4-RESULTS AND DISCUSSION

4.1. Effect of dietary protein sources, season of calving number and stage of lactation on:

4.1.1. Average daily milk yield (MY):

Data concerning average daily milk yield as affect by dietary protein sources, season of calving, number and stage of lactation was presented in Table (4) and illashated at Fig. (1).

There was a highly significant variation ($P<0.001$) in daily milk yield due to dietary protein sources (Table 5). The highest average of daily milk yield (9.09 kg /cow/day) was observed in cows fed ration containing black seed meal as a main source of protein followed by those fed ration containing roquette meal (8.42 kg/cow/day). No significant differences were observed between the two previously mentioned averages. On the other hand, the lowest average of daily milk yield (7.37 kg/cow/day) was found in cows fed ration containing cotton seed meal which was less than those fed ration containing sunflower seed meal by (0.71 kg/cow/day) as a sources of dietary protein. Which differe significantly with those of the other groups.

From obtained results, it could be concluded that, black seed and roquette meals when added to ration of dairy cattle improved daily milk yield than did cotton seed meal, which may

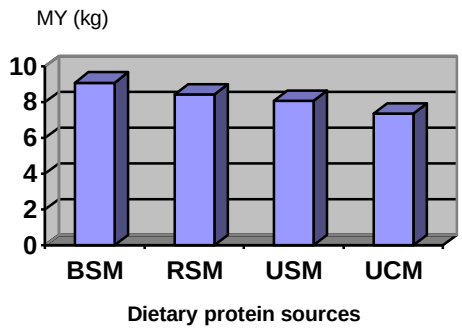
Table (5): The least squares analysis of variance and tests of significance of factors affecting average daily milk yield (MY) (kg/cow/day).

S.O.V	d.f	Average daily milk yield (MY)		
		SS	MS	F-ratios
Dietary protein sources	3	298.49	99.49	16.47***
Season of calving	3	169.13	56.37	9.33***
Lactation number	4	1616.10	404.02	66.88***
Lactation stage	43	6616.48	153.87	25.47***
Remainder	1002	6052.80	6.04	
Total	1055	15223.53		

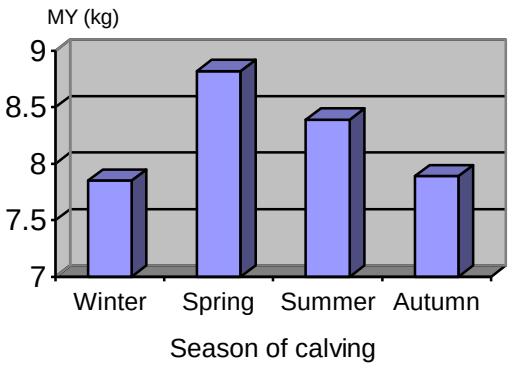
Where : ***=P<0.001

Fig. (1): Effect of studied factors on milk yield.

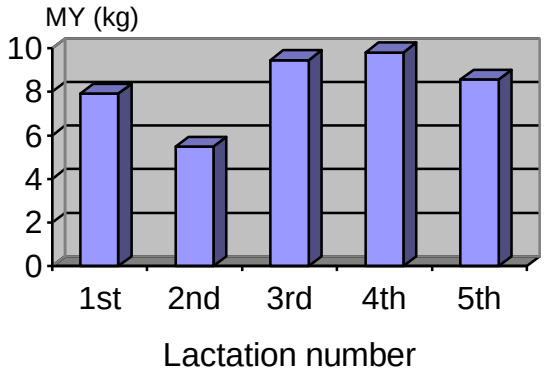
(A): Dietary protien sources.



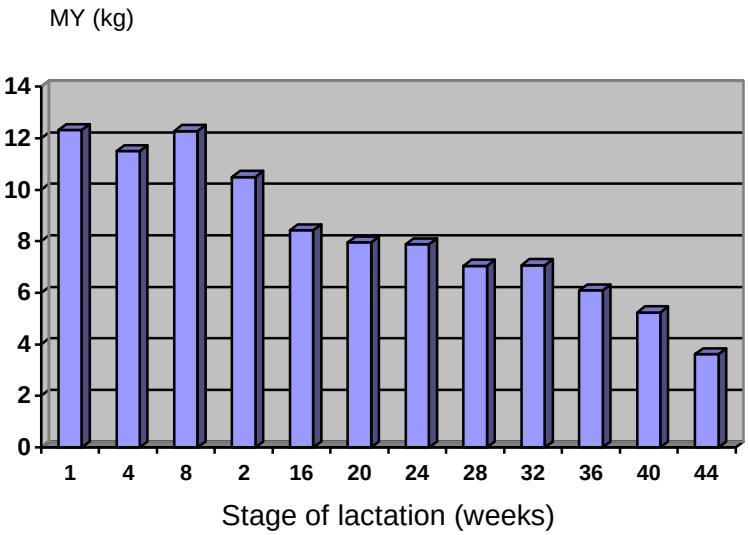
(B): Season of calving.



(C): Lactation number.



(D) :Lactation stage.



fulfil the animal requirement from essential amino acids and undegradable protein.

The average daily milk yield seemed to be significantly affected ($P<0.001$) by the season of calving. The highest value of daily milk yield (8.82 kg /cow /day) was recroded in cows calved during spring season, followed by those calved during summer months (8.39 kg/cow/day) with significant variation between the two values. On the other hand, the lowest average was found in cows calved during winter (7.85 kg/cow/day) and autumn (7.89 kg/cow/day). (with significant differences between the two values).

The previously mentioned results may lead to conclude that the spring season may provide dairy cows with the convenient environmental conditions for milk production. In addition the sufficient green fodder available during spring season from (*Trifolum alexandrinum*) may be the main reason for the highest average of milk yield obtained during this season.

These results agree with those of many investigators, who found that cows calved during spring and summer season yielded more milk than those calved in other seasons of the year. **Perera *et al.*, (1986)** found that the highest 30-day milk yield from Holstein cows was obtained during the spring season. While, the lowest value was found during the winter. On the other hand, **Martin et al., (1998)** and **Bangar and Narayankhedkar, (1998)** found that the highest milk yield average was from obtained cows calved during summer months.

However, **Al-Doori *et al.*, (2004)** reported that the maximum milk yield was produced by cows calving during autumn while, the minimum was at spring.

There was a significant variation ($P<0.001$) in average daily milk yield due to the lactation number. Gradual increase in daily milk yield was obtained with advancing lactation number, reaching its the maximum average in cows having 4 lactations (9.80 kg/cow/day) followed by those having 3 lactations (9.45 kg/cow/day) with insignificant variations between them. Daily milk yield declined thereafter to reach an average of 8.56 kg/cow/day in cows having 5 lactations which differed significantly with other parities. On the contarary, the lowest average (5.49 kg/cow/day) was found in cows having 2 lactations which was less than those having one lactation by (2.42 kg/cow/day) with significant differences between the two groups.

Results obtained agreed with those of **Mohamed, (1987), Vij et al., (1992) and Singh and Nagarcenkar, (1997)** who observed gradual increase in total milk yield which reached its maximum value during 4^{th} lactation after which it decreased. On the other hand, in Jersey and Red Dane cattle **(Das *et al.*, 2002)** and in Holstein- Friesian cows **(Al-Doori *et al.*, 2004)** found a gradual increase in milk yield up to the 3^{rd} lactation, which declined thereafter.

Average daily milk yield varied significantly ($P<0.001$) within various lactation stages without any pronounced trend. It

reached the highest values of 12.32 kg/cow/day at the first week then gradually decreased with advancing stage of lactation reaching an average of 11.95 kg/cow/day at the 4th week. It increased to attain an average of 12.28 kg/cow/day at the 8th week, decreased thereafter reaching it lowest value 3.61 kg/cow/day at the 44th week (at the end of lactation period). These results are in a good agreement with results of **Youniss, (1978)** who observed the highest average of milk yield from Jersey cows was found at the second week and the lowest average was found at the end of lactation period.

From all obtained results, it could be concluded that, increasing milk production just after calving and during first week, may be attributed to the increasing rate of prolactin secretion and other metabolic hormones which accelerate the metabolic rate and the cow's ability for milk production. In addition decreasing the daily milk yield with advance the stage of lactation may be due to decreasing efficiency of udder due to changes occurred in the physiological and hormonal status convenient to milk production as a result of the proceeding pregnancy.

4.1.2. 4 % Fat corrected milk yield (FCM):

Data concerning 4% fat corrected milk yield as affect by dietary protein sources, season of calving, number and stage of lactation was presented in Table (6) and illashated at Fig. (2).

RESULTS AND DISCUSSION

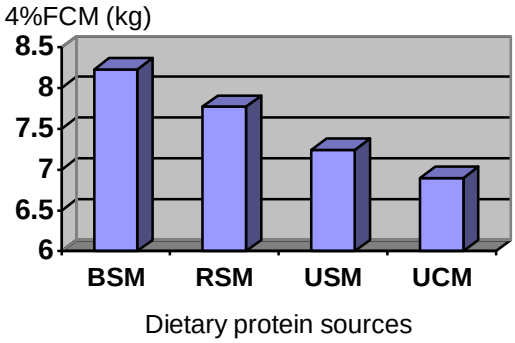
Table (7) : The least squares analysis of variance and tests of significance of factors affecting 4% fat corrected milk (FCM) (kg /cow /day).

S.O.V	d.f	4% Fat corrected milk yield (FCM)		
		SS	MS	F-ratios
Dietary protein sources	3	198.22	66.07	11.65***
Season of calving	3	94.15	31.38	5.53***
Lactation number	4	1305.57	326.39	57.53***
Lactation stage	43	3551.37	82.59	14.56***
Remainder	1002	5684.49	5.67	
Total	1055	11198.30		

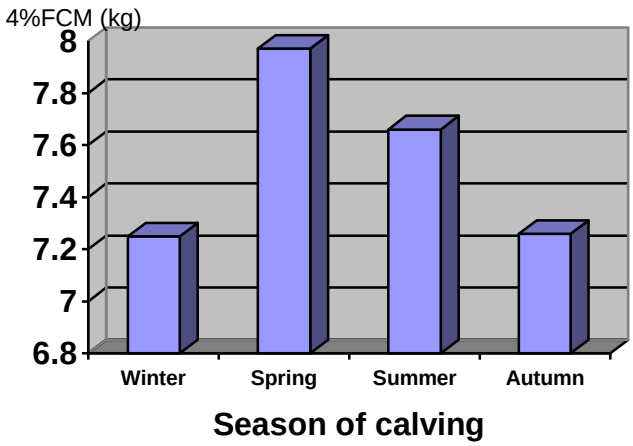
Where : ***=P<0.001

Fig. (2): Effect of studied factors on daily 4% fat corrected milk yield.

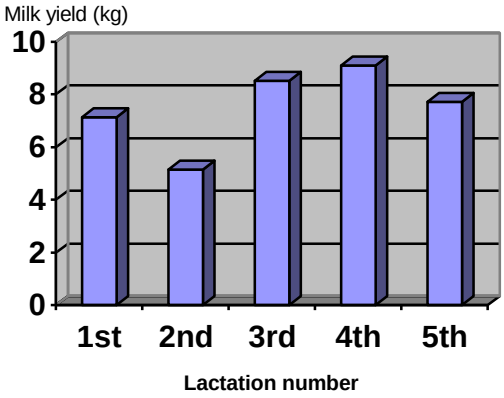
(A):Effect of dietary protien sources.



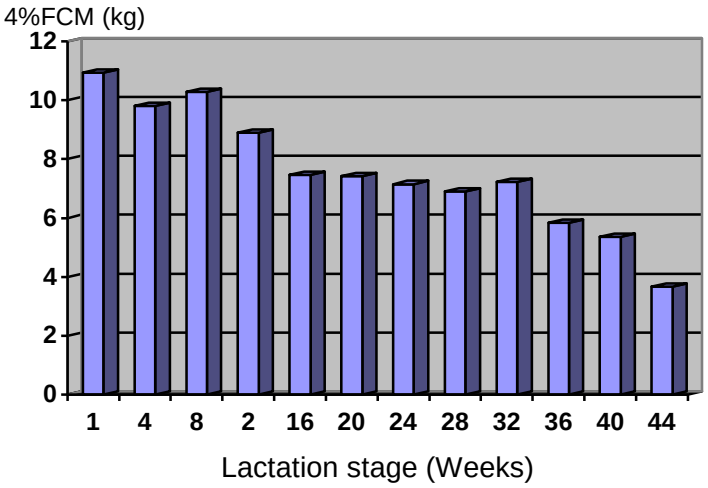
(B):Effect of season of calving.



(C):Effect of lactation number.



(D) :Effect of lactation stage.



There was a highly significant variation (P<0.001) in 4% fat corrected milk yield due to dietary protein sources (Table 7). The highest average of 4% fat corrected milk yield (8.23 kg/cow/day) was observed in cows fed ration containing black seed meal as a main source of protein followed by those fed ration containing roquette meal (7.77 kg/cow/day).With, no significant differences between the two averages. On the other hand, the lowest average of 4% fat corrected milk yield (6.90 kg/cow/day) was found in cows fed ration containing cotton seed meal which was less than those fed ration containing sunflower seed meal by (0.34 kg/cow/day) as a sources of dietary protein. (with, no significant differences between the two values).

From previously mentioned results, it could be concluded that, black seed and roquette meals when added to ration of dairy cattle improved daily milk yield than did cotton seed meal, which may fulfil the animal requirement from essential amino acids and undegradable protein.

The average of 4% fat corrected milk yield seemed to be significantly affected (P<0.001) by the season of calving. The highest value of 4% fat corrected milk yield (7.97 kg/cow/day) was found in cows calved during spring season, followed by those calved during summer months (7.66 kg/cow/day) with significant variation between the two values. On the other hand, the lowest average was found in cows calved during winter

(7.25 kg/cow/day) and autumn (7.26 kg/cow/day) months. (with significant differences between the two values).

The previously mentioned results may lead to conclude that the spring season may provide dairy cows with the convenient environmental conditions for milk production. In addition the sufficient green fodder available during spring season from (*Trifolum alexandrinum*) may be the main reason for the highest average of milk yield obtained during this season.

There was a significant variation ($P<0.001$) in average of 4% fat corrected milk yield due to the lactation number. Gradual increase in 4% fat corrected daily milk yield was obtained with advancing lactation number, reaching its the maximum average in cows having 4 lactations (9.11 kg/cow/day) followed by those having 3 lactations (8.53 kg/cow/day) with insignificant variations between the two values. The 4% fat corrected daily milk yield decline thereafter to reach an average of 7.73 kg/cow/day in cows having 5 lactations which differed significantly with other parities. On the other hand, the lowest average (5.15 kg/cow/day) was found in cows having 2 lactations which was less than those having one lactation by (1.99 kg/cow/day), (with significant differences between the two groups).

Average of 4% fat corrected milk yield varied significantly ($P<0.001$) within various lactation stages without any pronounced trend. It reached the highest values (10.93

kg/cow/day) at the first week then gradually decreased with advancing stage of lactation reaching an average of (9.80 kg/cow/day) at the 4th week. It increased to attain an average of (10.28 kg/cow/day) at 8th week, decreased thereafter reaching it lowest value (3.66 kg/cow/day) at 44th week, at the end of lactation period.

From all obtained results, it could be concluded that, increasing milk production just after calving and during first week, may be attributed to the increasing rate of prolactin secretion and other metabolic hormones which accelerate the metabolic rate and the cow's ability for milk production. In addition decreasing the daily milk yield with advance the stage of lactation may be due to decreasing efficiency of udder due to changes occurred in the physiological and hormonal status convenient to milk production as a result of the proceeding pregnancy.

4.1.3. Milk Constituents:

4.1.3.1. Fat percentage:

Data listed in Table (8) and illashted at Figure (3) present milk fat percentage as affected by dietary protein sources, season of calving , number and stage of lactation.

There was highly significant variation ($P<0.001$) in milk fat percentage due to dietary protein sources (Table 9), the highest average of fat percentage (3.7%) was observed in cows

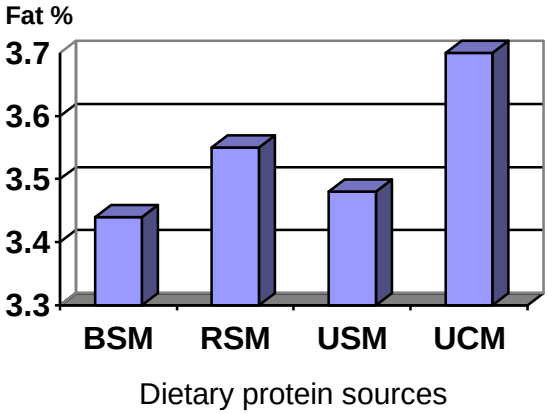
Table (9): The least squares analysis of variance and tests of significance of factors affecting fat percentage (F%) .

S.O.V. S.O.V	d.f. d.f	Fat percentage (F%)		
		SS	MS	F-ratios
Dietary protein sources	3	8.79	2.93	8.40^{***}
Season of calving	3	0.78	0.26	$0.75^{n.s}$
Lactation number	4	5.70	1.42	4.08^{**}
Lactation stage	43	193.89	4.50	12.92^{***}
Remainder	1002	349.75	0.349	
Total	1055	561.88		

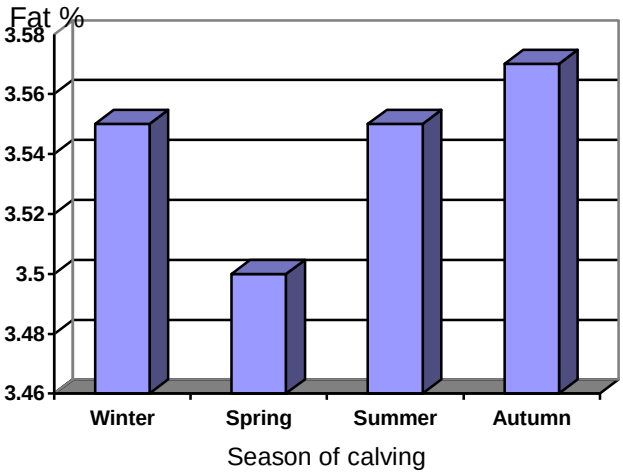
Where : n.s= not significant, **=P<0.01 and ***=P<0.001

Fig. (3): Effect of studied factors on fat percentage.

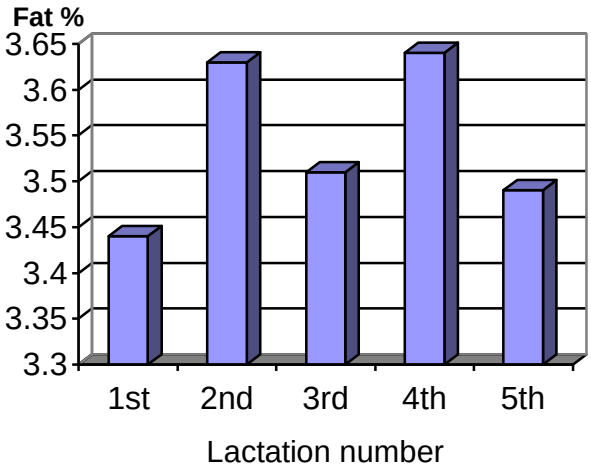
(A):Effect of dietary protien sources.



