RESULTS AND DISCUSSION

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4.1- Plasma estrogen level at different stages of estrous cycle:

Plasma estrogen pattern was studied in Ossimi ewes throughout the various stages of estrous cycle with respect to the effect of: parity number, ewe's body weight, type of birth (ewes having single or twin lambs), sex of lamb (ewes having male or female lamb) and age of ewe.

4.1.1- Effect of ewe's age:

Data concerning the pattern of plasma estrogen level throughout the different stages of estrous cycle in Ossimi ewes of different ages was presented in table (1).

Results obtained showed no characteristic trend for plasma estrogen level at different stages of estrous cycle or for groups of ewes of different ages. For example, while level of plasma estrogen increased, in ewes of age 20 to less than 40 months (20- months), from proestrus up to the met-estrus stage, this trend was not quite similar in ewes of age 40 to less than 60 months (40- months) or in ewes of age 60 months and more (60- months). On the

other hand, level of estrogen in plasma was, relatively, higher at the first observed estrus, proestrus and at metestrus for ewes of 60-, 40- and 20- months age, respectively. During diestrus stage, plasma estrogen level flactuated reaching its maximum level at the 10th, 6th and 7th day for ewes of 20- , 40- and 60- months of age, respectivley. At the second observed estrus, the highest value of plasma estrogen concentration was observed in ewes of 40- months age when compared with the two other groups of ewes applied.

However, analysis of variance for data showed no significant effect due to age of ewes, estrous cycle stages and the interaction between them (Table 2). This may give a satisfactory reason for the "relative" low productivity of Ossimi ewes which may be attributed to the irrigularity of hormonal secretion and correspondingly the abnormality of the hypothalamic-hypophyseal-gonadal hormonal balance regulating the reproductive activity.

Table (1): Plasma estrogen level (ng/ml) at the different stages of estrous cycle for Ossimi ewes of different ages (in months).

Stages of estrous cycle	Mean ± S.E. of plasma estrogen in Ossimi ewes of age ranging from		
	20 --- (7 ewes)	40 --- (10 ewes)	60 --- (11 ewes)
Pro-estrus (2 days)	0.1122±0.016	0.1210±0.011	0.1087±0.014
1st observed estrus	0.1228±0.013	0.1128±0.013	0.1327±0.019
Met-estrus (2 days)	0.1300±0.008	0.1176±0.013	0.1099±0.013
Diestrus:			
at 2nd day	0.1296±0.018	0.1229±0.016	0.1213±0.013
at 3rd day	0.1098±0.009	0.1076±0.012	0.1306±0.019
at 6th day	0.1322±0.021	0.1272±0.019	0.1146±0.021
at 7th day	0.1345±0.021	0.1184±0.012	0.1341±0.018
at 10th day	0.1418±0.027	0.1225±0.015	0.1277±0.016
at 11th day	0.1201±0.018	0.1268±0.014	0.1290±0.015
2nd observed estrus	0.1185±0.013	0.1349±0.017	0.1211±0.019

Table (2): Analysis of variance for data presented in table (1).

S.O.V.	d.f.	S.S.	M.S.	F.
Age of ewe (A)	2	0.0006	0.0003	0.12
Intervals of estimation (I)	9	0.0063	0.0007	0.28
Interaction (AxI)	18	0.0140	0.0008	0.32
Error	250	0.6306	0.0025	

4.1.2- Effect of ewe's body weight:

Data pressented in table (3) showed the average of plasma estrogen level at different stages of estrous cycle for Ossimi ewes of different body weight.

Results obtained revealed that ewes weighing either 30 to less than 40 kg (30- kg) or 50 kg and more (50- kg), had lower average of plasma estrogen level throughout the various stages of estrous cycle when compared with those weighing 40 to less than 50 kg (40- kg) which showed, relatively, the higher averages of plasma estrogen level at the corresponding stages. At most stages of estrous cycle, ewes weighing 30- kg showed higher averages of estrogen level than showed by those weighing 50- kg.

Analysis of variance for obtained data (Table 4) showed significant effect ($P < 0.01$) due to ewe's body weight on the average of plasma estrogen level.

It is well known that growth and development of various body systems in general and particularly the reproductive organs and endocrine glands, which is reflected as a proper body weight for high rate of reproduction, is considered the most important factor affecting the hormonal balance and correspondingly the reproductive activity. This is not quite clear in the present study since the pattern of hormonal level did not show the well known character

for higher productive breed of ewes. The insignificant variation existing in plasma estrogen level due to the estrous cycle stages (Table 4) supports this statement.

However, plasma estrogen level showed no characteristic trend throughout the various stages of estrous cycle, in ewes of different body weight category. During the first observed estrus, plasma estrogen concentration showed its highest level during the estrus period in ewes weighing 40- kg (0.1301 ng/ml) and 50- kg (0.1086 ng/ml) while the highest level was found during the 2 days of metestrus period in ewes weighing 30- kg (0.1137 ng/ml). During the 11 days of diestrus period, plasma estrogen concentration mantained, approximately, constant level in ewes weighing 40- kg and ranged from 0.1227 ng/ml to 0.1398 ng/ml which was, relatively, higher than the concentration observed at the days of Pro-estrus, first observed estrus and Met-estrus. This trend was not quite similar as in ewes weighing either 30- kg or 50- kg. In these groups of ewes estrogen level during the diestrus period flactuated, remaining higher than that observed at pro-estrus, first observed estrus and Met-estrus in some cases or lower in most cases.

The previously discussed results enable to ensure the statement that the inbalanced sexual hormone secretion is the main reason for the "relative" low productivity in the local sheep breed (Ossimi).

Finally, results obtained showed that the interaction between ewe's body weight and estrus cycle stages had no significant effect on plasma estrogen level (Table 4).

Results obtained partially agree with those of Keane (1974) and Al-Wahab and Bryant (1978), who stated that, once ewe lambs reach a threshold body weight for attainment of puberty, variation in body weight appear to have little influence on their reproductive performance.

Table (3): Plasma estrogen level (ng/ml) at the different stages of estrous cycle for Ossimi ewes of different body weight (in kg).

Stages of estrous cycle	Mean* ± S.E. of plasma estrogen in Ossimi ewes of body weight ranging from		
	30 --- (5 ewes)	40 --- (19 ewes)	50 --- (4 ewes)
Pro-estrus (2 days)	0.0829±0.013 ab	0.1284±0.009 b	0.0840±0.010 a
1st observed estrus	0.1083±0.016 a	0.1301±0.010 a	0.1086±0.037 a
Met-estrus (2 days)	0.1137±0.019 a	0.1208±0.008 a	0.1076±0.021 a
Diestrus:			
at 2nd day	0.1046±0.008 a	0.1374±0.011 a	0.0841±0.017 a
at 3rd day	0.1255±0.038 a	0.1227±0.008 a	0.0806±0.013 a
at 6th day	0.1132±0.037 a	0.1371±0.013 a	0.0717±0.005 a
at 7th day	0.1042±0.019 a	0.1398±0.012 a	0.1026±0.019 a
at 10th day	0.1055±0.023 a	0.1397±0.013 a	0.1099±0.027 a
at 11th day	0.1056±0.013 ab	0.1397±0.010 b	0.0861±0.014 a
2nd observed estrus	0.0836±0.015 ab	0.1456±0.012 b	0.0811±0.009 a

* Means within the same row followed by the same letters did not differ significantly ($P<0.05$) otherwise they do.

Table (4): Analysis of variance for data presented in table (3).

S.O.V.	d.f.	S.S.	M.S.	F.
Body weight (B)	2	0.0797	0.0399	18.14**
Intervals of estimation (I)	9	0.0063	0.0007	0.32
Interaction (BxI)	18	0.0198	0.0011	0.50
Error	250	0.5457	0.0022	

** = P < 0.01

4.1.3- Effect of parities:

Plasma estrogen level was estimated in ewes of different parities (from 1 to 5 parities) along the various stages of estrous cycle to detect any variation in this parameter due to this factor. Mean values of plasma estrogen level (ng/ml) are listed in table (5).

Results indicated showed no signifiant variation in plasma estrogen level due to parity number of ewes (Table 6). However, it was observed that ewes of 5 parities showed, relatively, higher values of plasma estrogen along the various stages of estrous cycle when compared to the corresponding values in ewes of other parities. This may be attributed to the insufficient number of ewes (2 ewes) available for the study rather than to the effect of the ewe's parity. On the other hand, plasma estrogen level showed no similar trend in the two succesive estrus period studied. While it was higher in the second estrus than in the first one in ewes of 1st, 2nd and 3rd parities, it was higher in the first estrus than in the second one in ewes of 4th and 5th parities. This also indicates the irregularity of the hormonal secretion along the reproductive life of the Ossimi ewes. However, no significant effect due to the estrous

stages was found on the level of estrogen in blood plasma (Table 6).

In addition no significant variation in plasma estrogen level was observed due to the interaction between parity number and stages of estrous cycle (Table 6).

Table (5): Plasma estrogen level (ng/ml) at the different stages of estrous cycle for Ossimi ewes in different parity number.

Stages of estrous cycle	Mean ± S.E. of plasma estrogen				
	1st parity (7 ewes)	2nd parity (4 ewes)	3rd parity (9 ewes)	4th parity (6 ewes)	5th parity (2 ewes)
Pro-estrus (2 days)	0.1080±0.017	0.0978±0.007	0.1243±0.012	0.1082±0.023	0.1381±0.040
1st observed estrus	0.1154±0.016	0.1273±0.031	0.1191±0.013	0.1195±0.027	0.1704±0.014
Met-estrus (2 days)	0.1327±0.011	0.1045±0.010	0.1141±0.013	0.1026±0.019	0.1527±0.004
Diestrus:					
at 2nd day	0.1043±0.014	0.1039±0.012	0.1393±0.016	0.1372±0.060	0.1239±0.030
at 3rd day	0.1013±0.012	0.1004±0.009	0.1156±0.012	0.1459±0.030	0.1276±0.064
at 6th day	0.1245±0.024	0.0915±0.007	0.1306±0.019	0.1135±0.020	0.1820±0.112
at 7th day	0.1282±0.022	0.1121±0.014	0.1238±0.012	0.1367±0.023	0.1535±0.087
at 10th day	0.1128±0.018	0.1246±0.021	0.1447±0.022	0.1343±0.024	0.1129±0.049
at 11th day	0.1110±0.018	0.1059±0.005	0.1358±0.014	0.1331±0.024	0.1534±0.048
2nd observed estrus	0.1343±0.025	0.1401±0.041	0.1279±0.012	0.1017±0.019	0.1241±0.054

Table (6): Analysis of variance for data presented in table (5).

S.O.V.	d.f.	S.S.	M.S.	F.
Parity number (P)	4	0.0187	0.0047	1.88
Intervals of estimation (I)	9	0.0063	0.0007	0.28
Interaction (PxI)	36	0.0423	0.0012	0.48
Error	230	0.5842	0.0025	

4.1.4- Effect of type of birth:

Data listed in table (7) show the effect of type of birth (ewes having single or twin lambs) on the plasma estrogen level along the various stages of the estrous cycle.

