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# BLOOD PLASMA PROTEINS LEVEL OF BARKI EWES DURING PREGNANCY AND SUCKLING PERIOD AS AFFECTED BY WATERING REGIME

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## ABSTRACT

Plasma total proteins and albumin were estimated in 40 adult Barki ewes (20 pregnant and 20 non-pregnant). Each group was divided into two equal subgroups (10 each); the 1st subgroup was watered daily while the second was watered once every 3 days. In the pregnant ewes, estimations were made during 2nd , 3rd and 5th months representing early, mid and late stages of pregnancy. After parturition, eight ewes were excluded; four pregnant ewes due to the mortality of their lambs and another four dry ewes from control group. Thus, the experiment continued during suckling period (from the 2nd to the 5th week post partum) on the reminder thirty-two Barki ewes as 16 suckling and 16 non-suckling on the same sequence as previously mentioned.

Results revealed that total protein and globulin were higher (P< 0.01) in pregnant ewes as compared with non-pregnant ones, while albumin level slightly increased in pregnant ewes with a difference that was insignificant. Albumin/Globulin ratio did not differ significantly between pregnant (0.90) and non-pregnant ewes (0.93). Dehydration during different pregnancy stages did not affect TP levels (7.67 vs. 7.64 g/dl for watered and deprived ewes, respectively) but resulted in a significant (P<0.05) decrease in GL levels (4.07 vs. 3.93 g/dl for watered and deprived ewes, respectively). Albumin level slightly increased in deprived ewes (3.72 g/dl) than watered ones (3.61 g/dl). Accordingly, A/G ratio was higher (P<0.05) in deprived ewes. The plasma total proteins slightly (P<0.05) decreased in suckling ewes as compared with non- suckling ones (7.66 vs. 7.91 g/dl, respectively). The albumin was significantly (P< 0.01) higher in lactating (3.99 g/dl) than in dry ones (3.83 g/dl) and subsequently resulted in higher A/G ratio. Dehydration during the five weeks of suckling period reduced (P<0.05) TP and GL levels while AL levels were the same in watered and deprived groups. Lack of water during the early pregnancy stage seemed to be of residual effect on suckling as judged by the low milk production (421 ml/h/day) since the second week of suckling. Watering sheep twice a week under harsh conditions is recommended without adverse effects on their productivity

**Keywords:** Ewes, Plasma proteins, Deprivation, Pregnancy, Suckling

## INTRODUCTION

Total proteins (TP) in the blood have a particular importance in maintaining safe plasma volume during water shortage conditions. This importance is due to the fact that TP in blood plasma generate a colloidal osmotic pressure, which controls the flow of water between blood and tissue fluids. This osmotic power of the plasma proteins depends mainly on plasma albumin (AL) and to a less extent on plasma globulin (GL) (Harper *et al.*, 1977). Albumin is characterized by relative abundance (55% of plasma proteins), small molecular weight (7000 Dalton) and a high residual negative charge at pH 7.4 which makes it very hydrophilic. Thus, albumin is responsible for 75-80% of the colloidal osmotic pressure of blood and maintaining osmotic equilibrium between blood and tissue fluids (Swenson, 1977). On the other hand, tolerance to thirst is of most importance to desert

1977). On the other hand, tolerance to thirst is of most importance to desert animals as they have to walk for few days without drinking water seeking for bushes and wells. The extra demands for water and nutrients during pregnancy and suckling (McDonald *et al.*, 1982) make the impact of thirst on the breeding females to come into question and deserve to be studied. During these periods, the metabolic activities of the ewes would be directed towards the support of the fetus and the on coming suckling period (Abdel-Bary, 1990). Information available on the normal variation in blood chemical constituents during suckling period of the ewe as affected by water deprivation is scanty. Previous results on the variation in these blood compounds pointed out to the effect of the stage of suckling in other dairy animals although they were conflicting due to different reasons (Samak, *et al.*, 1982). The present trial was designed to throw some light on the changes that might occur in the level of plasma proteins during pregnancy and suckling as affected by water deprivation for three days from mating up to the $5^{th}$ week of suckling.

## MATERIALS AND METHODS

The present study was carried out at Maryout Research Station, 35-km southwest of Alexandria, which belongs to the Desert Research Center. Forty adult Barki ewes (20 pregnant and 20 non-pregnant) of mixed ages (3-4 yrs and 39.5 ± 0.56 kg average initial body weight) were used. Each pregnant and non-pregnant group was divided into two equal subgroups; the first subgroup was watered once daily while the second subgroup was watered once every 3 days. After parturition, eight ewes were excluded, and the experiment continued on the reminder 32 ewes (16 suckling and 16 non-suckling) in the same sequence to study the effect of water regime on plasma proteins levels during the first five weeks of suckling.