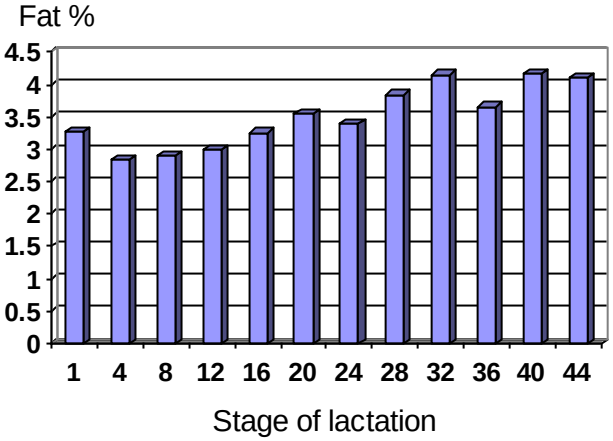
(B) :Effect of season of calving.



(C):Effect of lactation number.



(D):Effect of lactation stage.



(3.55%), with significant differences between the two previously mentioned values. On the other hand, the lowest value of fat percentage 3.44% was observed in cows fed ration containing black seed meal which less than those fed ration containing sunflower meal by (0.04%). Which did not differe significantly with other groups

The variation in milk fat percentage may be a result of the variation existed in the amount of milk yield which is negatively correlated with fat percentage. These results are sientifically logic, since there is a negative correlation between milk yield and fat percentage in cows fed ration containing black seed meal.

The season of calving was found to have insignificant effect on milk fat percentage (Table 9). However, the highest average of fat percentage (3.57%) was observed in cows calved during autumn season. Similer fat percentage average was obtained for milk of winter and summer seasons, (3.55%).

However, the lowest value (3.50%) was found in milk of cows calved uring spring season. These results agree with those of **Dubey *et al.*, (1997), Peeva *et al.*, (1997) and Suman *et al.*, (1998)** who found that, the season of calving did not significantly affect on milk fat percentage. On the other hand, **Ugur *et al.*, (1995)** reported that, the season of calving had significant effect ($P<0.01$) on fat percentage.

Fat percentage was significantly affected ($P<0.01$) by lactation number (Table 9). The highest average (3.64%) was

found in cows having 4 lactations followed by those having 2 lactations (3.63%) On the other hand, the lowest value (3.44%) was found in milk of cows having 1 lactation which was less than those having 5 lactations by (0.05%). However, it could be stated that the effect of lactation number on milk fat percentage had no pronounced trend. These results agree with those reported by **Agyemang *et al.*, (1991)**, who found that, lactation number had a significant effect on milk fat percentage. In contrary, **Ugur *et al.*, (1995)** did not observe any significant effect on fat percentage due to lactation number.

There was highly significant varartions ($P<0.001$, Table 9) due to the stage of lactation on fat percentage. Its minimum value (2.84%) was found at 6^{th} week after calving, and gradually increased with advancing the stage of lactation to reach highest average (4.16%) at the 40^{th} week of lactation period. It could be attributed to the increase of the physiological capacities for the production as time after parturition passed. These results go in a good agreement with those reported by **Hassan *et al.*, (1982) ; Sharaby, (1988)** and **Martin *et al.*, (1998)** in dairy cattle, who reported that the stage of lactation had significant and linear effect on milk fat percentage. They added that fat percentage increased with advance in lactation period.

4.1.3.2. Fat yield:

Data concerning fat yield (FY) as affected by dietary protein sources, season of calving, number and stage of lactation was presented in (Table 10) and illashated at the Fig. (4) .

Dietary protein sources had highly significant effect ($P<0.001$) on fat yield (Table 11). The highest average of fat yield (305.89 g/cow/day) was found in cows fed ration containing black seed meal followed by those fed ration containing requette meal (293.97 g/cow/day) However, no significant difference was found between these averages. On the contarary, the lowest average of fat yield (263.36 g/cow/day) was observed in cows fed ration containing cotton seed meal which was less than those fed ration containing sunflower meal by (3.68 g/cow/day), with no significant difference between these two averages.

Milk fat yield seemed to be significantly affected ($P<0.05$) by season of calving (Table 11). The highest average of fat yield (295.73 g/cow/day) was obtained in cows calved during spring followed by those calved during summer season (286.91 g/cow/day). While, cows calved during winter and autumn produced milk with similar milk fat yield average (273.81 g/ cow/ day). These results attributed to the positive relationship found between milk yield and fat yield, since the cows calved during spring and summer seasons produced more milk than those calved during winter and autumn. Similar trend

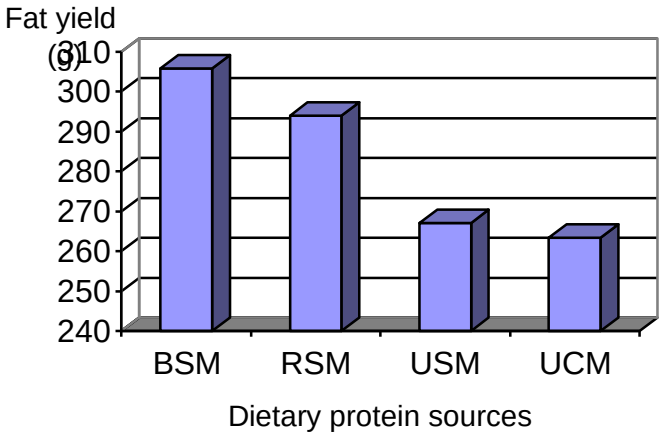
Table (11): The least squares analysis of variance and tests of significance of factors affecting fat yield (FY) (g/cow/day).

S.O.V	d.f	Fat yield (FY)		
		SS	MS	F-ratios
Dietary protein sources	3	250174.86	83391.62	8.20***
Season of calving	3	90134.79	30044.93	2.96*
Lactation number	4	1810585.94	452646.48	44.54***
Lactation stage	43	3466035.56	80605.47	7.93***
Remainder	1002	10183975.45	10163.65	
Total	1055	16293620.63		

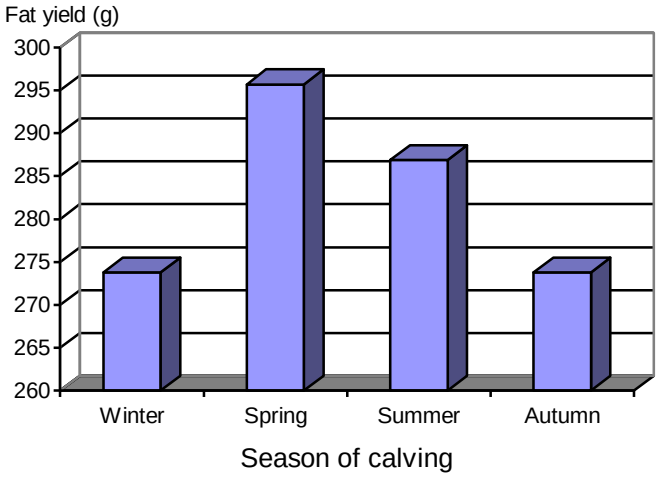
Where : *=P<0.05 and ***=P<0.001

Fig. (4): Effect of studied factors on fat yield.

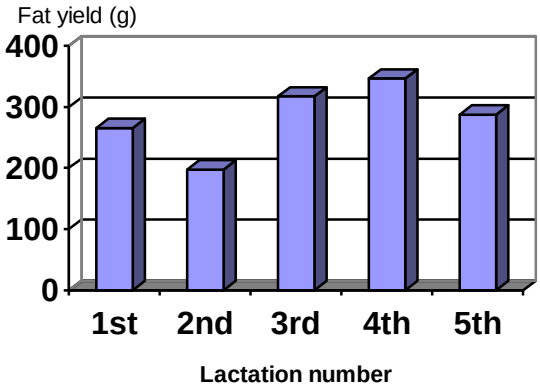
(A):Effect of dietary protien sources.



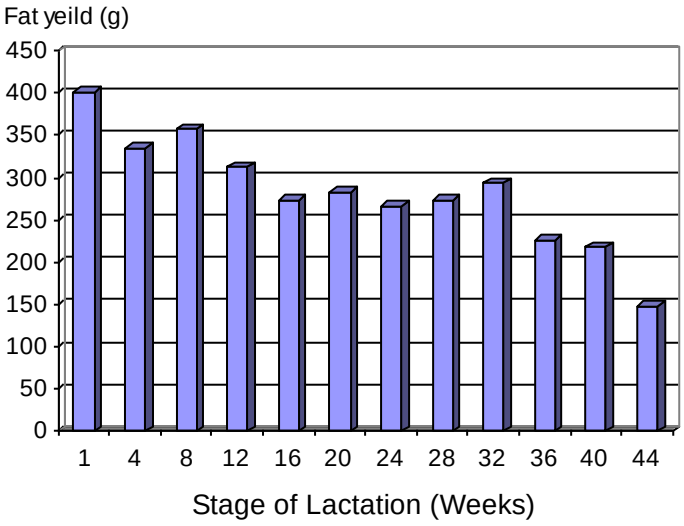
(B) :Effect of season of calving.



(C):Effect of lactation number.



(D):Effect of lactation stage.



was reported by **Sharaby, (1988)** ; **Ugur *et al.*, (1995)** and **Martin *et al.*, (1998)** who, reported that season of calving had high significant effect on milk fat yield and the highest value was found during summer months while, the lowest during winter. On the other hand, **Dubey *et al.*, (1997), Peeva *et al.*, (1997) and Suman *et al.*, (1998)** observed insignificant variation in fat yield due to the season of calving.

There was a significant variations ($P<0.001$) in milk fat yield due to the lactation number (Table 11). The highest value (346.23 g/cow/day) was observed in cows having 4 lactations followed by those having 3 lactations (316.81g/cow/day) with significant differences between the two mean values. On the other hand, the lowest average (197.07 g/cow/day) of milk fat yield was obtained in cows having 2 lactations which was less than those having 1 lactation by (68.45 g/cow/day) with significant variations between this two averages. However, the cows having 5 lactations had a moderate value of milk fat yield (287.19 g/cow/day) among other groups. **Marmandiu *et al.*, (2002)** revealed that, fat yield average was low during the first lactation. However, maximum yield was recorded at the third lactation. On the other hand, **Sharaby, (1988)** found that lactation number had insignificant effect on fat yield.

Results obtained revealed that, the stage of lactation had high significant effect ($P<0.001$) on fat yield (Table 11). The highest average (400.47 g/cow/day) was observed during first

week after calving, then gradually decreased with advancing lactation stage to reach a value of (312.60 g/cow/day) at the 12th week of lactation. The lowest average (147.78 g/cow/day) was obtained at the end of lactation period. These was a good agreement between the persent results and findining of **Hassan *et al.*, (1982)** who, found the stage of lactation had significant linear effect on milk fat yield.

4.1.3.3. Protein percentage:

Table (12) and Fig. (5) shows the least square means of milk protein percentage as affected by dietary protein sources, calving season, number and stage of lactation.

Dietary protein sources had no affect on milk protein percentage (Table 13). However, the highest average of protein percentage (3.24%) was found in cows fed ration containing sunflower meal as a mian source of protein followed by those fed ration containing cotton seed meal (3.23%). On the other hand, the lowest average (3.18%) was observed in cows fed ration containing roquette seed meal which was less than those fed ration contaning black seed meal by (0.04%).

Significant variation ($P<0.05$) was found in milk protein percentage due to the effect of calving season. The maximum average (3.30%) was observed in cows calved during summer, followed by those calved during winter months (3.24%). With, no significant differences between these two averages.

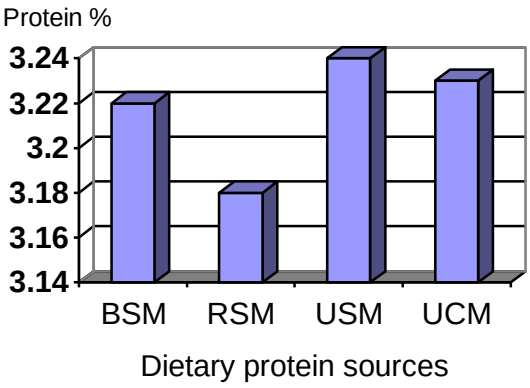
Table (13) :The least squares analysis of variance and tests of significance of factors affecting protein percentage (P%).

S.O.V	d.f	Protein percentage (P%)		
		SS	MS	F-ratios
Dietary protein sources	3	0.43	0.14	$0.45^{n.s}$
Season of calving	3	2.67	0.88	2.80^{*}
Lactation number	4	3.15	0.79	2.49^{*}
Lactation stage	43	54.04	1.25	3.96^{***}
Remainder	1002	317.82	0.317	
Total	1055	379.32		

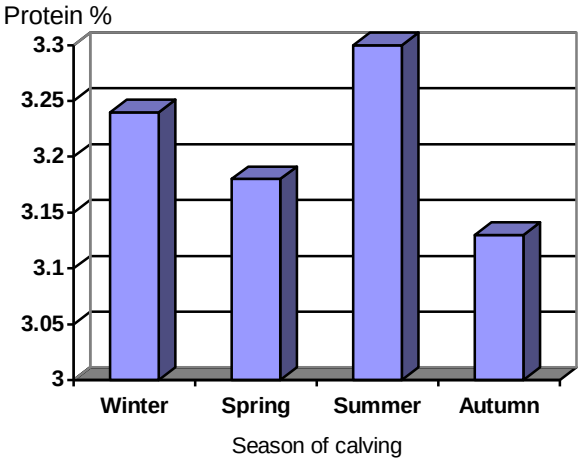
Where : n.s = not significant, *=P<0.05 and ***=P<0.001

Fig.(5):Effect of studied factors on protein percentage.

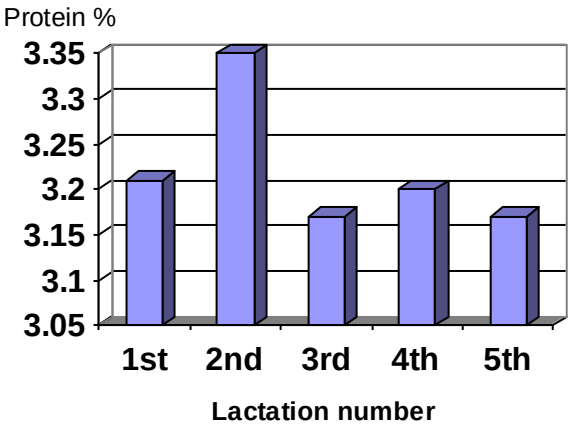
(A):Effect of dietary protien.



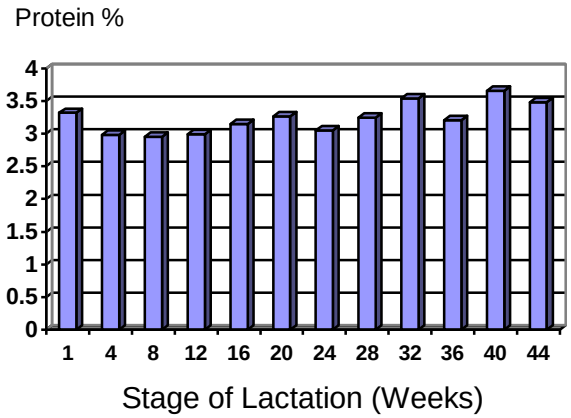
(B):Effect of season of calving.



(C):Effect of lactation number.



(D):Effect of lactation stage.



On the contarary, the lowest milk protein percentage average (3.13%) was found in cows calved during autumn monthes which was less than those calved during spring by (0.05%). With, significant variation between the two values. The obtained results agree with those of **Sharaby, (1988)** who found that season of calving had significant effect on protein percentage.

On the other hand, **Polkova, (1974) Dubey *et al.*, (1997)** reported that season of calving had insignificant effect on protein percentage.

There was significant variation ($P<0.05$) in protein percentage due to lactation number (Table 13), which averaged 3.21%, 3.35%, 3.17%, 3.20% and 3.17% for cows having 1, 2, 3, 4 and 5 lactations, respectively. The highest average of protein percentage was observed in cows having 2 lactations. While the lowest average was found in cows having 3 or 5 lactations. The present results agree with those reported by **El-Hami *et al.*, (1982)** who observed the highest value of protein percentage in cows having 2 lactations. However, **Sharaby, (1988)** reported that, the milk protein content was not affected by lactation number.

There was highly significant variation ($P<0.001$) in protein percentage due to the stage of lactation (Table 13). It averaged 3.32% at the beginning of lactation period, then decreased to reaching its lowest average (2.95%) at the 8th week from calving, and gradually increased to reach the highest

average (3.66%) at the 40th week from calving. The results obtained agree with those of **El-Hami *et al.*, (1981)** in Friesian milk, They found that milk protein percentage decreased to the minimum valeu of 2.59% at the 9th week and then gradually increased by advancing of lactation period to reach its maximum average at the end of lactation. Similar trend was found by **Rakes, (1977).**

4.1.3.4. Protein yield:

Data concerning protein yield as affected by dietary protein sources, calving season, number and stage of lactation was showed in Table (14) and illashated at the Figure (6)

There was a highly significant variations (P<0.001) in protein yield due to dietary protein sources (Table 15). The significant highest average of protein yield (288.20 g/cow/day) was observed in cows fed ration containing black seed meal as a main source of protein followed by those fed ration containing roquette meal (265.25 g/cow/day). On the other hand, the lowest average of protein yield (233.57 g/cow/day) was found in cows fed ration containing cotton seed meal which was less than those fed ration containing sunflower seed meal by (17.43 g/cow/day) as a sources of dietary protein. Which differe significantly with other groups.

The average of protein yield seemed to be highly significantly affected by the season of calving (P<0.001 Table 15). The highest value of protein yield (274.17 g/cow/day) was

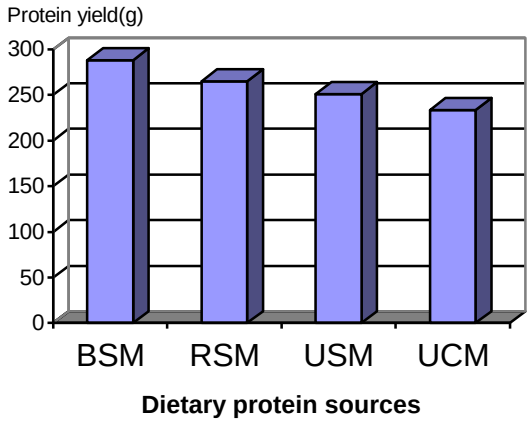
Table (15) :The least squares analysis of variance and tests of significance of factors affecting protein yield (PY) (g/cow/day).