Type of birth showed significant effect ($P < 0.01$) on plasma estrogen level (ANOVA table 8). During various stages of the first estrous, ewes having single lambs showed higher averages of plasma estrogen level when compared with the corresponding averages in ewes having twins. The higher average of plasma estrogen was observed at the 7th day of the diestrus stage in ewes having single lamb (0.1386 ng/ml) and at the 11th day of diestrus stage for ewes having twins (0.1113 ng/ml). The lower level was found at proestrus (0.1250 ng/ml) and at the 3rd day of diestrus stage (0.0970 ng/ml) in ewes having single lamb and twin lambs, respectively.

On the other hand, at the second estrus stage, ewes having twins showed higher average of plasma estrogen level (0.1538 ng/ml) than those having single lamb (0.1215 ng/ml). This is scientifically quite logic and may be attributed to the increasing number of the ovarian follicles formed and developed in case of twining which increase the total amount of

2- REVIEW OF LITERATURE

2.1- Role of gonadal and sexual hormones in regulating the reproductive activities in sheep:

It is well established that reproductive activities in mammals are considered mainly as a matter of the hormonal regulation, since the reproductive efficiency was, always, found to be closely related to the well balanced hormonal secretion existed during the various reproductive stages.

Follicle Stimulating Hormone (FSH) acts early in follicular development and certainly is required for the formation of the antrum folliculi. Perhaps more improtantly, FSH, acting synergistically, with estrogens causing the formation of both FSH and LH receptors in the granulosa cells of the follicle (Richards and Midgley, 1976). Miller et al. (1977), reported that, estradiol -17 β (E_2) plays an inhibitory role in regulating the synthesis and release of FSH through the estrogen receptors found in the hypothalamus (Pfaff, 1968), as well as in the pitiutary (Stumpf et al., 1975).

During the preovulatory phase of the estrous cycle in the sheep, plasma FSH levels decline as the concentrations of the gonadal steroids increase in

response to increased pulsatile secretion of LH (Baird and McNeilly, 1981). Both gonadotrophic hormones act upon the ovarian follicle to stimulate estrogen secretion (Short and Bulman, 1972). About three days prior to ovulation, circulating levels of estradial -17 β increases, causing increase in LH surge from the pituitary gland which causes the mature Graafian follicle to ovulate (Goding et al., 1969). However, an imbalanced release of both gonadotrophic hormones (FSH and LH) from the pituitary causes an absence of ovulation, especially, in anestrous ewes. In addition to the negative feedback mechanism upon gonadotropin secretion, McCann and Porter (1969), stated that, estrogen also exerts a positive feedback on LH secretion but not upon FSH. They added that, in the second half of the follicular period, FSH decreases as estrogen rises due to the negative feedback effect. On the contrary the positive feedback control of estrogen is operative upon LH secretion during this period as the level of this hormone increases. Beck and Convey (1977), suggested that, the positive feedback effects of estrogen (E_2) on LH secretion are at least partially due to a progressive increase in pituitary responsiveness to GnRH.

estrogen secreted. In addition the failure of maintaining the level of estrogen throughout the successive estrus stages indicate that twining in Ossimi sheep could not be considered, genetically, a pure character.

Analysis of variance for data obtained showed no significant variation in plasma estrogen level due to the stages of estrous cycle (ANOVA table 8), which indicates the irregularity of the hormonal secretion along the sexual cycle.

The interaction between type of birth and estrus cycle stages showed no significant effect on the level of plasma estrogen (Table 8).

Table (7): Plasma estrogen level (ng/ml) at the different stages of estrous cycle in Ossimi ewes having single or twin lambs.

Stages of estrous cycle	Mean ± S.E. of plasma estrogen in Ossimi ewes having	
	Single lambs (15 ewes)	Twin lambs (7 ewes)
Pro-estrus (2 days)	0.1250±0.011	0.1062±0.014
1st observed estrus	0.1289±0.009	0.0997±0.015
Met-estrus (2 days)	0.1252±0.009	0.1003±0.016
Diestrus:		
at 2nd day	0.1255±0.009	0.1111±0.022
at 3rd day	0.1294±0.012	0.0990±0.016
at 6th day	0.1358±0.015	0.1083±0.018
at 7th day	0.1386±0.011	0.1016±0.016
at 10th day	0.1298±0.011	0.0971±0.016
at 11th day	0.1314±0.008	0.1113±0.017
2nd observed esturs	0.1215±0.010	0.1538±0.031

Table (8): Analysis of variance for data presented in table (7).

S.O.V.	d.f.	S.S.	M.S.	F.
Type of birth (T)	1	0.0195	0.0195	9.75**
Intervals of estimation (I)	9	0.0043	0.0005	0.25
Interaction (TxI)	9	0.0168	0.0019	0.95
Error	200	0.3973	0.0020	

** = P < 0.01

4.1.5- Effect of the lamb sex:

Averages of plasma estrogen concentration (ng/ml) along the various stages of estrous cycle for Ossimi ewes having male or female lambs are tabulated in table (9).

No significant variation could be observed due to the lamb sex (ANOVA table 10). This is scientifically logic since the amount of estrogen hormone secreted depends mainly on the number of the ovarian follicles developed on the ovary and the secreting activity of the thecal cells rather than the sex of the embryo expected to be implanted and developed.

No significant differences were observed in the average of plasma estrogen level between different stages of the estrous cycle (Table 10). This may indicate that the estrogenic secretion had irregular rates along the estrous period.

Finally, the interaction between lamb sex and estrous cycle stages showed no significant effect on plasma estrogen concentration.

Table (9): Plasma estrogen level (ng/ml) at the different stages of estrous cylce in Ossimi ewes having male or female lambs.

Stages of estrous cycle	Mean ± S.E. of plasma estrogen in Ossimi ewes having	
	Male lambs (10 ewes)	Female lambs (5 ewes)
Pro-estrus (2 days)	0.1245±0.016	0.1261±0.016
First observed estrus	0.1297±0.013	0.1274±0.018
Met-estrus (2 days)	0.1207±0.013	0.1342±0.016
Diestrus:		
at 2nd day	0.1178±0.009	0.1410±0.020
at 3rd day	0.1352±0.015	0.1178±0.020
at 6th day	0.1391±0.020	0.1291±0.019
at 7th day	0.1477±0.012	0.1202±0.020
at 10th day	0.1378±0.014	0.1139±0.020
at 11th day	0.1301±0.010	0.1339±0.016
2nd observed esturs	0.1245±0.013	0.1154±0.019

Table (10): Analysis of variance for data presented in table (9).

S.O.V.	d.f.	S.S.	M.S.	F.
Sex of lamb (S)	1	0.0008	0.0008	0.42
Intervals of estimation (I)	9	0.0039	0.0004	0.21
Interaction (SxI)	9	0.0075	0.0008	0.42
Error	130	0.2411	0.0019	

Discussing results concerning the estrogen pattern during estrous cycle and the effect of the studied factors that suggested to have a considerable influence on estrogen level variation during this period to give a scientific servey for the hormonal pattern in Ossimi breed of sheep, it was clear that, in all groups of experimental ewes, there was'nt any significant variation in plasma estrogen level due to the estrous cycle stages. This disagreed with findings of many investigators (Moore et al., 1969; Strott et al., 1969; Ross et al., 1970; Pant et al., 1973; Niswender et al., 1974; Pant et al., 1977; Carson et al., 1978; Scaramuzzi and Land, 1978 and Baird and McNeilly, 1981) who all found that, estrogen level in circulating blood has a well recognized pattern throughout the estrous cycle. This pattern is a result of the interplay between the ovarian and hypothalamic-pituitary hormones (Pfaff, 1968; Niswender et al., 1974; Stumpf et al., 1975; Coppings and Malven, 1976; Beck and Convey, 1977 and Clarke et al., 1978).

During the follicular phase of the cycle there is a rapid increase in the blood level of estrogen (McNatty et al., 1981) which is an essential requirement for the onset of the behavioral estrus (Niswender

et al., 1974 and Pant et al., 1977). The peak of estrogen during the follicular phase exerts a positive feedback influence on the hypothalamo-hypophyseal axis resulting in the ovulatory surge of LH (Goding et al., 1969; McCann and Porter, 1969; Koreman et al., 1970; Ross et al., 1970; Niswender et al., 1974; Beck and Convey, 1977 and Goodman and Karsch, 1980). At the end of estrus, circulating estrogen and LH decline (Koreman et al., 1970 and Ross et al., 1970). In the postovulatory phase (metestrus), estrogen level declines and begins the progesterone secretion (Austin and Short, 1972 and McNatty et al., 1981). Proestrus is called the period after the corpus luteum fails when the progestorone level drops and FSH release stimulates folicle growth and rising estorgen levels lead to estrus (Koreman et al., 1970; Ross et al., 1970; Niswender et al., 1974 and Baired and McNeilly 1981).

This pattern was not clear in experimental Ossimi ewes which may be due to either the system applied in blood sampling along the estrous cycle or to the absence of the feedback oscillation of the hypothalamic-pituitaryovarian system. This may be the main physiological reason explaining the "relative" low reproductive and productive capacities

in this local breed of sheep. It is thus recommended that a special breeding program must be planned and carried out to improve the feedback oscillation of the hypothalamic-pituitary-ovarian system. This will, certainly lead to improve the reproductive pattern and to increase the productivity of this breed of sheep.

In addition it was found that except the ewe's body weight and the type of birth, other factors studied had no significant effect on the variation in plasma estrogen level during estrous cycle. This goes in harmony with findings of many investigators (Niswender et al., 1974; Beck and Convey, 1977; Baired and McNeilly, 1981 and Mivake et al., 1982) who reported that plasma estrogen level during estrous cycle was under control of the hypothalamic-hypophyseal relationships rather than under the control or influence of any other factor. This may lead to conclude that, there is no relationship between any factor studied and the estrogen level during estrous cycle or the reproductive ability of the ewe. So, these factors must not considered, by any mean, as important factors affecting the reproductive capacity in Ossimi ewes.

4.1.6- Plasma estrogen pattern at successive estrus for ewes of different parities showed irregular estrous cycle

About fourteen ewes gave forty one observed estrus of different parities (from one to five) and irregular estrous cycles were selected to find out the pattern of plasma estrogen at the successive estrus to illustrate the relation between estrous irregularity and estrogen level. In these ewes conception may occur after occurrence of several estrus and trials of mating or may not occur inspite of repeated mating at different observed estrus. Mean values are listed in table (11) while individual estimations for each ewe at each estrus and occurrence of conception are tabulated in table (13).

Inspecting the mean data (Table 11) showed that, average estrogen level had no similar magnitude at the successive estrus. In addition it showed no recognized trend either within parity or between different parities. For example, while ewes of the 5th parity showed the higher average of estrogen hormone (0.1565 ng/ml) at their first observed estrus when compared to those of other parities, ewes of the 4th, 1st and 3rd parities showed the higher plasma estrogen average at their fourth, third and fourth

estrus, respectively (0.1266, 0.2871 and 0.1835 ng/ml, respectively) [Table 11]. Similarly, while average of plasma estrogen level reached its highest level at the third observed estrus (0.2871 ng/ml) in ewes of the first parity, the maximum values were observed at the first estrus for ewes of 2nd and 5th parities (0.1517 and 0.1565 ng/ml, respectively) and at the fourth observed estrus in ewes of third (0.1835 ng/ml) and fourth (0.1266 ng/ml) parities.

However, analysis of variance for the obtained data did not show any significant variation in plasma estrogen level due to the parity number, successive estrus and the interaction between them (ANOVA Table 12). This may be attributed to the lack of number available or to the individual variation in hormonal regulation. In addition the insignificant variation found due to either parities or observed estrus does not let us to neglect the hormonal imbalance, existed, as a main reason for the estrus irregularity which is clearly obvious when estimated values for individual ewe were inspected (Table 13).

