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EFFECT OF MULTIPLE PARITIES ON MILK YIELD,UDDER AND MILK VEIN MEASUREMENTS IN NEWLY LABORED MAGHREBI SHE-CAMELS

By

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ABSTRACT

Thirteen newly labored Maghrebi she-camels, categorized according to the number of parities and the order of parturition, into three groups (1-2 parities), (3-4 parities) and (5-6 parities). Udder measurements were taken before and after hand milking on the eighth postpartum day and at the end of the eighth week post-partum. Measurements of the right and left milk veins were also taken on the eighth day after parturition. The daily milk yield of the She-Camel was estimated weekly from the eighth day of parturition until the end of the eighth week.

The udder measurements after milking decreased clearly, but not significant, and the measurements of the eighth week after calving compared to the measurements of the eighth day were non-significant increase. The udder measures increased with the increase in the multiple parities, but it was significant between the first group (1-2 parities) and other two groups (3-4 parities) and (5-6 parities). Differences between measures of the right and left milk veins were not significant, as their values (Length and Diameter) increased with the progression in the multiple parities until the difference between the first group (1-2 parities) and the last two groups was significant. The daily milk yield increased with the progression of time from parturition even the end of the eighth week, and also with the rise in the multiple Parities, but the significant increase occurred in the last two groups at the seventh and eighth week after calving.

Keywords:

Milk vain, Udder measurements, Milk yield, parturition order, She-camel.

INTRODUCTION

Dromedaries are strategic stockpile in food sovereignty hence chief source of meat, milk and by-products **(El-Bahrawy *et al.*, 2015 and Faraz *et al.*,2019a).** Due to exploding population the need has been evoked to explore new feed resources like camel by-products which have

not been fully exploited yet **(Faraz *et al.*,2019b).** Camel has the ability to sustain life and produce milk and meat in extreme environments, being less affected by feed and water shortage **(Faraz *et al.*, 2019c).** Thus, camels occupied the fifth position globally in the production of milk after cows, buffaloes, goats and sheep **(Faye and Bonnet, 2012).**

Camel milk has also become a prominent commercial activity in most of the countries that own camels, so the market potential for camel milk will develop significantly in the future **(Faye *et al.*, 2014).** Under intensive conditions, the average of milk yield was 390 to 5.310 L in 6 to 19 month in Saudi Arabian camels exploited **(Musaad *et al.*, 2013).** In different geographical region, milk yield in dromedaries found to be varied between 3.5 and 20 L **(Jianlin, 2005 and Kamoun and Jemmali,2012).**

Maghrebi she- camels have a greater milk potential, their milk yield under traditional extensive conditions averages 2.0 L/d although under more favorable conditions. It ranges between 6 and 12 L/d **(Ayadi *et al.*, 2009)**. Because of this important and huge production of milk, the udder is considered a very important organ of the dairy animal and its physiological and morphological characteristics are closely related to the performance of milk production **(Kominakis *et al.*, 2009).** The mammary gland is unique among glands in that it is only functional during lactation, and for its importance, model measurements of udder dimensions and morphology have been added in selection programs for milking animals such as ewes **(De la-Fuente,1996),** buffaloes **(Prasad *et al.*, 2010)** and cows **(Seykora and McDaniel, 1985).** A camel's udder like cattle udder consists of four quarters, each with its own teat. These glands are grouped together in the udder structure, and several researchers have described the anatomy of the camel mammary gland **(Smuts *et al.* 1987 and Al-Ani 2004).** Camels also were added to the main components of the dairy animal classification card for their distinguish in the well-developed mammary system **(Mishra *et al.* 1978).** Dairy camels are generally characterized by the development of milk vein and its prominence **(Al-Ani 2004),** in addition to the development of the udder **(Wardeh *et al.* 1990).** The developed milk veins in camels may reflect a greater ability to secrete milk **(Zayeed *et al.* 1991).** Some data on camel udder shape have been shown to have an effect on milk production, and the morphological change before and after manual milking may indicate the possibility of milk secretion under an extensive production system **(Eisa *et al.*, 2010).** A large variance was observed in the size and length of the udder and teat in camels, which can be attributed to various factors including the breed of the camel, stage of lactation, number of parities and

disease. The mammary gland grows with the growth of calves and its growth rate increases after puberty, and it accelerates greatly during pregnancy, and reaches its maximum development during the lactation period and subsides after the cessation of lactation **(Lacasse and Prosser 2003 and Delamaire and Guinard-Flament 2006).** Age and lactation period greatly affect the mammary gland **(Kausar *et al,*2001).**The quality of camel's milk is affected by different factors like feed type, environment and water availability **(Mustafa *et al.,* 2015).** Milk is the principal staple among camel products **(Schwartz, 1992),** while breed effect, nutrition, physiological status, milking practices and frequency, calf suckling and water availability are the major factors influencing the milk yield and composition in camels **(Ramet,2001).**With all of the aforementioned characteristics of camels in addition to their ability to produce milk from poor feed more than any other type of milking animals **(Wilson, 1997).** The study aims to measure and compare udder measurements before and after hand-milking during the first period of the postpartum stage, measuring of the milk vein and estimating the daily milk yield in Maghrebi She-Camels varying parities,to figure out its characteristics and productivity of milk under Egyptian conditions, and adding Information that contributes to improving its properties and increasing the productivity of milk.

