28.66^{6} ± 0.22
	T2	7.56' ± 0.07	4.81 ± 0.09	2.92 ± 0.17	1.57 ± 0.13	33.24' ± 0.44
	T3	$7.4I'^{6}$± 0.01	4.53 ± 0.19	2.88 ± 0.18	1.55 ± 0.06	32.42' ± 0.13
	T4	7.40± 0.11 6	4.44 ± 0.12	2.30 ± 0.16	1.61 ± 0.11	32.36' ± 0.24
					1.52 ± 0.06	29.48^{6} ± 0.20
4-months	T1	7.20` ± 0.02	4.32 ± 0.02	2.88 ± 0.01	1.50± 0.01	28.83^{b} ± 0.40
	T2	7.73' ± 0.12	4.64 ± 0.13	2.92 ± 0.07	1.59 ± 0.08	33.21' ± 0.37
	T3	$7.44^{l'}$ ± 0.01	4.45 ± 0.03	2.99 ± 0.02	1.49 ± 0.10	32.64' ± 0.32
	T4	7.53^{86}± 0.08	4.57 ± 0.04	2.95 ± 0.05	1.55 ± 0.02	31.25^{6} ± 0.32
	T5	7.51^{b} ± 0.02	4.56 ± 0.21	2.94 ± 0.23	1.58 ± 0.18	32.95' ± 0.49
6-monshs	T1	7.34^{b} ± 0.10	4.30 ± 0.18	3.04 ± 0.28	1.45 ± 0.18	28.51^{d} ± 0.22
	T2	7.88' ± 0.06	4.75 ± 0.05	3.13 ± 0.05	1.52 ± 0.03	35.39' ± 0.57
	T3	7.47^{6} ± 0.03	4.48 ± 0.05	2.99 ± 0.08	1.49 ± 0.06	33.71^{6} ± 0.18
	T4	7.37^{6} ± 0.11	4.30 ± 0.26	3.07 ± 0.37	1.45 ± 0.24	29.96' ± 0.31
	T5	7.55^{6} ± 0.02	4.49 ± 0.14	3.06 ± 0.13	1.48 ± 0.11	34.03^{6} ± 0.28

* SE = Standard error

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

Table(21):ANOVA for averages of blood parameters of Friesian calves fed the different experimental rations at different periods of the experimental trial.

SOV	df	TP		Albumin		Globulin		AVG ratio		Urea-N	
		MS	F	MS	F	MS	F	MS	F	MS	F
Tr	4	0.195	11.70**	0.15	3.28	0.008	0.10	0.003	0.09	27.20	67.82**
An (Tr.)	10	0.017		[illegible]		0.080	-	0.034	-	0.40	-
Period	3	0.639	66.82**	0.15	3.63*	0.226	3.69*	0.023	0.79	35.16	121.30"
P x Tr.	12	0.032	3.39**	0.03	0.72	0.005	0.08	0.003	0.12	6.90	23.81"
I Error	30	0.009	-	0.04	-	0.061		0.030	-	0.29	-

* = (P < 0.05) ** = (P < 0.01)

months. These results are within the normal levels reported by, (Kaneko, 1989), being 3.5 — 5.00 g / dl,.

The present results are in harmony with those reported by many workers, Abdel-Samee ***et al.,*** (1996) observed, a significant increase in serum Al by about 7 % in supplemented group with Bospro as compared with control. El-Maghawry ***et al.,*** (1993) reported that, Bospro supplement at level of 2.5 g / kg ration significantly increased Al of serum as compared with control.

Khattab *et aL,* (1997a) found that, blood serum Al did not differ significantly between control group and Lacto-sacc treated groups. The same trend was observed by **Mehany, (2000). Piva *et al.,*** (1993) reported that, blood plasma albumin was not adversely affected by dietary yeast culture, a similar trend was found by, **Jouany *et al.,*** (1998).

Data in Tables (20) and (21) showed that there were no significant differences in globulin (G) concentration and Al / G ratio in blood plasma of calves of all treatments. G concentration increased gradually, while Al / G ratio decreased gradually as period progress.

Our data for G concentration are within the range obtained by, **Fouad *et al.,* (1975)** in serum of healthy buffaloes (1.5 — 6.0 g / dl serum).

The present results are in accordance with those reported by, **El-Maghawry *et ed.,*** (1993) who observed that, serum G was not affected by Bospro supplementation. **Khattab *et al.,* (1997a)** indicated that, blood serum globulin did not differ significantly between the control and Lacto-sacc treated groups. A similar trend was observed by, **Abdel-Khalek *et al.,* (2000). Ragheb *et al.,* (2003)** reported that, levels of serum G did not differ significantly between two groups fed 0 and 2 kg Lacto-sacc / ton concentrate. Also, **Piva *et al.,* (1993)** found that, blood plasma G was not adversely affected by dietary yeast culture.

Results obtained revealed that, urea-N concentration in blood plasma of calves of T, was significantly higher than those of other groups. Also, values of urea-N concentration of T3, **14** and **T5** were significantly higher than that of T_1. No significant differences detected between T3 and T5. The concentrations of urea-N almost increased gradually as period progress.

Results of urea-N concentration in Table (20) are in accordance with those obtained by, **Fisher *et al.,*** (1993) (17.70 mg / dl) and Khinizy, (1997) (35.84 mg / dl) for plasma urea-N concentration.

The present result are in harmony with those reported by many worker, **Abdel-Samee *et al.,* (1996)** observed a significant increase in serum urea-N in supplemented group (30 g Bospro /h/d) as compared with control group. Also, **Samy *et al.,* (1994)** found that, serum urea-N increased significantly by Bospro supplementation.

Sanson and Stallcup (1984) reported that, supplementing the diets of Holstein bull calves with 27.2 g of malate per day had a little effect on blood serum urea-N. Also, **Sommart *et al.,*** (1993) found that, addition of yeast culture tended to increase blood urea nitrogen. **Ragheb *et al.,* (2003)** found a significant increase in concentration of urea-N in blood serum of supplemented group as compared with control group. The same trend was observed by, **Abo El-Nor and** Kholif **(1998), El-Badawi *et al.,* (1998) and Gado *et al.,* (1998)** by dietary yeast culture.

The present results may be related to the beneficial effect of Bospro and Gustor XXI on improving the digestibility coefficients of CP, CF, EE **(Abdel-Samee *et al.,* 1996).**

4.8.Body Weight and Weight Gain:

Averages of initial and final live body weight (LBW), total and daily body weight gain (BWG) of calves fed the experimental rations are presented in Table (22). Statistical analysis are presented in Table (23). Detailed data of changes in LBW of calves fed the experimental rations during the different periods of the feeding trial are shown in Appendixes (A. 6-10).

Pooled data in Table (22) showed that, total BWG and daily BWG of the animals followed the growth sigmoid curve.

Table (22): Averages (kg) ± SE of initial and final live body weight, total and daily body weight gain of Friesian calves fed the different experimental rations at different periods of the experimental trial

Items		Body weight		Av. total BWG, kg	Av. daily BWG, kg
Treatment		Av. initial LBW, kg	Av. final LBW, kg		
T,		187.00 ± 24.91	399.80 ± 33.49	212.80" ± 9.71	0.887° ± 0.04
T_2		188.00 ± 19.33	433.60 1 21.82	245.60' ± 8.77	1.023^{1} ± 0.03
13		188.00 ± 21.32	424.20 ± 19.61	236.20^{a} '± 10.47	0.984'^{4} ± 0.04
14		187.40 ± 16.11	402.80 ± 18.01	215.40^{b} ± 6.25	0.898° ± 0.03
15		187.40 ± 15.52	424.20 ± 13.67	236.80^{a6} ± 4.45	0.987'' ± 0.01
Period					
0-2 months		187.56^{d} ± 8.06	240.56^{d} ± 10.16	53.00 ± 2.70	0.883 ± 0.05
2-4 months		240.56` ± 10.16	300.08' ± 9.37	59.52 ± 2.00	0.992 ± 0.03
4-6 months		300.08° ± 9.37	360.00^{b} ± 9.08	59.92 ± 2.17	0.999 ± 0.04
6-8 months		360.00^{1} ± 9.08	416.92^{1} ± 9.51	56.92 ± 2.16	0.949 ± 0.04
Interaction					
Period	Treat.				
0-2 months	T,	187.00 ± 24.91	237.40 ± 34.89	50.40 ± 10.53	0.840 ± 0.17
	T,	188.00 ± 19.33	244.00 ± 21.94	56.00 ± 3.29	0.933 ± 0.05
	T3	188.00 ± 21.32	243.40 ± 26.83	55.40 ± 7.05	0.923 ± 0.11
	14	187.40± 16.11	239.40 ± 20.37	52.00 ± 5.30	0.867 ± 0.09
	I_5	187.40± 15.52	238.60± 15.95	51.20 ± 3.51	0.853 ± 0.06
2-4 months	T,	237.40 ± 34.89	292.40 ± 34.30	55.00 ± 2.05	0.917 ± 0.03
	12	244.00 ± 21.94	307.80 ± 20.57	63.80 ± 5.01	1.063 ± 0.08
	T_s	243.40 ± 26.83	304.40 ± 24.34	61.00 ± 4.49	1.016 ± 0.07
	T4	239.40 ± 20.37	295.60 ± 16.99	56.20 ± 4.77	0.937 ± 0.07
	T3	238.60 ± 15.95	300.20 ± 10.55	61.60 ± 5.82	1.027 ± 0.09
4-6 months	1_1	292.40 ± 34.30	346.80 ± 31.22	54.40 ± 3.67	0.907 ± 0.61
	12	307.80 ± 20.57	373.20 ± 23.84	65.40 ± 5.86	1.090 ± 0.09
	T_3	304.40 ± 24.34	365.80 ± 19.19	61.40 ± 6.74	1.023 ± 0.11
	T4	295.60 ± 16.99	350.00 ± 17.63	54.40 ± 3.47	0.907 ± 0.05
	T5	300.20 ± 10.55	364.20 ± 11.25	64.00 ± 2.88	1.067 ± 0.05
6-8 months	T_i	346.80 ± 31.22	399.80 ± 33.49	53.00 ± 3.85	0.883 ± 0.64
	T2	373.20 ± 23.84	433.60 ± 21.82	60.40 ± 8.51	1.007 ± 0.14
	I_3	365.80 ± 19.19	424.20 + 19.61	58.40 ± 3.69	0.973 ± 0.06
	T4	350.00 ± 17.63	402.80 ± 18.01	52.80 ± 2.42	0.880 ± 0.04
	T5	364.20 ± 11.25	424.20 ± 13.67	60.00 ± 4.32	0.999 ± 0.07

