

Somatic Cell Count (Scc) Of Milk And Its Correlation With Body Mass Index (Bmi) In Awassi Lambs

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Summary

A flock of the local breed of *Awassi (Ovis aries)* at the domestic animal farm which belonged to the Department of Animal Resources at the College of Agriculture at Baghdad University, Iraq, was used in this study over the period (from 1/12/2013 to 1/4/2014). From a minimum of the Day 10 up to Day 90 after lambing (after Birth to Weaning Age), a total of 240 milk samples from apparently healthy ewes were being milked half-udder by half-udder (from the Left & Right udder halves) from a (60) dairy *Awassi* Ewes of the major flock were surveyed. These 60 ewes which were being had a single male lamb birth (Primiparous native) were randomly picked out from the flock and sub divided in to (4) groups each with (15) ewes at the same age as possible as (≥ 2 , ≥ 3 , ≥ 4 & ≥ 5) years old which were in various stages of lactation as the (1st, 2nd, 3rd & 4th) Lactation respectively. Upon carrying out during the morning milking by hand, the samples were being taken from the milk of each half-udder in order to investigate their Direct Microscopic Somatic Cells Count (DMSCC) after California Mastitis Test (CMT) Screening examination of each ewe individually, to investigate SCC increasing due to Ovine Sub-clinical mastitis together with simple Correlation coefficients (r) between the Estimated study Parameters which include the recording of the (Weight (g)) & (Height (cm)) of the Lambs (at Day 1, Day 10 & Day 90) to calculate the Body Mass Index (BMI(g/cm²)). Also the effects of some factors on those traits were being investigated.

- Key Words : Awassi , Milk , Somatic Cells , Body Mass Index (BMI) .

ارتباط محتوى لبن نعاج العواسي من الخلايا الجسمية في مؤشر كتلة الجسم لحملاتها

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الخلاصة

شملت الدراسة (60) نعجة عواسي (*Ovis aries*) محلية سليمة ظاهريا قسمت إلى أربع مجاميع متقاربة الفئات العمرية (من سنتان إلى خمس سنوات فأكثر) ومتقاربة دورات الحلب (من الأولى إلى الرابعة فأكثر) , ومن ذوات الولادة الذكورية المفردة فقط , اختيرت عشوائياً من قطيع أغنام الحقل الحيواني التابع لقسم الثروة الحيوانية في كلية الزراعة / جامعة بغداد , العراق , وللمدة من بداية كانون الأول عام 2013 لغاية بداية نيسان عام 2014 , حيث تم جمع (240) عينة لبن بالحلب اليدوي صباحاً للفترة من بعد الولادة لغاية الفطام وبأعمار (10) و (90) يوم بهدف تقدير محتوى لبن هذه النعاج من عد الخلايا الجسمية SCC وتسجيل قياسات وزن (غم) حملاتها الذكورية المفردة , للفترة من الولادة إلى الفطام وبأعمار (1 و 10 و 90) يوم لغرض احتساب صفتي

معدل الزيادة اليومية للوزن (غم/يوم) ومعدل النمو (%غم/يوم). ودراسة بعض العوامل المؤثرة في هذه الصفات , وكذلك دراسة ارتباط مدى (Score) ارتفاع محتوى لبن النعاج بفئاتها العمرية الأربعة ودورات حلبها بعد الخلايا الجسمية SCC نتيجة الإصابة بالتهاب الضرع الضائي تحت السريري في ارتباط ذلك بصفات النمو المحتسبة للحملان المتقدمة الذكر , فضلاً على تقدير معامل الارتباط البسيط بين الصفات المدروسة . وقد كانت قيم معامل الارتباط الكلي بين قيم عد الخلايا الجسمية SCC و الصفات المدروسة لصفات النمو المحتسبة لحملان الدراسة كالتالي :

للوزن (غم) وبمستوى عالي المعنوية ($P \leq 0.01$) وبقيم بلغت (0.867 و 0.910) لكل من عمر 10 يوم و 90 يوم على التوالي وكان غير معنوي وبقيمة بلغت (0.344) لعمر (10 و 90) يوم .
وللارتفاع (سم) بقيمة معنوية ($P \leq 0.05$) بلغت (0.761) لعمر 10 يوم وبقيمة عالية المعنوية ($P \leq 0.01$) بلغت (0.918) لعمر 90 يوم وكان غير معنوي وبقيمة بلغت (0.390) لعمر (10 و 90) يوم .
ولمؤشر كتلة الجسم (غم/سم²) بقيمة معنوية سالبة ($P \geq 0.05$) بلغت (-0.658) لعمر 10 يوم وبقيمة معنوية ($P \leq 0.05$) بلغت (0.699) لعمر 90 يوم وكان غير معنوي وبقيمة بلغت (0.274) لعمر (10 و 90) يوم .
كلمات مفتاحية : عواسي , لبن , خلايا جسمية , مؤشر كتلة الجسم.