S.O.V	d.f	Protein yield (PY)		
		SS	MS	F-ratios
Dietary protein sources	3	306697.6	102232.5	13.21***
Season of calving	3	178910.0	59636.7	7.71***
Lactation number	4	1273076.5	318269.1	41.12***
Lactation stage	43	4867679.1	113201.8	14.63***
Remainder	1002	7754756.0	7739.3	
Total	1055	14908456.0		

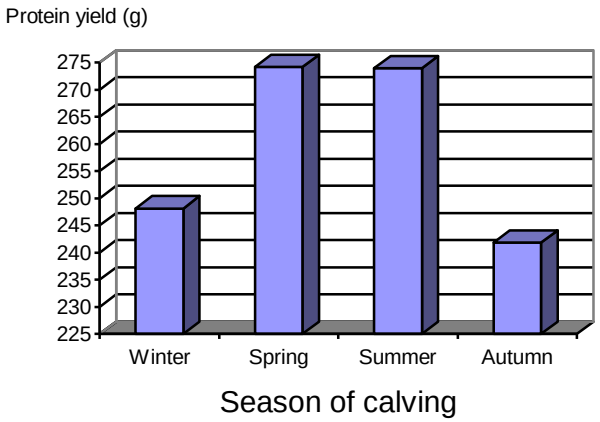
Where : ***=P<0.001

Fig. (6): Effect of studied factors on protein yield

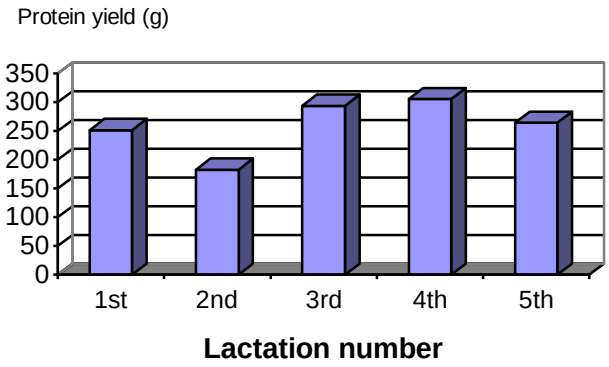
(A):Effect of dietary protien sources.



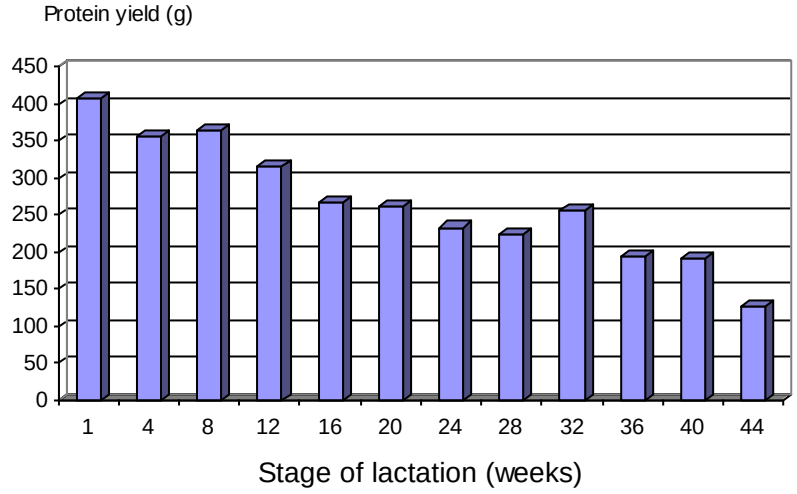
(B):Effect of season of calving.



(C):Effect of lactation number.



(D):Effect of lactation stage.



observed in cows calved during spring season. Then slightly decreased to reach a value of 273.94 g/cow/day in cows calved during summer. On the other hand, the lowest average of protein yield (241.80 g/cow/day) was found in cows calved during autumn which was less than those calved during winter by (6.31 g/cow/day). The present results agree with findings of **Abou El-Fadl, (1995)** who found that milk protein yield was significantly ($P<0.01$) affected by season of calving. He added that, cows calved during spring and summer had higher mean of protein yield than those calved during autumn and winter.

Highly significant effect ($P<0.001$) was found in protein yield due to lactation number (Table 15). The maximum average of protein yield (305.33 g/cow/day) was found in cows having four lactations followed by those having three lactations (293.52 g/cow/day). On the contarary, the minimum average was observed in cows having two lactations (182.86 g/cow/day) which was less than those having one lactation by (69.64 g/cow/day). This may be attributed to the positive relationship found between milk yield and milk protein yield.

There was highly significant variation ($P<0.001$) on protein yield due to lactation stage (Table 15). Its highest value (406.16 g/cow/day) was recorded at the first week of lactation, then it decreased to reach (364.20 g/cow/day) at the 8^{th} week after calving. It gradually decreased to reach the minimum value of (127.40 g/cow/day) at the end of lactation period.

4.1.3.5. Total solids percentage:

Table (16) and Figure (7) shows the least square means of milk total solids percentage as affected by dietary protein sources, calving season, number and stage of lactation.

There was highly significant variations in total solids percentage due to dietary protein sources ($P<0.001$ Table 17). The maximum average of total solids percentage (12.42%) was found in cows fed ration containing cotton seed meal (control ration), followed by those fed ration containing black seed meal (12.04%) as a mian protein sources. No significant difference between the two values was found. On the other hand, the lowest average of total solids percentage (11.66%) was observed in cows fed ration containing sunflower seed meal which was less than those fed ration containing roquette seed meal by (0.27%), with significant differences between two values and with mean values of the other groups.

Highly significant variation ($P<0.001$) in milk total solids percentage was found due to the effect of season of calving. The maximum average of total solids percentage (12.41%) was observed in cows calved during summer months, followed by those calved during spring seasons (12.09%). Significant difference was found between the two values. On the contarary, the lowest average of total solids percentage (11.72%) was found in cows calved during winter season which was less than those calved during autumn by (0.11%). The obtained results may be attributed to the negative relationship

Table (17) : The least squares analysis of variance and tests of significance of factors affecting total solids percentage (TS%).

S.O.V	d.f	Total solids percentage (TS%)		
		SS	MS	F-ratios
Dietary protein sources	3	74.96	24.98	33.48***
Season of calving	3	41.66	13.89	18.61***
Lactation number	4	21.41	5.35	7.17***
Lactation stage	43	407.11	9.47	12.69***
Remainder	1002	747.80	0.75	
Total	1055	1296.15		

Where : ***=P<0.001

Fig. (7): Effect of studied factors on total solids percentage.

(A):Effect of dietary protien sources.

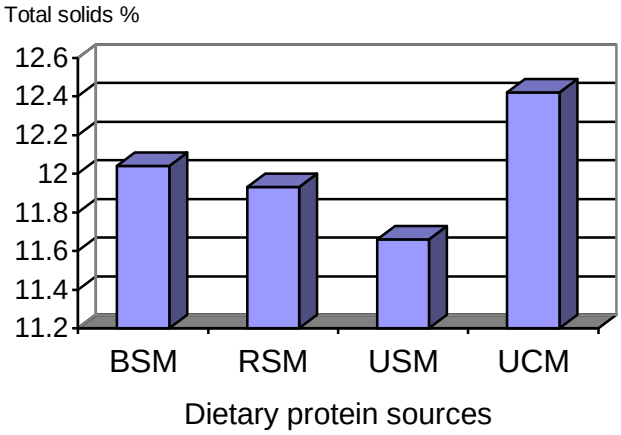
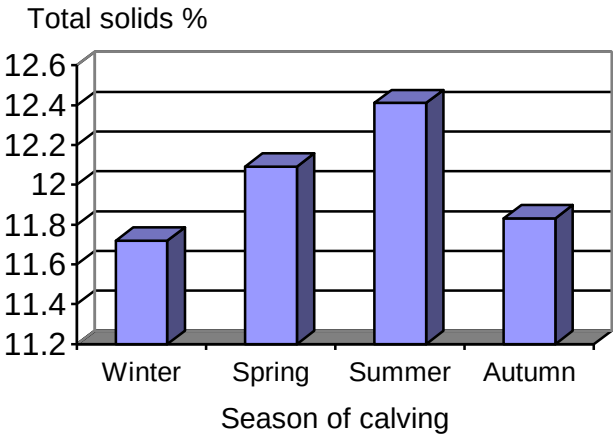
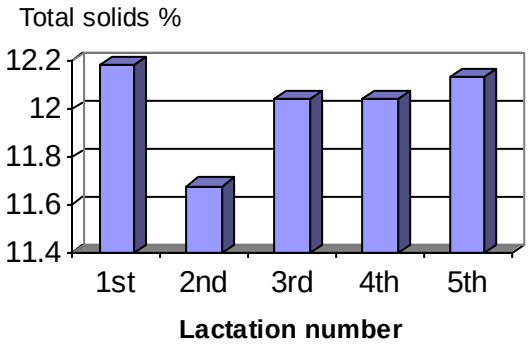


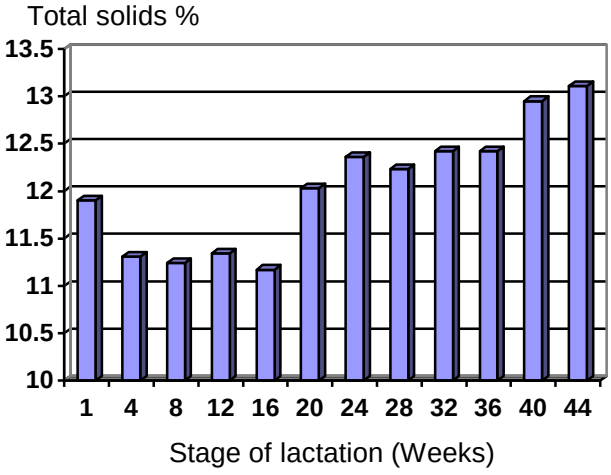
Fig. (B):Effect of season of calving.



(C):Effect of lactation number.



(D):Effect of lactation stage.



between milk yield and total solids percentage. The present results were in agreement with those findings of **Sharaby, (1988)** and **Moneib *et al.*, (1976)** they, reported that, the season of calving had significant effect on total solids percentage. On the other hand, **Agababyan, (1971)** reported that milk total solids content decreased during spring and increased during autumn.

The lactation number had highly significant effect on total solids percentage ($P<0.001$ Table 17). Its average mentionted 12.18%, 11.68%, 12.04%, 12.04% and 12.13% for cows having one, two, three, four and five lactations, respectively. The highest value of total solids percentage was observed in cows having one lactation. Which did not differe significantly with average total solids percentage in cows having 3, 4, and 5 lactations. The lowest value of total solids percentage was observed in cows having two lactations, which differ significantly with the mean value of the other parities. **Sharaby, (1988)** found that, number of lactation had moderately significant ($P<0.01$) effect on milk total solids percentage in Jersey and Friesian cows. On the other hand, **Dubey *et al.*, (1997)** observed that, number of lactation had insignificant effect on total solids percentage in milk buffaloes.

There was highly significant variation ($P<0.001$) in total solids percentage due to stage of lactation (Table 17). It averaged (11.90%), at the beginning of lactation period gradually decreased to reach its lowest average (11.17%) at the

16th week from calving. Then gradually increased to reach the highest average (13.11%) at the end of lactation period. The different averages varied significantly from stages.

The Obtained results agree with those reported by **Padekar and Bhoite (2002)** who, observed that the stage of lactation had significant (P<0.01) effect on total solids percentage in Gir cows, with overall mean (13.68%) and the highest average was observed during late lactation.

In contrary, **Sharaby, (1988**,) found that, the stage of lactation had insignificant effect on milk total solids percentage in Jersey and Friesian cows.

4.1.3.6. Total solids yield:

Concerning total solids yield Table (18) and Fig. (8). Dietary protein sources had highly significant effect on total solids yield (P<0.001 Table 19).

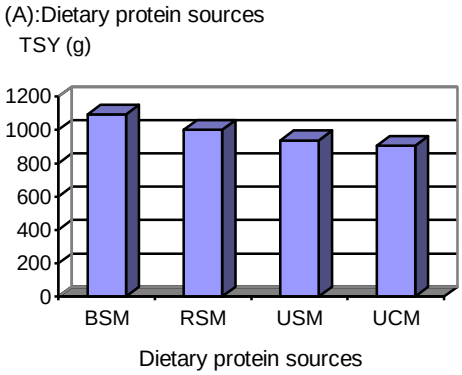
The highest average of total yield (1091 g/cow/day) was observed in cows fed ration containing black seed meal, followed by those fed ration containing roquette seed meal (1000.12 g/day). Significant variation was found between the two previously mentioned means. On the other side, the lowest average of total solids yield (904.62 g/cow/day) was found in cows fed ration containing cotton seed meal, which was less than those fed ration containing sunflower seed meal by (32.78 g/cow/day). However, no significant difference was found

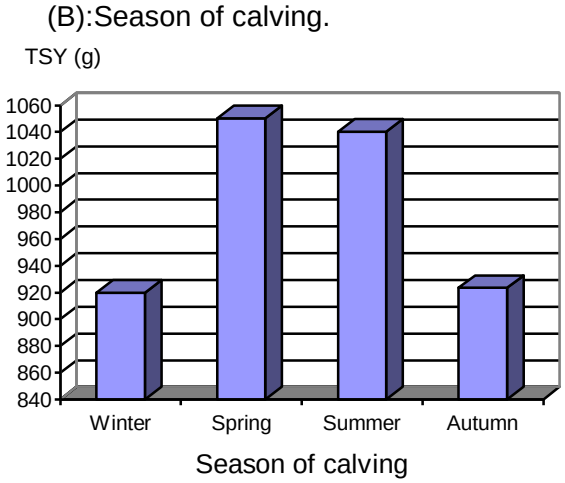
Table (19) :The least squares analysis of variance and tests of significance of factors affecting total solids yield (TSY) (g/cow/day).

S.O.V	d.f	Total solids yield (TSY)		
		SS	MS	F-ratios
Dietary protein sources	3	3856126.3	1285375.4	13.38***
Season of calving	3	3399442.8	1133147.6	11.79***
Lactation number	4	23664984.1	5916246.0	61.58***
Lactation stage	43	70793698.6	1646365.1	17.14***
Remainder	1002	96264657.2	96072.5	
Total	1055	206502159.8		

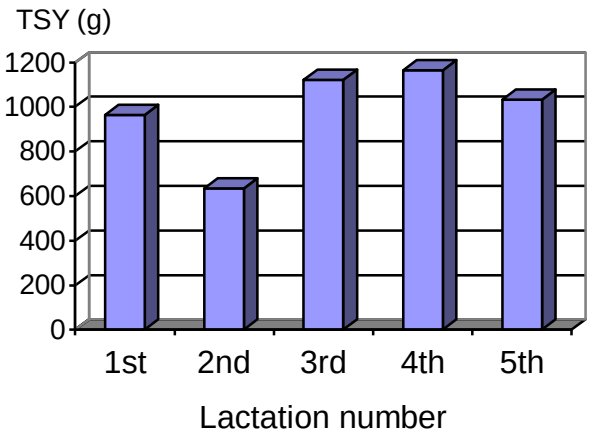
Where : ***=P<0.001

Fig. (8): Effect of studied factors on total solids yield.

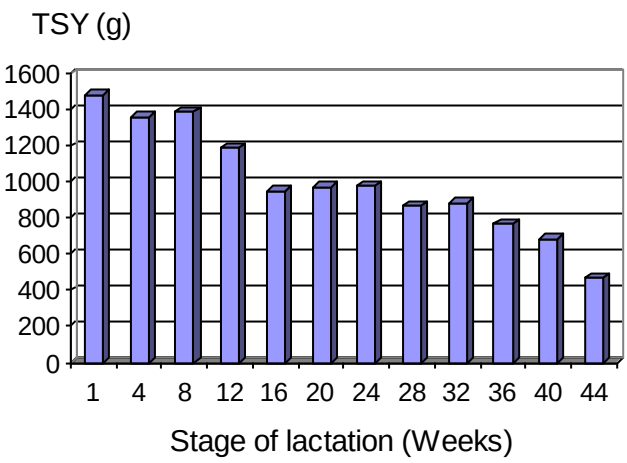




(C):Lactation number.



(D):Llactation stage.



between the two mean values. Significant difference was found with other groups.

Regardless the effect of other factors, there was highly significant variation in total solids yield due to season of calving ($P<0.001$ Table 19). Cows calved during spring season had the highest average of total solids yield (1050.22 g/cow/day), it was slightly lower in cows calved during summer which reaching an average of 1040.33 g/cow/day. However, there was significant differences between the two averages. In contrary, the cows calved during winter months produced milk with the lowest average of total solids yield (920.02 g/cow/day), which differ significantly with that of cows calved during autumn months (923.52 g/cow/day).

Highly significant variation ($P<0.001$) was found in total solids yield due to the effect of lactation number (Table 19). The maximum average of total solids yield (1164.00 g/cow/day) was found in cows having 4 lactations followed by those having 3 lactations (1121.67 g/cow/day), which did not differ significantly. On the other hand, the minimum total solids yield average was noticed in cows having 2 lactations (635.57 g/cow/day) which was less than those having 1 lactation by (327.87 g/cow/day), with significant differences between two means. While, cows having 5 lactation had moderate value (1032.95 g/cow/day) between that of cows having 3 or 4 lactations. The obtained results may be attributed to the positive relationship between milk yield and total solids yield.

Average of total solids yield varied significant (P<0.001) within various lactation stages without any pronounced trend. It was higher (1481.79 g/cow/day) at the first week after calving, then graduallt decreased to reach (1387.1 g/day) at the 8th week after calving. The minimum value of total solids yield (470.19 g/cow/day) was observed at the end of lactation period.

4.1.3.7. Solids-not-fat percentage:

Concerning the effect of dietary protein sources, calving season, number and stage of lactation on solids-not-fat percentage (Table 20 and Fig. 9) it was found that there was highly significant effects (P<0.001) in solids-not-fat percentage due to dietary protein sources (Table 21). The highest solids-not-fat percentage (8.72%) was produced by cows fed ration containing cotton seed meal (control ration), followed by those fed ration contaning black seed meal (8.60%). (With significant differences between the two averages). On the other hand, the lowest average of solids –not-fat percentage was observed in milk of cows fed ration containing sunflower seed meal (8.18%) which was less than those fed ration contaning roquette seed meal by (0.20%). Which differ significantly with other values.

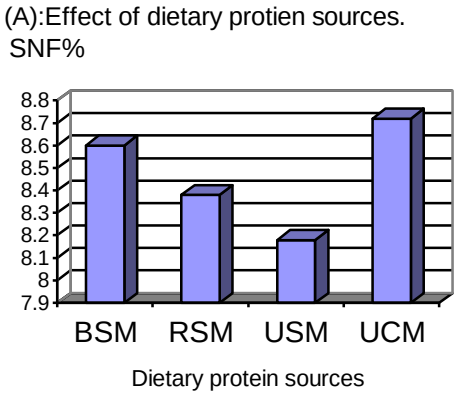
There was highly significant variation (P<0.001) was found in solids-not-fat percentage due to the effect of season of calving (Table 21). The maximum average (8.87%) was observed in cows calved during summer monthes, followed by

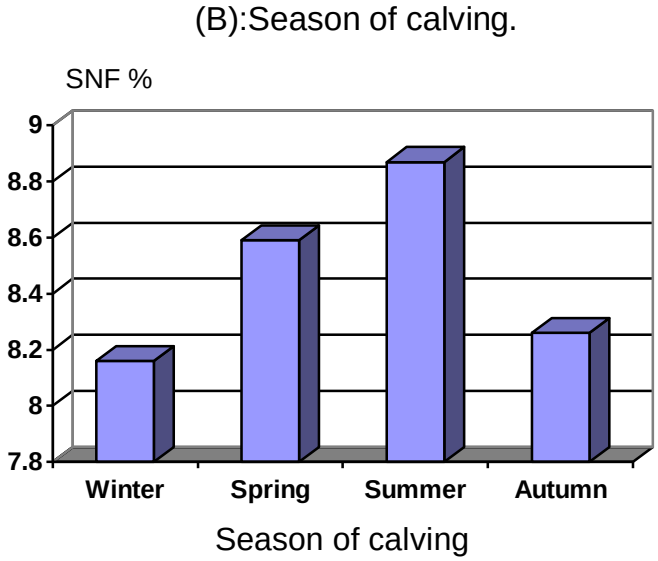
Table (21) : The least squares analysis of variance and tests of significance of factors affecting Solids-not-fat percentage (SNF%) .