* SE = Standard error

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

Table (23): ANOVA for averages (kg) ± SE of **initial and final live body weight, total and daily body weight gain of Friesian calves fed the** different experimental ration s erimental t ; I

SOV	LBW			Av. total BWG, kg			Av. daily BWG, kg		
	df	MS	F	df	MS	F	df	MS	F
Treatment	4	1218.47	0.10	4	260.93	3.07	4	0.072	3.07
An (Tr.)	20	12087.31	-	20	84.93	-	20	0.023	-
Period	4	209005.73	2172.12	3	253.51	1.61	3	0.070	1.61
Px Tr.	16	185.88	1.93	12	16.35	0.10	12	0.005	0.10
Error	80	96.22	-	60	157.39	-	60	0.043	-

Data in Table (22) showed that, the average initial LBW of calves was almost equal at the beginning of the feeding trial and there were no significant differences between treatments. At the end of first feeding period (60 days), calves fed **T2** and had insignificantly higher final LBW, total and daily BWG values than those fed T_1, **T4** and **T5.** In the same time, Gustor XXI supplementation of the experimental diets (T4 and T5) improved (P>0.05) LBW, total and daily BWG as compared with T_1. Whereas, throughout the second, third and fourth periods of the feeding trial, calves fed on rations **T7, T3** and **T5** had insignificantly higher final LBW, total and daily BWG than those fed rations T_1 and **T4.** However, calves of T, recorded the highest LBW, total and daily BWG values throughout all periods of the experimental trial. Results in Table (22) indicated that, there were no significant differences in both LBW, total and daily BWG of calves during all experimental periods due to treatments effect.

Results of the over all feeding period (240 days) illustrated in Table (22) showed that, T, had significantly (P<0.05) higher total gain and daily BWG values than those of T_1 and **T4,** whereas, **T3** and **T5** recorded insignificantly (P>0.05) higher total and daily BWG values than those of T1 and **T4.**

Our results are in agreement with the results of **Dhuyvetter *et al.,* (1996)** who reported that, the ADG was improved, when they fed crossbred heifers on high forage grower diets with 2 g *Aspergillus oryzae* fermentation extract (AO) Bospro / h / d. The same trend was observed by, **Samy *et al.,* (1994)** when fed lambs on 3 Bospro / h / d for 45 days. Also, **Sanson and Stallcup (1984)** reported that, supplemental feeding of malate to Holstein bull calves at the level of 27.2 g / h /d improved ADG. Moreover, **Martin *et al.,* (1999)** fed crossbred steers on 0, 40 and 80 g DL-malate / h /d. The authors showed that the ADG after 84 days was linearly increased significantly with more DL-malate as compared with control group. The same result was observed by, **Hudyma and Gray (1990)** and **Hancock *et al.,* (1994)** as they observed that yeast culture significantly improved ADG of steers.

Also, **Soltan, (1998)** indicated that, a significant higher final live body weight, when fed Egyptian cattle bulls on diet contained 1.35 kg yeast culture / ton. **El-Talty *et al.,*** (2001) reported that, the addition of yeast significantly increased final body weight compared with the control groups. The same trend was observed by, Mehany (2000) and Lesmeister *et al.,* (2004) when fed Friesian male calves on diet contained yeast culture.

However, Hackett et al., (1995) found that, the average weight of calves at the end experimental period was slightly increased, when fed crossbred calves on DL-malate (70 g / h /d).

Data of table (22) showed that the interaction between periods and treatments were not significant effects on LBW, total gain and daily BWG.

It is of interest to note that results of averages of total and daily BWG are in harmony with the results obtained in digestibility trial (Table 5) which showed that supplementation with Bospro and Gustor XXI improved the digestion coefficients of nutrients in most cases as compared with the control group. Also, they are in synchronization with the results of ruminal (Tables 14, 16 and 18) and blood plasma parameters (Table 20) which showed that ruminal TVFA's, blood plasma TP, albumin of treated animals were higher than those of control group.

4.9.Body Dimensions:

The averages of heart girth (HG), body length (BL), height at wither (HW), height at hook (HH), width at shoulders (WS), width at hook (WH), width at pinbone (WP) and rump length (RL) during the experimental periods for Friesian calves fed the experimental diets are shown in Table (24). Statistical analysis are presented in Table (25). Also, abdomen girth (AG), abdomen height (AH), abdomen depth (AD), chest depth (CD) and body confirmation at the end of the experiment for Friesian calves fed the experimental diets are presented in Table (26). Statistical analysis are illustrated in Table (27).

4.9.1.Heart girth:

The averages of heart girth (HG) at start time, after 2 months, 4 months, 6 months and 8 months ranged from 130.40 to 131.60, 142.40 to 148.20, 154.80 to 157.00, 162.20 to 166.60 and 170.80 to 175.80 cm, respectively, (Table 24).

There were no significant differences (P>0.05) in FIG values between treatments for initial and throughout all periods (Table 24). Our data indicated that, calves received ration contained 30 g Bospro/h/d (T2) recorded higher HG values in most periods, however, control group achieved lower values in most periods than supplemented groups.

This finding is in agreement with that reported by, Ibrahim *et al.,* (1997) with Baker's yeast and Lesmeister ***et al.,*** (2004) with yeast culture.

The present results of HG are near to that obtained by, Batra and Tochberry (1964) who recorded, the averages of HG were 155 and 176 cm at 12 and 18 months, respectively of Holstein Friesian calves, and El-Gaafarawy (1992) who sited that, HG for male Friesian calves ranged from 128.3 to 143.3 cm at 9 months, 135.9 to 155.5 cm at 11 months, 144.7 to 164.7 cm at 14 months and 153.4 to 174 cm at 18 months, respectively. However, present values were lower than that recorded by, Na ***et al.,*** **(1981)** who found that, HG averaged 186.4 and 200.8 cm at 18 months for Korean and Holstein-Friesian male calves, respectively, Cosar ***et al.,*** **(1991)** recorded that, HG at 9, 12, 15 and 18 months of age averaged 156.9, 166.5, 173.8 and 180.7 cm, respectively for male Holstein calves and **Mohi El-Din (1992)** sited that, the overall means of HG for buffalo bulls fed on the ration contained flavomycin or without falvomycin were 176.77 vs. 178.10 cm, respectively.

On the contrary, our results were higher than that stated by, **Alvarez *et al.,*** (1995) who recorded a range from 118 to 126 cm for male Holstein calves at 1 year of age, **El-Barbary *et al.,*** (1995) found that, HG values were 150.2 and 166.3 cm at 12 and 18 months, respectively, for male Friesian calves, and Zahed and **El-Gaafarawy (2001)** who stated that, HG values of Baladi calves were 134.8 and 151.3 cm at 12 and 18 months, respectively.

Table(24):Averages ± SE of body dimensions values (cm) of Friesian calves fed the different experimental rations at different periods of the experimental trial.