This watering regime was implemented during the breeding season (July 1 999) till the $5^{th}$ week of suckling as experimental period. Ewes were confined in semi-open shaded pens all day and night throughout the period of the experiment. Ewes were fed on Berseem (*Trifolium alexandrinum*) hay plus concentrate mixture according to their body weight requirements (Kearl, 1982). Biweekly blood samples were taken biweekly from all ewes (using clinical needle) during pregnancy up to parturition and weekly during the suckling period in the early morning before drinking and feeding. Plasma total protein (TP, g/dl) was determined using a test kit supplied by bioMe'rieux-France according to Henary *et al.*, (1974). Plasma albumin (AL) was also determined in g/dl depending on the reaction with bromocresol green at pH 4.2 according to Doumas *et al.* (1971). Plasma globulin (GL) was calculated by subtracting the albumin concentration from the plasma total proteins and A/G ratio was figured.

**Statistical analysis:**

The statistical analysis was conducting using SAS package (SAS, 1998). Split plot design for repeated measurements was applied utilizing GLM to test the effect of pregnancy, watering regime and their interactions. Duncan's multiple range test (DMRT) was also adopted to detect differences between means.

# RESULTS and DISCUSSION

**Effect of pregnancy on protein profiles:**

The total protein (TP) and globulin (GL) levels were higher (P<0.01) in pregnant ewes than non-pregnant ones, while albumin (AL) level slightly increased in pregnant ewes with the difference being insignificant (Table 1). Results of the present study , revealed that there was a tendency of total proteins to increase significantly during early and mid stages of pregnancy then declined (P<0.05) during the late stage (Fig.1). These results were in agreement with those reported by Abdel-Bary, (1990); Azamel (1996); Brozostowski *et al.*, (1996) and El-Sherief and Assad (2001). They reported a sudden drop in plasma protein of pregnant ewes through the 16$^{th}$ to the 18$^{th}$ week of pregnancy. The highest TP concentration in the present study, occurred during the mid stage of pregnancy (8.35 g/dl) then declined until parturition (7.12 g/dl). Such increases in the mid stage of pregnancy might be due to high protein demands for the embryo growth. The fetus synthesized all its proteins from the amino acids derived from the mother. The absolute growth of the fetus increases exponentially reaching a maximum at mid stage and extend especially in muscles, during late pregnancy (Jainudeen and Hafez, 1997), a matter reflected on increasing nutritional requirements of the pregnant animals themselves (El-Sherif and Assad, 2001). The increase in TP during early and mid stages of pregnancy was found to be parallel to the increase in both globulin (GL) and albumin (AL) levels (Fig. 2 and 3). However, the higher plasma GL during early and mid stages of pregnancy might be due to that, the embryo reacts as a foreign antigen where the fetus might possess some genes that might not be identical with those of the mothers (Bayoumi *et al.*, 1986). On the other hand, results revealed that the globulin level decreased (P<0.05) during the late stage of pregnancy either for watered or deprived ewes (Fig. 3 ). This was thought to be due to the start of production of globulin rich colostrum (El-Sherif and Assad, 2001). In sheep, the ability to synthesize milk constituents would appear 3-4 weeks prepartum (Davson and Segal, 1980).

Albumin/Globulin (A/G) ratio did not differ significantly between pregnant (0.90) and non-pregnant ewes (0.93). However, during both early and mid stages of pregnancy, A/G ratio was found to be narrow in pregnant than in non-pregnant ewes (0.87 vs. 0.92 and 0.86 vs. 0.93, respectively) though differences were insignificant (Fig. 4). This might be due to the higher GL concentrations during these stages. Values of GL concentrations were 4.33 vs. 3.82 g/dl, during the early stage and 4.50 vs. 3.90 g/dl, during the mid stage, for pregnant and non-pregnant ewes respectively. On the contrary, A/G ratio increased during the late stage of pregnancy (1.01) due to the decrease in GL level in this stage (Fig.4).

However, irrespective of water deprivation, pregnant ewes, in the present study, showed a good compensatory capacity to the loss of proteins just before parturition, which highlight the importance of good feeding during this critical stage for helping the ewe to rebuild its body protein.