S.O.V	d.f	Solids-not-fat percentage (SNF%)		
		SS	MS	F-ratios
Dietary protein sources	3	42.70	14.23	19.26***
Season of calving	3	48.59	16.20	21.92***
Lactation number	4	43.29	10.82	14.64***
Lactation stage	43	94.25	2.19	2.97***
Remainder	1002	740.57	0.74	
Total	1055	982.45		

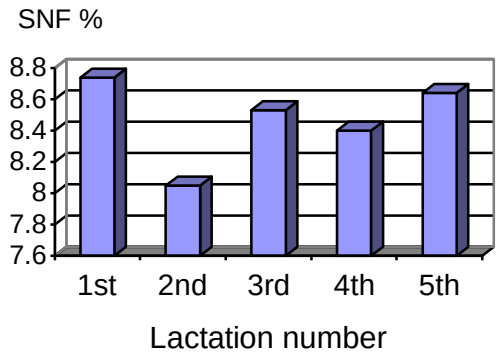
Where : ***=P<0.001

Fig. (9): Effect of studied factors on solids-not-fat percentage.

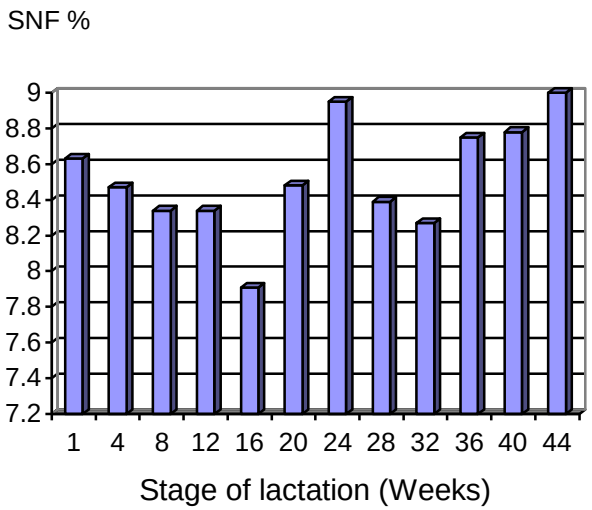




(C):Lactation number.



(D):Lactation stage.



those calved during spring (8.59%), which varied significantly. On the other side, the minimum average was found in cows calved during winter monthes (8.16%) which was less than those calved during autumn by (0.10%). No significant variation between the two mentioned averages. The present results were in agreement with those findings of **Pandey *et al.*, (1984)** in Murrah buffaloes, who reported that the solids-not-fat percentage increased during summer months and decreased during winter ones. On the other hand, **Dubey *et al.*, (1997)** stated that, season of calving had insignificant effect on solids-not-fat percentage. Which had higher average of SNF during winter, spring and autumn than during summer and rainy seasons calvers. **Pyne et al., (1991) and Suman et al., (1998),** reported similar results**.**

In the present results, the lactation number had highly significant effect ($P<0.001$) on solids-not-fat percentage (Table 21). It averaged 8.74%, 8.05%, 8.53%, 8.40% and 8.64% for cows having 1, 2, 3, 4 and 5 lactations, respectively. The highest value of solids-not-fat percentage was observed in cows having one lactation. Which significantly differ with other parities except cows having 5 lactations. On the other hand, the lowest value was observed in cows having 2 lactations. Which, significantly varied with other groups. Present results a disagree with those reported by many investigators, who reported the lactation number had insignificant effect on solids-not-fat

percentage **(Alsafar and Ali, 1970 and Patel *et al.*, 1974)** in dairy cows milk.

The average solids-not-fat percentage seemed to be significantly affected (P<0.001) by the stage of lactation, without any pronounced trend (Table 21). It averaged (8.63%), at the beginning of lactation period, gradually decreased to reach the lowest average of 7.91% at the 16th week after calving, (which differ significantly with other values). It then increased to reach the highest average (9.00%) at the end of lactation period.

Many investigators studied the effect of lactation stage on solids-not-fat content, **Youniss, (1978)**, **El-Hami *et al.*, (1981)** noticed that average of solids-not-fat percentage in cow's milk was relatively high at the first week after calving, decreased to reach its minimum value at the 7th week and then gradually increased up to the end of lactation period. **Darchan and Narayanan, (1984)** found that solids-not-fat percentage in Sahiwal cow's milk increased from 8.9 to 9.3% during the period from the first month to the tenth month of lactation. In Gir cow's milk **Padekar and Bhoite, (2002)** reported that stage of lactation had significant effect on solids-not-fat percentage (P<0.05). The highest average was observed during late lactation.

4.1.3.8. Solids-not-fat yield (SNFY):

Data presented in (Table 22 and Fig. 10) show the least squares means of solids-not-fat yield as affected by dietary protein sources, calving season, number and stage of lactation.

It was showed that the dietary protein sources had highly significant effect (P<0.001) on solids-not-fat yield (Table 23). The highest average of solids-not-fat yield (786 g/cow/day) was observed in cows fed ration containing black seed meal, followed by those fed ration roquette seed meal (706.16 g/cow/day), as a mian protein source in ration. (with significant differences between the two mentioned averages). On the other side, the lowest average of solids-not-fat yield (641.28 g/cow/day) was observed in milk produced by cows fed ration containing cotton seed meal (control group), which was less than those fed ration containing sunflower seed meal by (29.13 g/cow/day).

Regardless the effect of other factors, there was highly significant variations (P<0.001) due to season of calving on solids-not-fat yield (Table 23). The highest average of milk solids-not-fat yield (754.52 g/cow/day) was observed in cows calved during spring season, followed by those calved during summer (753.47 g/cow/day), (with significant variations between the two means). In contrary, the cows calved during winter months produced the lowest solids-not-fat yield average (646.23 g/cow/day) which was less than those calved during

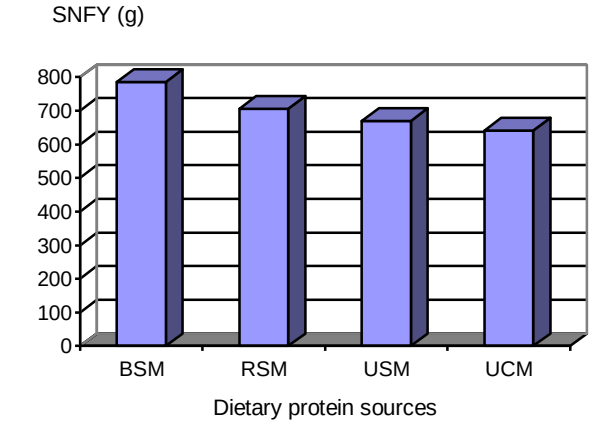
Table (23) :The least squares analysis of variance and tests of significance of factors affecting solids-not-fat yield (SNFY) (g/cow/day).

S.O.V	d.f	Solids-not-fat yield (SNFY)		
		SS	MS	F-ratios
Dietary protein sources	3	2218921.9	739640.7	13.81***
Season of calving	3	2407741.1	802580.4	14.99***
Lactation number	4	12733839.2	3183459.8	59.45***
Lactation stage	43	44107574.5	1025757.5	19.16***
Remainder	1002	53656823.1	53549.7	
Total	1055	120089842.0		

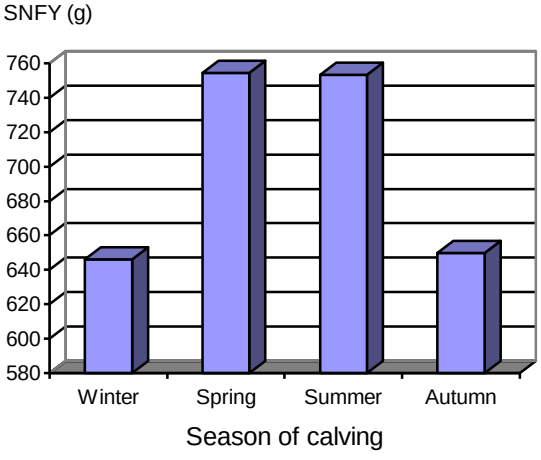
Where : ***=P<0.001

Fig. (10): Effect of studied factors on solids-not-fat yield.

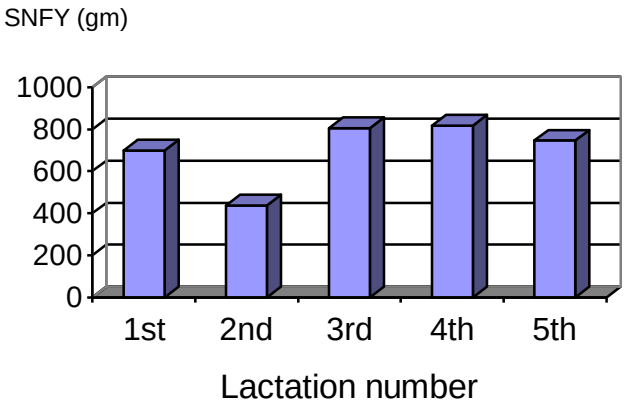
(A):Dietary protein sources.



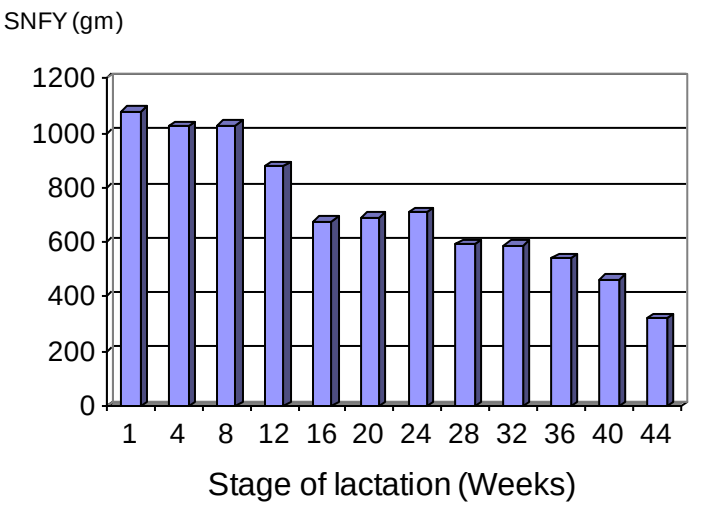
(B):Season of calving.



(C):Lactation number.



(D):Lactation stage.



autumn months by (3.49 g/cow/day), (which differ significantly).

Highly significant variation (P<0.001) was found in solids-not-fat yield due to the effect of lactation number (Table 23). The maximum value (817.74 g/cow/day) was found in cows having 4 lactations followed by those having 3 lactations (804.89 g/cow/day), (with no significant variations between the two values. On the other hand, the minimum value was noticed in cows having 2 lactations (438.52 g/cow/day) which was less than those having 1 lactation by (259.44 g/cow/day). (which, varied significantly). However, cows having 5 lactations had moderate average (745.82 g/day).

There was highly significant variation (P<0.001) in solids-not-fat yield due to lactation stage (Table 23). The highest value (1081 g/cow/day) was recroded just after calving at first week, slightly decreased to reach (1029 g/cow/day) at 8 weeks after calving, then gradually decrease to reach the minimum value (322.48 g/cow/day) at the end of lactation period.

4.1.3.9. Lactose percentage:

Concerning the effect of dietary protein sources, calving season, number and stage of lactation on lactose percentage was presented in Table (24) and Fig. (11).

Highly significant variations (P<0.001) was found in lactose percentage due to dietary protein sources (Table 25).

RESULTS AND DISCUSSION

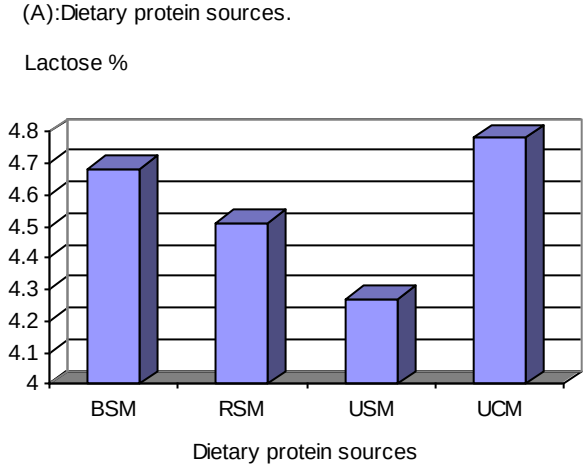
Table (25) : The least squares analysis of variance and tests of significance of factors affecting lactose percentage (L%).

S.O.V	d.f	Lactose percentage (L%)		
		SS	MS	F-ratios
Dietary protein sources	3	36.2	12.09	12.18***
Season of calving	3	33.2	11.07	11.16***
Lactation number	4	63.7	15.95	16.07***
Lactation stage	43	92.8	2.16	2.17***
Remainder	1002	994.5	0.99	
Total	1055	1235.2		

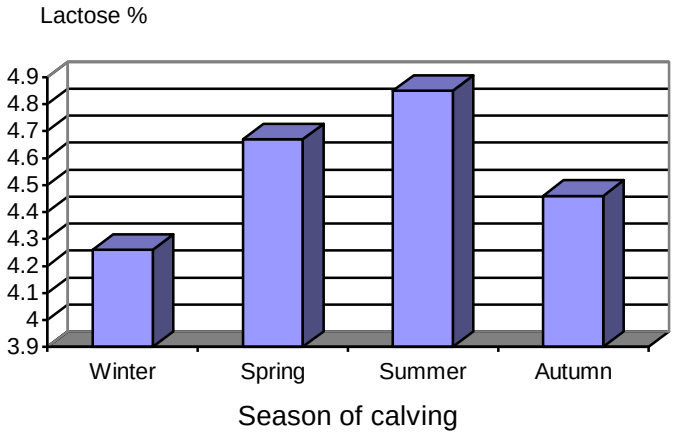
Where ***=P<0.001

Fig. (11): Effect of studied factors lactose percentage.

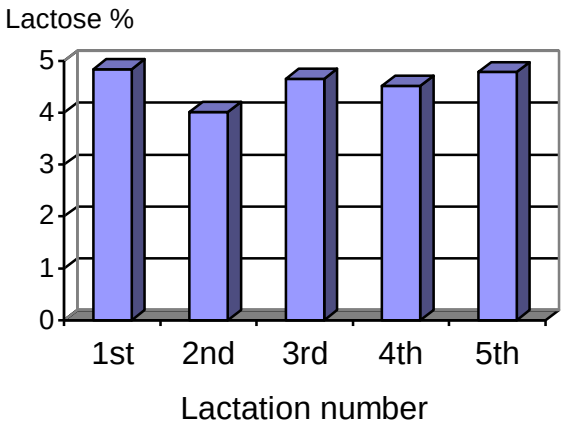
(A):Dietary protein sources.



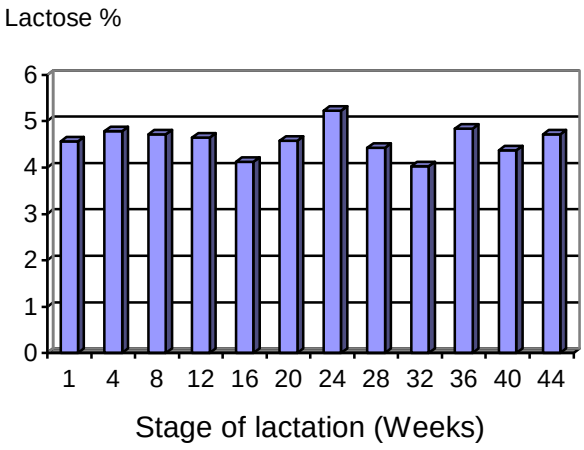
(B):Season of calving.



(C):Lactation number.



(D):Lactation stage.



Cows fed ration containing cotton seed meal (control group), produced milk containing the highest value of lactose percentage (4.78%) followed by those fed ration containing black seed meal (4.68%). On the other hand, the lowest average of lactose percentage (4.27%) was found in cows fed ration containing sunflower seed meal which was less than those fed ration containing roquette seed meal by (0.24 %). With highly significant differences among all dietary protein sources.

In addition, there was highly significant variation ($P<0.001$) in milk lactose percentage due to the effect of season of calving. The maximum value (4.85%) was observed in cows calved during summer months, followed by those calved during spring season (4.67%). (that differ significantly). In contarary, the lowest average of lactose percentage was found in cows calved during winter season (4.26%) which was less than those calved during autumn by (0.20%). (with significant differences between the two values). However, the average of milk lactose percentage did not significantly differ bwtween cows calved during spring and those calved during autumn.

Results of the present study disagree with those obtained by **Habeeb *et al.*, (1991)** who, found that, lactose content was lower in cows calved during summer than those calved during winter . In addition, **Sharaby, (1988)** reported that, season of calving had insignificant effect on milk lactose percentage in Jersey and Friesian cow's milk. On the other hand, **Pandey *et al.*, (1984)** found that the average of lactose percentage was

higher during summer months and early rainy season than during winter in Murrah buffaloes.

Lactation number had highly significant effect (P<0.001) on lactose percentage (Table 25). It averaged 4.84%, 4.01%, 4.65%, 4.52% and 4.78% for cows having 1, 2, 3, 4 and 5 lactations, respectively. The highest value of lactose percentage was observed in cows having one lactation. (which differ significantly with other groups except in group of cows having 3 lactations. On the other side, the lowest value was observed in cows having 2 lactations. There was a good agreement between present results and those reported by **Sharaby, (1988)** who found that lactation number had significant effect on milk lactose percentage in Jersey and Friesian cows. On the other hand, **Dubey *et al.*, (1997)** reported that lactation number had insignificant effect on milk lactose percentage with the highest value in buffaloes having two lactations. However, the lowest one was found in buffaloes having six lactations.

There was highly significant variation (P<0.001) in lactose percentage within various stages of lactation (Table 25). It averaged (4.56%), at the beginning of lactation period, gradually increased to reach highest average (5.22%) at the 24^{th} week after calving, gradually decreased to reach its lowest average (4.03%) at the 32^{nd} week after calving then increased with inpronouced trend to the end of lactation period.

Dubey *et al.*, (1997) found that stage of lactation had significant effect on lactose percentage. It averaged 4.76%

during first month, increased to reach peak (4.90%±0.03) at in the fourth month then decreased slowly thereafter in Murrah buffaloes. Similar results were reported by **Mohran and Fahmy (1992), Peeva *et al.*, (1997) and Peeva, (2001). Suman *et al.*, (1998)** who, reported that the peak value of lactose percentage was recorded at the third month of lactation. **Sharaby, (1988)** observed that the lactose content remained constant throughout lactation period with relatively more fluctuations in Jersey cow's milk than in Friesian. On the other hand **Mondragon *et al.*, (1983)** reported that lactose content in beef cattle was not affected by stage of lactation. However **Ettala, (1976)** found that the stage of lactation showed a marked effect on lactose content in cow's milk.

4.1.3.10. Lactose yield:

Data presented in Table (26) and illashted in Fig. (12) shows the effect of dietary protein source, calving season, number and stage of lactation on lactose yield.