Items		0-time	2-months	4-months	6-months	8-months
HG	T_1	130.40 ± 6.57	142.40 ± 7.85	154.80 ± 6.45	162.40 ± 4.69	170.80 ± 4.63
	T_2	130.40 ± 5.30	148.20 ± 4.01	156.40 ± 3.43	166.60 ± 3.58	175.80 ± 3.17
	T_3	131.60 ± 6.26	144.40 ± 5.89	155.40 ± 4.72	164.60 ± 3.13	174.00 ± 2.45
	T_4	130.60 ± 4.55	145.40 ± 3.80	156.40 ± 3.19	162.20 ± 3.19	171.00 ± 2.10
	T_5	131.40 ± 4.63	143.00 ± 3.36	157.00 ± 2.39	166.00 ± 1.06	175.20 ± 2.06
BL	T_1	94.40 ± 4.02	106.20 ± 4.16	112.08 ± 4.87	118.80 ± 4.45	123.60 ± 3.87
	T_2	94.60 ± 5.33	105.60 ± 4.66	115.60 ± 3.63	122.40 ± 2.67	127.80 ± 1.56
	T_3	95.20 ± 3.57	106.20 ± 2.56	114.80 ± 2.22	120.40 ± 2.79	127.00 ± 2.76
	T_4	94.80 ± 3.37	106.40 ± 2.80	116.40 ± 2.31	120.40 ± 1.94	124.60 ± 1.08
	T_5	94.60 ± 4.17	109.80 ± 3.26	119.60 ± 2.40	123.60 ± 2.50	127.20 ± 2.33
HW	T_1	108.00 ± 2.76	112.20 ± 2.87	119.40 ± 2.94	124.00 ± 2.21	126.40 ± 2.34
	T_2	109.20 ± 2.33	115.40 ± 2.73	120.60 ± 2.42	126.40 ± 2.04	130.20 ± 1.91
	T_3	109.00 ± 2.14	115.00 ± 2.24	120.60 ± 1.57	124.20 ± 1.16	127.00 ± 1.00
	T_4	108.00 ± 2.02	113.40 ± 2.31	118.80 ± 2.31	123.00 ± 1.52	127.40 ± 0.98
	T_5	109.00 ± 2.90	114.60 ± 1.83	120.00 ± 1.38	124.40 ± 1.43	127.60 ± 1.25
HH	T_1	114.40 ± 3.61	118.40 ± 3.47	123.20 ± 2.85	128.00 ± 2.28	129.80 ± 1.96
	T_2	114.20 ± 3.69	118.40 ± 3.59	124.40 ± 2.58	129.60 ± 2.71	131.60 ± 3.17
	T_3	115.20 ± 3.02	120.80 ± 2.52	125.00 ± 2.02	129.20 ± 1.65	131.80 ± 1.43
	T_4	114.00 ± 1.90	119.20 ± 1.62	121.80 ± 1.93	126.20 ± 1.50	130.40 ± 1.33
	T_5	115.40 ± 2.60	119.60 ± 2.11	123.00 ± 1.82	127.00 ± 1.82	131.00 ± 1.82
WS	T_1	24.60 ± 1.86	28.60 ± 2.11	31.40 ± 2.25	35.00 ± 2.57	38.60 ± 0.23
	T_2	26.00 ± 1.14	31.00 ± 1.34	33.80 ± 1.39	36.20 ± 1.32	39.80 ± 1.56
	T_3	24.60 ± 2.11	30.40 ± 0.93	32.80 ± 0.80	36.20 ± 0.73	39.20 ± 0.97
	T_4	26.40 ± 1.08	31.20 ± 0.59	33.60 ± 1.47	36.60 ± 1.63	38.80 ± 1.65
	T_5	26.00 ± 0.89	30.60 ± 1.08	33.40 ± 1.08	36.00 ± 1.45	39.60 ± 1.89
WH	T_1	34.60 ± 2.44	38.40 ± 2.38	41.00 ± 2.47	44.00 ± 2.30	45.60 ± 2.38
	T_2	35.60 ± 1.54	38.80 ± 1.16	41.20 ± 1.07	44.00 ± 0.89	47.20 ± 0.58
	T_3	35.80 ± 1.56	38.60 ± 1.43	41.20 ± 1.59	44.00 ± 1.38	46.40 ± 1.47
	T_4	35.40 ± 1.75	38.60 ± 1.29	41.20 ± 0.86	44.00 ± 0.71	46.00 ± 1.00
	T_5	34.60 ± 2.18	39.00 ± 1.30	40.80 ± 1.24	44.40 ± 0.98	46.20 ± 0.73
WP	T_1	9.60 ± 1.66	11.80 ± 1.16	13.20 ± 1.16	14.20 ± 1.16	15.60 ± 1.12
	T_2	10.60 ± 0.40	12.60 ± 0.51	13.60 ± 0.51	15.40 ± 0.40	17.00 ± 0.63
	T_3	10.80 ± 0.73	12.60 ± 0.68	13.80 ± 0.66	15.20 ± 0.73	16.40 ± 0.81
	T_4	10.20 ± 0.66	12.00 ± 0.63	13.20 ± 0.37	14.40 ± 0.51	16.00 ± 0.32
	T_5	9.60 ± 0.68	12.00 ± 0.71	13.60 ± 0.68	14.60 ± 0.68	16.20 ± 0.73
RL	T_1	23.80 ± 2.01	29.20 ± 1.83	32.20 ± 1.32	34.80 ± 1.07	36.60 ± 3.87
	T_2	24.00 ± 1.67	31.20 ± 0.80	32.80 ± 0.73	35.00 ± 0.89	37.80 ± 1.07
	T_3	22.60 ± 1.81	30.40 ± 1.08	32.40 ± 0.75	34.80 ± 0.92	36.60 ± 0.87
	T_4	22.80 ± 0.66	30.60 ± 1.17	32.80 ± 0.86	34.80 ± 0.86	37.20 ± 0.80
	T_5	23.80 ± 2.06	30.80 ± 0.97	32.80 ± 0.97	34.40 ± 0.81	37.40 ± 1.12

* SE = Standard error

Heart girth (HG)
Body length (BL)
Height at wither (HW)
Height at hook (HH)
Width at shoulders (WS)
Width at hook (WH)
Width at pinbone (WP)
Rump length (RL)

Table(25):ANOVA for averages of body dimensions values of Friesian calves fed the r - rations at different periods of the experimental trial.

SOV	df	HG		BL		HW		HH	
		MS	F	MS	F	MS	F	MS	F
Treatment	4	40.85	0.09	47.11	0.19	22.83	0.23	16.13	0.12
An (Tr.)	20	441.41	-	244.88	-	100.52		138.27	-
Period	4	6911.37	646.20**	3850.67	444.39**	1481.91	557.11**	1070.85	412.98**
Tr. x P	16	9.30	0.87	8.26	0.95	2.22	0.84	3.10	1.19
Error	80	10.70	-	8.67	-	2.66	-	2.59	-

SOV	df	WS		WH		WP		RL	
		MS	F	MS	F	MS	F	MS	F
Treatment	4	12.85	0.24	1.43	0.03	4.29	0.32	3.05	0.11
An (Tr.)	20	54.11	-	56.99		13.26	-	27.12	-
Period	4	688.69	386.25**	477.33	364.93**	136.59	533.55**	687.63	293.99**
Tr. x P	16	0.99	0.55	0.63	0.48	0.25	0.97	0.97	0.42
Error	80	1.78	-	1.31		0.26	-	2.34	-

** = (P<0.01)

4.9.2.Body length:

The averages of body length (BL) ranged form 94.40 to 95.20, 105.60 to 109.80, 112.80 to 119.60, 118.80 to 123.60 and 123.60 to 127.80 cm at the start of the experiment, after 2 months, 4 months, 6 months and 8 months of the experimental period, respectively, (Table 24).

Data of BL indicated that there were no significant (P>0.05) differences between treatments. However, T5 recorded the highest value in most periods, while, Ti (control group) recorded the lowest once in most periods. At the end of the feeding trial, T, recorded the highest value followed by other supplemented groups and control group recorded the lowest value.

These results are in accordance with that obtained by, **Desai and Shukla (1989) and Ibrahim *et al.,* (1997).**

These results are aeai by. **Sadek (1980)** who reported that, averages of BL were 109.3 and 122.0 cm at 12 and 18 month, respectively for Egyptian buffalo calves and **Khalil (1981)** who sited that, averages of BL values were 110.89 and 133.40 cm at 12 and 18 months of age, respectively for buffalo calves.

However, these results are lower than that recorded by, **Na *et al.,* (1981)** who found that, BL averaged 137.3 and 148.2 cm at 18 months for Korean and Holstein-Friesian male calves, respectively, Cosar ***et al.,* (1991)** recorded that, BL at 9, 12, 15 and 18 months of age averaged 115.6, 122.7, 127.0 and 131.1 cm, respectively for male Holstein calves and **Alvarez *et al.,* (1995)** recorded a range from 123 to 139 cm for male Holstein calves at 1 year of age.

On the other hand, our results are higher than that obtained by, **Omar (1984)** who reported that, the overall means of BL were 83.2, 91.1, 98.3 and 104.2 cm at 9, 12, 15 and 18 months of age, respectively for male (Dutch, English, French, Canadian and New Zealand) Friesian calves, **El-Barbary *et al.,* (1995)** who found that, BL values were 84.3 and 94.7 cm at 12 and 18 months, respectively, for male Friesian calves, and **Zahed and El-Gaafarawy (2001)** who stated that, BL of Baladi calves were 98.9 and 107.9 cm at 12 and 18 months, respectively.

4.9.3.Height at withers:

The averages of Height at withers (HW) ranged from 108.00 to 109.20 cm at the start of the experimental period, 112.20 to 115.40 cm after 2 months, 118.80 to 120.60 cm after 4 months, 123.00 to 126.40 cm after 6 months and 126.40 to 130.20 cm at the end of the experiment as shown in Table (24).

Data of HW indicated that, **T2** achieved insignificantly (P>0.05) higher HW values during all experimental periods as compare with other groups. However, the control group recorded almost the lowest values.

These results agreed with those of **Desai and Shukla (1989), Ibrahim *et aL,* (1997)** and **Lesmeister *et al.,* (2004).**

Results obtained in this study are within the averages recorded by, **Nigm (1979)** who found that, the averages of HW were 116.82, 124.17 and 128.27 cm at 12, 15 and 18 months, respectively for Baladi x Friesian crossbred calves, Khalil **(1981)** who sited that, average of HW values were 114.42 and 131.59 cm at 12 and 18 months of age, respectively for buffalo calves and **Zahed and El-Gaafarawy (2001)** who stated that, HW of Baladi calves were 117.7 and 126.1 cm at 12 and 18 months, respectively.. However, our data were lower than those obtained by, **Na *et al.,* (1981)** who found that, HW averaged 121.3 and 133.4 cm at 18 months for Korean and Holstein-Friesian male calves, respectively, **Cosar *et al.,* (1991)** who recorded that, HW at 9, 12, 15 and 18 months of age averaged 118.1, 124.0, 127.7 and 131.4 cm, respectively for male Holstein calves and **Mohi El-Din (1992)** who sited that, the overall means of HW for buffalo bulls fed on the ration with or without falvomycin were 131.95 vs. 133.70 cm, respectively.

On the contrary, the present results were higher than those recorded by, **Omar (1984)** who reported that, the overall means of HW were 101.1, 108.3, 114.5 and 119.6 cm at 9, 12, 15 and 18 months of age, respectively for male (Dutch, English, French, Canadian and New Zelandic) Friesian calves and **El-Barbary *et al.,* (1995)** who found that, HW were 107.7 and 118.5 cm at 12 and 18 months, respectively, for male Friesian calves.