**Effect of deprivation on protein profiles during pregnancy stages:**

Water deprivation during different pregnancy stages did not affect TP levels (Table 1). Average values were 7.68 and 7.74 g/dl during early stage; 7.94 and 7.92 g/dl during mid stage, 7.39 and 7.25 g/dl during late stage for watered and deprived ewes, respectively. Results also revealed a decrease (P<0.05) in GL level during late stage of pregnancy (3.86 vs. 3.56 g/dl for watered and deprived ewes, respectively) (Fig. 3).

**Table 1: Means ± SE of plasma proteins level as affected by pregnancy stages and deprivation.**

| Item | | Plasma Protein Levels | | | |
|---|---|---|---|---|---|
| | | TP (g/dl) | AL (g/dl) | GL (g/dl) | A/G ratio |
| Early stage | Pregnant | 8.07 ± 0.44 a | 3.75 ± 0.24 a | 4.33 ± 0.34 a | 0.87 ± 0.12 a |
| | Non-pregnant | 7.35 ± 0.44 b | 3.53 ± 0.24 a | 3.82 ± 0.34 b | 0.92 ± 0.12 a |
| | Watered | 7.68 ± 0.44 a | 3.61 ± 0.24 a | 4.08 ± 0. 34 a | 0.89 ± 0.12 a |
| | Deprived | 7.74 ± 0.44 a | 3.67 ± 0.24 a | 4.07 ± 0. 34 a | 0.90 ± 0.12 a |
| Mid stage | Pregnant | 8.35 ± 0.44 a | 3.85 ± 0.24 a | 4.50 ± 0.34 a | 0.86 ± 0.12 a |
| | Non pregnant | 7.61 ± 0.44 b | 3.61 ± 0.24 a | 3.90 ± 0.34 b | 0.93 ± 0.12 a |
| | Watered | 7.94 ± 0.44 a | 3.68 ± 0.24 a | 4.26 ± 0. 34 a | 0.87 ± 0.12 a |
| | Deprived | 7.92± 0.44 a | 3.78 ± 0.24 b | 4.15 ± 0. 34 b | 0.92 ± 0.12 a |
| Late stage | Pregnant | 7.12 ± 0.44 a | 3.59 ± 0.24 a | 3.54 ± 0.34 a | 1.01 ± 0.12 a |
| | Non pregnant | 7.52 ± 0.44 b | 3.64 ± 0.24 a | 3.89 ± 0.34 b | 0.94 ± 0.12 a |
| | Watered | 7.39 ± 0.44 a | 3.53 ± 0.24 a | 3.86 ± 0.34 a | 0.92 ± 0.12a |
| | Deprived | 7.25 ± 0.44 a | 3.70 ± 0.24 b | 3.56 ± 0. 34 b | 1.04 ± 0.12 b |
| Overall means | Pregnant | 7.85 ± 0.44 ** | 3.73 ± 0.24 a | 4.14 ± 0.34** | 0.90 ± 0.12 |
| | Non pregnant | 7.46 ± 0.44 | 3.59 ± 0.24 b | 3.87 ± 0.34 | 0.93 ± 0.12 |
| | Watered | 7.67 ± 0.44 | 3.61 ± 0.24 a | 4.07 ± 0.34 | 0.89 ± 0.12 |
| | Deprived | 7.64 ± 0.44 | 3.72 ± 0.24 b | 3.93 ± 0. 34 * | 0.95 ± 0.12 * |
| Pregnancy | | ** | NS | ** | NS |
| Watering | | NS | * | * | * |
| Pregnancy x watering | | * | * | * | NS |

**TP; total Protein. AL; Albumin. GL; Globulin. A/G; Albumin / Globulin **; P<0.01 *; P<0.05. Means in the same raw with different letters are significantly differed. NS. Not significant.**

Albumin (AL) level slightly increased in deprived ewes than watered ones (Table 1). On the other hand, Al level was maintained at higher concentrations during early and mid stages of pregnancy in deprived ewes as compared to either watered or barren ones (Fig. 2). Accordingly, A/G ratio was relatively higher (P<0.05) in deprived ewes. The present results were partially in agreement with those of El=Sherif, *et al.*, (1996). They reported that drawing fluids from the extravascular space to the blood stream under heat or thirst stress in Barki ewes caused a decrease in plasma protein concentration and higher values of A/G ratio. On the other hand, protein synthesized in this phase might be drown and devoted mainly for the hyperplasia of the growing embryos, and might be responsible for enlargement of both uterus and embryos (McDonald *et al.*, 1982). Contrary, dehydration during late stage of pregnancy resulted in a slightly reduction in TP, AL and GL levels as compared to the other two stages of pregnancy (Table 1). Once more, dehydrated pregnant ewes had higher TP and GL values than dehydrated non pregnant ones (Fig. 1and 3). The deprived pregnant ewes showed highest GL levels than non-pregnant ones either watered or deprived (Fig. 3). Globulin might be mobilized from lymphatic to the circulation or produced as antibodies ($\propto$ - globulin) by lymphoid tissues in response to water stress and/or pregnancy stress (El-Sherif and Assad, 2001).