MATERIAL AND METHODS

The present study was conducted at the department of animal biotechnology, animal production research institute,and Egypt.The present work was carried out in a Private Camels farm,Marsa Matrouh governorate, located in the north of Egypt, closest area to the western border of Egypt.The studies started on November,2018 and persisted until June, 2020.

Animals and Feeding:

Thirteen pregnant Maghrebi She-Camels (Camelus Dromedarius) were conserved from thirty healthy varying ages Maghrebi She-Camels. They were placed in the wide pen and wide paddock for exercising. The average of the thirteen Maghrebi she-camels body weight was 560 kg. Ration per animal was offered twice daily at 8 a.m. and 6 p.m. The ration was consisted of 7 kg of a forage mixture barley straw (Hordeum Vulgare) and 5-6 kg of a commercial feed concentrate mixture (12% CP). After parturition the thirteen viviparous she-camels were used to investigate the udder measurements round the milking, milk vein, milk yield during eight weeks after parturition. The rations were submitted to farm customary regime without any methodological interfering in it.

Experimental design:

Of the thirty Maghrebi She-Camels that were pollinated during the first quarter of 2019, a thirteen pregnant She-Camel managed to give calving successfully during the period from late march and through April of the year 2020. According to multiple parities they were classificated to three groups.The groups were arranged to (1-2 parities), (3-4 parities) and (5-6 parities).The distribution of the thirteen she-camels in the groups was 6,4,and 3 she-camels, respectively. These She-Camels were subjected over a period of eight weeks after calving to several measurements represented in the recording of udder measurements before and after milk twice during the eight weeks, the measurements of the milk vein after the passage of the colostrum period (8 Days After Calving), and the recording of the daily milk yield weekly during this period.

Udder measurements:

Each measurement was taken twice and the average of two readings was calculated before it was adopted as the basis for the study data. Udder measurements were taken twice over a period of eight weeks following delivery. The first time to take udder measurements was on the eighth day after birth and the second time at the end of the eighth week after parturition. These measurements were taken in the period of time around the milking once before milking and another after the udder measurements were as follows:

Length:It is the distance measured from one side between the anterior and posterior ligaments of the udder. Depth: It is the average lateral vertical distance between the base of the four teats and the abdominal wall at the base of the udder. Horizontal circumference: It is the sum of the measure of the horizontal surface distance of the right and left udder halves, from the anterior suspensory link between the anterior quadrants to the middle point between the posterior quadrants.Udder Size:It is the product of multiplying the horizontal circumference of the udder in its depth **(Maskovskaja, 1967).** Semi-Vertical circumference: It is the measurement of the vertical circumference of the udder surface between the anterior and posterior teats, starting with the abdominal wall at the base of the udder on one side, to the abdominal wall on the other.Udder height: is the vertical distance from the ground to the base of the teats, Classified into: a- Fore quarter height: is the average distance from the ground to the base of the front teats b- Rear quarter height: is the average distance from the ground to the base of the rear teats. Teat length: It is the distance between the base of the teat and its tip, and it is classified into: a- Fore teat length,b- Rear teat length. Teat Diameter: It is the average

thickness of the teat the middle of the teat, and it is classified into:a- Fore teat diameter, b - Rear teat diameter. Distance between teats: It is the distance between every 2 teat s from the middle point of the, teat and it is classified:a-Fore teats,b- Rear teats, c- Right teats,d- Left teats. Teats measurements method was described by **(Abdalla *et al,* 2015).** The units of measure used in udder measurements were the centimeter and square centimeter, and the instruments were the measuring tape and vernier caliper.

Milk vein measurements:

The milk vein was measured once during the experiment on the eighth day after calving, and the measurements taken were milk vein length and milk vein diameter, each measurement was taken twice and the average of two readings was calculated before adopting it as a basis for the study data.Milk vein length:The length of the milk vein was measured linearly by pulling the tape measure in a straight line along the protruding vein starting in front of the fore quadrants of the udder until it disappeared into the abdominal cavity. Milk vein diameter: The thickness of the milk vein was measured in the clearest part of it, approximately in the middle,by using a vernier caliper.These measurements were performed on both the right and left milk veins. It was conducted following the measurements of the udder. The units of measure used in milk vain measurements were the centimeter, and the instruments were the measuring tape and vernier caliper.