4.9.4.Height at hook:

The averages of height at hook (HH) ranged from 114.00 to 115.40 cm at the start of the experiment, 118.40 to 120.80 cm after 2 months, 121.80 to 125.00 cm after 4 months, 126.20 to 129.60 cm after 6 months and 129.80 to 131.80 cm at the end of the experiment, respectively as shown in Table 24.

There were no significant (P>0.05) differences in HH between treatments at all experimental periods. Calves received the ration contained 45 g Bospro /h /d (T_3) recorded the highest **HH** value in most periods and at the end of the experiment, while, the control group showed the lowest value at the end of the experiment. A similar trend was observed by, **Lesmeister *et al.,*** (2004).

These results are higher than those obtained by, **El-Barbary *et al.,* (1995)** who found that, HH were 110.8 and 121.0 cm at 12 and 18 months, respectively, for male Friesian calves.

4.9.5. Vvidth at shoulders:

The averages of width at shoulders (WS) ranged from 24.6 to 26.4 cm at the start of the experiment, 28.6 to 31.2 cm after 2 months, 31.4 to 33.8 cm after 4 months, 35.0 to 36.6 cm after 6 months and 38.6 to 39.8 cm at the end of the experiment, respectively.

There were no significant (P>0.05) differences in WS between treatments at the start of the experiment and throughout all experimental periods. Our data indicated that, the control group recorded the lowest values during all periods and at the end of the experiment.

These results are close to that stated by, **Mohi El-Din (1992)** who sited that, the overall means of WS for buffalo bulls fed on the ration with or without falvomycin were 36.10 vs. 35.84 cm, respectively.

4.9.6. Width at hook:

The averages of width at hook (WH) at the start time ranged from 34.6 to 35.8 , 38.4 to 39.0, 40.8 to 41.2, 44.0 to 44.4 and 45.6 to 47.2 cm after 2, 4, 6 months and at the end of the experiment, respectively, as shown in Table (24).

There were no significant (P>0.05) differences in values of WI-I between treatments at the start of the experiment and at all feeding periods. Results obtained showed that, calves the received ration contained 30 g Bospro /h/d (T_2) recorded the highest **WI-1** value and those of the control group showed the lowest one at the end of experiment. These data are in accordance with that obtained by, Lesmeister *et al.,* **(2004),** with low level of yeast culture.

The present results are close to those obtained by, **El-Barbary** *et al.,* **(1995)** who found that, WH were 38.5 and 37.0 cm at 12 and 18 months, respectively, for male Friesian calves and lower than those stated by, **Mangurkar** and **Desai (1978)** who recorded that, mean of HW was 53.60 cm for Nili-grade she-buffaloes.

4.9.7. Width at pinbone:

The averages of Width at pinbone (WP) at the start time ranged from 9.6 to 10.8, 11.8 to 12.6, 13.2 to 13.8, 14.2 to 15.4 and 15.6 to 17.0 cm after 2, 4, 6 months and at the end of the experiment, respectively (Table 24).

No significant (P>0.05) differences were detected in WP between treatments at the start of the experiment and throughout all feeding periods. At the end of the experimental period, all supplemented groups had insignificantly higher WP values as compared with the control group.

Results of WP are lower than those obtained by, **Mohi El-Din (1992)** who sited that, the overall means of WP for buffalo bulls fed on the ration with and without falvomycin were 20.97 vs. 20.4 cm, respectively and **El-Barbary *et al.,*** (1995) who found that, WP were 40.5 and 45.0 cm at 12 and 18 months, respectively, for male Friesian calves. However, these results were higher than that those by, **Nigm (1979)** who reported that, the averages of WP were 10.29, 12.48 and 13.58 cm at 12, 15 and 18 months, respectively for Baladi x Friesian crossbred calves.

4.9.8. Rump length:

The averages of rump length (RL) values at ranged from 22.6 to 24.0, 29.2 to 31.2, 32.2 to 32.8, 34.4 to 35.0 and 36.6 to 37.8 cm at the start of the experiment, after 2, 4, 6 months and at the end of the experiment, respectively, (Table 24).

Data of RL indicated that, calves received the ration contained 30 g Bospro /h/d (T2) showed highly insignificant the RL values at all experimental periods and at the end of the experiment. The control group recorded the lowest value at the end of the experiment.

Data obtained one higher than those reported by, **El-Barbary *et al.,* (1995)** who found that, RL values were 24.5 and 27.2 cm at 12 and 18 months, respectively, for male Friesian calves.

4.9.9.Abdomen girth:

The averages of abdomen girth (AG) for T_1, T,, T3, 14 and T5 were 204.2, 204.8, 204.8, 204.4 and 204.4 cm, respectively, without significant differences between all treatments (Tables 26 and 27).

Our data are within the averages obtained by, **Mohi EI-Din (1992)** who sited that, the overall means of AG was for buffalo bulls fed on the rations with and without falvomycin were 204.3 vs. 206.4 cm, respectively at the final record, however, these results are lower than those obtained by, **Mangurkar and Desai (1978)** who reported that, the mean of AG 225.96 cm for Nili-grade she-buffaloes. On the contrary, **Sadek (1980)** obtained results lower than our results, he found that the averages of AG were 175.9 and 194.6 cm at 12 and 18 month, respectively for Egyptian buffalo calves.

4.9.10.Abdomen **height:**

Calves fed the ration contained 30 g Bospro /h/d (T2) had slightly higher abdomen height (AH) value as compared with T_i and T4, while, T3 and T5 recorded an intermediate values. The averages of AH for T_1, T.), T3, T4 and T5 were 55.0, 55.4, 55.2, 55.0 and 55.2 cm, respectively. The present results are lower than that obtained by, **EI-Kholy (1991)** who reported that, the least square of AH for Friesian calves treated and untreated with flavomycin was 64.13 cm at 450 kg body weight.

4.9.11.Abdomen depth:

The average of abdomen depth (AD) was insignificantly (P>0.05) higher with the low level of Bospro (T2) as compared with control group, while 13, T4 and T5 recorded an intermediate values. The averages of AD for T_i, 12, T3, 14 and T5 were 74.0, 76.2, 74.6,74.4 and 74.6 cm, respectively.

Table (26): Averages ± SE of some body dimensions (cm) at the end of Friesian experiment of calves fed the different experimental rations.

Items	Treatments				
	T_1	T_2	T3	T4	T5
Abdomen girth (AG)	204.20 ± 9.36	204.80 ± 2.15	204.80 ± 1.85	204.40 ± 3.42	204.40 ± 1.94
Abdomen height (AH)	55.00 ± 0.55	55.40 ± 1.40	55.20 ± 0.73	55.00 ± 0.71	55.20 ± 1.02
Abdomen depth (AD)	74.00 ± 1.52	76.20 ± 0.86	74.60 ± 1.03	74.40 ± 0.60	74.60 ± 0.68
Chest de pth (CD)	68.40 ± 1.72	71.60 ± 0.51	69.20 ± 0.58	68.80 ± 0.97	69.00 ± 1.67

* SE = Standard error

Table (27): ANOVA for averages of some body dimensions at the end of experiment of Friesian calves fed the different experimental rations.

SOV	df	Abdomen girth		Abdomen height		Abdomen depth		Chest depth	
		MS	**F**	MS	F	MS	F	MS	F
Treatment	4	0.36	0.00	0.14	0.03	3.54	0.72	8.00	1.10
Error	20	111.24	-	4.34	-	4.92	-	7.30	

These results are close to those obtained by, **El-Kholy (1991)** who reported that, the least square of AD for Friesian calves treated and untreated with flavomycin was 74.25 cm at 450 kg body weight , Whereas, these results were higher than those obtained by, **Sadek (1980)** who sited that, the averages of AD were 58.1 and 63.3 cm at 12 and 18 month, respectively for Egyptian buffalo calves.

4.9.12.Chest depth:

The low level of Bospro, 30 g Bospro /h/d (T_2) recorded insignificantly (P>0.05) higher chest depth (CD) value as compared with control group, while. 13 , T4 and T5 recorded intermediate values.

The averages of CD for T_1, T.), T3, T4 and T5 were 68.4, 71.6, 69.2, 68.8 and 69.0 cm, respectively.

The previous results are within those recorded by, **Mohi El-Din (1992)** who sited that, the overall means of CD for buffalo bulls fed on the ration with and without falvomycin were 72.9 vs. 75.1 cm, respectively at the end of the experiment, and near with those obtained by, **El-Kholy (1991)** who reported that, the least square of CD for Friesian calves treated and untreated with flavomycin was 70.88 cm at 450 kg body weight. However, these results were higher than those stated by, **Sadek (1980)** who reported that, averages of CD were 57.6 and 64.0 cm at 12 and 18 months, respectively for Egyptian buffalo calves, and **Khalil (1981)** who sited that, average of CD values were 54.44 and 67.26 cm at 12 and 18 months of age, respectively for buffalo calves.

Generally, it was observed that, all body dimensions tended to increase gradually with the increase of body weight form the start to the end of experiment. These results indicated that, the increase of these dimensions by the body weights and the ages accompanied by increase in body size of animal and body weight throughout all periods of the experiment.

4.10.Carcass Characteristics:

4.10.1.Carcass dimensions:

The averages of carcass length, round length and carcass conformation score are tabulated in Table (28). Statistical analysis are presented in Table (29).

The averages of carcass length ranged from 125 to 129 cm. Supplemented groups with either Bospro or Gustor XXI had insignificantly higher carcass length values than the control group. These data are in harmony with those of the fasting body weights and hot carcasses weights among treatments (Table 30).