Highly significant effect was found due to dietary protein source ($P<0.001$) on lactose yield (Table 27). The highest mean of lactose yield (433.98 g/cow/day) was observed in cows fed ration containing black seed meal, followed by those fed ration containing roquette seed meal (382.94 g/cow/day), as a main source of protein. Difference between the two means was found to be of significant value.

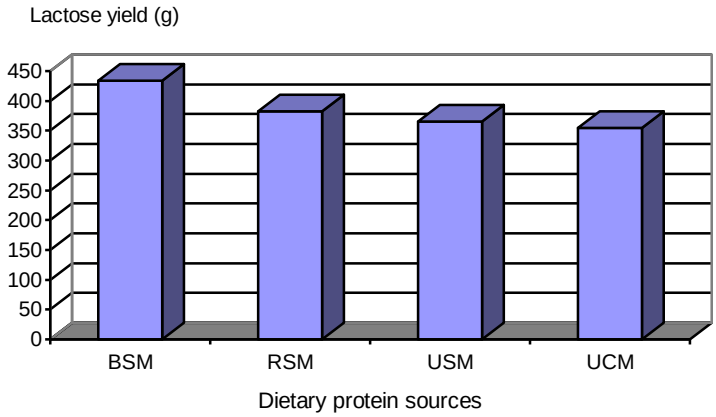
Table (27) : The least squares analysis of variance and tests of significance of factors affecting lactose yield (LY) (g/cow/day).

S.O.V	d.f	Lactose yield (LY)		
		SS	MS	F-ratios
Dietary protein sources	3	698365.1	232788.37	9.35***
Season of calving	3	952822.5	317607.52	12.75***
Lactation number	4	4760950.7	1190237.98	47.79***
Lactation stage	43	15443888.9	359160.21	14.42***
Remainder	1002	24954660.1	24904.85	
Total	1055	48552961.8		

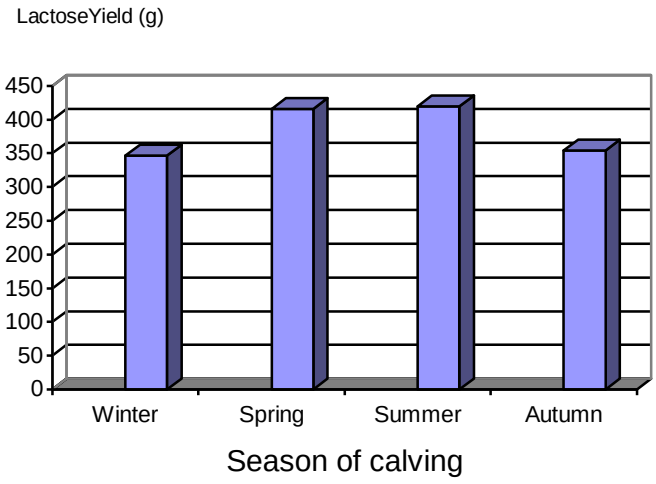
Where: ***=P<0.001

Fig. (12): Effect of studied factors on lactose yield.

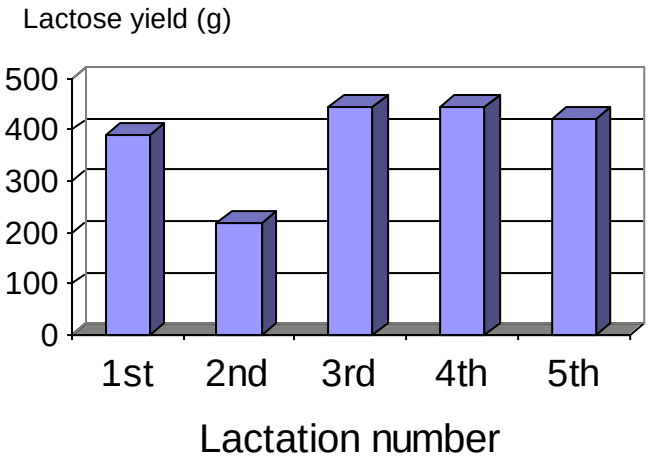
(A):Dietary protein sources.



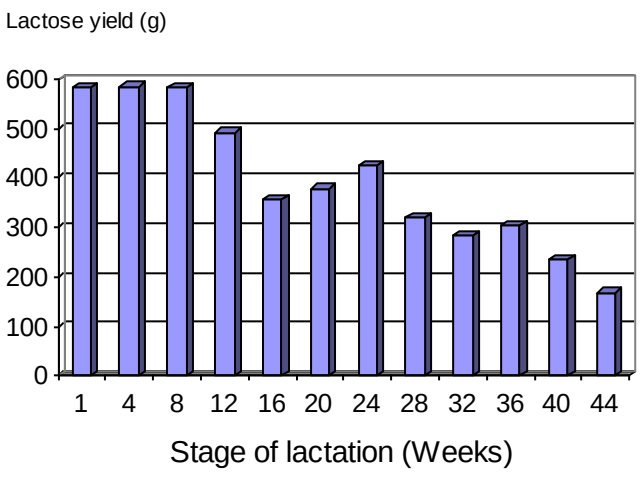
(B):Season of calving.



(C):Lactation number.



(D):Lactation stage.



On contrary, the lowest average of lactatose yield (354.75 g/cow/day) was found in milk produced by cows fed ration containing cotton seed meal as a control ration,which was less than those fed ration containing sunflower seed meal by (10.54 g/cow/day). With, insignificant difference between the two means. The obtaind results may by attributed to the positive relationship between existed milk yield and lactose yield.

There was highly significant variations ($P<0.001$) in lactose yield due to season of calving. Cows calved during summer season produced milk of significant high lactose yield average (419.4 g/cow/day). Which was slightly lower in milk of cows calved during spring (416.2 g/cow/day). However, the differences between the two values were significant. In contrary, the cows calved during winter months produced the lowest average (346.7 g/cow/day) which was less than those calved during autumn months by (7.9 g/cow/day), which differed significantly.

Milk lactose yield was significantly affected ($P<0.001$) by number of lactation (Table 27). The maximum average (445.9 g/cow/day) was found in cows having 4 lactations followed by those having 3 lactations (443.9 g/day). However, insignificant difference was found between the two averages. On the other hand, the minimum milk lactose average was noticed in cows having 2 lactations (219.0 g/cow/day) which was less than those having 1 lactation by (172.4 g/cow/day). The previously mentioned two average varied significantly.

However, cows having 5 lactations had milk contained an average of milk lactose mentioned (421.0 g/cow/day). This may be attributed to the positive relationship existed between milk and lactose yields. **Sharaby, (1988)** reported that lactation number had highly significant effect on milk lactose yield with overall mean of 0.133±0.1 and 0.312±0.15 kg/day for Jersey and Friesian cows, respectively. **Suman *et al.*, (1998)** reported that, the lactose yield increased from the first to the third lactation, and then decreased to the sixth lactation in Murrah buffaloes.

Concerning the effect of lactation stage on lactose yield, there was highly significant variation ($P<0.001$) due to lactation stage on milk lactose yield (Table 27). Its average weighted (583.03, 584.42 and 582.13 g/cow/day) at 1st week, 4th week and 8th week after calving, then gradually decrease to reach the minimum value (167.92 g/cow/day) at the end of lactation period.

4.1.3.11. Ash percentage:

Data presented in Table (28) and illashted in Fig. (13) showed the effect of dietary protein sources, calving season, number and stage of lactation on milk ash percentage.

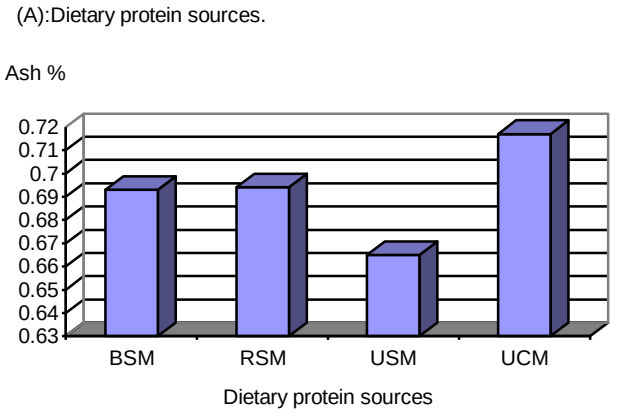
There was highly significant variations ($P<0.01$) due to dietary protein sources on milk ash percentage (Table 29). The highest value of ash percentage (0.717%) was found in cows fed ration containing cotton seed meal (control group), followed by those fed ration containing roquette meal (0.694%).

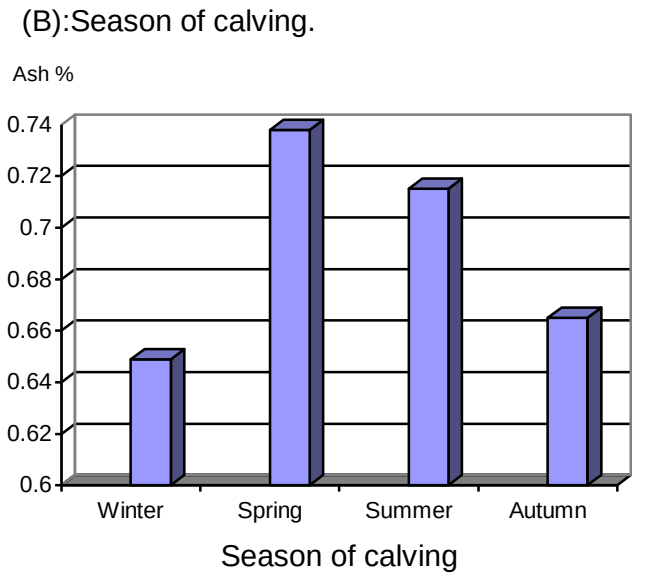
Table (29) : The least squares analysis of variance and tests of significance of factors affecting ash percentage.

S.O.V	d.f	Ash %		
		SS	MS	F-ratios
Dietary protein sources	3	0.329	0.109	6.34^{**}
Season of calving	3	1.33	0.444	25.62^{***}
Lactation number	4	0.12	0.030	$1.71^{n.s}$
Lactation stage	43	1.68	0.039	2.24^{***}
Remainder	1002	17.36	0.017	
Total	1055	21.01		

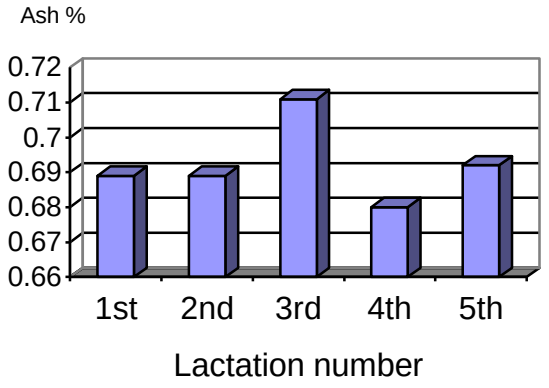
Where : n.s = not significant, **=P<0.01 and ***=P<0.001

Fig. (13): Effect of studied factors on ash percentage.

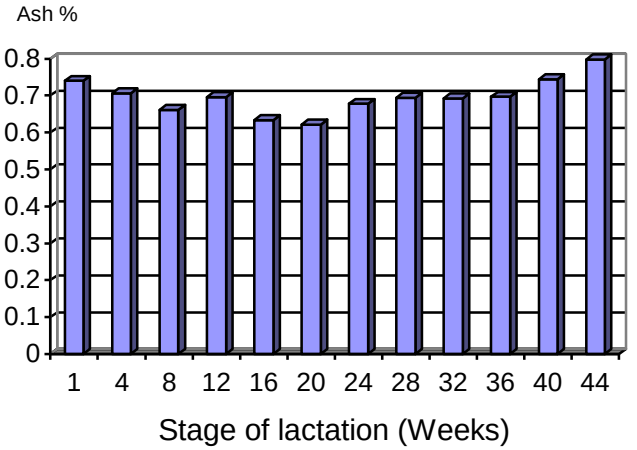




(C):Lactation number.



(D):Lactation stage.



Difference between the two means was of significant value. On the other hand, the lowest average of ash percentage (0.665%) was observed in cows fed ration containing sunflower seed meal then increased with those fed ration containing black seed meal (0.693%). The previously two means differ significantly.

There was highly significant effects ($P<0.001$) in milk ash percentage due to the effect of season of calving (Table 29). The maximum value (0.738%) was observed in cows calved during spring months, followed by those calved during summer season (0.715%). However, diference between the two averages there was of no significant value. In the contarary, the lowest average of ash percentage (0.649%) was found in cows calved during winter season, then increased with those calved during autumn (0.665%).

The lactation number was found to have highly significant effect ($P<0.001$) on milk ash percentage. It averaged 0.689%, 0.689%, 0.711%, 0.680% and 0.692% for cows having 1, 2, 3, 4 and 5 lactations, respectively. The highest value of milk ash percentage was observed in cows having three lactations. On the other hand, the lowest value was observed in cows having four lactations.

In addition, there was highly significant variation ($P<0.001$) in milk ash percentage due to stage of lactation (Table 29). It averaged (0.740%) at the beginning of lactation period, then gradually increased to reach its highest average (0.798%) at the 44^{th} week after calving at the end of lactation.

4.1.3.12. pH value of milk:

Table (30) and Fig. (14) showed the effect of dietary protein sources, calving season, number and stage of lactation on the pH value of milk.

pH of milk was insignificantly affected by dietary protein sources (Table 31). The highest value of pH (6.56) was observed in cows fed ration containing roquette seed meal, followed by those fed ration ontaining sunflower seed meal (6.52). On the other hand, the lowest average (6.40) was observed in cows fed ration black seed meal which was less than those fed ration containing cotton seed meal as a control ration by (0.08).

Insignificant variation in pH of milk was found due to the effect of calving season (Table 31). The maximum value (6.62) was observed in cows calved during summer months, followed by those calved during spring season (6.50). On the other hand, the lowest average was found in cows calved during autumn (6.42) then increased with those calved during winter (6.43).

In the present results, showed that the lactation number had insignificant effect on pH of milk. It averaged 6.40, 6.54, 6.58, 6.49 and 6.45 for cows having 1, 2, 3, 4 and 5 lactations, respectively. The highest value of milk pH was observed in cows having three lactations. On the other hand, the lowest value was observed in cows having one lactation.

pH of milk was insignificantly affected by stage of lactation (Table 31). It averaged (6.35), at the beginning of

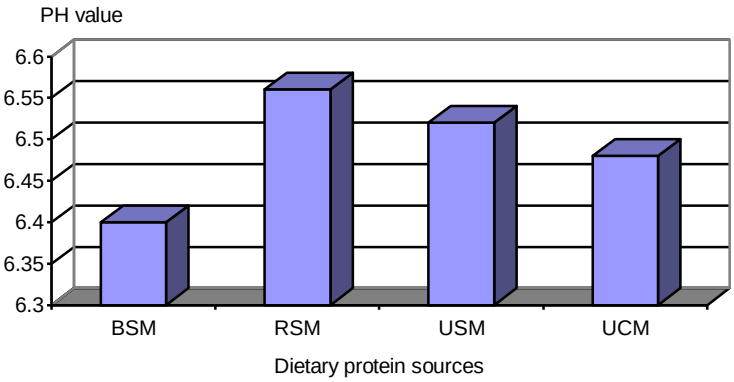
Table (31) :The least squares analysis of variance and tests of significance of factors affecting pH of milk.

S.O.V	d.f	pH value		
		SS	MS	F-ratios
Dietary protein sources	3	3.35	1.118	$0.92^{n.s}$
Season of calving	3	3.40	1.136	$0.99^{n.s}$
Lactation number	4	4.47	1.119	$0.92^{n.s}$
Lactation stage	43	5.83	1.458	$1.20^{n.s}$
Remainder	1002	1216.81	1.214	
Total	1055	1289.43		

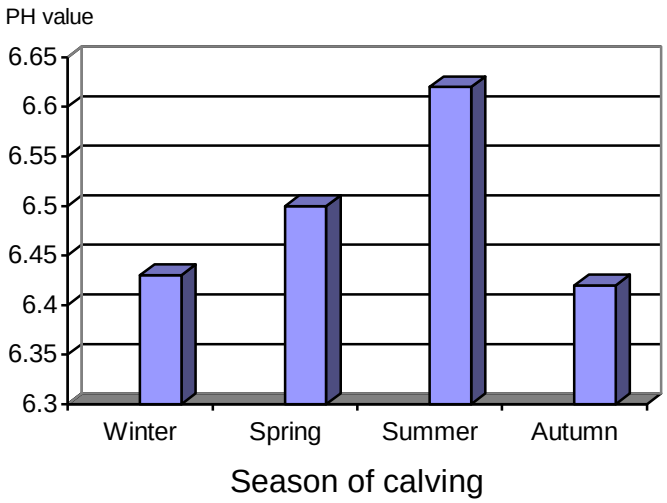
Where n.s = not significant.

Fig. (14): Effect of studied factors on milk pH value.

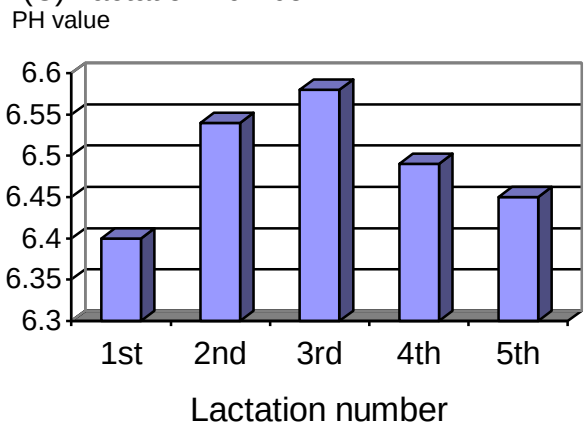
(A):Dietary protein sources.



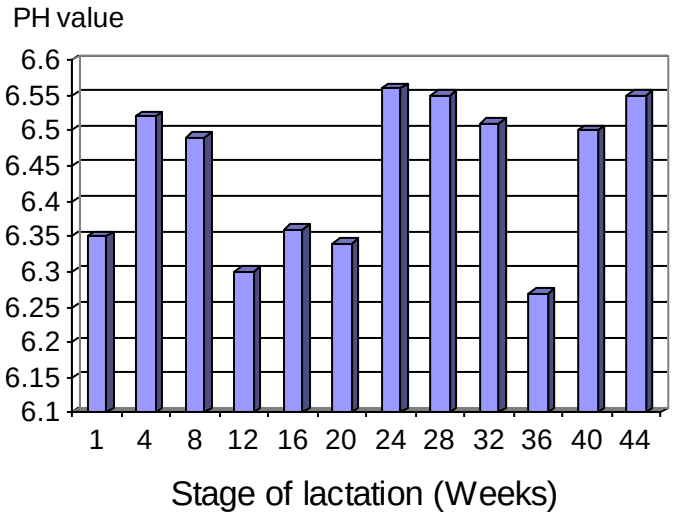
(B):Season of calving.



(C):Lactation number.



(D):Lactation stage.



lactation period then gradually increased to reach its highest average (6.56) at the 24th week after calving and renianed approximately constent up to the end of lactation period.

4.1.4. Rectum temperature (RT):

Concerning the effects of dietary protein sources, calving season, number and stage of lactation on rectum temperature were showed in Table (32) and illashated in Fig. (15).