Milk yield:

Estimation of daily milk production was done once a week, starting from the eighth day of birth until the end of the eighth week. Milking was done manually twice during the measurement day at $07:00^{h}$ and $19:00^{h}$. The calves accompanied to their dams, where the udder of the She-Camel was tied in the middle of the night before the day of estimating the milk yield. At the time of milking, the calves were allowed to suckle their dams to stimulate the secretion of milk, and then it is removed after the start of flowing the milk until the completion of hand milking in a plastic bucket. It is estimated by weight and then by volume using a graduated cylinder. And taking into account that, the specific density is approximately equal to one, the average of the two measures was calculated to adopt the milk yield data. After estimating the amount of milk, it is returned to the herdmen, who seemed to be very knowledgeable about ways to refeed it in ways that are safe for calves. After that, the calves were left to their dams until the next measure time.

Statistical analysis:

Data obtained were tabulated and statistically computed by SAS (SAS Version 9.0, SAS Inst. Inc., and Cary, NC). To have the analysis of variance procedure and Duncan's Multiple Range test to detect significant differences among means.

RESULTS AND DISCUSSION

Thirteen newly labored Maghrebi She-Camels were classified according to the multiple Parities into three groups. The results were recorded about the effect of multiple Parities, milking process and the time elapsed after parturition on the udder measurements of Maghrebi she-camels in (Tables 1, 2): A highly increase in the value of udder length/cm was observed with the increase in the number of parities **(EISA *et al,* 2008; Abd-Alla *et al,* 2015 and Mostafa *et al,* 2017),** and it was significant between (1-2 parities) and (3-4 parities and 5-6 parities).There were insignificant increases in the value of udder length/cm before milking more than after milking.The value of udder length/cm at the end of the eighth week after parturition increased non-significantly more than the eighth day after parturition.

There were non-significant differences between the mean of each multiple Parities and the (Multiple Parities Overall Mean) at all times of the experiment.The same trend that occurred in the udder length/cm measurements was repeated with each of the udder horizontal circumference,udder depth,uddersemi-vertical circumference,and udder size,but with different values (As recorded in table 1). All values increased with the progress in the parities, and their values decreased insignificantly after milking less than before, and also increased non-significantly at the end of the experiment more than the beginning and their averages made an insignificant difference from the (Multiple Parities Overall Mean).

These results fully or partially agreed with those reported by **(Lacasse and Prosser 2003; Delamaire and Guinard-Flament 2006; Kausar *et al,* 2001; EISA *et al,* 2008; Ayadi *et al,* 2013; Abd alla *et al,* 2015; Mostafa *et al,* 2017; Ibrahim, 2018; and Ashour *et al,* 2019).**

Table (1): The variation (Mean ± S.E) of Maghrebi She-Camels udder measurements/cm after and before milking among different parities after parturition.