**Effect of suckling on plasma protein levels:**

The plasma total proteins slightly decreased (P<0.05) in suckling ewes as compared with non- suckling ones (7.66 vs. 7.91 g/dl). The albumin was significantly (P< 0.01) higher in suckling (3.99 vs. 3.83 g/dl) than non-suckling ewes, which subsequently resulted in higher A/G ratio (Table 2). On the other hand, globulin was significantly higher in dry ewes than in suckling ones. However, during the five weeks of suckling (Table 2); plasma Tp in lactating ewes tended to decrease relatively until the 4$^{th}$ week then increased significantly at the 5$^{th}$ week of suckling period as compared to non-lactating ewes (Fig. 5). Albumin however, showed a fluctuated trend but increased (P<0.05) during the 5$^{th}$ week in lactating than non-lactating ones. (Fig.6). Likewise, GL levels took an opposite trend to that of AL during the 3$^{rd}$ and 4$^{th}$ weeks and increased during the 5$^{th}$ week of suckling (Fig. 7). In the fifth week of suckling, plasma TP was significantly (P< 0.05) higher in lactating ewes either watered or deprived. Globuline, however, was higher (P<0.05) in non-lactating ewes compared with lactating ones (Fig. 7). These results would confirm those of Mohey El-Din (1983) and Hassan, *et al.*, (1986). They attributed the decline in plasma TP during suckling period to the high milk yield and the increased utilization of plasma proteins for milk biosynthesis and/or to the transport of proteins and serum albumin directly to the milk. Globulin might be used in formation of milk protein (casein) and antibodies. Suckling ewes were found to meet this high utilization of protein with more digestible crude protein and total digestible nutrients per kg BW $^{0.75}$ than pregnant and non-pregnant dry ewes (Singh and Singh, 1990). Similar findings were reported on dairy cattle by Rowlands *et al.*, (1986) and on ewes (El-Nouty *et al.*, 1983). It was established that milk yield in ewes reached a peak at the 3$^{rd}$ week of suckling that persisted till the 5$^{th}$ week then declined thereafter (Abdel-Bary, 1990 and Azamel, *et al.*, 1994). Consequently, the higher values of plasma Tp and AL observed in the 5$^{th}$ week of suckling could be attributed to the lower milk production by the ewes at that time (Table 3 and Fig. 9). On the contrary, the A/G ratio was higher (P<0.05) during suckling period in lactating ewes than in non-lactating ones (Fig. 8). Bayoumi *et al.*, (1986) reported that there was a slight increase in A/G ratio during the first five weeks of suckling. Likewise, El-Nouty *et al.*, (1987) found that total serum proteins as well as its albumin and globulin fractions were lower during early lactation than during late lactation. Similar results were also found by Hassan *et al.*, (1986). They reported that total serum protein in lactating goats increased significantly (P< 0.01) as lactation advanced.

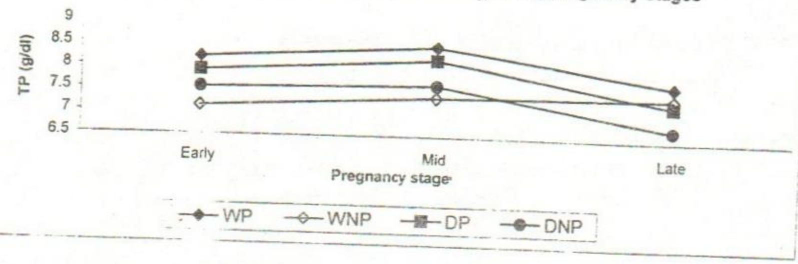


Figure 1: Tp levels as affected by deprivation during pregnancy stages

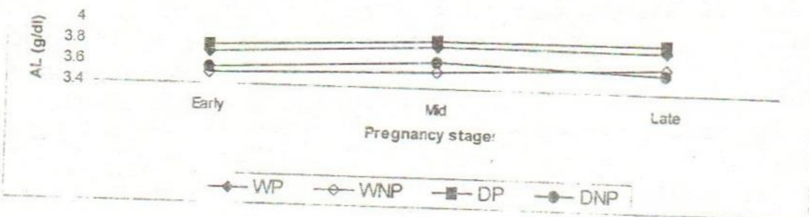


Figure 2: AL levels as affected by deprivation during pregnancy stages.