Data listed in table (13) showed contradictory results by means of which no scientific or logic statement could be concluded. However, it could be reported that, level of plasma estrogen had different

pattern in each individual ewe. While it took a constant or nearly constant value between different estrus in some ewes (see ewe no. 921, 1137, 1138, 1882 and 1880), its magnitude flactuated in others. In addition, in some ewes showing a constant plasma estrogen value, conception occurred after the third estrus (ewe No. 1137) or fourth estrus (ewes No. 1880 and 1882). However, in others, no conception was obtained and no more estrus was observed after the second estrus. In most of experimental ewes conception occurred after plasma estrogen reached a certain level.

From all previously mentioned results, it could be concluded that, level of estrogen is not the main physiological requirement for the occurrence of conception and is not alone the main reason for estrous cycle regularity. But the balance between hypothalamus, pituitary and gonadal hormonal activity is required for regular reproductive performance in ewes. Estrogen level during estrous cycle stages is a result of this hormonal balance and may be one of the most important hormone regulating hypothalamic-hypophyseal-gonadal axis but is not the only hormone causing the hormonal balance required for optimum reproductive activity. It is well known that during the stage of follicular formation estrogen level increases

to the level causing a decrease in FSH secretion from the pituitary and increase in LH causing ovulation (Koreman et al., 1970; Ross et al., 1970 and Baird and McNeilly, 1981). This usually occurs during the last half of heat period and is more closely related to the end of estrus than to the begining (McDonald, 1975). Thus estrogen surge from the ovary must be at a level sufficient to cause LH release from the pituitary and correspondingly to cause ovulation at the peak of sexual desire. At this case only conception is obtained. In pure breeds of ewes the hormonal balance is clear and estrogen level at which feedback mechanism between gonads and pituitary is approximately similar within successive estrus and between individuals within each breed. This was not quite clear in Ossimi which supports the statment that a breeding programe must be planned to select ewes of good hormonal balance and not of a certain reproductive performance.

Table (11): Average of plasma estrogen level (ng/ml) for Ossimi ewes of different parities showing irregular estrous cycle.

Parity number	Plasma estrogen level (ng/ml) (M ± S.E)			
	1st observed estrus	2nd observed estrus	3rd observed estrus	4th observed estrus
1st parity	0.1070 ± 0.04	0.0873 ± 0.02	0.2871 ± 0.00	0.1412 ± 0.00
2nd parity	0.1517 ± 0.07	0.0949 ± 0.01	--	--
3rd parity	0.1284 ± 0.02	0.1239 ± 0.02	0.1538 ± 0.04	0.1835 ± 0.00
4th parity	0.1247 ± 0.03	0.1261 ± 0.03	0.1254 ± 0.03	0.1266 ± 0.06
5th parity	0.1565 ± 0.00	0.0634 ± 0.00	0.0727 ± 0.00	--

Table (12): Analysis of variance for data presented in table (11).

S.O.V.	d.f.	S.S.	S.S.%	M.S.	F ratio
Parity (P)	4	0.0069	5.8	0.0017	0.55
Observed estrous (O)	3	0.0093	7.8	0.0031	1.00
Interaction (PxO)	12	0.0380	31.8	0.0032	1.03
Error	21	0.0653	54.6	0.0031	
Total	**40**	**0.1195**	**100%**		

Table (13): Estimated values of plasma estrogen level (ng/ml) at successive estrous for ewes of different parities showed irregular estrous cycle.

Parity No.	Ewe No.	estrogen level at the ..... observed estrus in ng/ml			
		First	Second	Third	Fourth
1	1314	0.1464	0.1112	0.2871	0.1412*
	1138	0.0675	0.0634**	--	--
2	1042	0.2197	0.1061**	--	--
	921	0.0836	0.0836**	--	--
	1137	0.0805	0.0805	0.0805*	--
	1116	0.1835	0.1835	0.2093	0.1835*
3	1886	0.1726	0.1335*	--	--
	418	0.0987	0.1190**	--	--
	1876	0.1068	0.1030**	--	--
	1882	0.0634	0.0634	0.0634	0.0697*
4	1880	0.1835	0.1835	0.1835	0.1835*
	809	0.1272	0.1315	0.1294**	--
5	861	0.1565	0.0634	0.0705*	--
	1879	0.1565	0.0634	0.0749**	--

* At which conception occurred.

** No conception and no more estrus.

4.1.7- The regression equations for predicting plasma estrogen level during estrous cycle:

The data in table (14) indicate that, in each of the first fourth parities of Ossimi ewes, difference in plasma estrogen level among different stages of estrous cycle were not statistically significant. It may be stated that differences were not of considerable magnitudes to attain significance.

Estimating the variation due to the linear trend from the data and dividing it by the total variation among different stages gave a low percentage of the variation which could not be predicted from a linear regression equation. Otherwise, the test for linear trend is not significant. Therefore, a first-degree equation (linear equation) is not the form of the best fitting curve for prediction of the level of estrogen during estrous cycle.

The same resutls were obtained when the second-degree equation (quadratic) was calculated.

Fig. (2) graphically illustrates the changes occurred in plasma estrogen level among different days during estrous cycle in Ossimi ewes.

Table (14): Least squares analysis of variance for plasma estrogen level (ng/ml) during different stages of estrous cycle in ewes.

Source of variation	1st parity		2nd parity		3rd parity		4th parity	
	d.f	M.S	d.f	M.S	d.f	M.S	d.f	M.S.
Among different stages	9	0.0001	9	0.0009	9	0.0009	9	0.0016
Error	60	0.0025	30	0.0015	80	0.0020	50	0.0034

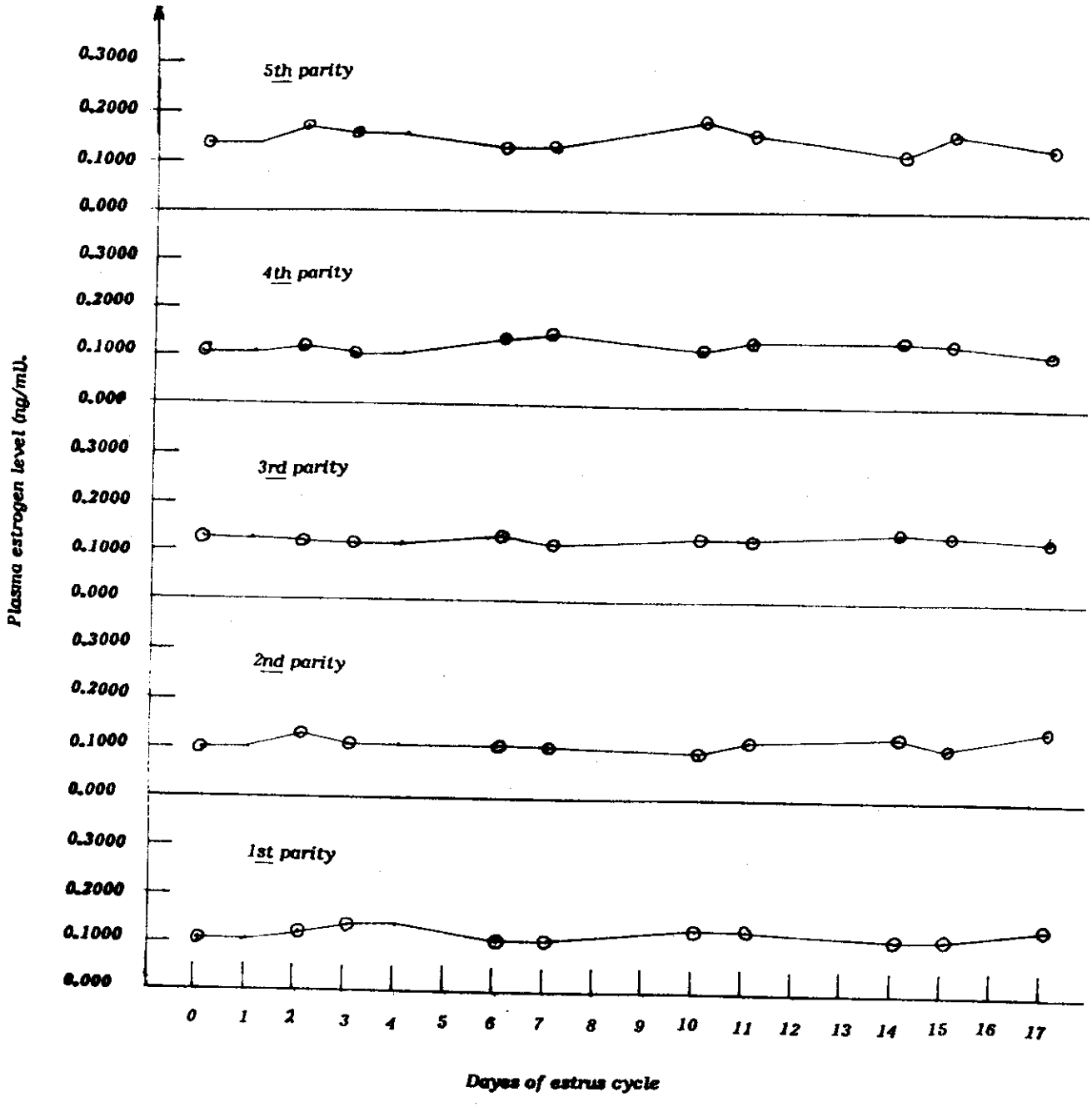

Fig. (2): Plasma estrogen level (ng/ml) at different stages of estrus cycle for Ossimi ewes of different parity number.

4.1.8- The linear correlation between plasma estrogen level and time intervals throughout the estrous cycle in Ossimi ewes:

Table (15) shows the linear correlation between plasma estrogen level and time intervals throughout the estrous cycle in Ossimi ewes.

From the table, it is shown that, the coefficients of correlation were positive and very low which are in accordance with the corresponding result concerning the linear regression (Table 14) which showed insignificant values.

Results in Table (15), indicated that, ewes of the 2nd parity showed 'relatively' adequate correlation coifficient value (0.164) when compared with the values of the other parities. While, the value of the 4th parity was the lowest among them.

Table (15): The linear correlation between plasma estrogen level and time intervals throughout the estrous cycle in Ossimi ewes.

Parity number	The linear correlation coefficient values
Changes in dates within:	
1st parity	0.075
2nd parity	0.164
3rd parity	0.109
4th parity	0.022

4.2- Plasma estrogen level during the pregnancy period:

Plasma estrogen level was estimated in Ossimi ewes of different parity number, different body weight, type of birth, sex of lamb (ewes having male or female lamb) and of different ages. Estimation was carried out during pregnancy period at 30 days intervals starting from the 10th day after conception up to the 130th day of pregnancy.

4.2.1- Effect of ewe's age:

Data presented in table (16) showed averages of plasma estrogen at 30 days intervals along 130 days of pregnancy period for Ossimi ewes of different ages.

It was observed that ewes aging 40 to less than 60 months (40- months) showed, relatively, higher averages of plasma estrogen at all intervals of estimations when compared with the corresponding values of ewes aging either 20 to less than 40 months (20-months) or 60 months and more (60- months). However, analysis of variance for data obtained showed no significant variation in plasma estrogen level due to the ewe's age (ANOVA Table 17).