Times	Multiple parities	Around milking	Udder						
			Length	Horizontal circumference	Depth	Semi-vertical circumference	Size	Height	
								Fore quarter	Rear quarter
Eighth Day After Parturition	1-2 parities	Before	$19.41^{DC} \pm 0.82$	$47.11^{ED} \pm 3.38$	$19.05^{DE} \pm 0.85$	$42.26^{DC} \pm 3.91$	$899.75^{ED} \pm 117.20$	$101.36^{A} \pm 2.64$	$99.96^{A} \pm 2.54$
		After	$18.55^{D} \pm 0.82$	$42.23^{E} \pm 3.38$	$17.60^{E} \pm 0.85$	$38.55^{DC} \pm 3.91$	$745.29^{E} \pm 117.20$	$101.36^{A} \pm 2.64$	$99.96^{A} \pm 2.54$
	3-4 parities	Before	$23.52^{BA} \pm 1.01$	$61.07^{BAC} \pm 4.14$	$23.3^{BAC} \pm 1.04$	$51.55^{BC} \pm 4.79$	$1424.66^{BAC} \pm 143.54$	$99.12^{A} \pm 2.29$	$98.57^{A} \pm 2.20$
		After	$22.60^{BA} \pm 1.01$	$56.17^{BDC} \pm 4.14$	$21.82^{BDAC} \pm 1.04$	$48.07^{DC} \pm 4.79$	$1228.98^{BDC} \pm 143.54$	$99.17^{A} \pm 2.29$	$98.62^{A} \pm 2.20$
	5-6 parities	Before	$24.86^{A} \pm 1.16$	$70.73^{A} \pm 4.78$	$24.76^{BA} \pm 1.21$	$65.40^{A} \pm 5.53$	$1751.87^{A} \pm 165.74$	$90.68^{B} \pm 1.87$	$90.21^{B} \pm 1.80$
		After	$24.13^{A} \pm 1.16$	$67.13^{BA} \pm 4.78$	$23.70^{BA} \pm 1.21$	$62.36^{BA} \pm 5.53$	$1591.14^{BA} \pm 165.74$	$90.73^{B} \pm 1.87$	$90.23^{B} \pm 1.80$
	Overall mean	Before	$21.93^{BAC} \pm 0.56$	$56.86^{BDC} \pm 2.29$	$21.67^{BDC} \pm 0.58$	$50.46^{BC} \pm 2.65$	$1257.90^{BDC} \pm 79.62$	$95.74^{BA} \pm 1.27$	$95.03^{BA} \pm 1.22$
		After	$21.08^{BDC} \pm 0.56$	$52.26^{EDC} \pm 2.29$	$20.30^{DEC} \pm 0.58$	$46.97^{DC} \pm 2.65$	$1089.31^{EDC} \pm 79.62$	$95.78^{BA} \pm 1.27$	$95.06^{BA} \pm 1.22$
End of Eighth Week After Parturition	1-2 parities	Before	$19.50^{DC} \pm 0.82$	$47.35^{ED} \pm 3.38$	$19.11^{DE} \pm 0.85$	$35.95^{D} \pm 3.91$	$907.27^{ED} \pm 117.20$	$101.26^{A} \pm 2.64$	$99.83^{A} \pm 2.54$
		After	$18.55^{D} \pm 0.82$	$42.21^{E} \pm 3.38$	$17.58^{DE} \pm 0.85$	$38.56^{DC} \pm 3.91$	$744.23^{E} \pm 117.20$	$101.36^{A} \pm 2.64$	$99.96^{A} \pm 2.54$
	3-4 parities	Before	$23.67^{BA} \pm 1.01$	$61.57^{BAC} \pm 4.14$	$23.45^{BA} \pm 1.04$	$51.70^{BC} \pm 4.79$	$1445.37^{BAC} \pm 143.54$	$99.02^{A} \pm 2.29$	$98.47^{A} \pm 2.20$
		After	$22.57^{BA} \pm 1.01$	$56.17^{BDC} \pm 4.14$	$21.82^{BDAC} \pm 1.04$	$48.02^{DC} \pm 4.79$	$1228.98^{BDC} \pm 143.54$	$99.17^{A} \pm 2.29$	$98.62^{A} \pm 2.20$
	5-6 parities	Before	$24.90^{A} \pm 1.16$	$71.00^{A} \pm 4.78$	$24.93^{A} \pm 1.21$	$65.70^{A} \pm 5.53$	$1770.31^{A} \pm 165.74$	$90.63^{B} \pm 1.87$	$90.18^{B} \pm 1.80$
		After	$24.13^{A} \pm 1.16$	$67.13^{BA} \pm 4.78$	$23.70^{BA} \pm 1.21$	$62.36^{BA} \pm 5.53$	$1591.14^{BA} \pm 165.74$	$90.71^{B} \pm 1.87$	$90.23^{B} \pm 1.80$
	Overall mean	Before	$22.03^{BAC} \pm 0.56$	$57.18^{BDC} \pm 2.29$	$21.79^{BDAC} \pm 0.58$	$47.66^{DC} \pm 2.65$	$1272.00^{BDC} \pm 79.62$	$95.66^{BA} \pm 1.27$	$94.96^{BA} \pm 1.22$
		After	$21.07^{BDC} \pm 0.56$	$52.26^{EDC} \pm 2.29$	$20.30^{DEC} \pm 0.58$	$46.96^{DC} \pm 2.65$	$1088.82^{EDC} \pm 79.62$	$95.77^{BA} \pm 1.27$	$95.06^{BA} \pm 1.22$

:Significantly differed, P<0.01

Table (2): The variation (Mean ± S.E) of Maghrebi She-Camels teat measurements/cm after and before milking among different parities after parturition.