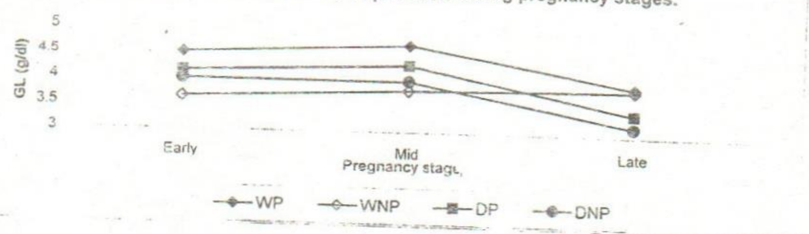


Figure 3: GL levels as affected by deprivation during pregnancy stages.

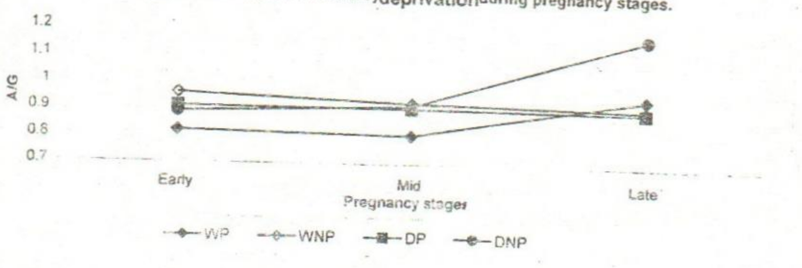


Figure 4: A/G ratio as affected by deprivation during pregnancy stages.

Figurer 5: Changes in TP level during sucklingas affected by water deprivation.

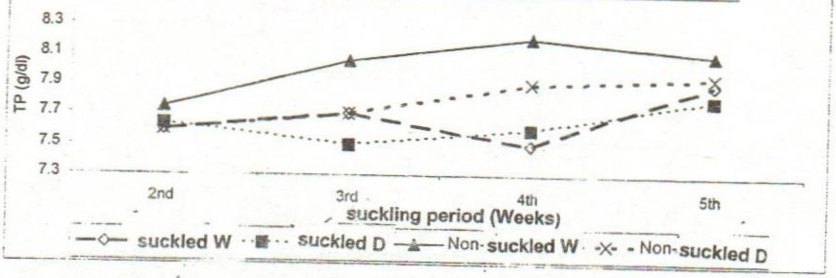


Figure 6: Changes in Al level duringsucklingas affected by water deprivation.

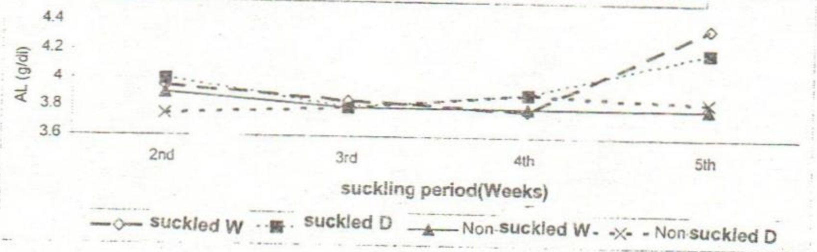


Figure 7 : Changes in GL level duringsucklingas affected by water deprivation.

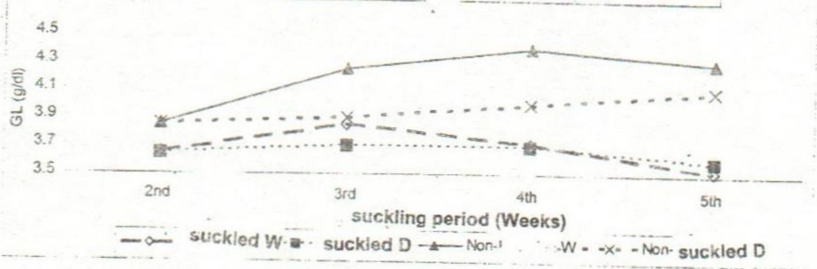


Figure 8: Changes in A/G ratio durinсsucklingas affected by water deprivation.