The insignificant effect of ewe's age on estrogen level in blood plasma of pregnant ewes may lead to conclude that hormonal level during pregnancy is the result of the gonadotrophic-gonadal hormonal balance rather than the ewe's age.

On the other hand, plasma estrogen level decreased or slightly increased during the first 70 days of pregnancy while it obviously increased during the last period reaching its maximum level at the 130th day. The rate of increase was, relatively, higher in ewes aging 40- months proceeded by those aging 20-months and 60- months. Plasma estrogen level increased by 0.3126, 0.2515 and 0.2327 ng/ml during the period from 70 to 130 days of pregnancy for ewes aging 40-months, 20- months and 60-months, respectively. Analysis of vairance for data (ANOVA Table 17) showed significant ($P < 0.01$) vairation in plasma estrogen level due to the periods of estimation.

However, the interaction between ewe's age and intervals of estimation had no significant effect on plasma estrogen level (ANOVA Table 17).

Many investigators reported that, plasma estrogen showed a gradual increase toward the end of the pregnancy and showed an acute incrase during the

last day of pregnancy (Challis, 1971; Liggins et al., 1972; Thorburn et al., 1972; Currie et al., 1973 and Robertson and Smeaton, 1973).

Table (16): Plasma estrogen level (ng/ml) at 30 days intervals throughout pregnancy period for Ossimi ewes of different ages (in months).

Time of estimation (days during pregnancy period)	Mean ± S.E. of plasma estrogen in Ossimi ewes of age ranging from		
	20 ----- (11 ewes)	40 ----- (9 ewes)	60 ---- (5 ewes)
10th days	0.1127±0.006	0.1192±0.013	0.1240±0.028
40th days	0.1053±0.009	0.1361±0.009	0.1019±0.022
70th days	0.1052±0.009	0.1336±0.012	0.1151±0.012
100th days	0.1906±0.030	0.1932±0.012	0.1530±0.022
130th days	0.3567±0.046	0.4462±0.086	0.3478±0.050

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

S.O.V.	d.f.	S.S.	M.S.	F.
Ewe age (A)	2	0.0326	0.0163	1.72
Intervals of estimation (I)	4	1.3704	0.3426	36.06**
Interaction (AxI)	8	0.0332	0.0042	0.44
Error	110	1.0450	0.0095	

** = P < 0.01

4.2.2- Effect of ewe's body weight:

Table (18) shows averages of plasma estrogen in ng/ml. for Ossimi ewes of different body weight estimated at 30 days intervals throughout 130 days of pregnancy period. Analysis of variance for these data is presented in table (19).

It was found that, ewes weighing 50 kg and more (50- kg) showed higher average of plasma estrogen level at 10th, 40th and 70th day of pregnancy, while those weighing 40 to less than 50 kg (40- kg) had, relatively, the higher average at 100th and 130th day of pregnancy. Averages of plasma estrogen in ewe's weighing 30 to less than 40 kg (30- kg) were, the lowest when compared with the corresponding values of the other two groups of ewes (Table 18).

However, analysis of variance (ANOVA Table 19) showed no significant vaiation in plasma estrogen level due to ewe's body weight.

These results go in agreement with those obtained by Anderson et al. (1975) and Steele et al. (1976), who stated that, plasma estrogen level is a function of hormonal balance between pituitary and gonads rather than the ewe's body weight.

Plasma estrogen level decreased, during the first month (from 10 to 40 days) in ewes weighing 30- kg and 40- kg, while it continued decreasing up to the 70th day of the gestation period in ewes weighing 50- kg. Then it increased up to the end of experimental period. It reached its maximum level at the 130th day of pregnancy. The rate of increase during the previously mentioned periods was higher in ewes weighing 40- kg proceeded by those weighing 50- kg and 30- kg, respectively. Plasma estrogen level increased by 0.1988, 0.2877 and 0.2177 ng/ml in ewes weighing 30- kg, 40- kg and 50- kg, respectively.

Analysis of variance for data obtained showed significant ($P < 0.01$) variation in plasma estrogen due to the period of estimation (ANOVA Table 19).

These results agree with those of Challis (1971); Liggins et al. (1972); Anderson et al. (1975); Steele et al. (1976) and Challis et al. (1977), who stated that, there was an obvious increase in estrogen level near the time of parturition or at the end of gestation period.

The interaction between ewe's weight and intervals of estimation was found to be of no significant effect on the level of plasma estrogen.

Table (18): Plasma estrogen level (ng/ml) at 30 days intervals throughout the pregnancy period for Ossimi ewes having different body weight (in kg).

Time of estimation (Days during pregnancy period)	Mean ± S.E. of plasma estrogen in Ossimi ewes of body weight ranging from		
	30 ----- (3 ewes)	40 ---- (20 ewes)	50 ---- (2 ewes)
10th days	0.1107±0.028	0.1174±0.007	0.1271±0.057
40th days	0.1049±0.028	0.1164±0.007	0.1246±0.059
70th days	0.1175±0.018	0.1168±0.008	0.1235±0.060
100th days	0.1185±0.022	0.1941±0.019	0.1816±0.002
130th days	0.3037±0.039	0.4041±0.045	0.3423±0.159

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

S.O.V.	d.f.	S.S.	M.S.	F.
Body weight (W)	2	0.0197	0.0099	0.89
Intervals of estimation (I)	4	1.3704	0.3426	30.86**
Interaction (WxI)	8	0.0269	0.0034	0.31
Error	110	1.2175	0.0111	

** = P < 0.01

4.2.3- Effect of parities:

Data concerning the effect of parities on plasma estrogen level through 130 days of gestation period is presented in table (20).

From results obtained it was observed that ewes of the third parity almost, had the higher averages of plasma estrogen when compared with the corresponding values in ewes of the other experimental groups. However, analysis of variance for this data revealed no significant variation in plasma estrogen level due to the parity number (ANOVA Table 21). This lead to state that sexual hormone secretion reached its optimum level after sexual maturity and maintained without any remarkable change up to the end of the reproductive life of the ewe.

Ewes having null, 1st, and 4th parity, plasma estrogen level decreased during the period from 10 to 40 days of pregnancy then increased steadily till the end of 130 days of gestation period. The decreasing period continued up to the 70th day in ewes having the 2nd parity then plasma estrogen level increased towards the end of the 130th day of pregnancy. On the other hand, decreases in plasma estrogen level did not exist in ewes of the 3rd parity except during the period from 40 to 70 days of pregnancy period while increased during the other periods studied.

Table (20): Plasma estrogen level (ng/ml) at 30 days intervals throughout the pregnancy period of Ossimi ewes in different parity number.

Time of estimation (Days during pregnancy period)	Mean* ± S.E. of plasma estrogen				
	Null parity (2 ewes)	1st parity (7 ewes)	2nd parity (3 ewes)	3rd parity (8 ewes)	4th parity (5 ewes)
10th days	0.1217±0.006 a	0.1054±0.011 a	0.1410±0.027 a	0.1250±0.013 a	0.1059±0.021 a
40th days	0.0789±0.015 b	0.0984±0.006 ab	0.1294±0.026 ab	0.1434±0.009 a	0.1019±0.022 ab
70th days	0.1074±0.022 a	0.1064±0.013 a	0.1113±0.008 a	0.1332±0.014 a	0.1151±0.021 a
100th days	0.2685±0.144 a	0.1899±0.031 a	0.1465±0.027 a	0.2019±0.019 a	0.1359±0.021 a
130th days	0.5432±0.061 a	0.3660±0.074 a	0.2876±0.058 a	0.4232±0.091 a	0.3563±0.044 a

* Means within the same row followed by the same letters did not differ significantly ($P<0.05$) otherwise they do.

Table (21): Analysis of variance for data presented in table (20).

S.O.V.	d.f.	S.S.	M.S.	F.
Parity number (P)	4	0.0557	0.0139	1.45
Intervals of estimation (I)	4	1.3704	0.3426	35.69**
Interaction (PxI)	16	0.0934	0.0058	0.60
Error	100	0.9617	0.0096	

** = P < 0.01

4.2.4- Effect of type of birth:

Averages of plasma estrogen level for Ossimi ewes having single or twins lamb at 30 days intervals along 130 days of gestation period are tabulated in table (22).

Results obtained revealed that, except at the 10th day of gestation period averages of plasma estrogen level were higher in ewes having twins than those having a single lamb. However, analysis of variance for data did not show any significant variation in plasma estrogen concentration due to the type of birth (ANOVA Table 23). This may be due to either the hormonal irregularity characterizing Ossimi ewes in general or to the insufficient number of the available experimental ewes which did not enable to indicate the effect of the type of birth on estrogen level in the pregnant ewes blood.

Ewes having single lamb, plasma estrogen level decreased by 0.0081 ng/ml during the first month (10 to 40 days) then it increased towards the end of the pregnancy period. The rate of increase was, relatively, low during the first proceeding month (40 to 70 days) while it was higher during the last period of gestation period (100 to 130 days).

Plasma estrogen pattern differed in ewes having twin lambs. It increased steadily from the first period of gestation up to the end of experimental period, with lower rate during the first period when compared with the rate during the last period.

In both two groups of ewes (having single lamb or twin lambs) plasma estrogen concentration reached its maximum value at the 130th day of gestation period. However, at this time ewes having twins showed higher plasma estrogen average (0.4273 ng/ml) than those having single lamb (0.3682 ng/ml) as shown in table (22).

Analysis of variance (ANOVA Table 23) showed significant ($P < 0.01$) variation in plasma estrogen level due to the period of estimation. While no significant variation was detected in this trait due to the interaction between type of birth and the estimation period.

Table (22): Plasma estrogen level (ng/ml) at 30 days intervals throughout pregnancy period for Ossimi ewes having single or twins lambs.

Time of estimation (Days during pregnancy period)	Mean ± S.E. of plasma estrogen for Ossimi ewes having	
	Single lambs (17 ewes)	Twins lambs (8 ewes)
10th days	0.1205±0.007	0.1107±0.018
40th days	0.1124±0.009	0.1225±0.013
70th days	0.1134±0.008	0.1238±0.017
100th days	0.1731±0.021	0.2073±0.019
130th days	0.3682±0.047	0.4273±0.067

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

S.O.V.	d.f.	S.S.	M.S.	F.
Type of birth (T)	1	0.0115	0.0115	1.22
Intervals of estimation (I)	4	1.3704	0.3426	36.45**
Interaction (TxI)	4	0.0155	0.0039	0.41
Error	115	1.0838	0.0094	

** = P < 0.01

4.2.5- Effect of the lamb sex:

Data presented in table (24) show the effect of the lamb sex on plasma estrogen level during 130 days of the gestation period.

Result obtained revealed that, average of estrogen level in blood of pregnant ewes having female embryo was higher than of those having male embryo at 10th, 40th and 70th days of gestation period and lower at 100th and 130th days (Table 24). However, analysis of variance for these obtained data did not show any significant effect due to the sex of the lamb on the level of plasma estrogen during pregnancy (ANOVA Table 25). This is scientifically logic since the estrogen hormone is the function of the maternal gonadal activity rather than the influence of the sex of the embryo.

In case of ewes having male embryo, plasma estrogen concentration decreased slightly during the peirod from 10 to 30 days of pregnancy then it increased towards the end of the gestation period. The rate of this increase was low during the first period and relatively higher during the last two months (from 70 to 130 day).