Times	Multiple parities	around milking	Teats							
			Length		Diameter		Distance between teat			
			Fore	Rear	Fore	Rear	Fore	Rear	Right	Left
Eighth Day After Parturition	1-2 parities	Before	$3.20^{DE} \pm 0.61$	$2.30^{DC} \pm 0.47$	$1.78^{DE} \pm 0.27$	$2.30^{DE} \pm 0.33$	$10.10^{B} \pm 0.63$	$9.50^{D} \pm 0.62$	$2.01^{EDC} \pm 0.27$	$2.01^{DC} \pm 0.25$
		After	$2.56^{E} \pm 0.61$	$1.81^{D} \pm 0.47$	$1.70^{E} \pm 0.27$	$2.21^{E} \pm 0.33$	$10.06^{B} \pm 0.63$	$9.46^{D} \pm 0.62$	$1.98^{E} \pm 0.27$	$1.98^{D} \pm 0.25$
	3-4 parities	Before	$5.50^{BAC} \pm 0.75$	$4.15^{BA} \pm 0.58$	$2.90^{BAC} \pm 0.34$	$3.60^{BAC} \pm 0.41$	$12.85^{A} \pm 0.77$	$11.95^{BAC} \pm 0.76$	$3.02^{BAC} \pm 0.33$	$3.00^{BA} \pm 0.30$
		After	$4.97^{BDAC} \pm 0.75$	$3.67^{BDC} \pm 0.58$	$2.77^{BDAC} \pm 0.34$	$3.50^{BDAC} \pm 0.41$	$12.75^{A} \pm 0.77$	$11.85^{BAC} \pm 0.76$	$2.95^{EBDAC} \pm 0.33$	$2.92^{BAC} \pm 0.30$
	5-6 parities	Before	$7.06^{A} \pm 0.86$	$5.16^{A} \pm 0.67$	$3.70^{A} \pm 0.39$	$4.53^{A} \pm 0.47$	$14.20^{A} \pm 0.89$	$13.46^{BA} \pm 0.88$	$3.83^{A} \pm 0.38$	$3.76^{A} \pm 0.35$
		After	$6.63^{BA} \pm 0.86$	$4.70^{BA} \pm 0.67$	$3.60^{BA} \pm 0.39$	$4.43^{BA} \pm 0.47$	$14.20^{A} \pm 0.89$	$13.43^{BA} \pm 0.88$	$3.80^{A} \pm 0.38$	$3.76^{A} \pm 0.35$
	Overall mean	Before	$4.80^{BDC} \pm 0.41$	$3.53^{BDC} \pm 0.32$	$2.56^{DEC} \pm 0.19$	$3.21^{DEC} \pm 0.22$	$11.89^{BA} \pm 0.42$	$11.16^{DC} \pm 0.42$	$2.74^{EDC} \pm 0.18$	$2.72^{BDC} \pm 0.17$
		After	$4.24^{DEC} \pm 0.41$	$3.05^{BDC} \pm 0.32$	$2.46^{DEC} \pm 0.19$	$3.12^{DEC} \pm 0.22$	$11.84^{BA} \pm 0.42$	$11.11^{DC} \pm 0.42$	$2.70^{EDC} \pm 0.18$	$2.68^{BDC} \pm 0.17$
End of Eighth Week After Parturition	1-2 parities	Before	$3.18^{DE} \pm 0.61$	$2.30^{DC} \pm 0.47$	$1.83^{DE} \pm 0.27$	$2.33^{DE} \pm 0.33$	$10.15^{B} \pm 0.63$	$9.56^{D} \pm 0.62$	$2.10^{EDC} \pm 0.27$	$2.05^{DC} \pm 0.25$
		After	$2.56^{E} \pm 0.61$	$1.81^{D} \pm 0.47$	$1.70^{E} \pm 0.27$	$2.21^{E} \pm 0.33$	$10.05^{B} \pm 0.63$	$9.46^{D} \pm 0.62$	$2.00^{ED} \pm 0.27$	$1.98^{D} \pm 0.25$
	3-4 parities	Before	$5.50^{BAC} \pm 0.75$	$4.15^{BA} \pm 0.58$	$2.97^{BAC} \pm 0.34$	$3.67^{BAC} \pm 0.41$	$12.95^{A} \pm 0.77$	$12.05^{BAC} \pm 0.76$	$3.02^{BAC} \pm 0.33$	$3.02^{BA} \pm 0.30$
		After	$4.97^{BDAC} \pm 0.75$	$3.67^{BDC} \pm 0.58$	$2.77^{BDAC} \pm 0.34$	$3.50^{BDAC} \pm 0.41$	$12.80^{A} \pm 0.77$	$11.85^{BAC} \pm 0.76$	$3.00^{BDAC} \pm 0.33$	$2.92^{BAC} \pm 0.30$
	5-6 parities	Before	$7.13^{A} \pm 0.86$	$5.23^{A} \pm 0.67$	$3.73^{A} \pm 0.39$	$4.66^{A} \pm 0.47$	$14.20^{A} \pm 0.89$	$13.53^{A} \pm 0.88$	$3.83^{A} \pm 0.38$	$3.76^{A} \pm 0.35$
		After	$6.56^{BA} \pm 0.86$	$4.66^{BA} \pm 0.67$	$3.60^{BA} \pm 0.39$	$4.43^{BA} \pm 0.47$	$14.13^{A} \pm 0.89$	$13.36^{BAC} \pm 0.88$	$3.73^{BA} \pm 0.38$	$3.70^{A} \pm 0.35$
	Overall mean	Before	$4.80^{BDC} \pm 0.41$	$3.54^{BDC} \pm 0.32$	$2.62^{BDEC} \pm 0.19$	$3.28^{BDEC} \pm 0.22$	$11.94^{BA} \pm 0.42$	$11.24^{BDC} \pm 0.42$	$2.78^{EBDC} \pm 0.18$	$2.74^{BDC} \pm 0.17$
		After	$4.23^{DEC} \pm 0.41$	$3.04^{BDC} \pm 0.32$	$2.46^{DEC} \pm 0.19$	$3.12^{DEC} \pm 0.22$	$11.83^{BA} \pm 0.42$	$11.10^{DC} \pm 0.42$	$2.70^{EDC} \pm 0.18$	$2.66^{BDC} \pm 0.17$

:Significantly differed, P<0.01.