Sadek (1980) found no significant influence of sire on the carcass length of buffaloes. The presented results are nearly to similar those obtained by, **Osterc *et al.*, (1976)** who recorded, that the average of carcass length for Holstein Friesian was 129.3 cm, when slaughtered at 460 kg body weight and **Chiericato (1983)** who found that, the average of carcass length for Italian Friesian was 125.7 cm, when it was slaughtered at approximately 483 kg. However, these results are lower than those obtained by, **El-Kholy (1991)** who recorded that, carcass length was 132 cm for Friesian calves and this value was higher than values recorded by, **Nigm (1979)** for Baladi x Friesian crossbred calves 110.15, 120.13 and 124.37 cm at 12, 15 and 18 months, respectively.

The averages of round length ranged from 77.0 to 79.5 cm. Round length values were insignificantly (P>0.05) higher with supplemented groups as compared with control one.

These result are close to those obtained by, **Nigm (1979)** who found that, the averages of round length were 70.39, 76.33 and 80.23 cm at 12, 15 and 18 months, respectively for Baladi x Friesian crossbred calves and **El-Kholy (1991)** who recorded that, the least squares means of round length was 78.13 cm for Friesian calves.

Table (28): Averages ± SE of carcass dimensions of Friesian calves fed the different experimental rations.

hems	Treatments				
Carcass dimensions:	**T1**	**T2**	**T3**	**14**	**T5**
Carcass length (cm)	125.00 ± 1.00	129.00 ± 1.00	126.50 ± 0.50	126.00 ± 2.00	127.00 ± 1.00
Round length (cm)	77.00 ± 1.00	79.50 ± 0.500	78.00 ± 0.00	77.00 ± 2.00	78.50 ± 2.50

• SE = Standard error

Table (29): ANOVA for averages of carcass dimensions of Friesian calves fed the different experimental rations.

SOV	dr	Carcass length		Round length	
		MS	F	MS	F
Treatment	4	4.40	1.52	2.25	0.49
Error	5	2.90		4.60	

4.10.2.Dressing percentage:

The averages of the fasting body weights, carcass weight, dressing percentage (based on both fasting and empty body weight) are shown in Table (30). Statistical analysis are presented in Table (31).

Dressing percentage of hot carcass weight without offals based on fasting body weight ranged from 54.69 to 59.82%. The corresponding values of the dressing percentage based on empty body weight ranged from 61.99 to 67.01%. Moreover, dressing percentage of hot carcass weight with offals (heart, liver, kidneys, testes and spleen) based on fasting body weight ranged from 57.49 to 62.46%. The corresponding values of the dressing percentage based on empty body weight ranged from 65.16 to 69.96%. These results are within the values of dressing percentage of hot carcass with offals (heart, liver, kidneys and testes) obtained by, **Etman (1985),** who found dressing percentage (based on fasting body weight) ranged from 54.71 to 61.14% and dressing percentage (based on empty body weight) ranged from 59.96 to 66.64% for Friesian calves with fasting live weight ranged from 434.5 to 452 kg and empty live weight ranged from 384.5 to 417.8 kg.

The differences in fasting body weight, empty body weight and hot carcass weight were not significant (P>0.05) between treatments, although, values of fasting body weight, empty body weight and hot carcass weight were higher for supplemented animals than for control once, and there were harmony with results of growth performance of treated groups (Table 22).

The dressing percentages (based on fasting or empty live body weight) did not differ between treatments. The highest values of dressing percentage at all status were recorded by T7, and the lowest once were shown by T4. **El-Hommosi and Abdel-Hafiz (1979)** found that increasing the dietary energy content led to a rise in dressing percentage.

The previous results are in accordance with results obtained by, **Shamsudin** *et* **a/., (1994)** with Bospro and **Mir and Mir (1994), El-Basiony** *et* **a/., (1998), Fayed**

Table (30): Averages ± SE of fasting, empty body weight, hot carcass weight and dressing percentages of Friesian calves fed the different experimental rations.

Items	Treatments				
	T_i	12	T3	T_4	T_5
Fasting body weight (kg)	379.50 ± 11.50	461.00 ± 12.00	407.00 ± 10.00	404.00 ± 39.00	426.50 ± 34.50
Empty body weight (kg)	331.00 ± 14.30	411.57 ± 10.37	358.23 ± 8.37	356.65 ± 37.35	376.55 ± 33.15
Hot carcass weight (kg)	210.00 ± 10.00	276.00 ± 16.00	234.00 ± 14.00	222.00 ± 32.00	244.00 ± 14.00
Dressing % (A)	55.31 ± 0.96	59.82 ± 1.91	57.45 ± 2.03	54.69 ± 2.65	57.32 ± 1.35
Dressing % **(B)**	63.43 ± 0.28	67.01 ± 2.19	65.27 ± 2.39	61.99 ± 2.48	64.97 ± 2.01
Dressing % (C)	58.15 ± 1.27	62.46 ± 1.79	59.89 ± 2.11	57.49 ± 2.79	59.97 ± 1.17
Dressing % (D)	66.69 ± 0.59	69.96 ± 2.06	68.04 ± 2.47	65.16 ± 2.63	67.98 ± 1.81

$$\text{Dressing \% (A)} = \frac{\text{Carcass weight}}{\text{Fasting weight}} \text{ a } 100$$

$$\text{Dressing \% (B)} = \frac{\text{Carcass weight}}{\text{Empty body weight}} \times 100$$

$$\text{Dressing \% (C)} = \frac{\text{Carcass weight + (liver + heart + kidneys + spleen + testes)}}{\text{Fasting weight}} \times 100$$

$$\text{Dressing \% (D)} = \frac{\text{Carcass weight + (liver + heart + kidneys + spleen + testes)}}{\text{Empty body weight}} \times 100$$

Table (3 1): ANOVA for averages of fasting, empty body weight, hot carcass weight dressing percentages of Friesian calves fed the different experimental rations.

KW	df	Fasting body weight		Empty body weight		Hot carcass we'ght		Dressing % (A)		Dressing % (B)		Dressing % (C)		Dressing % (D)	
		MS	F	MS	F	MS	F	MS	F	MS	F	MS	F	MS	F
Tr	4	1845.85	↑A9	1779.03	8.19	8.19	8.19	8.19	1.17	7.26	0.87	7.46	1.01	6.34	0.76
Error	5	1235.00		1150.49	6.99	6.99	-	6.99	-	8.30	-	7.36		8.36	-

(2001), Khalifa *et al.,* (2001) and **Khattab *et al.,* (2003)** with yeast culture, **Martin *et al.,* (1999)** with DL-Malate.

4.10.3.Carcass components:

4.10.3.1.Boneless meat:

The weights and percentages of boneless meat were significantly (P<0.05) higher with group fed (30 g Bospro /h/d), (T,) as illustrated in Table (32). Statistical analysis are presented in Table (31). It could be noticed that groups supplemented with either Bospro (T, and T3) or Gustor XXI (T_5) recorded higher boneless meat weights than the control group. Whereas, the group supplemented with the low level of Gustor XXI (T_4) showed the lowest boneless meat percentage.

Boneless meat % ranged from 78.97 to 82.02 %. These results are within the values obtained by, **Salama (1995)** who found that, the percentages of boneless meat in carcass of Friesian calves ranged from 78.6 to 83.1 %.

Also, the previous data are in good agreement with those reported by, **Abou Ammou and El-Hosseiny (1999)** who found that, meat % were 44.8, 46.9 and 49.1, for lambs fed on 0, 10 and 15 g Bospro / h/d, respectively. Similarly, **Mir and Mir (1994)** with steers and **EI-Basiony *et al.,* (1998)** with buffalo calves, observed a slight increase in boneless meat % with yeast culture supplemented group than unsupplemented one. Whereas, **Garin *et al.,* (2000)** found a small decrease in boneless meat % with Gustor XXI supplementation with lambs.

4.10.3.2.Bone:

The averages of weight and percentage of bone for calves fed the experimental rations are shown in Table (32). Statistical analysis are presented in Table (33). There were no significant (P>0.05) differences in bone weight due to supplementation effect. However, values of bone weight were slightly higher for calves fed supplemented

Table (32): Averages ± SE of carcass components of Friesian calves fed the different experimental rations.

Items	Treatments				
Carcass components	T_1	**T2**	**T3**	**T4**	**T5**
Left side carcass weight (kg)	105.00 ± 5.00	138.00 ± 8.00	117.00 ± 7.00	111.00 ± 16.00	122.00 ± 7.00
Boneless meat weight (kg)	83.80^{6} ± 3.20	113.20^{a} ± 6.70	95.00^{ab} ± 7.00	87.70^{sb} ± 12.90	99.50^{a6} ± 4.50
Boneless meat %	79.85^{ab} ± 0.75	82.02' ± 0.10	81.13^{ab} ± 1.13	78.97^{b} ± 0.23	81.61^{ab} ± 0.99
Bone weight (kg)	21.20 ± 1.80	24.80 ± 1.30	22.00 ± 0.00	23.30 ± 3.10	22.50 ± 2.50
Bone %	20.15^{a6} ± 0.75	17.98^{b} ± 0.10	18.87^{6} ± 1.13	21.02' ± 0.23	$18.39'^{6}$ ± 0.99
Meat / bone ratio	3.97 ± 0.19	4.56 ± 0.03	4.32 ± 0.32	3.75 ± 0.05	4.45 ± 0.29

* SE = Standard error

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

Table (33): ANOVA for averages of carcass components of Friesian calves fed the different experimental rations.

SOV	df	Left side carcass weight		Boneless meat weight		Boneless meat %		Bone weight		Bone %		Meat : bone ratio	
		MS	F	MS	F	MS	F	MS	F	MS	F	MS	F
Treatment	4	316.600	1.79	263.35	2.26	3.23	2.79	3.77	0.45	3.23	2.79	0.23	2.54
Error	5	177.20	-	116.32	-	1.16	-	8.32	-	1.16	-	0.09	

rations than for those fed the control ration. Moreover, percentage of bone for the low level of Gustor XXI (T_4) was **higher than that for other groups.**
Values of bone % ranged from 17.98 to 21.02 %. These results are in accordance with those obtained by, Salama, (1995), from 16.9 to 21.4% and Gaafar, (2001), 18.28 to 21.15% both in carcass of Friesian calves. It was a reverse trend to that of meat %.