The rectum temperature seemed to be significantly affected ($P<0.05$) by dietary protein sources (Table 33). The highest value of rectum temperature (39.08 °C) was observed in cows fed ration containing sunflower seed meal, followed by those fed ration containing black seed meal (38.99 °C), with significant difference between the two values. On the other hand, the lowest average was observed in cows fed ration containing cotton seed meal (38.92 °C) which was less than those fed roquette seed meal by (0.03 °C) as a main source of protein. The difference between the mentioned two averages was of no significant value.

There was highly significant variation ($P<0.001$) in rectum temperature due to the season of calving. The maximum value ((39.18 °C)) was observed in cows calved during winter months, followed by those calved during spring season (39.07°C). (no significant variations was found between the two means). On the contarary, the lowest average was found in cows calved during autumn (38.78 °C) then

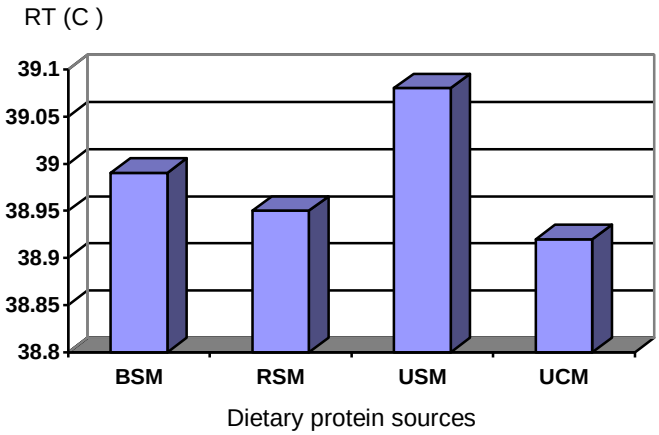
Table (33) :The least squares analysis of variance and tests of significance of factors affecting rectum temperature (RT).

S.O.V	d.f	Rectum temperature (RT).		
		SS	MS	F-ratios
Dietary protein sources	3	3.41	1.137	2.62*
Season of calving	3	18.19	6.065	13.98***
Lactation number	4	10.86	2.717	6.26***
Lactation stage	43	48.69	1.132	2.61***
Remainder	1002	434.68	0.433	
Total	1055	525.41		

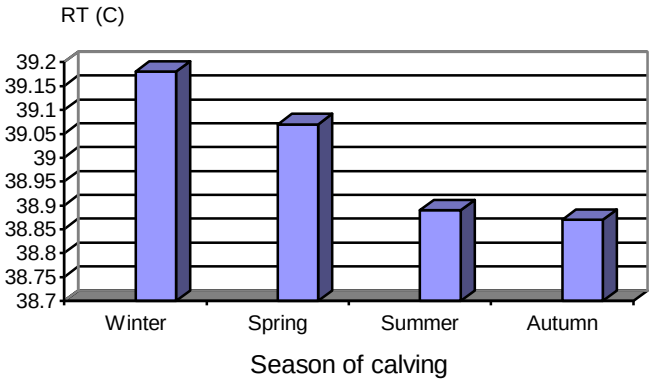
Where: *=P<0.05 and ***=P<0.001

Fig. (15): Effect of studied factors on rectum temperature.

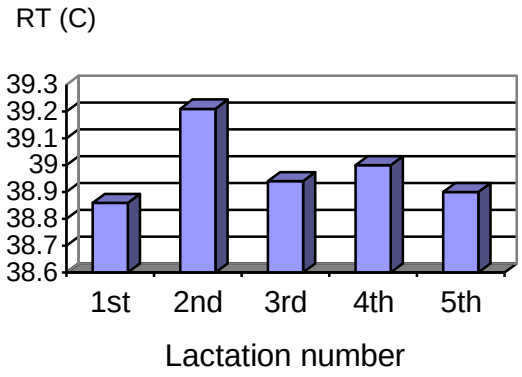
(A):Dietary protein sources.



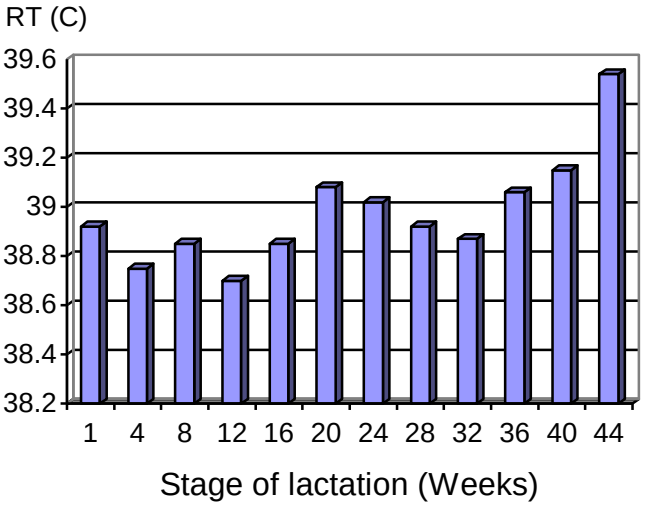
(B):Season of calving.



(C):Lactation number.



(D):Lactation stage.



increased with those calved during summer (38.89 °C). However, difference between the two previously means was insignificant. However, there was significant differences among cows calved during winter and speing and those calved during summer and autumn.

Highly significant effect (P<0.001) was found in rectum temperature due to lactation number (Table 34). It averaged (38.86, 39.21, 38.94, 39.00 and 38.90 °C) for cows having 1, 2, 3, 4 and 5 lactations, respectively. The highest value of rectum temperature was observed in cows having two lactations. On the other side, the lowest value was observed in cows having one lactation. However, significant differecens was found between average of rectum temperature of cows having 2 lactation that of cows of the other groups.

There was highly significant variation (P<0.001) in rectum temperature due to the lactation stage (Table 33). It averaged (38.92°C) at the beginning of lactation period, gradually decreased to reach its lowest average (38.70°C) at the 12^{th} week after calving. It was gradually increased to reach the highest average (39.54 °C) at the end of lactation period.

4.1.5. Body weight (BW) of cows:

Data presented in Table (34) and illashted in Fig. (16) show the effect of dietary protein sources, calving season, number and stage of lactation on body weight of treated cows.

There was high significant variations ($P<0.001$) on body weight of cows due to dietary protein sources (Table 35). The highest average of body weight (445.66 kg) was found in cows fed ration containing sunflower seed meal, followed by those fed ration cotton seed meal (control ration) (434.86 kg). Significant difference was found between the two averages. On the other hand, the lowest average was found in cows fed ration containing black seed meal (416.60 kg) which was less than those fed ration containing roquette seed meal by (12.42 kg), which differed significantly. This may be attributed to the fact that the cows produced more milk had less body weight.

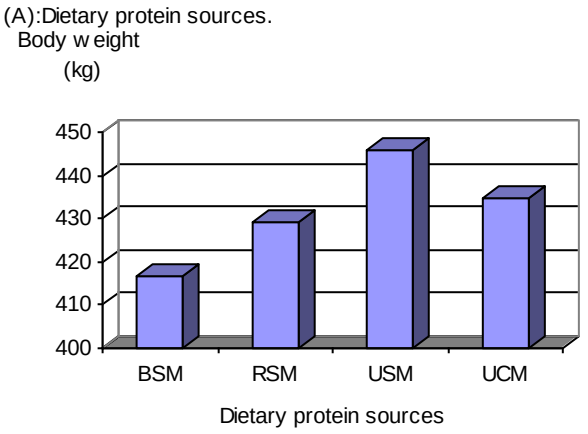
The season of calving had highly significant effects ($P<0.001$) on cows body weight (Table 35). The maximum value (452.15 kg) was noticed in cows calved during spring season, followed by those calved during autumn (432.22 kg). Significant difference was estimated between the two means. On the other hand, the lowest body weight average was found in cows calved during winter (413.94 kg) then increased with those calved during summer (427.83 kg). The two means differed significantly with the other averages. These results may be attributed to the optimum environmental conditions during

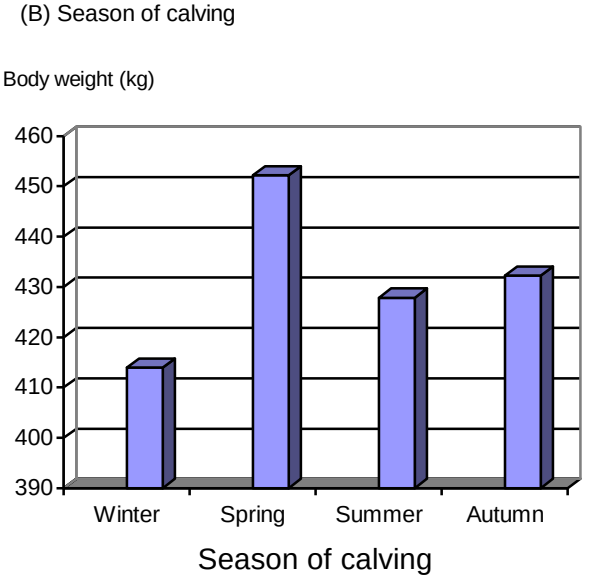
Table (35) : The least squares analysis of variance and tests of significance of factors affecting body weight.

S.O.V	d.f	Body weight (BW)		
		SS	MS	F-ratios
Dietary protein sources	3	89012.0	29670.7	42.7***
Season of calving	3	215827.8	71942.6	103.5***
Lactation number	4	1434851.6	358712.9	516.3***
Lactation stage	43	26862.1	624.7	0.9n.s
Remainder	1002	696223.6	694.8	
Total	1055	2763432.7		

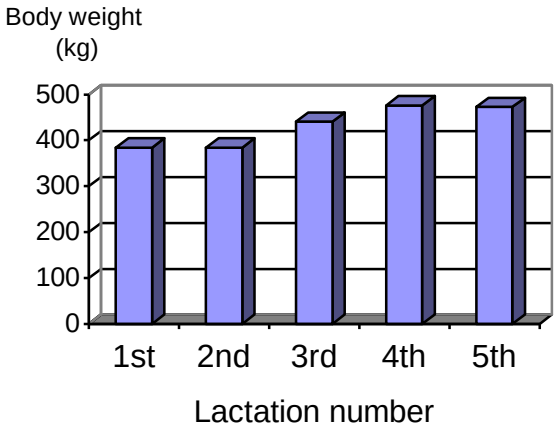
Where : n.s = not significant, and ***=P<0.001

Fig. (16): Effect of studied factors on body weight of cows.

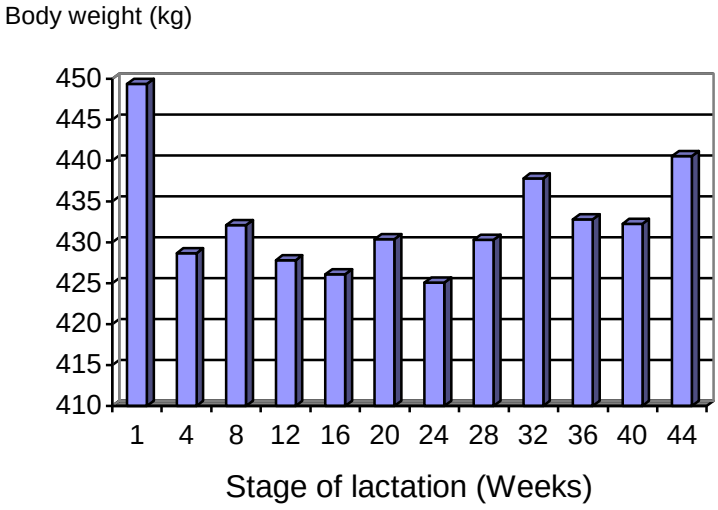




(C):Lactation number.



(D) Stage of lactation



spring and autumn seasons, which rate of feed intake was increased.

The obtained results showed that, the lactation number had highly significant effect (P<0.001) on cows body weight. Its average increased from (384.20 kg), in cows having one lactation, to reach the maximum value of (475.90 kg) in mature cows at 4th lactation. However, its average weight (472.81kg) in those having 5th lactation. With significant differences between all averages.

Data presented in (Table 34) revaled, insignificant variation in cow's body weight due to stage of lactation (Table 35). The highest average of body weight (449.4 kg), was found at the 1st week after calving, which was gradually decreased to reach its lowest average (425.1 kg) at the 24th week after calving then gradually increased to reach an average 440.6 kg at the end of lactation period.

4.2. Effect of dietary protein sources, season of calving, number and stage of lactation on some blood plasma constituents:

4.2.1. Total proteins:

Data concerning plasma total proteins as affected by dietary protein sources, calving season, number and stage of lactation was presented in Table (36) and illashted in Fig. (17).

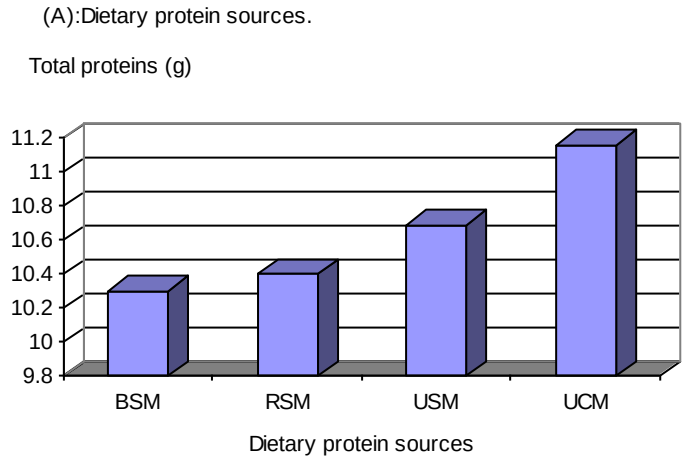
There was highly significant variations (P<0.001) in plasma total proteins due to dietary protein sources (Table 37).

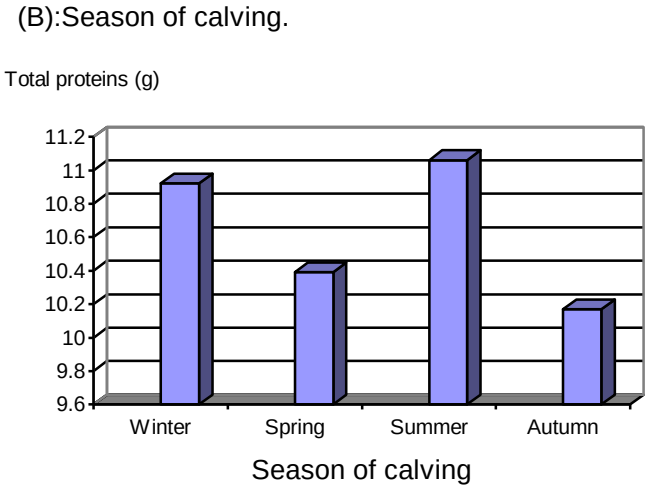
Table (37) : The least squares analysis of variance and tests of significance of factors supposed to affect plasma total proteins (TP) (g/100ml).

S.O.V	d.f	Total proteins (TP)		
		SS	MS	F-ratios
Dietary protein sources	3	46.41	15.47	6.01^{***}
Season of calving	3	49.2	16.40	6.36^{***}
Lactation number	4	89.8	22.45	8.71^{***}
Lactation stage	21	61.53	2.93	$1.14^{n.s}$
Remainder	496	1274.7	2.57	
Total	527	1521.6		

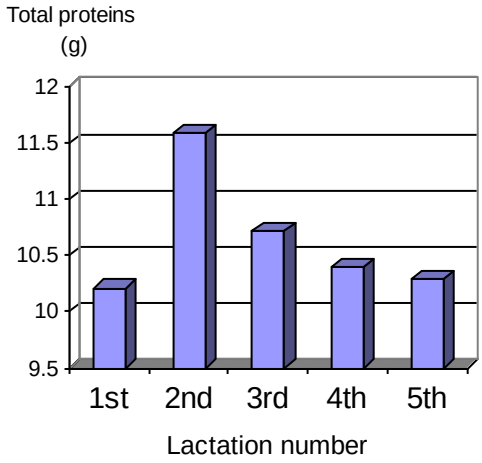
Where : n.s= not significant and ***=P<0.001

Fig. (17): Effect of studied factors on plasma total proteins.

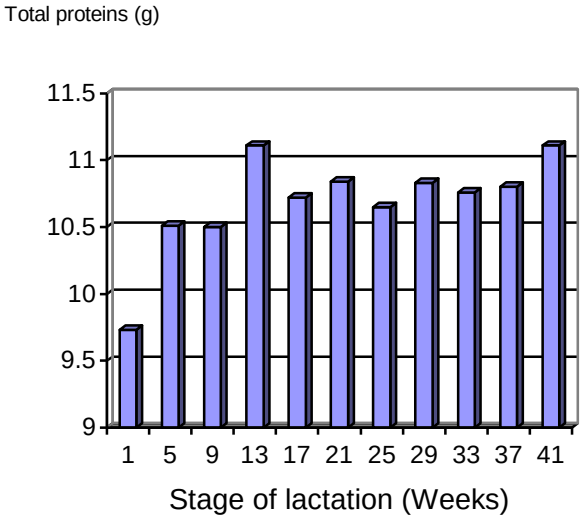




(C):Lactation number.



(D):Lactation stage.



The highest average of plasma total proteins (11.16 g/100ml) was observed in cows fed ration containing cotton seed meal as a control ration, followed by those fed ration containing sunflower seed meal (10.69 g/100ml). Significant differences were observed between the two previously mentioned averages. On the other hand, the lowest average was found in cows fed ration containing black seed meal (10.30 g/100ml) which was less than those fed ration containing roquette seed meal by (0.10 g/100ml). Which did not differe significantly with those of the other groups. These results are scientifically logic, whereas the cows produced more milk had the lowest value of plasma total proteins, which is necessary during syntheses.

The average plasma total proteins seemed to be significantly affected ($P<0.001$) by season of calving (Table 37). The maximum value (11.06 g/100ml) was observed in cows calved during summer, followed by those calved during winter season (10.92 g/100 ml). Significant differences were observed between the two previously mentioned values. On contarary, the lowest average was found in cows calved during autumn (10.17 g/100ml) then increased with those calved during spring (10.39 g/100ml). Difference between the two previously mentioned average was of significant value. This may be attributed to the seasonal differences in environmental conditions, which affected on milk production and total proteins content in blood plasma.

There was a good agreement between the present results and those reported by **Shaffer *et al.*, (1981)** they found high

significant seasonal effect on serum total proteins in Holstein ; Guernsey ; Jersey and Brow Swiss cows. They added that it was high during hot season, medium in intermediate and low during cool season. In addition, **Toharmat *et al.*, (1998)** found that, the plasma total plasma proteins level in Holstein cows was higher during summer months than during autumn ones. On the other hand, under Egyptian conditions **Marai *et al.*, (1995 and 1997)** noticed that, the serum total proteins in Friesian and Holstein cows decreased significantly in summer months as compared with winter ones. **Manal et al., (1999),** reported similar results in buffaloes.

The obtained results, showed that the lactation number had highly significant effect ($P<0.001$) on plasma total proteins (Table 37). It averaged 10.21, 11.59, 10.71, 10.39 and 10.29 for cows having 1, 2, 3, 4 and 5 lactations, respectively. The highest value of plasma total proteins was observed in cows having two lactations, Significant differences were observed between the previously mentioned average with the other groups. However, the lowest value was observed in cows having one lactations, which did not differ significantly with the other groups. The obtained results indicated that, the plasma total proteins had no pronounced trend with lactation number.