From tracking the measurements of udder height/cm of its two types fore quarter height and rear quarter height, a non-significant increase in the value was found in favor of fore quarter height **(EISA *et al,* 2008).** There was gradual decrease in the value of udder height/cm with the increase in the multiple Parities, this agrees with **(EISA *et al,* 2008),** while **(Mostafa *et al,* 2017)** recorded opposite trend. The value of udder Height/cm decreased with increasing in the multiple parities to be significant decreasing in the third group (5-6 parities). There were slight increases in the value of udder Height/cm after milking than before.

The value of udder height/cm decreased slightly at the end of the eighth week after parturition than the first week. There were non-significant differences between the mean of each multiple parities and the (Multiple Parities Overall Mean) at all times of the experiment.

In the measurements of teat length/cm of both types (Fore Teat Length) and (Rear Teat Length), there was a clear but not significant increase in the value of fore teat length compared to rear teat length. These results are in agreement with what was reached by **(Ashour *et al,* 2019),**and contrary to what was presented by **(Mostafa *et al,*2017).**

The relatively large increase in the value of teat length/cm correspond with ascent in the multiple parities and it became a significant difference between group (1-2 parities) and the other two groups (3-4 parities) and (5-6 parities), and there were also non-significant differences between the averages of each multiple Parities and the (Multiple Parities Overall Mean) at all times of the experiment **(EISA *et al,*2008; Abd-Alla *et al,*2015;Ibrahim, 2018; Aboul-Rayat, 2019; and Ashour *et al,* 2019).**There were non-significant increase in the value of Teat length/cm before milking more than after milking in all groups in all stages of the experiment **(Ashour *et al,* 2019).** No change in the value of (Teat Length) was observed at the end of the eighth week after parturition than the eighth day in the beginning. In both types of measurement of teat diameter/cm which are (ForeTeat Diameter) and (Rear Teat Diameter), there was a clear but not significant increase in the value of rear teat diameter compared to fore teat diameter, this is consistent with **(EISA *et al,* 2008; Ayadi *et al,* 2013; Abd-Alla *et al,* 2015; Mostafa *et al,* 2017; Ibrahim, 2018; Aboul-Rayat, 2019; and Ashour *et al,* 2019).** On the other hand, **(Eisa and Mustafa,2012)** reported that rear teat diameter was found to be significantly different greater than fore teats **(Cited by, Ashour, *et al,* 2019).**

The relatively large rise in the value of teat diameter/cm has been gradual with the increase in the multiple parities **(EISA *et al,* 2008; Abd Allah *et al,* 2015; Mostafa *et al,* 2017; and**

Ashour *et al,* 2019), and increase was a significant between (1-2 parities) and (3-4 parities and 5-6 parities), and there were non-significant differences between the averages of each group of multiple parities and the (Multiple Parities Overall Mean) at all times of the experiment. There were non-significant decreases in the value of teat diameter/cm after milking less than before in all portion orders in all stages of the experiment **(Ashour *et al,* 2019).** An increase in the value of teat diameter/cm was observed at the end of the eighth week after parturition with a slight difference, but it was more pronounced in the group (3-4 parities). In the measurements of Distance Between Teats/cm of its four types (Distance Between Fore Teats), (Distance Between Rear Teats), (Distance Between Right Teats) and (Distance Between Left Teats), during each stage of the experiment the increase in the value of distance between teats from (1-2 parities) to (5-6 parities) in all its four types **(EISA *et al,* 2008; Abd Allah *et al,* 2015; and Mostafa *et al,* 2017).** High differences were found in the value of the (Distance Between Teats) between its four types and some of them, as the differences between them varied in the value and the level of significance, so its highest values were in distance between fore teats and the lowest in distance between Left teats **(EISA *et al.,* 2008; and Mostafa *et al,* 2017).**

The relatively large increase in the value of distance between teats/cm has resulted from an increase in the multiple parities, until it became a significant difference between the group (1-2 parities) and the other two groups, and there were also non-significant differences between the averages of each multiple parities groups and the (Multiple ParitiesOverall Mean) at all times of the experiment. There was a non-significant decrease in the value of the distance between teats/cm with its four types after milking than before measurement in all groups in all stages of the experiment. This agrees with **(Ashour *et al,* 2019)** in the two types of measurements that they studied, they are distance between fore teats and distance between rear teats. A non-significant increase in the value of distance between teats/cm of its four types was observed at the end of the eighth week after parturition compared to the eighth day in the beginning. It was noticed from this study that, the udder measurements grew and developed during the eight weeks of the lactation period at a rate that was considered greater than their growth and development during twelve months of the gestation period, and this is consistent with what was recorded by a number of researchers including **(Kausar *et al,* 2001)** who stated that, the age and lactation significantly affect the mammary gland.

The great variation in the size and length of the udder and teats in She-Camels is attributed to

various factors including the type of camel, the stage of lactation, the number of parities and disease **(Lacasse and Prosser 2003; and Delamaire and Guinard-Flament 2006). (Osman, 2006)** reported marked trend of increase in all udder and teat measurements by advancing parity, stage of lactations and age of camel. **(EISA *et al,* 2008)** reported that, the majority of the udder measurements evaluated seemed to increase with increasing parity order.