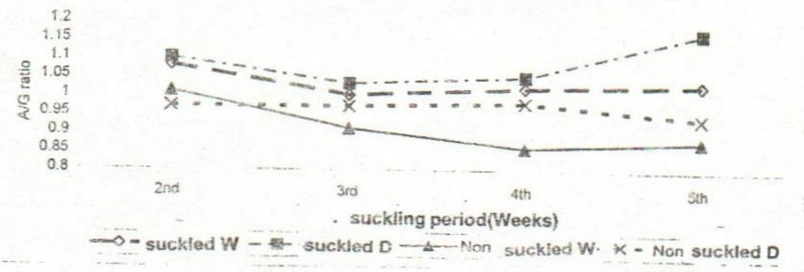

Figure 9: Milk yield (ml/h/day) of watered and deprivated ewes during suckling period

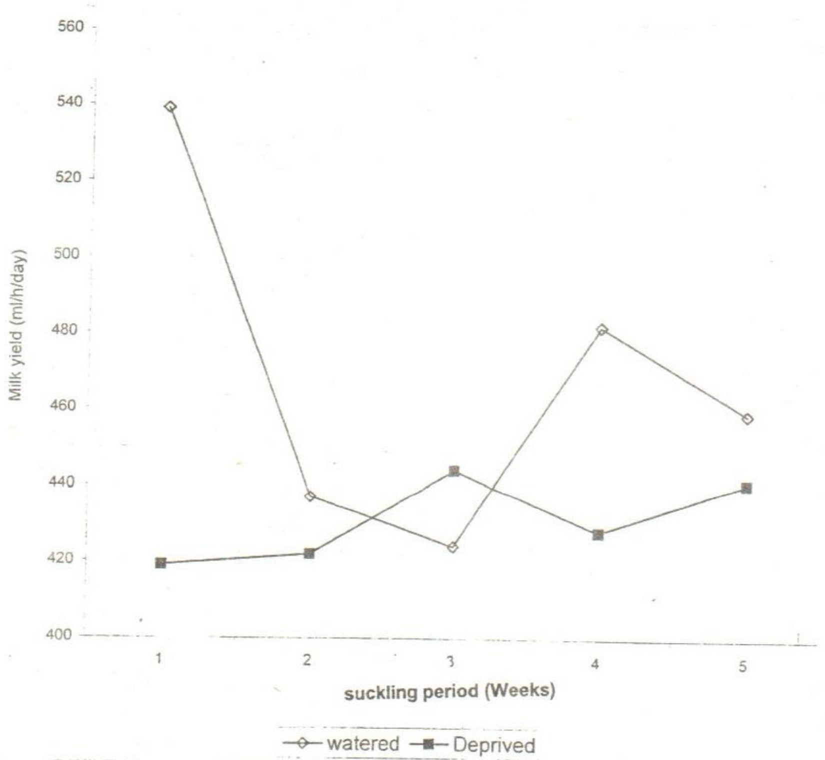

**Table2: Means ± SE of plasma proteins level during suckling period (5 weeks).**

| Item | | Plasma Protein Levels | | | |
|---|---|---|---|---|---|
| | | TP (g/dl) | AL (g/dl) | GL (g/dl) | A/G ratio |
| 2nd week | suckling | 7.62 ± 0.36 a | 3.98 ± 0.29 a | 3.64 ± 0. 16 a | 1.09 ± 0.06 a |
| | Dry[1] | 7.68 ± 0.36 a | 3.82 ± 0.29 b | 3.86 ± 0. 16 b | 0.99 ± 0.06 a |
| | Watered | 7.68 ± 0.36 a | 3.93 ± 0.29 a | 3.75 ± 0. 16 a | 1.05 ± 0. 06 a |
| | Deprived | 7.62 ± 0.19 b | 3.88 ± 0.29 a | 3.74 ± 0. 16 a | 1.04 ± 0. 06 a |
| 3rd week | suckling | 7.60 ± 0.36 a | 3.83 ± 0.29 a | 3.77± 0. 16 a | 1.02 ± 0.06 a |
| | Dry[1] | 7.48± 0.36 b | 3.51 ± 0.29 b | 3.97 ± 0. 16 b | 0.92 ± 0.06 a |
| | Watered | 7.88 ± 0.36 a | 3.83 ± 0.29 a | 4.05 ± 0. 16 a | 0.95 ± 0. 06 a |
| | Deprived | 7.70± 0.36 b | 3.83 ± 0.29 a | 3.87 ± 0. 16 b | 0.99 ± 0. 06 a |
| 4th week | suckling | 7.55 ± 0.36 a | 3.84 ± 0.29 a | 3.71 ± 0. 16 a | 1.04 ± 0.06 a |
| | Dry[1] | 8.05± 0.36 b | 3.85 ± 0.29 a | 4.20 ± 0. 16 b | 0.92 ± 0.06 b |
| | Watered | 7.85 ± 0.36 a | 3.79 ± 0.29 a | 4.06 ± 0. 16 a | 0.93 ± 0. 06 a |
| | Deprived | 7.75± 0.36 a | 3.90 ± 0.29 b | 3.85 ± 0. 16 b | 1.01 ± 0. 06 a |
| 5th week | suckling | 7.85 ± 0.36 a | 4.29 ± 0.29 a | 4.24 ± 0. 16 a | 1.21 ± 0.06 a |
| | Dry[1] | 8.03 ± 0.36 b | 3.83 ± 0.29 b | 4.20 ± 0. 16 a | 0.91 ± 0.06 b |
| | Watered | 8.00 ± 0.36 a | 4.09 ± 0.29 | 3.91 ± 0. 16 a | 1.05 ± 0. 06 a |
| | Deprived | 7.75 ± 0.36 b | 3.90 ± 0.29 | 3.85 ± 0. 16 a | 1.05 ± 0. 06 a |
| Overall means | Lactated | 7.66 ± 0.36 | 3.99 ± 0.29 | 3.67± 0.16 | 1.09 ± 0.06 |
| | Dry[1] | 7.91 ± 0.36 | 3.83 ± 0.29 | 4.08 ± 0.16 | 0.94 ± 0.06 |
| | Watered | 7.86 ± 0.19 | 3.91 ± 0.29 | 3.94 ± 0.16 | 0.99 ± 0. 06 |
| | Deprived | 7.74 ± 0.19 | 3.91 ± 0.29 | 3.83 ± 0.16 | 1.02 ± 0. 06 |
| Suckling | | * | * | * | * |
| Watering | | * | NS | * | NS |
| Suckling x watering | | NS | NS | * | NS |