4.10.3.3.Meat / bone ratio:

There were no significant (P>0.05) differences between treatments in meat : bone ratios (Table 32 and 33). The meat / bone ratios showed a similar trend as boneless meat percentages and a reverse trend to the bone percentages.

The meat / bone ratios ranged from 3.75 to 4.56. In good agreement with these results **Soroor (1993) reported that, ratios of meat / bone ranged** from 3.5 to 4.6 in Friesian calves, similarly **Gaafar (2001)** found that these ratios ranged from 3.73 to 4.47 in Friesian calves.

Shamsudin *et al.*, (1994) observed that, meat / bone ratio increased significantly with 0.15 and 0.30 % Bospro /h/d, while it was not affected with 0.45% Bospro / h/d with swamp buffalo calves.

4.10.4.Fore and hind quarters:

There were no significant differences between treatments in the weights and percentages of fore and hind quarters and weights of fore and hind quarters boneless meat as tabulated in Table (34). Statistical analysis are presented in Table (35). Supplemented groups had better values than control group and T, recorded the best weights of fore and hind quarters and its boneless meat weights.

Percentages of fore quarter were higher than those of hind quarter. The percentages of fore and hind quarters relative to left side carcass weight ranged form 52.41 and 45.71 to 54.29 and 47.59%, respectively.

Table (34): Averages ± SE of fore and hind quarters of Friesian calves fed the different experimental rations.

Items	Treatments				
	T_1	**T2**	**T3**	**14**	**Ts**
Fore quarter weight (kg)	55.00 ± 2.00	72.50 ± 2.50	63.50 ± 3.50	9.50	66.00 ± 4.00
Hind quarter weight (kg)	50.00± 3.00	65.50± 5.50	53.50± 3.50	6.50	56.00± 3.00
Fore quarter boneless meat weight (kg)	42.80± 1.20	58.45 ± 1.95	51.00 ± 3.00	7.90	53.00 ± 3.00
Hind quarter boneless meat weight (kg)	41.00+ 2.00	54.75 ± 4.75	44.00 ± 4.00	41.00 ± 5.00	46.50 ± 1.50
Fore quarter % relative to left side carcass weight (kg)	52.41 ± 0.59	52.61 ± 1.24	54.29 ± 0.26	53.48 ± 0.85	54.09 ± 0.17
Hind quarter % relative to left side carcass weight (kg)	47.59 ± 0.59	47.39 ± 1.24	45.71 ± 2.60	46.52 ± 0.85	45.91 ± 0.17

* SE = Standard error

Table (35): ANOVA for averages of fore and hind quarters of Friesian calves fed the different experimental rations.

SOV	df	Fore quarter weight		Hind quarter weight		Fore quarter boneless meat weight		Hind quarter boneless meat weight		Fore quarter %		Hind quarter %	
		MS	F	MS	F	MS	F	MS	F	MS	F	MS	F
Tr	4	87.65	1.70	75.15	1.83	71.69	2.09	64.65	2.32	1.43	1.32	1.43	1.31
Error	5	51,50		41.10	-	34.26	-	27.93	-	1.08	-	1.08	

These results agreed with those of *Afifi et al.,* **(1974), Abou-Selim (1980), Etman (1985), Soroor (1993)** and **Gaafar (2001),** who reported that, the percentage of fore quarter was higher than that of hind quarter.

4.10.5. Organs, offals and fat of some organs:

The average weights of organs, offals and fat of some organs and their percentages relative to fasting body weights of the different carcasses of Friesian calves fed the experimental rations are presented in Tables (36) and (37). Statistical analysis are presented in Tables (38) and (39). Hide, head, tail, legs, full and empty-rumen, full and empty-intestine, lungs, liver, spleen, testes, kidneys, heart weights were not affected by Bospro or Gustor XXI supplementation. These results are in agreement with those reported by, **Abou Ammou and El-Hosseiny (1999)** who found that, offals and organs weights did not affect by Bospro addition. Also, heart fat and intestine fat weights were not different between treatments. However, **Abou Ammou and El-Hosseiny (1999)** with lambs, reported that, Bospro supplementation increased internal fat significantly. Kidneys fat showed a significant increase for T2 as compared with other supplemented groups. However, there were no significant differences in kidneys fat weights between control and other groups. This finding agree with that reported by, **Garin** *et al.,* (2000) with Gustor XXI. Moreover, **Abou Ammou and El-Hosseiny (1999)** reported that, Bospro with high level (15 g/h/d), had no significant effect on kidneys fat weight, while the low level of Bospro (10 g/h/d) decreased it significantly with lambs. In general, the weights of offals, organs and carcass fats increased slightly in most cases with the low level of Bospro.

Lungs, spleen, testes and kidneys percentages did not show remarkable change between treatments. This finding is supported by a similar one reported by, **El-Basiony** *et al.,* **(1998)** and **Fayed (2001)** with yea-sacc. Also, there were no significant differences between treatments in offals, organs and fat of some organs, but the control group had a significant ($P<0.05$) higher heart percentage as compared with that of T3. These results are in good agreement with those reported by, **Martin** *et al.,* **(1999) who**

Table (36): Averages ± SE of weights (kg) of organs, offals and fat of some organs of Friesian calves fed the different experimental rations.

Items	Treatments				
	T,	Tz	T3	T4	T5
Hide	27.00 ± 2.00	33.00 ± 1.00	32.00 ± 1.00	29.00 ± 3.00	30.00 ± 2.00
Head	19.50 ± 0.50	23.60 ± 1.40	21.00 ± 0.00	21.00 ± 0.90	22.75 ± 2.25
Tail	1.10±0.10	1.45±0.05	0.97±023	1.10±0.10	125±025
Legs	9.45 ± 0.050	10.30 ± 0.20	9.65 ± 0.45	9.55 ± 0.35	9.30 ± 0.20
Full-rumen	56.50 ± 0.500	56.00 ± 1.00	56.00 ± 1.00	56.00 ± 1.00	56.50 ± 0.50
Empty-rumen	13.80 ± 1.50	15.10 ± 0.90	14.73 ± 0.47	15.10 ± 0.90	15.30 ± 1.20
Full-intestine	22.70 ± 1.50	25.75 ± 0.25	22.40 ± 0.60	24.0 ± 3.0	25.65 ± 3.15
Empty-intestine	16.90 ± 0.700	17.23 ± 0.03	14.90 ± 0.50	17.55 ± 1.45	16.90 ± 0.10
Lungs	4.70 ± 0.10	6.25 ± 0.25	5.60 ± 0.40	5.25 ± 0.75	5.00 ± 0.50
Liver	5.90 ± 0.90	6.63 ± 0.13	5.70 ± 0.50	6.40 ± 0.80	6.25 ± 0.75
Spleen	1.075 ± 0.075	1.17 ± 0.07	1.075 ± 0.075	0.900 ±0.100	1.10 ± 0.100
Testes	0.675 ± 0.125	0.725 ± 0.075	0.675 ± 0.075	0.750 ± 0.150	0.675 ± .125
Kidneys	1.250 ± 0.350	1.625 ± 0.125	1.100 ± 0.100	1.525 ± 0.275	1.50 ± 0.50
Heart	1.95 ± 0.050	2.00 ± 0.0	1.40 ± 0.10	1.80 ± 0.40	1.85 ± 0.25
Kidneys fat	1.50^{8b} ± 0.10	2.27^{a} ± 0.23	1.27" ± 0.27	1.33" ± 0.43	1.05" ± 0.05
Heart fat	0.47 ± 0.27	0.45 ± 0.20	0.23 ± 0.03	0.30 ± 0.10	035 ± 0.15
Intestine fat	1.80 ± 0.40	1.20 ± 0.00	1.50 ± 0.30	1.10 ± 0.10	1.95 ± 0.45

* SE = Standard error

*a and b : means with different superscripts in the same row are significantly (P < 0.05) different.

Table (37): Averages ± SE of weight % of organs, offals and fat of some organs relative to fasting weight of Friesian calves fed the different experimental rations.

Items	Treatments				
	Ti	T2	13	T4	-|•
Hide	7.11 ±0.31	7.17 ± 0.40	7.86 ± 0.05	7.17 ± 0.05	7.04 ± 0.10
Head	5.14 ± 0.02	5.11 ± 0.17	5.17 ± 0.13	5.25 ± 0.28	5.33 ± 0.09
Tai I	0.29 ± 0.02	0.31 ± 0.01	0.24 ± 0.05	0.28 ± 0.05	0.30 ± 0.08
Legs	2.49 ± 0.06	2.24 ± 0.10	2.37 ± 0.05	237 ± 0.15	2.19 ± 0.13
Full-rumen	14.91 ± 0.59	12.15 ± 0.10	13.76 ± 0.09	13.97 ± 1.10	13.35 ± 1.19
Empty-rumen	3.63 ± 0.29	3.28 ± 0.28	3.62 ± 0.03	3.75 ± 0.14	3.59 ± 0.01
Full-intestine	6.00 ± 0.58	5.59 ± 0.20	5.51 ±0.01	5.92 ± 0.17	5.99 ± 0.25
Empty-intestine	4.46 ± 0.32	3.74 ± 0.090	3.67 ± 0.21	4.35 ± 0.06	3.99 ± 0.30
Lungs	1.24 ± 0.01	1.36 ± 0.09	1.38 ± 0.13	1.29 ± 0.06	1.17 ± 0.02
Liver	1.55 ± 0.19	1.43 ± 0.07	1.40 ± 0.09	1.58 ± 0.05	1.46 ± 0.06
Spleen	0.28 ± 0.01	0.25 ± 0.03	0.27 ± 0.03	0.23 ±0.01	0.26 ± 0.00
Testes	0.17 ± 0.03	0.15 ± 0.01	0.17 ± 0.03	0.18 ± 0.02	0.15 ± 0.01
Kidneys	0.33 ± 0.09	0.35 ± 0.03	0.27 ± 0.02	0.37 ± 0.03	0.35 ± 0.09
Heart	0.51^{2} ± 0.01	0.43^{ab} ± 0.01	0.35^{b} ±0.01	0.44''' ± 0.06	0.43^{8b} ± 0.03
Kidneys fat	0.39 ± 0.03	0.49 ± 0.03	0.31 ± 0.06	0.34 ± 0.14	0.25 ± 0.03
Heart fat	0.13 ± 0.07	0.10 ± 0.04	0.05 ± 0.01	0.07 ± 0.02	0.08 ± 0.03
Intestine fat	0.47 ± 0.09	0.26 ± 0.01	0.37 ± 0.08	0.28 ± 0.05	0.45 ± 0.07

* SE = Standard error

*a and b : means with different superscripts in the same row are significantly (P < 0.05) different.