Present results disagree with those reported by **Shaffer *et al.*, (1981)** who found positive and significant relationship between serum total proteins and age of Holstein ; Guernsey ; Jersey and Brown Swiss cows. **Shrikhande and Sarode, (1999)**

found that, the age of cows had significant effect (P<0.05) on serum total proteins. Its highest average was found in cows aged 5-8 years in dairy cattle. In addition, **Rajora *et al.*, (1997)** showed, a positive relationship between serum total proteins and lactation number in crossbred cows (Sahiwal x Jersey and or Holstein). **Sivaraman *et al.*, (2003)** reported that, the total protein content increased significantly (P<0.01) with increasing age. The highest average was found in cows aged 10 to 13 years in Jersey cows.

Lacation stage showed insignificant effect on plasma total proteins (Table 38). Plasma total proteins mostly and steadily increased by advancing lactation period. The lowest mean value of plasma total proteins (9.73 g/100ml) was observed at the 1st week of lactation period, then increased to reach its maximum value (11.11 g/100ml) at the 13th week and 41st week after calving.

4.2.2. Albumin:

Data listed in Table (38) and Fig. (18) show the least square means of plasma albumin level as affected by dietary protein sources, calving season, number and stage of lactation.

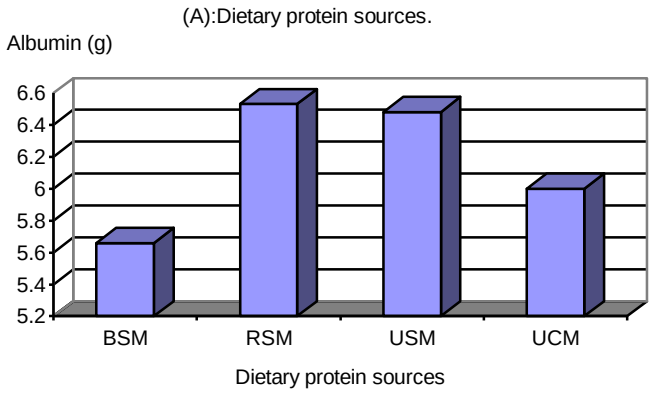
There was a highly significant variations (P<0.001) in plasma albumin level due to dietary protein sources (Table 39). The highest mean of plasma albumin content (6.53 g/100ml)

Table (39) : The least squares analysis of variance and tests of significance of factors supposed to affect albumin (AL) (g/100ml).

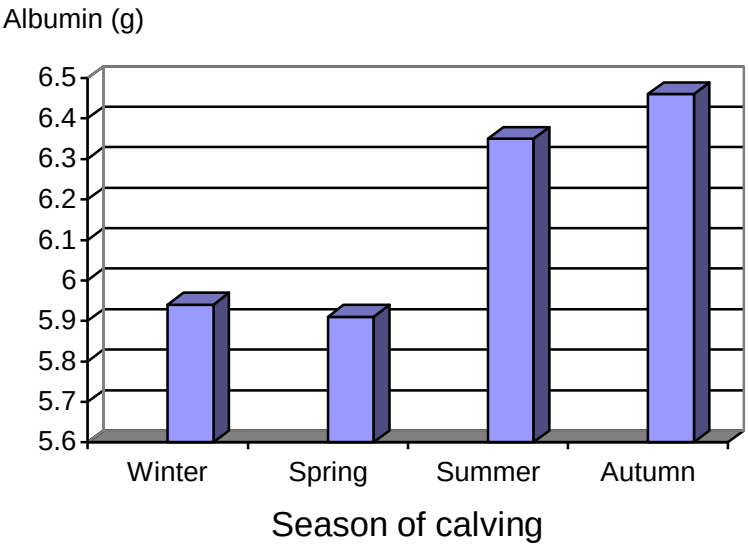
S.O.V	d.f	Albumin (AL)		
		SS	MS	F-ratios
Dietary protein sources	3	59.79	19.93	8.87***
Season of calving	3	22.32	7.44	3.31**
Lactation number	4	52.88	13.22	5.88***
Lactation stage	21	40.95	1.95	0.87n.s
Remainder	496	1111.04	2.24	
Total	527	1286.98		

Where : n.s= not significant **=P<0.01 and ***=P<0.001

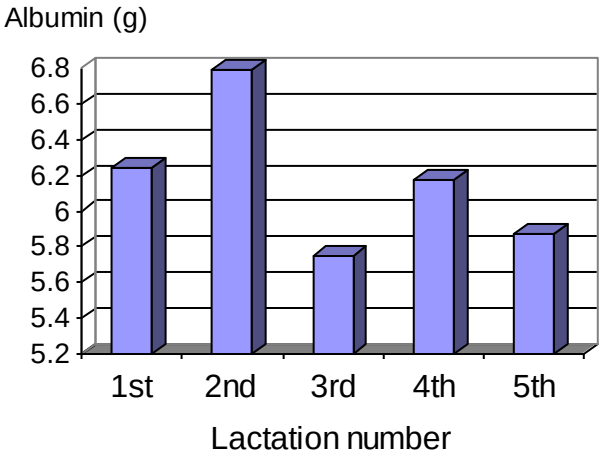
Fig.(18):Effect of studied factors on plasma albumin



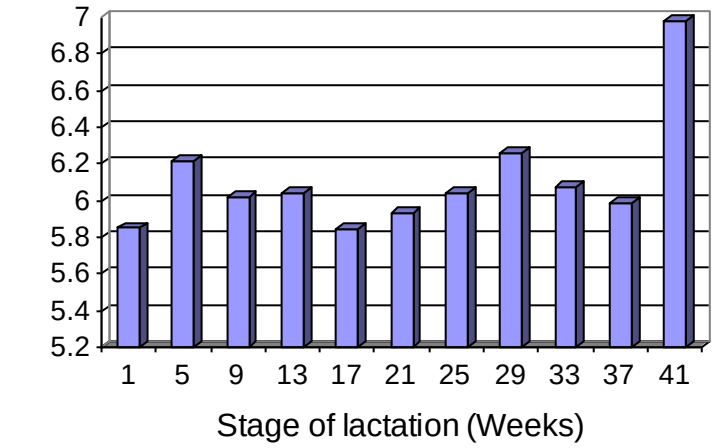
(B):Season of calving.



(C):Lactation number.



(D):Lactation stage.



was found in cows fed ration containing roquette seed meal, followed by those fed ration containing sunflower seed meal (6.48 g/100ml). Significant differences were found between the two previously mentioned averages. On the other hand, the lowest mean of plasma albumin (5.66 g/100ml) was noticed in cows fed ration containing black seed meal which was less than those fed ration containing cotton seed meal (control ration) by (0.34 g/100ml). Significant differences were observed between the two previously mentioned averages.

There was high significant variation ($P<0.01$) in plasma albumin due to season of calving. The maximum average was observed in cows calved during autumn season (6.46 g/100ml), followed by those calved during summer one (6.35 g/100ml). Significant difference was observed between the two previously mentioned averages. On the contarary, the minimum average of plasma albumin level was observed with cows calved during spring (5.91 g/100ml) then increased with those calved during winter (5.94±0.13 g/100ml). This may be attributed to the seasonal differences in environmental conditions, which affected milk production and plasma albumin level. There was a good agreement between the present results and those reported by **Baranowski and Grzesiak, (2001)** who noticed that serum albumin was higher in August and September with an average (44.08±4.92 g/liter) in Leine sheep.

On the other hand, **Mohamed and Johnson, (1985) and Habeeb *et al.*, (1989 and 1991)** reported that serum albumin decreased significantly by 8.77% during summer than during

winter season in Friesian cows. The present results showed that, there was high significant variation ($P<0.001$) in plasma albumin due to the lactation number (Table 40). It averaged 6.24, 6.79, 5.75, 6.17 and 5.87 for cows having 1, 2, 3, 4 and 5 lactations, respectively. The highest mean of plasma albumin was found in cows having two lactations (which did not differ significantly with those having 1 and 4 lactations). However, the lowest value of plasma albumin was observed in cows having three lactations (which differed significantly with those having 1, 2 and 4 lactations).

The obtained results indicated that, the plasma albumin had no recognized trend with lactation number. There was partially agremment between the persent results and which reported by **Shrikhande and Sarode, (1999)** who found that, the plasma albumin level was low in cows aged more than 8 years. On the other hand, **Sharma *et al.*, (1998)** reported that, the age of animals had insignificant effect on plasma albumin in crossbred cattle.

Stage of lacation had insignificant effect on plasma albumin level (Table 40). However, the lowest average of plasma albumin (5.85 g/100ml) was observed at the early lactation period, then increased with no pronounced trend reach to maximum mean value (6.98 g/100ml) at the end of lactation period. There was agood agreement between the previously results and those reported by **Little, (1974)** who observed that plasma albumin content reached its lowest value just after

calving then increased during the first 100 days. However, **Hewett, (1974)** observed no change in albumin level with stage of lactation in Sweeden dairy cattle.

4.2.3. Globulin:

The least square means of plasma globulin as affected by dietary protein sources, calving season, number and stage of lactation was presented in Table (40) and illashated at Fig. (19).

There was a highly significant variations ($P<0.001$) in plasma globulin due to dietary protein (Table 41). The highest mean of plasma globulin (5.16 g/100ml) was found in cows fed ration containing cotton seed meal, followed by those fed ration containing black seed meal (4.64 g/100ml) (with significant variation between the two previously mentioned means). On the other hand, the lowest mean (3.88 g/100ml) was observed in cows fed ration containing roquette seed meal which was less than those fed ration containing sunflower seed meal by (0.33 g/100ml) (with significant variation between the two previously mentioned means).

This result is scientifically logic. It is well known that changes in globulin content in blood are more related to the rate of antibodies biosynthesis in cows of microbial infection rather than the its rate of metabolic processes which affect either total proteins or albumin in blood plasma.

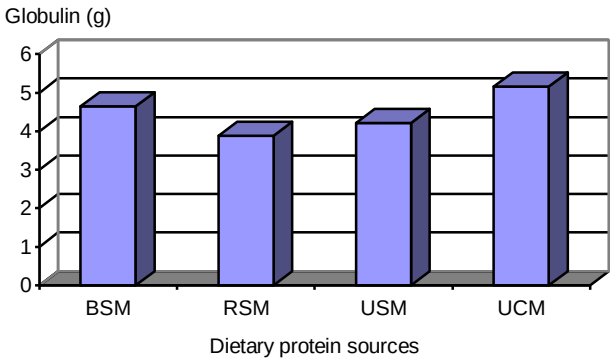
Table (41) : The least squares analysis of variance and tests of significance of factors supposed to affect on plasma globulin (GL)(g/100ml).

S.O.V	d.f	Globulin (GL)		
		SS	MS	F-ratios
Dietary protein sources	3	117.18	39.06	8.83^{***}
Season of calving	3	87.72	29.24	6.61^{***}
Lactation number	4	67.48	16.87	3.82^{**}
Lactation stage	21	71.82	3.42	$0.77^{n.s}$
Remainder	496	2192.32	4.42	
Total	527	2536.52		

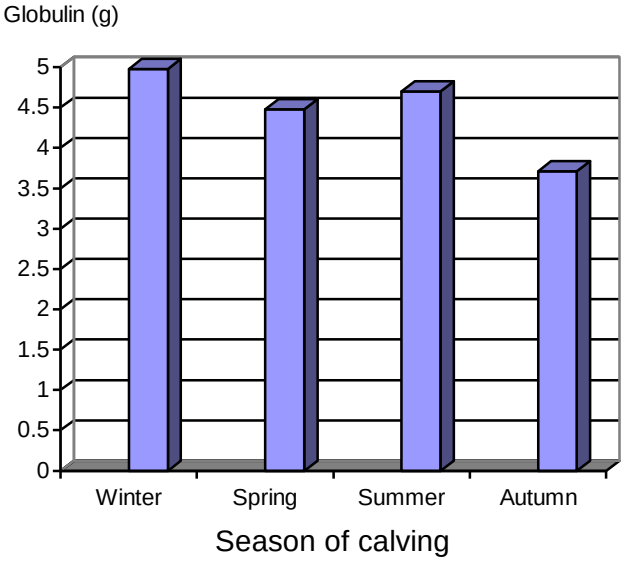
Where : n.s= not significant **=P<0.01 and ***=P<0.001

Fig. (19): Effect of studied factors on plasma globulin.

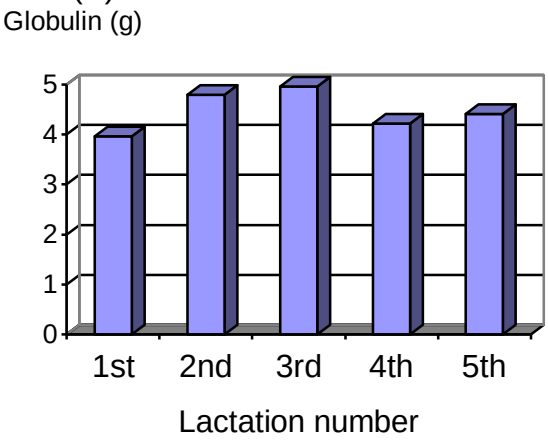
(A):Dietary protein sources.



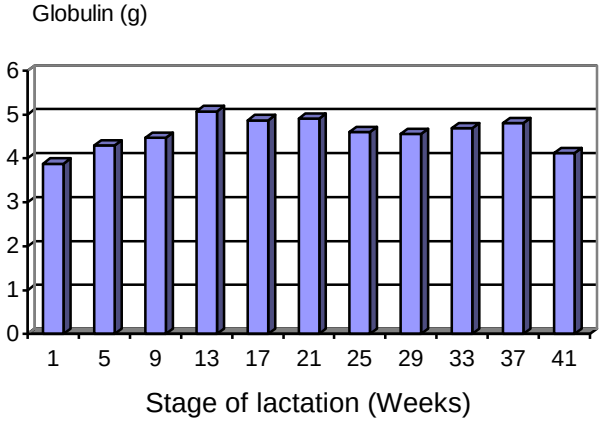
(B):Season of calving.



(C):Lactation number.



(D):Lactation stage.



Blood plasma globulin was affected significantly (P<0.001) by season of calving (Table 41). The highest mean value (4.98 g/100ml) was observed in cows calved during winter season, followed by those calved during summer (4.70 g/100ml) (However, insignificant variations was observed between the two mentioned groups). On the other hand, the lowest average was found in cows calved during autumn (3.71 g/100ml) then increased with those calved during spring (4.48 g/100ml) (with, significant variations was observed between the two mentioned means.

Lactation number had high significant effect (P<0.01) on plasma globulin. The highest average was observed in cows having 3 lactations (4.96 g/100ml), followed by those having 2 lactations (4.79 g/100ml) (which varied significantly). On the other hand, the lowest average was found in cows having one lactation (3.96 g/100ml) which was less than those having 4 lactations by (0.26 g/100ml). However, No significant differences were observed between the two previously mentioned values. In addition, cows having 5 lactation had moderate value of plasma globulin level (4.41 g/100ml) between those having 2 and 4 lactations. In Jersey crossbred cows **Sivaraman *et al.*, (2003)** reported that serum globulin fraction level significantly increased (P<0.01) with increasing age, reaching its maximum level at 10 to 13 years of age.

The stage of lacation had insignificant effect on blood plasma globulin (Table 41). The lowest average of plasma

globulin (3.88 g/100ml) was observed at the 1st week of lactation period, gradually increased to reach the maximum value (5.07 g/100ml) at 13th week after calvingand then gradually decrease to reach an average (4.12 g/100ml) at the end of lactation period.

4.2.4 Total lipids:

Table (42) show the least square means of plasma total lipids as affected by dietary protein sources, calving season, number and stage of lactation. Data are graphically presented in Fig. (20).

High significant variations (P<0.001) in plasma total lipids were found due to dietary protein sources (Table 43). The highest average of plasma total lipids (410.8 mg/100ml) was found in cows fed ration containing roquette seed meal as a mean sources of protein, followed by those fed ration containing black seed meal (375.83 mg/100ml) (However, no significant difference was found between the two previously mentioned averages). On the contrary, the lowest average was observed in cows fed ration containing cotton seed meal (control group) (247.79 mg/100ml) then increased with those fed ration containing sunflower seed meal (369.63 mg/100ml). With significant differences was observed between the two previously mentioned values.

RESULTS AND DISCUSSION

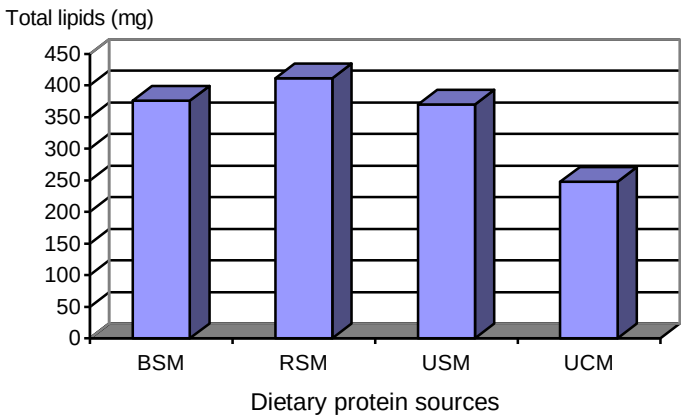
Table (43) : F-ratios of the least squares analysis of variance and tests of significance of factors affecting plasma total lipids (TL) (mg/100ml).

S.O.V	d.f	Total lipids (TL)		
		SS	MS	F-ratios
Dietary protein sources	3	1784473.2	594824.4	19.48***
Season of calving	3	741155.7	247051.9	8.09***
Lactation number	4	2318236.4	579559.1	18.98***
Lactation stage	21	515886.0	24566.0	0.80n.s
Remainder	496	15142582.4	30529.4	
Total	527	20502333.7		

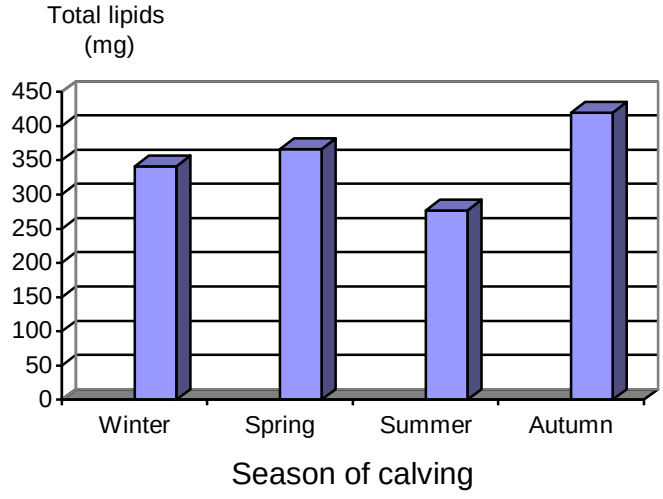
Where : n.s=not significant, and ***=P<0.001

Fig. (20): Effect of studied factors on plasma total lipids.