Plasma estrogen pattern differed in ewes having female embryo. In this case estrogen level in blood plasma increased from the begining of gestation and remained so till the end of the pregnancy peirod. The rate of increase grew higher towards the end of the pregnancy period.

On the other hand, at the 130th day of pregnancy ewes having male lamb showed, relatively, higher plasma estrogen average (0.4165 ng/ml) than those having female one (0.2942 ng/ml).

Analysis of variance for obtained data showed significant ($P < 0.01$) variation in plasma estrogen level due to the pregnancy time while the interaction between time of gestation and sex of lamb was of no significant value (ANOVA Table 25).

Table (24): Plasma estrogen level (ng/ml) at 30 days intervals throughout pregnancy period for Ossimi ewes having male or female lambs.

Time of estimation (Days during pregnancy period)	Mean ± S.E. of plasma estrogen for Ossimi ewes having	
	Male lambs (19 ewes)	Female lambs (6 ewes)
10th days	0.1167±0.009	0.1192±0.014
40th days	0.1137±0.009	0.1220±0.014
70th days	0.1153±0.008	0.1239±0.016
100th days	0.1862±0.019	0.1770±0.025
130th days	0.4165±0.045	0.2942±0.059

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

S.O.V.	d.f.	S.S.	M.S.	F.
Sex of lamb (S)	1	0.0115	0.0115	1.26
Intervals of estimation (I)	4	1.3704	0.3426	36.65**
Interaction (SxI)	4	0.0578	0.0145	1.59
Error	115	1.0415	0.0091	

** = P < 0.01

From all obtained results concerning the estrogen level during the pregnancy period it was found that, non of the factors studied had singificant effect on the level of plasma estrogen level during the pregnancy period. This is scientifically logic because estrogen level in the blood of the pregnant ewes is a result of hormonal activity of either hypothalamus or pituitary gland (Meites et al., 1951), which stimulate the formation of the corpus luteum (Kelly et al., 1974) and mantain its biological activity all over the gestaiton period in general and during the first half of this period specially (Meites et al., 1951; Denamur, 1974 and Miller and Stone, 1981). In addition the placental production of some gonadotropin-like hormones may play pronounced role in this aspect.

In all species of mammals and specially in ewes, the production of estrogen and progesterone during pregnancy continues to rise throughout most of the pregnancy period (Bassett et al., 1969; Challis, 1971; Liggins et al., 1972; Thorburn et al., 1972; Currie et al., 1973; Robertson and Smeaton, 1973; Cox, 1975 and Gamal, 1986). This is quite typical to findings of the present work. Gradual and continuous rise in the level of plasma estrogen was observed

in all experimental groups of ewes. It was reported by McDonald (1975) that, corpus luteum production of estrogen and progesterone is augmented, perhaps even replaced, by hormone production from placenta. He added that, there is usually a drop in the production of these hormones, just before parturition. This was not clear in the present study, which may be attributed to the stop of plasma estrogen estimation at the 130th day of the gestation period. The drop in estrogen level in blood plasma may occurr after this period and near the end of the gestation period.

Therefore, the linear regression equation is considered, in this study, the form of the best fitting curve for predicting the level of estrogen in any date during pregnancy.

The linear regression equations for pregnancy period in different parties are:

For Null parity $\hat{Y} = -0.0141 + 0.0034\ X$

For 1st parity $\hat{Y} = 0.0332 + 0.0020\ X$

For 2nd parity $\hat{Y} = 0.0911 + 0.0010\ X$

For 3rd parity $\hat{Y} = 0.0525 + 0.0022\ X$

For 4th parity $\hat{Y} = 0.0382 + 0.0018\ X$

Where,

$\hat{Y}$ denote predicted plasma estrogen level (ng/ml);

and

X denote any data during pregnancy period.

Curves in Fig. (3) illustrate changs in plasma estrogen level among different intervals during pregnancy period of Ossimi ewes in different parities and the prediction equations.

Table (26): Least squares analysis of variance for plasma estrogen level (ng/ml) during 30 days intervals along pregnancy period of ewes in different parities.

Source of variation	Null parity		1st parity		2nd parity		3rd parity		4th parity	
	d.f	M.S	d.f	M.S	d.f	M.S	d.f	M.S	d.f	M.S
Among different intevals	4	0.0746*	4	0.0912**	4	0.0151*	4	0.1259**	4	0.0593**
Linear	1	0.2133**	1	0.2627**	1	0.0288*	1	0.3430**	1	0.1430**
Quadratic	1	0.0842*	1	0.0975**	1	0.0271*	1	0.1340**	1	0.0744**
Cubic	1	0.0005	1	0.0043	1	0.0041	1	0.0263	1	0.0166*
Deviation from cubic	1	0.0004	1	0.0003	1	0.0004	1	0.0003	1	0.0032
Error	5	0.0100	30	0.0096	10	0.0034	35	0.0147	20	0.0038

* Significant at the 5% level.

** Significant at the 1% level.

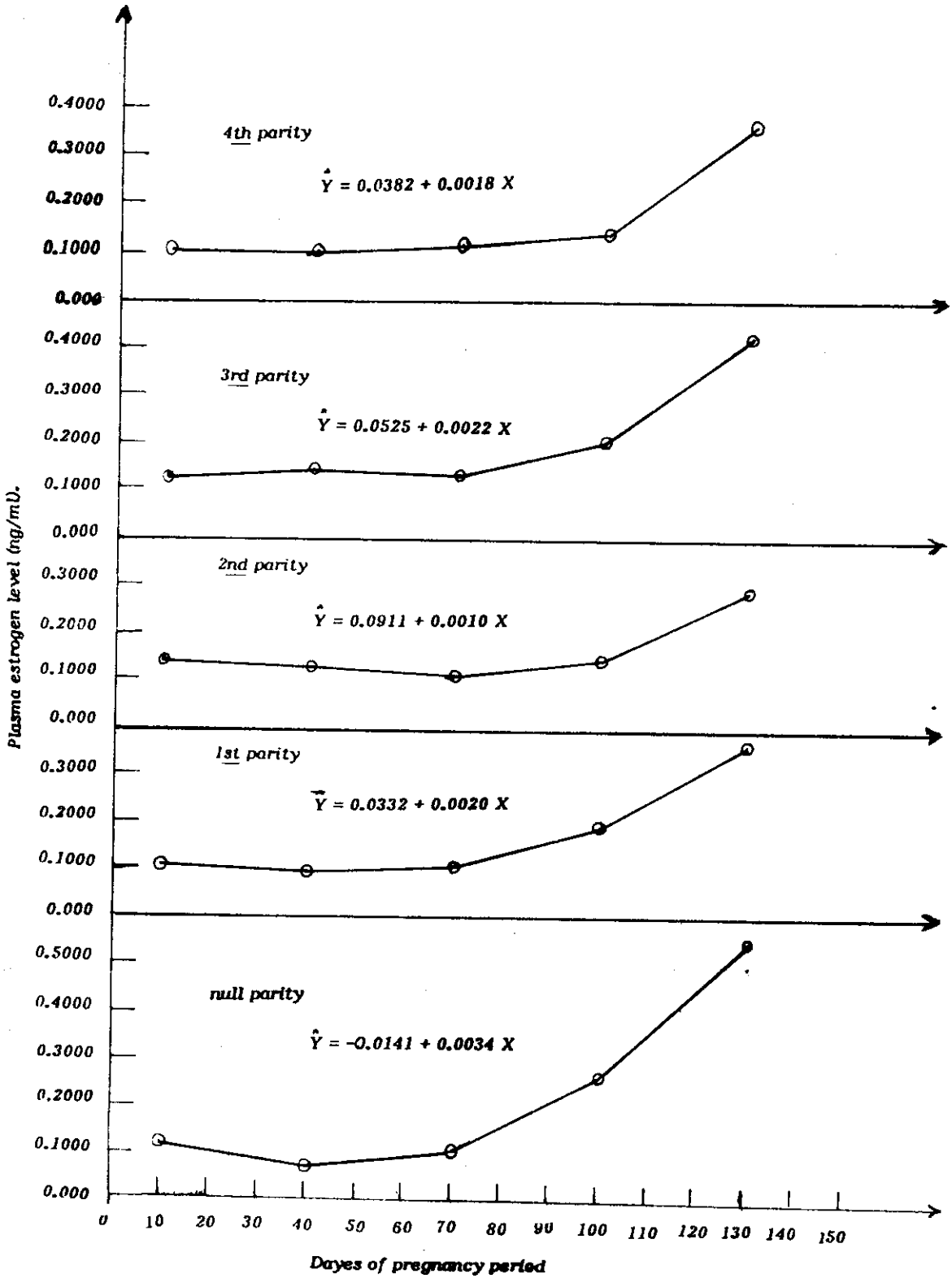

Fig. (3): Plasma estrogen level (ng/ml) at 30 days intervals throughout the pregnancy period for Ossimi ewes of different parity number.

4.2.7- The linear correlation between plasma estrogen level and time intervals along 130 days of pregnancy period of Ossimi ewes:

Table (27) shows the linear correlation between plasma estrogen level and time intervals along 130 days of pregnancy period of Ossimi ewes.

From the table, it is shown that the coefficients of correlation were positive and strong which is in accordance with the previous result of linear regression that showed highly signifiacnt values (see table 26).

Resutls obtained also indicated that ewes of Null parity showed the highest correlation coefficient value (0.783) when compared to those of the other parities. While, those of the 3rd parity had the lowest correlation coefficient value (0.581).

Table (27): The lienar correlation between plasma estrogen level and time intervals along 130 days of pregnancy period of Ossimi ewes.

Pairty number	The linear correlation coefficient values
Changes in dates within:	
Null parity	0.783
1st parity	0.634
2nd parity	0.692
3rd parity	0.581
4th parity	0.676

4.2.8- Gestation length (in days) as influenced by parity number, body weight and age of ewe, type of birth and the sex of the lamb:

General mean of the gestation length was estimated as well as the gestation length of ewes differed in type of birth, sex of the embryo, pairty number, age and body weight of ewe. Data is tabulated in table (28).

Results obtained revealed that, general mean of the gestation length averaged 151.68±0.05 days, which is similar to the average obtained by El-Wishy et al. (1971) [151.6 days] and slightly higher than that reported by Mabrouk et al. (1976) [151.2±0.1 days], but somewhat shorter than reported by Suliman et al. (1978) [153±3.3 days].

Inspecting data of gestation length in ewes of different parities, it was found that the shorter length was observed in ewes of the first parity (150.86 days) while the higher average of gestation length was found in ewes of the second parity (153.33 days). Generally, it could be reported that, average gestation length ranged from 150.86 to 153.33 days. However, analysis of variance showed no significant effect due to parity number on the gestation length (ANOVA Table 29).

Average of the gestation length was found to decrease as ewe's body weight increased. Variation in this trait due to the ewe's body weight was insignificant (ANOVA Table 29).

Similar results were found concerning the effect of either type of birth, sex of the embryo or ewe's age. Non of these factors was found to have any significant effect on gestation length (ANOVA Table 29).

Results obtained agreed with those obtained by Gordon (1967), Southam et al. (1971) and Dýrmundsson (1972), who all found that the length of gestation period in ewe lambs appeared to be similar to, or, in some cases, somewhat shorter than that observed in yearling and adult ewes. And also, agreed with those reported by Suliman et al. (1978), who found that gestation length was not significantly affected by age of ewe, sex of the foetus or litter size. On the contrary, they disagree with the findings of El-Wishy et al. (1971), who concluded that the sex of lambs and type of lambing had significant effect on gestation length.