Table (38): ANOVA of averages of weights (kg) of organs, offals and fat of some organs of Friesian calves fed the different ex

SOV	df	Hide		Head		Tail		Legs		Full rumen		Empty rumen	
		MS	F	MS	F	MS	F	MS	F	MS	F	MS	F
Treatment	4	11.40	1.50	5.17	1.60	0.07	1.22	0.30	1.83	0.15	0.11	0.72	0.32
Error	5	7.60	-	3.23	-	0.05	-	0.16	-	1.40	-	2.21	-

SOV	df	Full intestine		Empty intestine		Lungs		Liver		Spleen		Testes	
		M.S.	F	M.S.	F	M.S.	F	M.S.	F	M.S.	F	M.S.	F
Treatment	4	4.99	0.58	2.16	1.89	0.71	0.71	0.28	0.31	0.02	1.38	0.003	.10
Error	5	8.64	-	1.14	-	0.42	-	0.91	-	0.01	-	0.026	-

SOV	df	Kidneys		Heart		Kidneys fat		Heart fat		Intestine fat	
		M.S.	F	M.S.	F	M.S.	F	M.S.	F	M.S.	F
Treatment	4	0.09	0.50	0.11	1.20	0.44	3.46	0.02	0.36	0.27	1.46
Error	5	0.19	-	0.09		0.13	-	0.06	-	0.18	-

Table (39): ANOVA of averages of weight % of organs, offals and fat of some organs relative fasting weight of Friesian calves fed the different experimental rations.

SOV	df	Hide		Head		Tail		Legs		Full rumen		Empty rumen	
		M.S.	F	M.S.	F	M.S.	F	M.S.	F	M.S.	F	M.S.	F
Treatment	4	0.22	2.04	0.01	0.28	0.002	0.34	0.028	1.32	2.015	1.68	0.06	0.85
Error	**5**	**0.11**	-	0.05	-	0.005	-	0.022	-	1.199	-	0.07	-

SOV	df	Full intestine		Empty intestine		Lungs		Liver		Spleen		Testes	
		M.S.	F	M.S.	F	M.S.	F	M.S.	F	M.S.	F	M.S.	F
Treatment	4	0.11	0.59	0.25	2.52	0.015	0.28	0.012	0.54	0.0008	1.48	0.0003	0.31
Error	5	0.19	-	0.10	-	0.012	-	0.022	-	0.0005	-	0.0008	-

SOV	df	Kidneys		Heart		Kidneys fat		Heart fat		Intestine fat	
		M.S.	F	M.S.	F	M.S.	F	M.S.	F	M.S.	F
Treatment	4	0.003	0.46	0.007	3.86	0.017	1.62	0.001	0.43	0.018	2.08
Error	5	0.007	-	0.002	-	0.011	-	0.003	-	0.009	-

found that, internal fat% did not differ between treatments, when steers and heifers fed on 0 and 90.8 g /h/d of DL-Malate.

4.10.6.Carcass physical dissection (lean, fat and bone percentages in 9-10-rib cut):

The percentages of lean, fat and bone of 9-10-11 [1] rib cut of Friesian calves fed the experimental rations ranged between 67.85 and 72.55, 9.53 and 13.20 and 16.45 and 19.03 %, respectively (Table, 40). These results are within the values reported by, **Bedeir *et al.*, (1980)** who found that, the percentages of lean, fat and bone of 9- 10-11 [1] rib cut of buffalo calves were 71.78, 9.47 and 17.75%, respectively. **Awad (1996)** reported that, the percentages of lean, fat and bone of 9-10-11`h rib cut were 60.88, 17.48 and 21.64%, respectively. Also, **Gaafar (2001)** recorded that, the percentages of lean, fat and bone of 9-10-11 [1] rib cut ranged between 65.36 and 68.22, 10.67 and 16.29 and 18.35 and 21.11%, respectively.

Treated groups had insignificantly (P>0.05) higher lean percentage than control group. Yea-sacc and Lacto-sacc. Also, Bospro and Gustor XXI had no significant effect on bone percentages. The control group recorded the highest fat percentage and T7 recorded the lowest one, the differences in fat percentage due to treatment effect were not significant (Table, 40). This result is in accordance with those of **Abou Ammou** and **El-Hosseiny (1999).**

These, findings agree with those reported by, **Khattab *et al.*, (2003)** when lambs were fed on diet contained 100% energy. However, **Abou Ammon and El-Husseiny (1999)** found that, lambs fed 15 g of Bospro/h/d had significantly higher lean percentage than lambs fed 0 or 10 g of Bospro /h/d.

Table (40): Averages ± SE of physical dissection of 9-10-11 th rib cut of Friesian calves fed the different experimental rations.

Items	Treatments				
	T_1	**T2**	T_3	**T4**	**T5**
Lean %	67.85 ± 3.58	72.55 ± 0.53	69.63 ± 2.01	70.73 ± 0.80	72.01 ± 2.19
Fa t °A	13.20 ± 1.30	9.53 ± 0.71	11.52 ± 0.57	10.23 ± 1.09	11.54 ± 1.22
Bone %0	18.95 ± 2.28	17.91 ± 1.24	18.85 ± 2.57	19.03 ± 0.29	16.45 ± 0.97

* SE = Standard error

Table (41): ANOVA for averages of physical dissection of 9-10-11 rib cut of Friesian calves fed the different experimental rations.

SOV	df	Lean %		Fat %		Bone %	
		MS	F	MS	F	MS	
Treatment	4	7.172	0.80	3.961	1.91	2.423	0.42
Error	5	9.011	-	2.077	-	5.752	

4.10.7.Physical characteristics of *Logissimus dorsi* muscle :

4.10.7.1.Area of *Longissinius dorsi* (cm^2):

Eye muscle *L. dorsi* (L,D) area of Friesian calves fed the experimental rations ranged from 54.61 to 77.70 cm^2 as shown in Table (42). Statistical analysis are presented in Table (43). The eye muscle area of the carcasses insignificantly (P>0.05) increased with supplemented groups with either Bospro or Gustor XXI. However, Friesian calves fed on Bospro during the fattening period (calves of T2 and TO recorded highest eye muscle area than the others and the lowest area was recorded by those of the control group, but differences in all cases were not significant (Table 42).

The previous data is in accordance with those of **Mir and Mir (1994), Fayed (2001)** and **Khattab** *et* ***al.,*** **(2003)** with yeast culture and **Martin** *et al.,* **(1999)** with malate. **Abou Ammou and El-Hosseiny (1999)** reported that, lambs fed on high level of Bospro have a larger eye muscle area than those fed on low level of Bospro.

Results obtained herein are within those obtained by, **Nigm (1979)** who found that, eye muscle area of Friesian calves ranged from 54.41 to 93.76 cm^2.
The differences among the groups in eye muscle area might be attributed to the variation in carcass weight, edible meat percentage and the marbling of carcass, **(Etman, 1985).**

4.10.7.2.Fat depth over *L. dorsi (mm):*

The values of fat depth over *L. dorsi* of calves were not significantly (P>0.05) affected by the levels of either Bospro or Gustor XXI in the experimental rations as presented in Tables (42) and (43). Gustor XXI fed groups showed the highest values of average fat depth over the *L. dorsi* followed by Bospro fed groups and the control group recorded the lowest value. Similar results were reported by, **Mir and Mir (1994)** with yeast culture, **Martin** *et al.,* **(1999)** with malate and **Garin** *et al.,* **(2000)** with Gustor XXI.

Table (42): Averages ± SE of physical characteristics of *L. dorsi* muscle of Friesian calves fed the different experimental rations.

Items	Treatments				
	Ti	**T2**	**T3**	T_4	T_5
Area of *L. dorsi* (LD) (cm2)	54.61 ± 3.55	60.63 ± 8.01	77.70 ± 11.09	57.38 ± 3.92	62.52 ± 5.83
Fat depth over LD (mm)	1.00 ± 0.75	1.13 ± 0.87	1.13 ± 0.12	1.25 ± 0.25	1.37 ± 0.12
Width of LD (cm)	15.15 ± 0.95	16.55 ± 0.55	17.60 ± 1.90	15.75 + 0.95	15.70 + 0.50
Depth of LD (cm)	9.15 ± 0.15	10.40 ± 0.70	9.50 ± 1.00	8.85 ± 0.65	10.90 ± 0.90
Index of LD %	60.69 ± 4.79	63.05 ± 6.33	53.99 ± 0.15	56.65 + 7.55	69.31 ± 3.53

* SE = Standard error

Table (43): ANOVA for averages of physical characteristics of *L. dorsi* muscle of Friesian calves fed the different experimental rations.