**Dry[1]; means: non pregnant non sucklingewes. SE; Standard error. TP; Total Protein. AL; Albumin. GL; Globulin. A/G; Albumin / Globulin **; P<0.01 *; P<0.05. Means in the same row with different letters are significantly differed. NS; not significant.**

**Effect of deprivation on plasma proteins profile and milk production:**

Deprivation during suckling period (5 weeks) reduced (P<0.05) TP and GL levels while AL levels were the same in watered and deprived groups (Table 2). Results also showed that TP and AL levels fluctuated among the first four weeks of suckling and increased (P<0.01) during the 5th week in lactated ewes. Moreover, deprived suckled ewes maintain high AL concentration in the 4th and 5th week of suckling than in watered suckled ones. On the other hand, the present study showed that deprivation did not affect significantly milk yield (Table 3). Lack of water during early pregnancy stage seemed to be of residual effect on lactation as judged by the pronounced lower milk production (421 ml/h/day) since the 2nd week of suckling (Fig 9). However, ewes were able to tolerate direct thirst maintaining a reasonable milk supply for their offspring. Such trend was in agreement with those obtained by Azamel, (1996) on Barki X Merino sheep and Maltz and Shkolinik (1980) on goats. The former reported that sheep performed such duty while losing much of body weight. Because of high water content (77-85%), goats maintained milk production under repeated 2-day dehydration, keeping milk volume unchanged under water shortage which might be performed at the expense of decreasing water in urine and other water excretion routes (Olsson and Dahlborn, 1989). The mild weather that coincided with the suckling season (December-January) probably alleviated the effect of thirst on ewes in the present study. The least water expenditure in that period according to Taÿmour, *et al*., (1984) probably enabled the dehydrated ewes to economized inadequate water for suckling.

Olsson and Dahlborn (1989) on goats, stated that water deprivation caused plasma osmolarity and vasopressin concentration to increase. Lactating goats reduced water loss in urine, milk and by evaporation, and rectal temperature reached higher levels than in non-lactating animals. This saving of water could allow milk production to be maintained for a longer time. In addition, the role of placental fluids especially amnion during the late stages of pregnancy might alleviate the thirst effect on pregnant animals (Khalil, 2002; personal communication).

**Table3: Average milk yield (ml/head/day) of watered and deprived ewes.**

| **Weeks** | **Lactated ewes** | | **SE** |
|---|---|---|---|
| | **watered** | **Deprived** | |
| 2 | 539 a | 419 b | 25.3 |
| 3 | 437 a | 422 a | 25.3 |
| 4 | 424 a | 444 a | 25.3 |
| 5 | 482 a | 428 b | 25.3 |
| **Overall mean** | 468.2 | 430.8 | 13.9 |
| **SE** | 34.8 | 43.8 | 25.3 |

## CONCLUSION

Dehydration during pregnancy stages was found to be of minor effect due to the ability of ewes to drink a large amount of water in the day of drinking which seemed to cover their need under the prevailing climate. But dehydration during the early stage of pregnancy seemed to be more pronounced than the other two stages. On the other hand, this trend of change in plasma proteins might represent an adaptive response under semi-arid conditions, to the higher need of water mobilization by blood to mammary glands for milk production. Albumin is an important factor in keeping equilibrium with tissue fluids and responsible for 75-80% of the colloidal osmotic pressure in blood. However, irrespective of dehydration, pregnant ewes, in the present study, showed a good compensatory capacity to the loss of proteins just before parturition, which indicated the importance of good feeding during this critical stage for helping the ewe to rebuild its body protein. Also, watering Barki sheep twice a week under prevailing harsh conditions might be recommended without adverse effects on their productivity.