Table (28): Gestation length (in days) as influenced by parity number, body weight and age of ewe, type of birth and sex of the lamb.

Classification	Gestation length
	Means ± S.E
General mean	151.68 ± 0.50
Parities:	
Null parity	151.00 ± 0.00
1st parity	150.86 ± 1.33
2nd parity	153.33 ± 0.67
3rd parity	152.00 ± 0.68
4th parity	151.60 ± 1.21
Ewe body weight:	
30- kg	152.33 ± 1.67
40- kg	151.75 ± 0.57
50- kg	150.00 ± 0.00
Ewe age:	
20- months	151.45 ± 0.89
40- months	152.11 ± 0.70
60- months	151.40 ± 1.08
Type of birth:	
Single	151.94 ± 0.68
Twins	151.13 ± 0.55
Sex of lamb:	
Male	151.47 ± 0.56
Female	152.33 ± 1.12

4.2.9- The relationship between the gestation length of ewes and the birth weight of their lambs:

Regression coefficient computation revealed that $b_{y.x} = xy/ x^2 = 0.06$. Thus, for a one-unit increase in X, there is an incrase of 0.06 unit of Y. Otherwise, it could be stated that, for a day increase in gestation length, there is an increase of 0.06 kg in birth weight.

In addition the following equation relates birth weight (Y) to gestation length (X)

$$Y = 0.06\ X - 5.8308$$

where

Y is the expected birth weight

X is a day increase in gestation length

Testing for the presence of linear regression revealed that ther is no regression.

The averages of gestation length in days of ewes and birth weight in kg of there lambs are shown in table (30).

Table (30): The averages of gestation length (in days) of ewes and birth weight of their lambs.

Gestation length (days)		Birth weight (kg)	
Mean	**Range**	**Mean**	**Range**
151.68	145-155	3.27	1.75-4

The original data are plotted in figure (4), from which it appears that a positive and weak relationship exists between birth weight and gestation length.

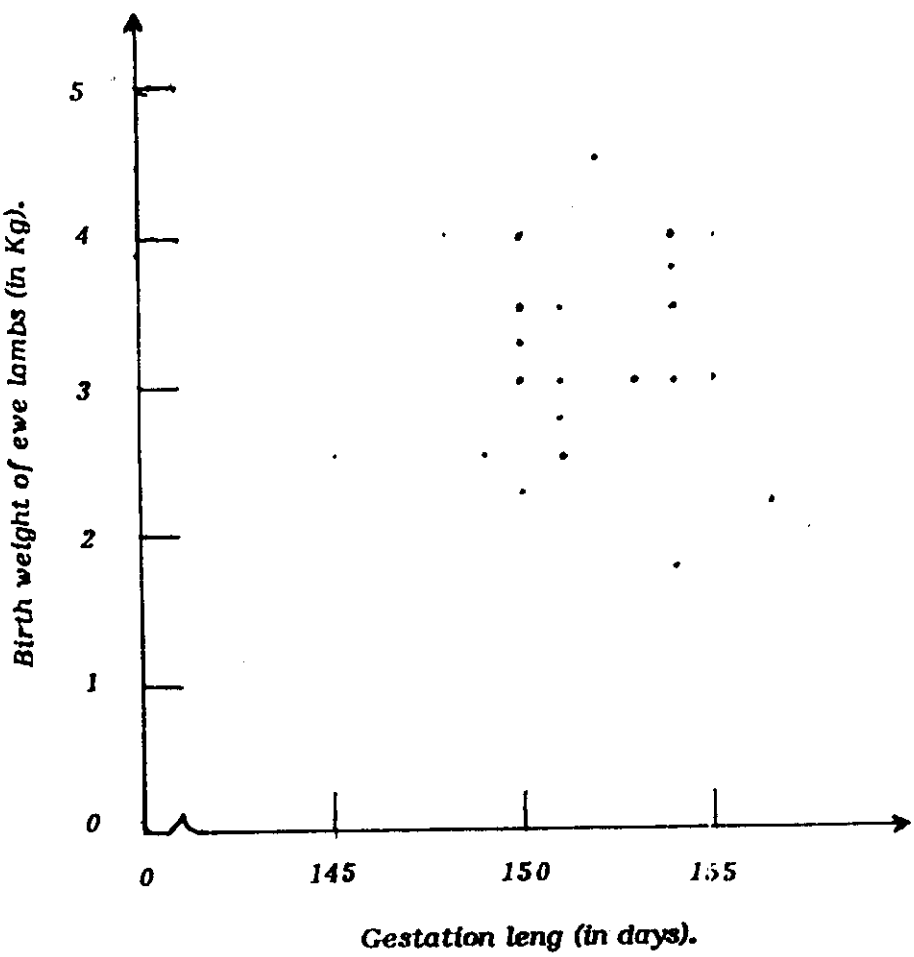

Fig. (4): The relationship between the gestation length of ewes and the birth weight of their lambs.

4.3- Plasma estrogen level along 60 days of the postpartum period:

Plasma estrogen level was estimated at lambing day and at 10, 30 and 60 days intervals of the post-partum period. These estimations were carried out in Ossimi ewes of different ages, body weights, parities number, Type of birth (single or twins) and sex of lamb.

4.3.1- Effect of the ewes' age:

Data presented in table (31) shows averages for plasma estrogen level during the postpartum period of ewes of different ages.

Results obtained showed that, plasma estrogen level was almost higher in ewes aged 40- months when compared to other groups. However, at lambing days ewes aged 60- months had relatively the higher average (0.3798 ng/ml) of plasma estrogen level followed by that in ewes aged 40- months (0.3277 ng/ml). The lowest average was observed at this time in ewes aged 80- months (0.2456 ng/ml). However, statistical evaluation of data obtained showed no significant variation in plasma estrogen level due to the ewe's age (ANOVA Table 32).

In all experimental groups of Ossimi ewes (of different ages), plasma oestrogen level decreased, after parturition, by advancing time. The rate of decrease differed between the successive period. In all groups of ewes it was found that plasma estrogen level decreased with the highest rate during the first 10 days of the postpartum period. It decreased by 0.1134, 0.1197, 0.1670, 0.2441 and 0.1459 ng/ml in ewes aged, less than 20, 20-, 40-, 60- and 80- months, respectively. The rate of decrease slowered gradually as time after parturition is passed. In addition the greatest decreasing rate throughout the 60 days of the postpartum period was observed in ewes aging 60- months followed by those aging 40- months. Plasma estrogen level decreased by 0.1260, 0.1753, 0.1842, 0.2503 and 0.1435 ng/ml throughout the 60 days of the postpartum period in ewes aged less than 20 months, 20- months, 40- months, 60-months and 80- months, respectively (Table 31). Analysis of variance for obtained data showed significant ($P < 0.01$) variation in plasma estrogne level due to the time intervals after parturition (ANOVA Table 32).

However, no significant effect was observed due to the interaction between ewe's age and time intervals on plasma estrogen level (ANOVA Table 32).

Table (31): Plasma estrogen level (ng/ml) throughout 60 days postpartum period as affected by age of ewe (in months).

Time of estimation (Days after lambing)	Mean ± S.E. of plasma estrogen in Ossimi ewes of age ranging from				
	Less than 20 (8 ewes)	20 --- (16 ewes)	40 --- (14 ewes)	60 --- (12 ewes)	80 --- (6 ewes)
Lambing day	0.2621±0.042	0.2987±0.045	0.3277±0.045	0.3798±0.086	0.2456±0.055
10th days	0.1487±0.022	0.1790±0.036	0.1607±0.013	0.1357±0.012	0.0997±0.018
30th days	0.1389±0.016	0.1538±0.021	0.1513±0.012	0.1356±0.013	0.1166±0.017
60th days	0.1361±0.016	0.1234±0.011	0.1435±0.011	0.1295±0.013	0.1021±0.011

Table (32): Analysis of variance for data presented in table (31).

S.O.V.	d.f.	S.S.	M.S.	F.
Ewe age (A)	4	0.0645	0.0161	1.22
Intervals of estimation (I)	3	1.2410	0.4137	31.34**
Interaction (AxI)	12	0.0918	0.0077	0.58
Error	204	2.6832	0.0132	

** = P < 0.01

4.3.2- Effect of ewe's body weight:

Average of plasma estrogen level during 60 days of the postpartum period in ewes of different body weights are listed in table (33).

From the results obtained, it was found that, average of plasma estrogen level was higher, at lambing day, in ewes weighing 40- kg (0.3333 ng/ml) followed by those weighing 50- kg (0.3017 ng/ml) then by ewes weighing 30- kg (0.2779 ng/ml). At the 60th day of the postpartum period results differed. At this time ewes weighing 50- kg showed the highest plasma estrogen average (0.1351 ng/ml) followed by ewes weighing 40- kg (0.1304 ng/ml) then by those weighing 30-kg (0.1267 ng/ml) (Table 33). Generally, it could be reported that, ewes weighing 30- kg showed the lowest plasma estrogen average at postpartum intervals after lambing time. However, analysis of variance for data did not show any significant effect due to the ewe's body weight on plasma estrogen level during the 60 days period after lambing (ANOVA table 34).

Plasma estrogen level decreased, in all ewes of different body weights, as time after parturition passed reaching its minimum level at the 60th day after lambing. The rate of decrease diminished as time passed. The higher amount of decrease occurred

in all groups during the first 10 days after lambing. The rate of decrease, on the other hand, differed according to the ewe's body weight. During the first 10 days after lambing, plasma estrogen level decreased with greater magnitude in ewes weighing 40- kg (0.1865 ng/ml) followed by ewes weighing 50- kg (0.1479 ng/ml) then by those weighing 30- kg (0.1164 ng/ml). However, plasma estrogen level showed higher rate of decrease during the periods from 10-30 days and from 30-60 days in ewes having 30- kg body weight when compared to the groups of ewes. On the other hand, ewes weighing 50- kg showed a slight increase in plasma estrogen level during the period from 30-60 days which may indicate an initiation of postpartum sexual cycle in such relatively early time. Finally, it could be reported that all over the 60 days of the postpartum period the higher rate of decrease in plasma estrogen was found in ewes weighing 40- kg followed by those weighing 50- kg and 30- kg, respectively. During this period plasma estrogen level decreased by 0.1512, 0.2029 and 0.1660 ng/ml in ewes weighing 30-, 40- and 50- kg, respectively.

Analysis of variance showed significant ($P < 0.01$) variation in plasma estrogen level due to the time after lambing. While the interaction between

ewe's body weight and intervals of estimation had no significant effect (ANOVA Table 34).

Table (33): Plasma estrogen level (ng/ml) throughout 60 days postpartum period as affected by body weight (in kg).

Time of estimation (Days after lambing)	Mean ± S.E. of plasma estrogen in Ossimi ewes of body weight ranging from		
	30 ----- (20 ewes)	40 ----- (34 ewes)	50 ----- (2 ewes)
Lambing day	0.2779±0.030	0.3333±0.038	0.3017±0.140
10th days	0.1615±0.029	0.1468±0.009	0.1538±0.029
30th days	0.1433±0.009	0.1437±0.012	0.1314±0.052
60th days	0.1267±0.009	0.1304±0.007	0.1351±0.049

Table (34): Analysis of variance for data presented in table (33).