SOV	df	Area of L dorm (cm	—	Fat depth over LD (mm)		Width of LD (cm)		Depth of LD (cm		Index of LD %	
		MS	F	MS	F	MS	F	MS	F	MS	F
Tr	4	161.530	1.62	0.041	0.07	1.813	0.76	1.489	1.36	0.007	1.46
Error	5	99.657	-	0.569	-	2.387	-	1.098	-	0.005	-

4.10.7.3.Width of *L. dorsi (cm):*

The average width of *L. dorsi* of calves fed the experimental rations are illustrated in Table (42).

The average width of *L. dorsi* ranged from 15.15 to 17.60 cm. T3 (45 g Bospro/h/d) recorded the highest value and T_1 showed the lowest one. There were no differences between treatments as shown in Table (43).

4.10.7.4.Depth of *L. dorsi* (cm):

There were no significant differences between treatments for depth of eye muscle of Friesian calves fed the experimental rations are shown in Table (42).

The average depth of *L. dorsi* ranged from 8.85 to 10.90 cm. 15 recorded the highest value and T4 achieve the lowest one as shown in Table (42).

4.10.7.5.Index of *L. dorsi:*

Averages of index of *L. dorsi* of calves fed the experimental rations are illustrated in Table (42). Statistical analysis presented in Table (43) showed that there were no significant differences between treatments.

The average index of *L. dorsi* ranged from 53.99 to 69.31 %. T5 recorded the highest value and 13 showed the lowest value.

4.10.8. Physical characteristics of meat of rib cut:

4.10.8.1.pH values:

Data presented in Table (44) showed that, average pH values were nearly similar in fresh meat of Friesian calves carcasses. The pH values of fresh meat ranged from 5.77 to 5.87 for calves fed the experimental rations, with no significant differences between treatments due to treatment effect (Table 45).

Table (44): Averages ± SE of physical characteristics of meat of rib cut of Friesian calves fed the different experimental rations.

Items	Treatments				
Physical characteristics	**T1**	**T2**	**T3**	**Ty**	**T5**
pH values	539 ± **0.03**	5.87 ± **0.05**	5.77 ± **0.05**	5.85 ± **0.01**	5.81 ± **0.07**
Color intensity	**0.305 ± 0.01**	0.295 ± **0.01**	0.295 ± **0.01**	0.298± **0.003**	**0.297± 0.003**
Meat tenderness cm2	**3.37[6] ± 0.07**	**3.71[a] ± 0.08**	**3.61[a6]± 0.03**	**3.45[6] ± 0.09**	**3.49['6] ± 0.02**
WHC cm2	**7.83 ±** 0.26	**7.03 ±** 0.05	**7.16 ±** 0.57	**732 ±** 0.57	**7.23 ±** 0.12

* SE = Standard error
*a and b : means with different superscripts in the same row are significantly (P < 0.05) different.

Table (45): ANOVA for averages of physical characteristics of meat of rib cut of Friesian calves fed the different experimental rations.

SOV	df	pH values		Color in ensity		Meat tend erness cm2		WHC cm^2	
		MS	F	MS	F	MS	F	MS	F
Tr	4	0.003	0.86	0.00004	0.47	0.04	4.35	0.19	0.64
Error	5	0.004	-	0.00008	-	0.01	-	0.29	-

Similar results were reported by **El-Kholy** *a al.,* **(1999) and Khattab** *et al.,* (2003).

4.10.8.2.Color intensity:

The color intensity of fresh meat for the calves fed the experimental rations ranged from 0.295 to 0.305 showed in Table (44). Statistical analysis proved that there were no significant differences in color intensity of fresh meat due to treatment effect as presented in Table (45).

Color intensity decreased insignificantly with treated groups specially with those fed the low and high levels of Bospro.

In this respect, **Yamazaki (1981)** observed that, marbling fat content of carcass was the most important factor affected color intensity of meat. **Allen and Kilkenny (1980)** suggested that, dark cutting is usually due to stress before slaughter which uses up muscle glycogen and limits the amount of lactic acid which finally causes the dark color. **Bidner** *et al.,* **(1986)** reported that, a part of darker lean color is due to a higher myoglobin concentration in the eye muscle of steers.

The present results are higher than those obtained by, **Salama (1995)** who found that, color intensity of Friesian eye muscle ranged from 0.235 to 0.255 and **Gaafar (2001)** who observed that the color intensity of Friesian eye muscle ranged from 0.253 to 0.283, however, it was lower than that recorded by, **Etman (1985), El-Mounir (1990) and Mehany (1999)** who reported that, the color intensity of Friesian eye muscle ranged from 0.339 to 0.768, 0.398 to 0.468 and 0.331 to0.535, respectively.

4.10.8.3.Meat tenderness::

Tenderness of fresh meat of 9-10-11th rib cut are shown in Table (44). Statistical analysis are presented in Table (45). The values ranged from 3.37 to 3.71 CM^2 for Friesian calves fed the experimental rations. Meat tenderness of T2 group was significantly higher (P<0.05) than that of T_i and 14 groups.

These results are within the values obtained by, Etman (1985) who found that, tenderness of fresh meat of Friesian calves ranged from 3.15 to 4.11 cm^2. In this respect, Udin (1967) reported that, high tenderness of fresh meat may be attributed to high contents of carcass fat. Etman (1985) noted that, the differences in tenderness might be due to the variations in moisture contents in meat, difference of fiber diameter, amount of connective tissue and protein solubility.

4.10.8.4.Water holding capacity:

Water holding capacity (WHC) of fresh meat for 9-10-11 th rib cut of Friesian calves fed the experimental rations are illustrated in Table (44). Statistical analysis are presented in Table (45). WHC ranged from 7.03 to 7.83 cm^2, with no significant differences in WHC values between treatments.

Alsmeyer, (1962) attributed the differences in WHC to kind of feeding; change in myofibrillar proteins (Goll ***et al.,*** 1974); different muscles in carcass (Forrest, 1981) and differences in total soluble nitrogen in fresh meat (Hamm, 1972 and Etman, 1985).

4.10.9.Chemical composition of meat of rib cut:

4.10.9.1.Moisture:

The moisture percentages of meat of rib cut of calves fed the experimental rations are shown in Table (46). Statistical analysis are presented in Table (47). T_1 and **T4** groups had significantly higher ($P<0.05$) moisture content than **T2** and **T3** groups. Moisture content ranged from 76.55 to 77.79%. The highest value was recorded by control (T_1) and the lowest one was shown by **12.**

In accordance with the previous results, Etman (1985) found that, the moisture of *eye* muscle ranged from 75.77 to 77.33 % and Mehany (1999) reported that the percentage of the moisture of eye muscle of Friesian calves ranged from 74.98 to 77.60%.

4.10.9.2.Crude protein:

The contents of CP on DM basis in meat of rib cut of Friesian calves fed experimental rations are shown in Table (46). Statistical analysis are presented in Table (47). There were no significant differences in meat CP content meat between different treatments. Similar results were reported by **Abou Ammou and El-Hosseiny (1999)** with Bospro in sheep and **Khalifa** *et al.,* **(2001)** with yeast culture in buffalo calves.

The average CP content of meat of rib cut for the different groups ranged form 86.88 to 88.03% on DM basis. The average CP content of meat was slightly lower for calves of supplemented groups than for the control one.

These results are within the values obtained by, Etman (1985), who recorded that CP content of meat of buffalo calves ranged from 85.98 to 88.55% on DM basis.

4.10.9.3.Ether extract:

The contents of EE on DM basis in meat of rib cut of Friesian calves fed the experimental rations are presented in Table (46). Statistical analysis are illustrated in Table (47). There were no significant differences in EE content of meat between different treatments.

The average EE content of meat for the different groups ranged from 7.19 to 8.33% on DM basis. The average EE content of meat was slightly higher for animal groups received diets supplemented with Bospro and Gustor XXI than for control group.

Taie **(1998)** reported that, EE content of meat decreased with increasing the CP content in the diet.

These results are within the values reported by, **Etman** (1985) and Mehany **(1999) on DM** basis.

Table (46): Averages ± SE of chemical composition of meat of rib cut of Friesian calves fed the different experimental rations.

Items	Treatments				
Chemical composition (on DM basis)	**T_1**	**T2**	**T_3**	**T.4**	**T5**
Moisture %	**77.79˙ ±** 0.11	76.55^{4} ± 0.39	76.77^{b} ± 0.23	77.57'± 0.06	77.13^{a}± 0.03
Protein %	88.03 ± 0.55	86.88 ± 0.41	87.40 ± 1.07	87.80 ± 0.87	86.99 ± 0.55
Ether extract %	7.19 ± 0.77	8.33 ± 0.09	8.03 ± 1.08	7.49 ± 0.69	8.02 ± 0.09
Ash %	4.79± 0.22	4.80± 0.32	4.57± 0.01	4.71 ± 0.19	4.99± 0.46

* SE = Standard error
*a and b : means with different superscripts in the same row are significantly (P < 0.05) different.

Table (47): ANOVA for averages of chemical composition of meat of rib cut of Friesian calves fed the different experimental rations.

SOV	df	Moisture		CP		EE		Ash	
		MS	F	MS	F	MS	F	MS	F
Treatment	4	0.54	6.04*	0.50	0.46	0.42	0.47	0.05	0.30
Error	5	0.09	-	1.07		0.9		0.16	

* = (P < 0.05)

4.10.9.4.Ash:

Data given in Table (46) showed the average ash content of meat of rib cut of calves fed experimental rations. Statistical analysis are presented in Table (47).

There were no significant differences between treatments in ash content of meat. Our data are in agreement with those of **Abou Ammou and El-Hosseiny (1999)** with Bospro and **Khalifa *et al.,* (2001)** with yeast culture.

Ash content for different groups ranged form 4.57 to 4.99% on DM basis. Similar results were reported by **Mehany (1999).**