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## مستوي بروتينات بلازما الدم للنعاج البرقي ومدى تأثرها بالتعطيش

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**قسم فسيولوجيا الحيوان والدواجن- شعبة الإنتاج الحيواني والدواجن- مركز بحوث الصحراء- المطرية- القاهرة**

أجريت هذه الدراسة على ٤٠ نعجة برقى ( ٢٠ نعجة حوامل و٢٠ نعجة غير حوامل) قسمت كل مجموعة إلى تحت مجموعتين أحدهما تشرب يوميا والأخرى كل ٣ أيام بهدف قياس البروتين الكلى والالبيومين خلال الشهر الثاني والثالث والخامس من الحمل وبعد الولادة تم اختبار ٣٢ نعجة ( ١٦ نعاج برقي مرضعات و١٦ نعاج جافة ) قسمت أيضا مثل مثيلاتها الحوامل وتم تقدير مستوي بروتينات الدم خلال الأسبوع الثاني والثالث والرابع والخامس من الرضاعة وذلك لدراسة تأثير الرضاعة على تركيز بر وتينات بلازما الدم. أظهرت نتائج الدراسة الآتي:

زاد مستوى بروتينات البلازما والجلوبيولين معنويا في النعاج الحوامل عن الغير حوامل بينما زاد مستوى الالبيومين زيادة طفيفة لم تكن ذات تأثير معنوي. اتجهت بروتينات الدم إلى الزيادة في المرحلة المبكرة والوسطى من الحمل ثم انخفضت تدريجيا في المرحلة المتأخرة قبل الولادة. لوحظ أيضا أن أعلى تركيز لبروتينيات الدم كان في المرحلة الوسطى من الحمل ( الشهر الثالث) ثم انخفض بعد ذلك حتى الولادة. لم تتأثر نسبة الالبيومين /الجلوبيولين معنويا بالحمل حيث أخذت نفس الاتجاه لكل من البروتين الكلى والجلوبيولين حيث انخفضت قيمها في النعاج الحوامل عن الغير حوامل فى المرحلة المبكرة والوسطى وارتفعت فى المرحلة المتأخرة من الحمل.

لم يؤثر التعطيش معنويا على مستوى البروتين الكلى في فترات الحمل المختلفة بينما انخفض مستوى الجلوبيولين معنويا في النعاج المعطشة وعلى العكس كان هناك زيادة في مستوى الالبيومين خلال المرحلة المبكرة والوسطى من فترة الحمل مما نتج عنة زيادة في نسبة الالبيومين /الجلوبيولين في النعاج المعطشة.

انخفض مستوى بروتينات الدم الكلية والجلوبيولين معنويا في النعاج التي ترضع عن مثيلاتها الجلد وزاد الالبيومين وكذلك نسبة الالبيومين/ الجلوبيولين معنويا.

أثناء فترة الرضاعة (٥ أسابيع) اتجهت مستويات البروتين الكلى والجلوبيولين في النعاج المرضعات إلى الانخفاض حتى الأسبوع الرابع وزادت معنويا في الأسبوع الخامس مقارنة بالكنترول بينما اتخذ الالبيومين اتجاها معاكسا حيث زاد معنويا في النعاج المرضعات عن الكنترول الذي ارتفع فيه معنويا مستوى الجلوبيولين. أدى التعطيش إلى حدوث انخفاض غير معنوي في إنتاج اللبن في النعاج المعطشة وكذلك انخفض مستوى البروتين الكلى والجلوبيولين في حين لم يتأثر مستوى الالبيومين بين النعاج المعطشة والتي تشرب يوميا. أظهرت النتائج أن التعطيش وان لم يكن له تأثير على فترة الحليب (٥ أسابيع) إلا أن التعطيش في المرحلة المبكرة من الحمل كان له تأثير تراكمي عند الحليب حيث سجلت النعاج المعطشة اقل إنتاج خلال الأسبوع الثاني من الحليب.