S.O.V.	d.f.	S.S.	M.S.	F.
Ewe body weight (W)	2	0.0064	0.0032	0.24
Intervals of estimation (I)	3	1.2410	0.4137	31.34**
Interaction (WxI)	6	0.0357	0.0060	0.45
Error	212	2.7974	0.0132	

** = P < 0.01

Plasma estrogen level decreased, in all groups, with higher rate during the 10 days after parturition. Then the rate of decrease diminished gradually by time. During this period (10 days after lambing), plasma estrogen level decreased with greater rate in ewes at their 5th parity followed by those at their 3rd parity then by ewes at their 6th parity. The lowest decreasing rate in plasma estrogen level was observed during this period in ewes at their 2nd parity. Plasma estrogen level decreased by 0.1434, 0.0470, 0.2709, 0.1285, 0.2940, 0.2076 and 0.1078 ng/ml in ewes at their 1st, 2nd, 3rd, 4th, 5th, 6th and 7th parity, respectively.

Along the wholl postpartum period studied the higher amount of decrease in plasma estrogen level was observed in ewes at their 3rd parity followed by those at their 5th parity. The amounts of decrease in plasma estrogen level during the 60 days of the postpartum period were 0.1823, 0.0947, 0.2804, 0.1429, 0.2638, 0.1945 and 0.1116 ng/ml in ewes at their 1st, 2nd, 3rd, 4th, 5th, 6th and 7th parities, respectively (Table 35).

Analysis of variance for data showed significant variation ($P < 0.01$) in plasma estrogen level due to the time intervals after lambing (ANOVA Table 36).

Table (35): Plasma estrogen level (ng/ml) throughout 60 days postpartum period as affected by the parity number in Ossimi ewes.

Time of estimation (Days after lambing)	Mean ± S.E. of plasma estrogen						
	1st parity (18 ewes)	2nd parity (8 ewes)	3rd parity (12 ewes)	4th parity (12 ewes)	5th parity (2 ewes)	6th parity (2 ewes)	7th parity (2 ewes)
Lambing day	0.3131±0.041	0.2222±0.027	0.4090±0.068	0.2668±0.56	0.4373±0.335	0.2860±0.168	0.2629±0.101
10th days	0.1697±0.033	0.1752±0.025	0.1381±0.012	0.1383±0.013	0.1433±0.040	0.0784±0.002	0.1551±0.028
30th days	0.1590±0.019	0.1419±0.019	0.1322±0.012	0.1311±0.015	0.1433±0.040	0.1311±0.013	0.1551±0.028
60th days	0.1308±0.009	0.1275±0.017	0.1286±0.011	0.1239±0.015	0.1735±0.043	0.0915±0.007	0.1513±0.015

Table (36): Analysis of variance for data presented in table (35).

S.O.V.	d.f.	S.S.	M.S.	F.
Parity number (P)	6	0.0727	0.0121	0.92
Intervals of estimation (I)	3	1.2410	0.4137	31.58**
Interaction (PxI)	18	0.2090	0.0116	0.89
Error	196	2.5578	0.0131	

** = P < 0.01

4.3.4- Effect of type of birth:

Data in table (37) shows averages of plasma estrogen level along 60 days of the postpartum period for ewes having single or twins lambs.

Results obtained revealed that, average of plasma estrogen level at lambing day was relatively, higher in ewes having twin lambs (0.3279 ng/ml) than those having single lamb (0.3073 ng/ml) (table 37). At the 10th and 60th days after lambing the results were quite different. At these intervals ewes having single lamb showed, relatively, higher plasma estrogen average than those having twins (Table 37). However, analysis of variance showed no significant effect for the type of birth on the postpartum plasma estrogen level (ANOVA Table 38).

On the other hand significant ($P < 0.01$) variation was observed in plasma estrogen level during the 60 days of the postpartum period due to the intervals of estimation (ANOVA Table 38).

Plasma estrogen level decreased at time after lambing passed reaching its minimum level at the 60th day after parturition. The rate of decrease was higher in ewes having twins than those having single lamb. Plasma estrogen level decreased by 0.1749

and 0.2082 ng/ml during 60 days of the postpartum period in ewes having single lamb and twins, respectively.

The rate of decrease was also observed to be affected by the time intervals after lambing. It was, relatively, greater during the first 10 days after lambing then gradually diminished towards the end of the experimental period. Plasma estrogen level decreased by 0.1466 and 0.2008 ng/ml during the first 10 days after lambing in ewes having single lamb and twins, respectively, while it decreased by 0.0153 and 0.0097 ng/ml during the period from 30 to 60 days after lambing, respectively. In addition it was observed that, the total decreasing amount was achieved in ewes having twins than those having single lamb. Plasma estrogn level decreased by 0.1749 and 0.2082 ng/ml during the whole period in ewes having single lamb and twins, respectively.

Analysis of variance (ANOVA Table 38) showed no significant variation in plasma estrogen level due to the interaction between type of birth and estimation period.

Table (37): Plasma estrogen level (ng/ml) throughout 60 days postpartum period for Ossimi ewes having single or twin lambs.

Time of estimation (Days after lambing)	Mean ± S.E. of plasma estrogen for Ossimi ewes having	
	Single lambs (42 ewes)	Twin lambs (14 ewes)
Lambing day	0.3073±0.030	0.3279±0.055
10th days	0.1607±0.015	0.1271±0.011
30th days	0.1477±0.009	0.1294±0.012
60th days	0.1324±0.001	0.1197±0.011

Table (38): Analysis of variance for data presented in table (37).

S.O.V.	d.f.	S.S.	M.S.	F.
Type of birth (T)	1	0.0050	0.0050	0.38
Intervals of estimation (I)	3	1.2410	0.4137	31.82**
Interaction (TxI)	3	0.0165	0.0055	0.42
Error	216	2.8180	0.0130	

** = P < 0.01

4.3.5- Effect of the lamb sex:

Data listed in table (39) show averages of plasma estrogen during 60 days of postpartum period for ewes having male or female lamb.

From the obtained results it could be observed that, ewes having female lamb showed relatively higher averages of estrogen level at lambing day, and at the 30th and 60th days after parturition when compared with those having male lamb. While ewes having male lamb showed, relatively, higher plasma estrogen level at the 10th day of the postpartum period (Table 39). However, analysis of variance for obtained data did not show any significant variation in plasma estrogen level during the 60 days of the postpartum period due to sex of the embryo (ANOVA Table 40).

In both the two groups of ewes (having male or female embryo), it was observed that, plasma estrogen level decreased as time after lambing passed. However, the rate of decrease differed according to period from labming day. This rate was found to be, relatively, higher just after lambing day then it slowered gradually as time passed. Plasma estrogen level decreased by 0.1226 and 0.2101 ng/ml in ewes having male and female lamb, respectively, during the first 10 days after lambing. While it decreased

by 0.0140 and 0.0028 ng/ml during the period from 10 to 30 days and by 0.0199 and 0.0058 ng/ml during the last period (from 30 to 60 days after lambing) for ewes having male and female lamb, respectively. All over the experimental period (from lambing day up to 60 days after) ewes having female lambs showed, relatively, higher rate of decrease in the plasma estrogen level when compared with those having male lamb. It decreased by 0.1565 and 0.2187 ng/ml in ewes having male and female lambs, respectively (Table 39).

Analysis of variance for obtained data showed significant ($P < 0.01$) variation in plasma estrogen level due to time intervals after parturition. However no significant variation was found due to the interaction between lamb sex and time interval (ANOVA Table 40).

Table (39): Plasma estrogen level (ng/ml) throughout 60 days postpartum period for Ossimi ewes having male or female lambs.

Time of estimation (Days after lambing)	Mean ± S.E. of plasma estrogen for Ossimi ewes having	
	Male lambs (32 ewes)	Female lambs (24 ewes)
Lambing day	0.2789±0.029	0.3571±0.046
10th days	0.1563±0.019	0.1470±0.010
30th days	0.1423±0.012	0.1442±0.009
60th days	0.1224±0.007	0.1384±0.009

Table (40): Analysis of variance for data presented in table (39).

S.O.V.	d.f.	S.S.	M.S.	F.
Sex of lamb (S)	1	0.0257	0.0257	2.02
Intervals of estimation (I)	3	1.2410	0.4137	32.57**
Interaction (SxI)	3	0.0628	0.0209	1.65
Error	216	2.7510	0.0127	

** = P < 0.01

Inspecting results concerning the influences of some factors related to either the ewe (as a dam body weight, age and parity number) or to the embryo itself (single, twins and sex of the embryo) on plasma estrogen pattern during 60 days after parturition, it could be reported that, any of these factors had significant effect on the postpartum level of plasma estrogen during this period. This is quite true from the scientific side of view. It is known that, the foetus in domestic animals may have a role in partuiriton and not in the postpartum level of plasma estrogen. Attention was focused during last years on the role of foetal corticoids acting on the uterus and placenta causing increased estrogen and PGF output (Anderson et al., 1975; McDonald, 1975 and Steele et al., 1976). This, also, goes in agreement with that reported by Liggins et al., (1972) and Challis et al. (1977), who stated that, the foetal pituitaryadrenal axis plays a key role in signalling the initiation of labor in sheep. However, there is a great insufficiency in literature concerning the effect of the previously mentioned factors on the level of plasma estrogen after parturition.

On the other hand, it was found, in all experimental groups of ewes, that plasma estrogen level was, relatively, high at lambing day then gradually decreased towards the 60th day after lambing. This is scientifically logic, since it is now well stated that progesterone declines a few hours or days before parturition (Bassett et al., 1969; Shevah et al., 1975 and Gamal, 1986). The withdrowal of progesterone block would allow the stimulatory effects of estrogen to be manifested (Challis, 1971 and Challis et al., 1977). Possibly progesterone production is stopped by the interaction of the prostaglandin with foetal glucocorticoids acting as a stimulus for PG synthesis (Currie et al., 1973; Liggins et al., 1973; Liggins, 1974; McDonald, 1975; Prud'homme and Bosc, 1977). Estrone and estradiol were found to increase during pregnancy reaching a peak few days before parturition (Challis, 1971; Thorburn et al., 1972; Robertson and Smeaton, 1973 and Challis et al., 1977). The decrease in plasma estrogen level after parturition may be attributed to the maintenance of the corpus luteum by the stimulus lactation so that the ovary usually does not grow follicles or ovulate as long as the lambs are suckling (Smith, 1978; Culler et al., 1982 and Foxcroft et al., 1987).

As soon as weaning occurs most ewes show a cyclic activity in the ovaries accompanied by estrus and ovulation (McDonald, 1975; Edwards and Foxcroft, 1983 and Varley et al., 1984) and correspondingly, estrogen level may show a pronounced rise in blood plasma which was not observed in the present work because of the relative short time of estimation (60 days only) after parturition. In addition it was found (by El-Fouly et al., 1977) that, the interval from parturition to 1st estrus was significantly longer in Ossimi ewes (125.7 days) than in Rahmani ewes (69.6 days), and they added that, this interval was not significantly affected by the age of the ewe.

4.3.6- The regression equations for predicting plasma estrogen level during postpartum period:

Analysis of variance for plasma estrogen level of ewes, in different parities, among intervals along 60 days of the postpartum period is presented in table (41).