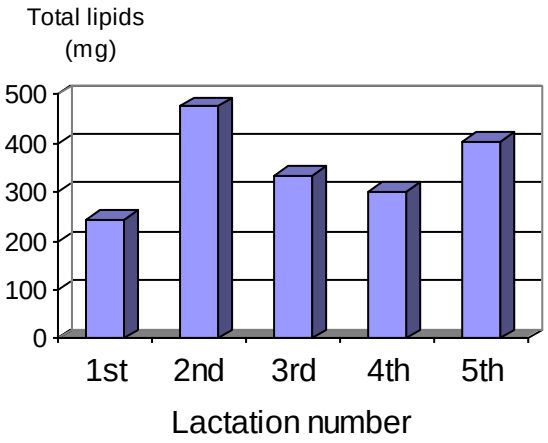
(A):Dietary protein sources.



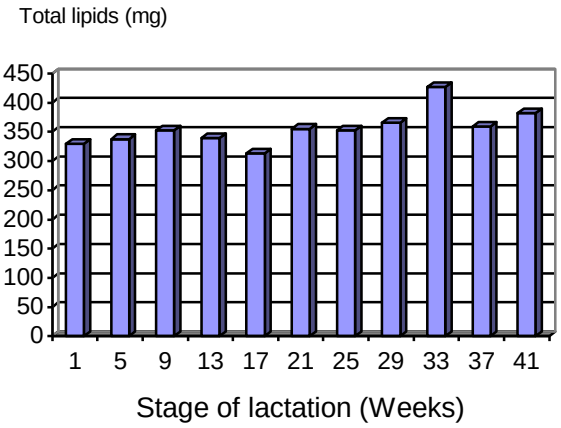
(B):Season of calving.



(C):Lactation number.



(D):Lactation stage.



In addition, there was high significant variation ($P<0.001$) in plasma total lipids due to the season of calving (Table 43). The maximum value of plasma total lipids (419.33 mg/100ml) was noticed in cows calved during autumn, followed by those calved during spring (366.36 mg/100ml). However, there was no significant variations between the two previously mentioned values. On the other hand, the lowest average of total lipids (277.12 mg/100ml) was observed in cows calved during summer which was less than those calved during winter by (64.11 mg/100ml) (the two means did not significantly differ). This may be attributed to the seasonal differences in environmental conditions, which effect milk production and fulfilled requirement from total lipids.

There was a good agreement between the obtained results and those reported by **Marai *et al.*, (1997)** who, found that the plasma total lipids content decreased significantly during summer months in lactating Friesian and Holstein cows. In addition, **Kumar and Pachauri, (2001)** reported that, there was a significant increase ($P<0.01$) in plasma total lipids during summer month in high yielding dairy cattle.

The obtained results reveled that, the lactation number showed highly significant effect ($P<0.001$) on plasma total lipids (Table 43). It averaged 243.25, 475.43, 333.47, 300.00 and 402.904 mg/100ml for cows having 1, 2, 3, 4 and 5 lactations, respectively. The highest value of plasma total lipids was found in cows having two lactations. Which significantly

differed with those having 1, 3 and 4 lactations. On the contarary, the lowest value of plasma total lipids was observed in cows having one lactations. The obtained results indicated that, the plasma total lipids had no pronounced trend with lactation number.

There was a good agreement between the present results with those reported by **Kholif, (1999)** who, found that serum total lipids level reached its highest average at the 2nd lactation in lactating buffaloes.

The average of plasma total lipids varied insignificantly within various lacation stages without any pronounced trend.(Table 44). It recorded 329.51 mg/100ml at the 1st weeks. It reached the lowest mean value of 313.24mg/100ml at the 17th week after calving, then gradually increased to reach its maximum mean value of 426.59 mg/100ml at the 33th week after calving then decreased thereafter to reach an average of 382.20 mg/100 ml at the 41th week.

Resltus obtained agree with those reported by **Rapheal *et al.*, (1973)** who found that serum total lipids concentration was significantly lower during early lactation than during peak and lactating-pregnancy when milk production was at its highest level. In addition, **Prakash and Tandon, (1979)** reported that serum total lipids concentration was lower during early lactation than at the peak.

4.2.5. Total cholesterol:

Data conserning the effect of dietary protein sources, calving season, number and stage of lactation on blood plasma total cholesterol is presented in Table (44) and illashted in the Fig. (21).

Variations in the plasma total cholesterol due to dietary protein sources was found to be of a highly significant value ($P<0.001$) (Table 45). The highest mean of plasma total cholesterol (211.2 mg/100ml) was found in cows fed ration containing sunflower seed meal as the main sources of protein, followed by those fed ration containing black seed meal (195.0 mg/100ml). However, significant difference was observed between the two previously mentioned means. On the contrary, the lowest mean of plasma cholesterol was observed in cows fed ration containing roquette seed meal (175.6 mg/100ml) then increased with those fed ration containing cotton seed meal as a control ration (188.5 mg/100ml) (with No significant difference between the two previously mentioned means.

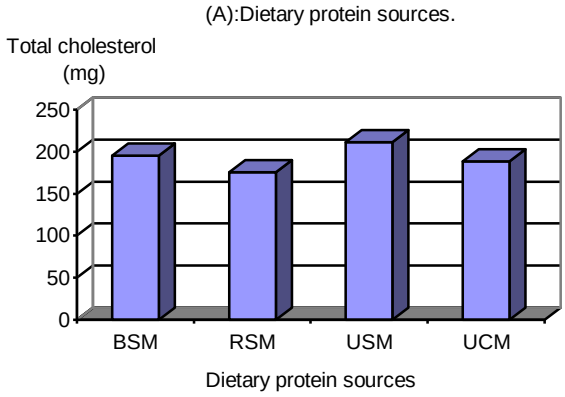
High significant variations ($P<0.001$) in plasma total cholesterol due to season of calving (Table 46). The maximum average (232.47 mg/100ml) was observed in plasma of cows calved during autumn, followed by those calved during spring (186.21 mg/100ml) (the two avergaes significantly differed). On the other hand, the plasma cholesterol minimum average was estimated in cows calved during winter (173.36 mg/100ml)

Table (45) : The least squares analysis of variance and tests of significance of factors affecting plasma total cholesterol (TC) (mg/100ml).

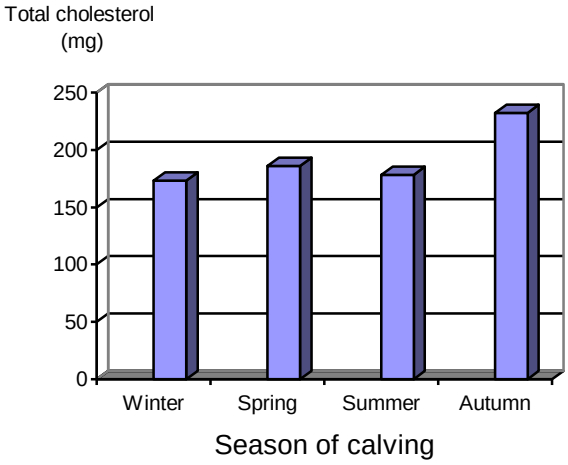
S.O.V	d.f	Total cholesterol (TC)		
		SS	MS	F-ratios
Dietary protein sources	3	76713.0	25571.0	5.77***
Season of calving	3	205778.7	68592.9	15.48***
Lactation number	4	237189.6	59297.4	13.38***
Lactation stage	21	164732.4	7844.4	1.77*
Remainder	496	2197478.4	4430.4	
Total	527	2812850.1		

Where : *=P<0.05 and ***=P<0.001

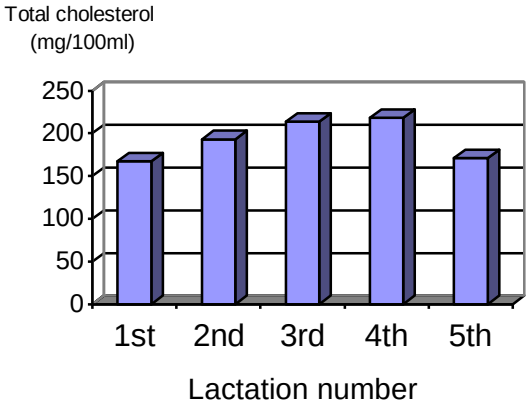
Fig. (21): Effect of studied factors on plasma total cholesterol



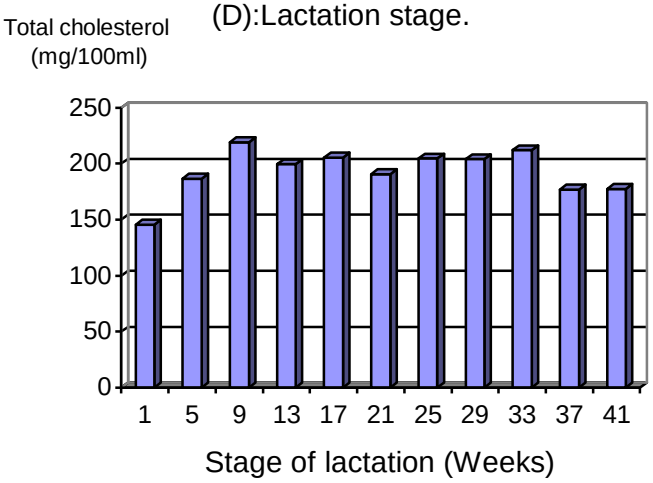
(B):Season of calving.



(C):Lactation number.



(D):Lactation stage.



which was less than those calved during summer by (4.89 mg/100ml). (However, no significant difference was observed between the two previously mentioned means. Results of the present study partially agree with those reported by **Mesaric *et al.*, (1997)** who found that the cholesterol level was insignificantly higher ib plasma of animal calved during winter season than during summer.

Lactation number was found to have highly significant effect ($P<0.001$) on plasma total cholesterol (Table 46). It averaged (167.22, 193.20, 213.55, 218.00 and 170.89 mg/100ml) for cows having 1, 2, 3, 4 and 5 lactations, respectively. The plasma total cholesterol content gradually increased with advancing of age (lactation number) to reach its highest mean (218.00 mg/100ml) during 4^{th} lactation then decreased to 170.89 mng/100ml at the 5^{th} lactation. While, the lowest value was observed in cows at 1^{st} lactation. However, there was no significant differences between plasma cholesterol of cows having 1 and 5 lactations and between cows having 3 and 4 lactations. There was a good agremment was found between the persent results and those reported by **Shaffer *et al.*, (1981)** who found that, the total serum cholesterol level increased significantly with increasing age of Holstein ; Guernesy ; Jersey and Brown Swiss cows. Similar results were found by **Tumbleson and Hutcheson, (1971) ; Laird, (1972) and Arave *et al.*, (1975)** in dairy, Angus cows and heifers**.**

The stage of lacation had insignificant effect on plasma total cholesterol level (Anova Table 46). The lowest average (145.61 mg/100ml) was recorded at the 1st week of lactation period, then increased with no recognizable trend to reach its maximum mean value (205.36 mg/100ml) at the 17th week of lactation period, then gradually deceased to reach 177.44 mg/100ml up to the 41th week.

4.2.6.Glutamic-oxaloacetic-transaminase (GOT) and glutamic-pyruvic transaminase (GPT):

Data showing the effect of dietary protein sources, calving season, number and stage of lactation on blood GOT and GPT listed in Table (46) and graphically in the Fig. (22).

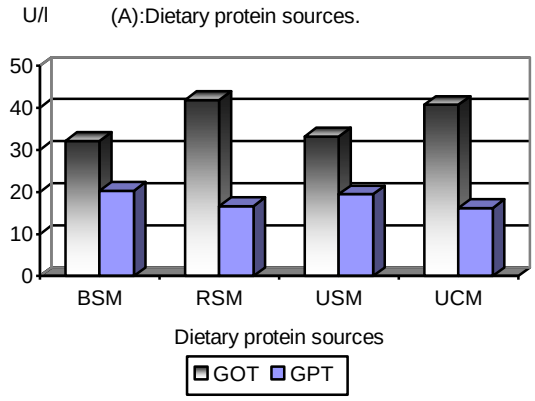
Insignificant variation was in serum GOT and GPT due to dietary protein sources (Table 47). The highest mean serum GOT average (41.88 U/l) was observed in cows fed ration containing roquette seed meal as a main sources of protein, followed by those fed ration containing cotton seed meal (40.73 U/l). On the contrary, the lowest serum GOT average was found in cows fed ration containing black seed meal (32.16 U/l) then increased with those fed ration containing sunflower seed meal (33.23 U/l). In addition, serum GPT maximum value (20.28 U/l) was found in cow fed ration containing black

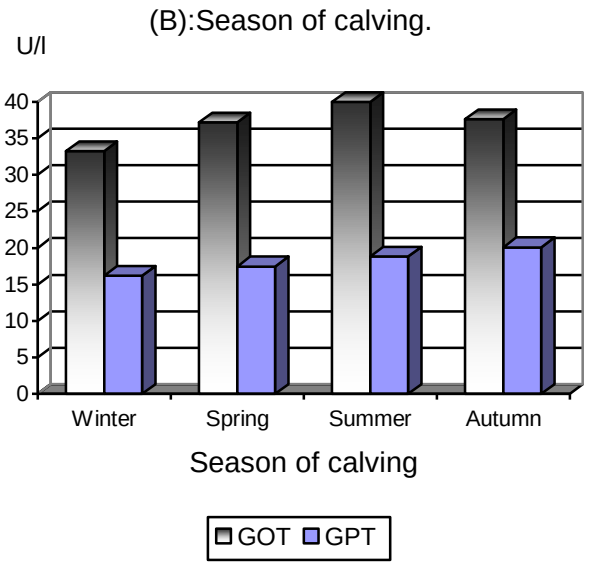
Table (47) : The least squares analysis of variance and tests of significance of factors affecting GOT and GPT plasma.

S.O.V	d.f	SS		MS		F-ratios	
		GOT	GPT	GOT	GPT	GOT	GPT
Dietary protein sources	3	4161.6	659.4	1387.2	219.8	$1.81^{n.s}$	$1.94^{n.s}$
Season of calving	3	973.2	403.2	324.4	134.4	$0.42^{n.s}$	$1.18^{n.s}$
Lactation number	4	1870.0	681.2	467.5	170.3	$0.61^{n.s}$	$1.50^{n.s}$
Lactation stage	10	13362.0	1836	1336.2	183.6	$1.74^{n.s}$	$1.62^{n.s}$
Remainder	243	186186.6	27604.8	766.2	113.6		
Total	263	206553.4	31184.6				

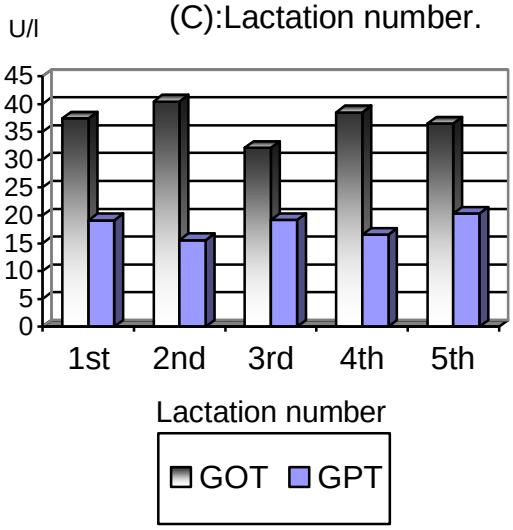
Where : n.s=not significant

Fig. (22): Effect of studied factors on plasma GOT and GPT.

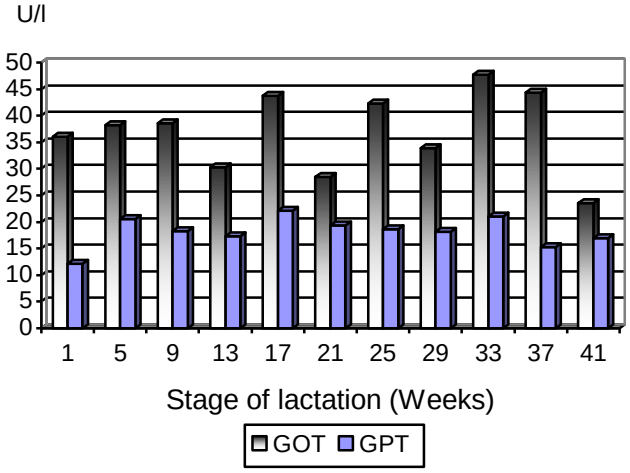




(C):Lactation number.



(D):Lactation stage.



seed meal, followed by those fed ration containing sunflower seed meal (19.45 U/l). On the other hand, the minimum average was observed in cows fed ration containing cotton seed meal (16.21 U/l) which was less than those fed ration containing roquette meal by (0.41 U/l) .

Season of calving seemed to have insignificantly affected on serum GOT (Table 47). The maximum average (39.99 U/l) was observed in cows calved during summer, followed by those calved during autumn (37.59 U/l). On the other hand, the minimum average was observed with cows calved during winter (33.24 U/l) then increased with those calved during spring (37.18 U/l). Serum GPT reached its highest mean (20.08 U/l) in cows calved during autumn followed by those calved during summer (18.81 U/l). On the contarary, the lowest mean of serum GPT (16.19 U/l) was observed in cows calved during winter season, which was less than those calved during spring by (1.29 U/l). Results obtained in the present study agree with those reported by **Crist et al., (1967)** who observed that GOT and GPT activity reached their highest value during the summer months and while their lowest level was observed during the winter in Holstein cows**.** On the other hand, **Boots et al., (1970)** found that season of the year had insignificant effect on blood serum GOT and GPT level in Holstein cows.

Results of the persent study showed that, the lactation number had insignificant effect on serum GOT and GPT. Serum

GOT averaged (37.39, 40.47, 32.15, 38.50 and 36.50 U/l) for cows having 1, 2, 3, 4 and 5 lactations, respectively. While, serum GPT mounted (19.09, 15.58, 19.15, 16.54 and 20.34 U/l) for cows having 1, 2, 3, 4 and 5 lactations, respectively (Table 47).

In Holstein, Guernsey, Jersey and Brown Swiss females **Shaffer *et al.*, (1981)** found that the age of females did not significantly affected serum GOT level. Similary, **Boots *et al.*, (1970)** reported that the age had insignificant effect on blood serum GOT, while it had significant effect on GPT activity in Holstein heifers. On the other hand, in Holstein cows **Boots *et al.*, (1970)** observed significant difference in glutamic-pyruvic transaminase (GPT) activity between lactations with the youngest (having one lactation) cows which had the highest average. While, the older cows having 9 lactations had the lowest average.

Opposite trend was observed in glutamic-oxaloacetic-transaminase activity (GOT). It was found that the lactation number had insignificant effect on serum GOT level with highest level in cows having 6 lactations and the lowest value tended in cows having one lactation. These may be attributed to the fact that metabolic activity decreases by advancing age which showes an obvious deterioration in physiological status in general, so decrease in enzym activity with age is expected.

In lactating buffaloes **Kholif, (1999)** found that lactation number had significant effect on serum GOT and GPT, the

lowest value was observed in 2nd lactation and gradually increased to reach its highest value at the 6th lactation for GOT and at the 5th lactation for GPT. Data obtained showed that the stage of lacation had insignificant effect on serum GOT and GPT (Table 48). The highest mean value of GOT (47.68 U/l) was observed at the 33th week. On the other hand the lowest average (23.51 U/l) was found at the 41th week without pronounced trend observed in GOT during different lactation stages. In addition, serum GPT had no pronounced trend during vrious lactation stage. Its highest mean(22.06 U/l) was observed at the 17th week and the lowest mean value (12.18 U/l) was found at first week after calving (Table 47).