Table (3): The variation (Mean ± S.E) of Maghrebi She-Camels milk vein (Cm) measurements among number of parities after parturition.

Multiple parities	Milk vein measurements in eighth day after parturition			
	Length		Diameter	
	Right	Left	Right	Left
1-2 parities	73.75^{B} ±1.80	72.28^{B} ±1.79	1.61^{B} ±0.26	1.52^{B} ±0.25
3-4 parities	80.92^{A} ±2.20	80.80^{A} ±2.19	1.91^{A} ±0.32	1.79^{A} ±0.31
5-6 parities	82.80^{A} ±2.54	82.10^{A} ±2.53	2.36^{A} ±0.37	2.27^{A} ±0.36
Overall Mean	78.04^{BA} ±1.22	77.16^{BA} ±1.21	1.96^{BA} ±0.18	1.86^{BA} ±0.17

:Significantly differed, P<0.01.

Averages of the right and left milk vein measurements for newly labored Maghrebi she-camels classified according to multiple Parities are presented in (Table 3). In the measure milk vein length/cm on the right and left sides, a slight (Non-Significant) difference was observed between the right and left milk veins. The milk vein length/cm gradually increased with the altitude of multiple parities **(EISA *et al,* 2008 and Abd -Alla *et al,* 2015).**

A significant differences were observed between (1-2 parities) and (3-4 parities and 5-6 parities).There were also non-significant differences between the averages of each multiple parities groups and the (Multiple Parities Overall Mean). Milk vein length reduced by a few centimeters in Maghrebi she-camels than the results of the study of **(EISA *et al,* 2008)** that was conducted on Sudanese camels. A measure of milk vein diameter/cm adopt a similar trend to milk vein length/cm, with a wide difference in the values. In the measure of milk vein diameter/cm on the right and left sides, a slight (non-significant) difference was observed between the thickness of right and left milk veins. The increase in the milk vein diameter/cm progressed with an increase in the multiple parities **(EISA *et al,* 2008; Abd- Alla *et al,* 2015; Ibrahim; 2018; Aboul-Rayat, 2019 and Ashour *et al,* 2019),** until the difference became a

significant difference between (1-2 parities) and (3-4 parities and 5-6 parities).

There were also non-significant differences between the averages of each multiple parities groups and the (Multiple Parities Overall Mean).

Table (4): The variation (Mean ± S.E) of Maghrebi she-camels milk yield (Kg/d) among number of parities after parturition.

Multiple parities	Daily milk yield Kg/d							
	1 Eighth Day After parturition	Last of 2 Weeks	Last of 3 Weeks	Last of 4 Weeks	Last of 5 Weeks	Last of 6 Weeks	Last of 7 Weeks	Last of 8 Weeks
1-2 parities	1.18^{T} ± 0.14	1.36^{STR} ± 0.14	1.54^{SPTQ} ± 0.14	2.00^{MPNL} ± 0.14	2.48^{HKIJL} ± 0.14	2.82^{HFI} ± 0.14	3.13^{FDEC} ± 0.14	3.39^{BDA} ± 0.14
3-4 parities	1.44^{STQR} ± 0.17	1.79^{SPNOQR} ± 0.17	2.07^{MFNO} ± 0.17	2.56^{HKIG} ± 0.17	2.96^{HFDG} ± 0.17	3.33^{BDE} ± 0.17	3.68^{BA} ± 0.17	3.81^{BA} ± 0.17
5-6 parities	1.51^{SPTQR} ± 0.20	1.91^{MPNOQ} ± 0.20	2.28^{MKNJ} ± 0.20	2.63^{HFIJG} ± 0.20	3.08^{FDEG} ± 0.20	3.45^{BDA} ± 0.20	3.76^{BA} ±0.20	3.92^{A} ±0.20
Overall Mean	1.34^{ST} ± 0.09	1.62^{SPTR} ± 0.09	1.88^{MPNO} ± 0.09	2.32^{MKIL} ± 0.09	2.77^{HFIJG} ± 0.09	3.12^{FDE} ± 0.09	3.44^{BDAC} ± 0.09	3.64^{BAC} ± 0.09

:Significantly differed, P<0.01

The amount averages of the daily milk yield of newly labored Maghrebi She-Camels classified according to multiple parities during an eight-week period after parturition are presented in (Table 4).The daily yield of milk production, estimated by weight in kilograms, the average of weights increased by increasing in the multiple parities and the order of parturitions from (1-2 parities) to (5-6 parities) during each week of the experiment in accordance of the trend with **(EISA *et al,* 2008; Mostafa *et al,* 2017 and Ashour *et al,* 2019),** but insignificant increases.The lowest daily milk yield was from the (1-2 parities) and the highest in the (5-6 parities), consistent with **(Bekele *et al,* 2002).** On the other hand **(Zeleke, 2007)** noted that, the lowest milk yield in She-Camels was recorded at the sixth parity and the highest was recorded at the third parities, while **(Al-Saiady *et al,* 2012)** reported that, the lowest milk yield was observed of the first,second and fourth lactation.While,the highest milk productivity was observed at the third and sixth parities of lactation. The daily milk yield increased by progressing in the time of the experiment from the first week (The Eighth Day