The data show that, differences in plasma estrogen level due to estimation in intervals along the postpartum period had highly singificant contribution to the total variation of this trait.

The linear trend was significant ($P< 0.01$) in all four parities (1st, 2nd, 3rd, 4th parities). However, the quadratic trend was significant ($P <0.05$) in the 1st and 3rd parities only.

In 1st, 2nd, 3rd and 4th parities, the total variation among intervals were 0.3597, 0.0426, 0.6864 and 0.1668, respectively. However, the variation due to the linear trend were 0.2799, 0.0403, 0.4305 and 0.1140, respectively. Since, 78, 95, 63 and 68 percent of the variation in the estrogen level in 1st, 2nd, 3rd and 4th parities, respectively, were due to the changing in estrogen level by time, which may be predicted from linear regression equation.

Therefore, the linear regression equation is considered, in this study, the form of the best fitting curve for predicting the level of estrogen at any interval during the postpartum period.

The linear regression equations for postpartum period in different parities are:

For 1st parity $\hat{Y} = 0.2533 - 0.0024\ X$

For 2nd parity $\hat{Y} = 0.2031 - 0.0014\ X$

For 3rd parity $\hat{Y} = 0.2873 - 0.0034\ X$

For 4th parity $\hat{Y} = 0.2100 - 0.0018\ X$

where:

$\hat{Y}$ denote predicted plasma level (ng/ml);

X denote any date during postpartum period.

Curves in Fig. (5) illustrate changs in plasma estrogen level among different intervals during post-partum period of Ossimi ewes in different parities and the prediction equation.

Table (41): Least squares analysis of variance for plasma estrogen level (ng/ml) of Ossimi ewes at intervals of estimation along postpartum period.

Source of variation	1st parity		2nd parity		3rd parity		4th parity	
	d.f.	M.S.	d.f.	M.S.	d.f.	M.S.	d.f.	M.S.
Among different intervals	3	0.1199**	3	0.0142*	3	0.2288**	3	0.0556**
Linear	1	0.2799**	1	0.0403**	1	0.4305**	1	0.1140**
Quadratic	1	0.0596*	1	0.0021	1	0.2144**	1	0.0441
Cubic	1	0.0202	1	0.0002	1	0.0415	1	0.0087
Deviation from cubic	-	--	-	--	-	--	-	--
Error	68	0.0142	28	0.0041	44	0.0152	44	0.0110

* Significant at the 5% level.

** Significant at the 1% level.

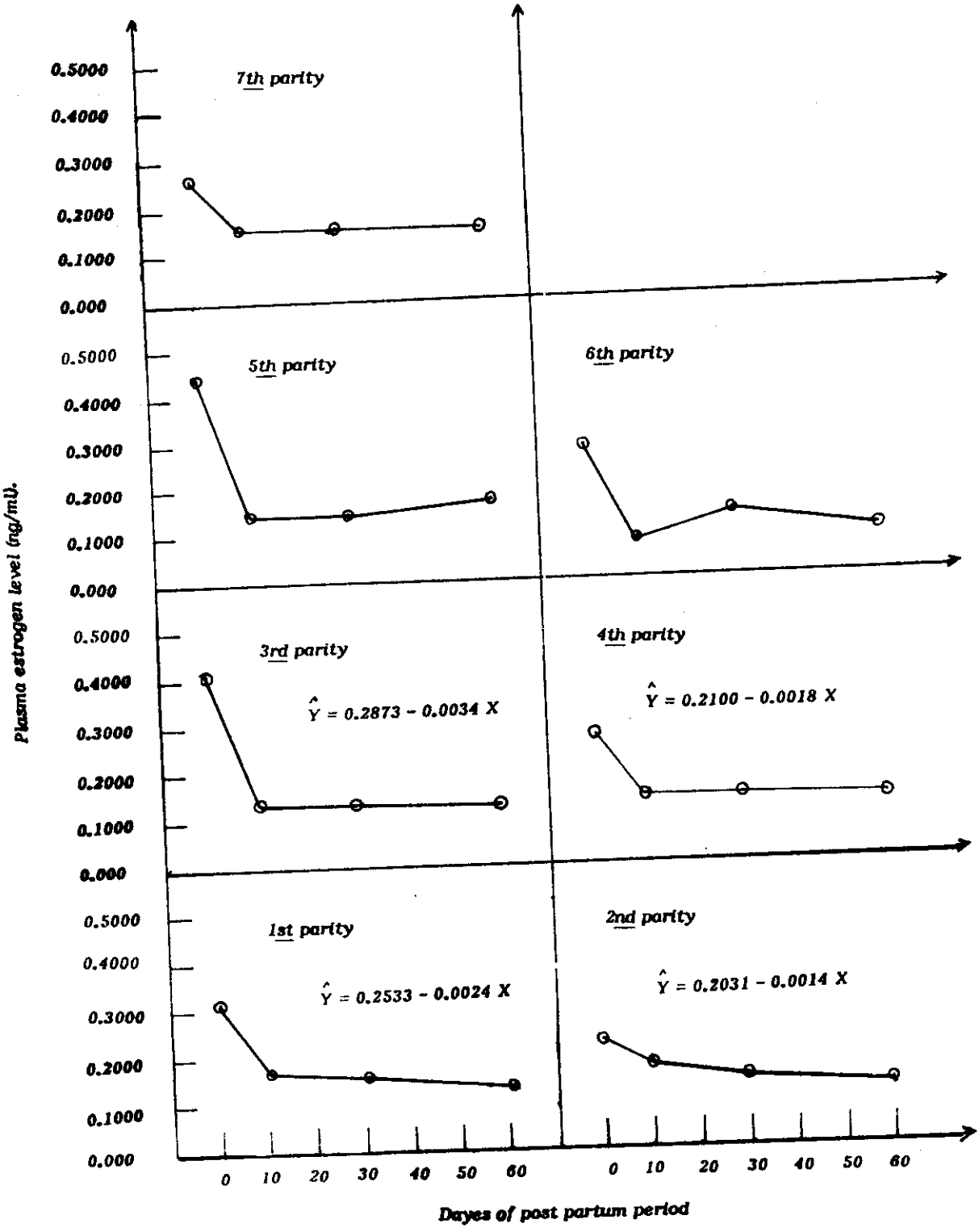

Fig. (5): *Plasma estrogen level (ng/ml) throughout 60 days of postpartum period as affected by the parity number in Ossimi ewes.*

4.3.7- The linear correlation between plasma estrogen level and time intervals along 60 days of postpartum period of Ossimi ewes:

Table (42) shows the linear correlation between plasma estrogen level and time intervals along 60 days of the postpartum period of Ossimi ewes.

From the table, it is shown that, the coefficients of correlation were of negative and strong values (but lower in values than those of the pregnancy period [see table 27]) which is in accordance with the previous result of the linear regression that showed highly significant values (see table 41).

Results obtained also indicated that, ewes of the 3rd parity showed the highest correlation coefficient value (-0.563) when compared to those of the other parities, while, ewes of the 4th parity had the lowest correlation coefficient value (-0.418).

Table (42): The lienar correlation between plasma estrogen level and time intervals along 60 days of postpartum period of Ossimi ewes.

Pairty number	The linear correlation coefficient values
Changes in dates within:	
1st parity	-0.459
2nd parity	-0.504
3rd parity	-0.563
4th parity	-0.418

SUMMARY

SUMMARY

The present study was carried out at Sheep Experimental Farm, Department of Animal Production, Faculty of Agriculture, Zagazig University (Benha Branch). Radioimmunological assays for plasma estrogen were performed in laboratories of the Endocrinology Research Unit, Atomic Energy Establishment.

It was aimed to detect plasma estrogen pattern in Ossimi sheep during different stages of estrus cycle, pregnancy period and 60 days postpartum period in ewes of different ages, parities and body weights.

The study was performed on 63 Ossimi ewes, which were subjected to normal husbandary system applied at the station.

Hormonal assay was carried out at different stages of estrous cycle, at 10th, 40th, 70th, 100th and 130th days of pregnancy period and at lambing day and at the 10th, 30th and 60th days after parturition in ewes of different ages, parities and body weight. In addition assay was performed at the same periods in ewes having different types of birth (Single or twins) and different sex of embryo (male or female).

RESULTS OBTAINED COULD BE SUMMARIZED AS FOLLOWS:

I- Plasma Estrogen Level At Different Stages Of Estrous Cycle:

1- Except the ewe's body weight and the type of birth, which showed significant ($P<0.01$) effect on plasma estrogen level during estrous cycle, other studied factors had no significant effect on this trait.

2- There was'nt any significant variation in plasma estrogen level due to estrous cycle stage. Which may indicate the absence of the feedback oscillation of hypothalamic- hypophyseal- ovarian system. This may be the main physiological reason explaining the 'relative' low productivity in Ossimi sheep.

3- No significant interaction effect was found between any of the factors studied and estrous cycle intervals.

4- Analysis of variance for the data of ewes having irregular estrous cycle, did not show any significant variation in plasma estrogen level due to the parity number, successive estrus phases and the interaction between them.

5- The first degree equation of regression was not found to be the form of the best fitting curve for predicting the level of estrogen during estrous cycle.

6- The coefficients of correlation between plasma estrogen level and time intervals throughout the estrous cycle in ewes of 1st, 2nd, 3rd and 4th parities were, 0.075, 0.164, 0.109 and 0.022, respectively.

II- Plasma Estrogen Level During 130 Days Of Pregnancy Period:

1- Any of the factors studied had significant effect on the level of plasma estrogen level during the pregnancy period. This indicates that estrogen levels in plasma of the pregnant ewes along the pregnancy period is a result of hormonal activity of either hypothalamus or pituitary gland rather than any other factor.

2- Gradual and continuous rise in the level of plasma estrogen was observed in all experimental groups of ewes. Variation in plasma estrogen level during various intervals of pregnancy

period was found to be significant ($P<0.01$) in all groups.

3- The interactions between each of the factors studied and intervals of pregnancy period were found to be of no significant effect on the level of plasma estrogen.

4- The linear regression equation was found to be the form of the best fitting curve for predicting the level of estrogen in any date during pregnancy.

5- The coefficients of correlation between plasma estrogen level and time intervals throughout the pregnancy period in ewes of null, first, second, third and fourth parities were, 0.783, 0.634, 0.692, 0.581 and 0.676, respectively.

6- Gestation period averaged 151.68 days which was not affected by any factor studied. On the other hand, average of birth weight of new born lambs was found to be 3.27 kg. Partial regression coefficient indecated that for one day increase in gestation length, there is an increase of 0.06 kg.

III- Plasma Estrogen Level Along 60 Days Of The Postpartum Period.

1- Any of the factors studied had significant effect on level of plasma estrogen level along 60 days of the postpartum period.

2- In all experimental groups of ewe's plasma estrogen level was relatively higher at lambing day, then gradually decreased towards the 60th day after lambing. Variations in this trait due to the postpartum intervals of estimation was found to be significant ($P<0.01$).

3- The interaction between each of the studied factor and intervals of estimation was found to have insignificant effect on the level of plasma estrogen along the 60 days of postpartum period.

4- The linear regression equation was found to be the form of the best fitting curve for predicting the level of estrogen in any intervals during the postpartum period.

5- The coefficients of correlation between plasma estrogen level and time intervals throughout the postpartum period were -0.450, -0.504, -0.563, -0.418 in ewes of the 1st, 2nd, 3rd and 4th parities, respectively.