After Parturition) to the eighth week, but in general there were no significant increases, except in the increases of the seventh and eighth weeks compared to the first week in the groups (3-4 parities) and (5-6 parities), this corresponds with the natural curve of milk production in mammals, where the rate of daily milk production increases with the progression in the lactation period until it reaches the top of the production curve and stabilizes for a period of time and then decreases until it stops at the end of the lactation. It is noticeable that there is a similarity between the rates of the daily milk yield of the Maghrebi she-camels at the end of the eighth week (Second Month) after parturition with what was recorded by **(Ashour *et al,* 2019)** in terms of quantity, but measurements of the daily milk yield of their study began in the third month after parturition. Some studies indicated that there is a high correlation between udder measurements and daily milk yield. **(EISA *et al,* 2008)** reported that, some of the measurement of the She-Camel udder proved to have an impact on milk yield.

They also referred to udder measures that have a significant correlation with the daily milk yield, and noted the below: Parameters like udder depth, height of fore and rear quarters, fore teat diameter and distance between teats clearly indicated significant correlation between these traits and daily milk yield. Some studies also indicated that, the shape of the udder is related to the daily milk yield. **(Musaad *et al,* 2017)** reported that, It's clear that teat and udder shapes and dimensions have higher statistically relationship with milk yield in lactating camels, and he attached that there were significant ($p \leq o.o5$) between various udder shapes and total milk yield clearly shown at first stage of lactation. In the addition by **(Tag El-Dein *et al,* 2011)** Reported, the udder shape appeared to have marked effects ($p \leq o.o1$) on milk yield. Not only is the shape of the udder and its measurements related to the daily milk yield, but also their change before and after milking is related to the milk yield. **(Eisa *et al,* 2010)** reported that, some data on the shape of the udder of camels have proven to have an effect on milk production and the morphological change before and after manual milking indicates the possibility of milk secretion under an extensive production system. And as studies confirmed the relationship of udder measurements with milk yield, they also confirmed the relationship of milk vein and its measurements to milk yield. Dairy camels are generally characterized by the development and prominence of milk veins **(Al-Ani,2004),** in addition to the development of the udder **(Wardeh *et al,* 1990).** The developed milk veins in camels reflect a greater ability on milk secretion **(Zayeed *et al,* 1991).**

CONCLUSIONS

Results of the current study indicated that, the varying increase in the level of significance in the measurements of the udder, the milk vein and the daily milk yield with the progress in the multiple Parities and the order of parturition, while the effect of the passing time from parturition until the expiry of eight weeks was more clear and higher significant in increasing daily milk yield than the change in udder measures.

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تأثير تعدد الولادات على محصول اللبن ومقاييس الضرع و وريد اللبن فى النوق المغربى حديثة

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الملخص

ثلاثة عشر ناقة مغربى حديثة الولادة ، صُنِفت بحسب عدد الولادات و ترتيب الولادة إلى ثلاثة مجاميع، هى المجموعة (1-2 موسم ولادة) و(3-4 موسم ولادة) و (5-6 موسم ولادة). أُخِذت مقاييس الضرع قبل و بعد الحليب اليدوى فى اليوم الثامن بعد الولادة و أخر الأسبوع الثامن بعد الولادة. كما أتخِذات قياسات وريد اللبن الأيمن و الأيسر فى اليوم الثامن بعد الولادة. قُدِر محصول اللبن اليومى للنوق أسبوعياً من اليوم الثامن للولادة و حتى أخر الأسبوع الثامن. تناقصت مقاييس الضرع بعد عملية الحلب تناقصاً واضحاً عن قبله و لكن غير معنوى, كما تزايدت فى قياسات الأسبوع الثامن عن قياسات اليوم الثامن زيادةً غير معنويةً. زادت مقاييس الضرع بالزيادة فى تعدد الولادات و لكنها كانت معنوية بين المجموعة الأولى و المجموعتين الثانية و الثالثة. كانت الفروق بين مقاييس وريد اللبن الأيمن و الأيسر غير معنويةً. زادت قيمة مقاييس وريد اللبن (الطول و السمك) بالتقدم فى تعدد الولادات إلى أن أصبح الفرق بين المجموعة الأولى و المجموعتين الأخيرتين معنوياً، التى زادت فيها المجموعة الثالثة عن الثانية زيادة غير معنوية. زاد محصول اللبن اليومى بتقدم الزمن من الولادة و حتى أخر الأسبوع الثامن، و أيضاً بالإرتقاء فى تعدد الولادات، إلا أن الزيادة المعنوية حدثت فى المجموعتين الثانية و الثالثة فى الأسبوعين السابع و الثامن من الولادة.