Introduction

The livestock contributed about one-third of Iraqi rural families' income prior to the 1960s . In the 1970s , the government started to emphasize livestock and fish production in an effort to add protein to the national diet . Although sheep numbers actually declined from 1970 to 2000 , production per head and overall total meat and milk production increased , but less than the potential . In 2001 the sheep population in Iraq (without Kurdistan) was around (6.009.139) (CSO/Iq.2008) . By 2008 , this number were estimated to have increased to (7.722.375) in which about 63.86% of the Domesticated Livestock According to FAO statistics (2011) , by 2009 there were 7.8 million sheep .

The fat-tailed *Awassi* sheep (Epstein,1985) , is the main breed in Iraq , its is about more than (59.0%) of the total number of the Maine Iraqi Breeds of Sheep and spreading from (Ninawa in to Wasit) Iraqi Governorates (Al-Zubaidy,2014) , famous for its meat and ability to tolerate heat, drought, cold, long treks and it is bred under desert conditions .

The *Awassi* lambs grow fast and can reach 20kg live weight at two months , if they are fed concentrates , they can reach 40kg at five months .

Researchers estimate , in fact , that the average daily weight gain of *Awassi* sheep in Iraq could be raised from current the 100g/day to more than 220g/day . *Awassi* is also one of the best dairy sheep in the world , producing 1.75 liters/day on average , with a lactation of 200 days/year . The ability to conceive while still lactating is another advantage . *Awassi* is hardy and requires low maintenance (FAO.,2014) .

The Ovine Mastitis an important disease of sheep with serious financial losses (Portolano *et al.*,2007) . Mastitis continues to be an economically vital disease all over the world . The first important and basic fact is that Mastitis costs money and it is a major cause of economic losses to the sheep industry . Mastitis is by definition , inflammation of the mammary gland either occurs with clinical signs (Clinical Mastitis) or without (Sub-clinical Mastitis) i.e. "loss of function" without the other clinical inflammatory signs (Timms,2007) .

Most of the research works conducted to study the impact of Mastitis in the livestock industry have focused on Dairy Cattle . However , Mastitis also exists in the Sheep industry and only recently researchers

have begun to evaluate the extensiveness and significance of this problem (Gonzalo *et al.*,2002) .

Although Sub-clinical Mastitis does not lead to visible changes in the milk or udder , it is more important economically than Clinical Mastitis due to its higher prevalence and has a major impact on both animal welfare and economy in the dairy industry , associated with a decrease in milk yield and altered potential quality and physico-chemical properties and its one of the main cases of alteration in content of milk (Urech *et al.*,1999 ; Chiaradia *et al.*,2013) and it's one of the most common causes of culling of affected ewes from the flock (Pugh,2002) reducing the ewe longevity .

It is well documented that there is a high relationship between amount of reduce milk produced and consumed and reduce pre-weaning lamb growth performance by low weaning weights and lamb deaths . So the Sub clinical mastitis represents an important risk to the competitiveness of the economic sectors related to sheep milk production (Hamed *et al.*,1993) .

The definition of Sub-clinical mastitis is an inflammation that is not readily detected clinically i.e. there are no readily detectable changes in the udder itself and no visual milk abnormalities . but adversely affects by lowered milk production (Timms,2007) . What constitutes Sub-clinical mastitis in sheep in terms of level of Somatic Cell Counts (SCC) , California Mastitis Test (CMT) results and bacteriological culture results are not as clearly defined as for dairy cattle (Menzies,2000) .

Detection procedures used for dairy flocks have also been applied to ewes . Among them , the SCC has been identified as one of the most accurate

indirect tests widely used to differentiate between healthy and infected mammary glands in ruminants (De la Cruz *et al.*,1994) , while the CMT is the only technique of diagnosis that can be used in field conditions , this method is easy and inexpensive enough for dairymen to afford (Maisi,1990) .

Materials and Methods

The study was carried out over 4 months from 1/12/2013 to 1/4/2014 at the farm of Animal Resources Department / the College of Agriculture / University of Baghdad ,Iraq . the sample size was calculated to be 240 for both Day 10 & 90 however , depending on flock size were randomly chosen a total of 60 lactating ewes for inclusion in this study .

The total of sixty (60) newly born lambs Awassi breed (*Ovis aries*) were had an Individual-Identification by Tagging with plastic Ear Tags during the first (24-48 h) after birth . The Continuous Suckling regime method was applied up to weaning , the lambs kept with their Dams in a separate yard for 3 days to be insure that they consume enough Colostrums , then the dams started to graze in the fields of the college daily from morning up to mid-day while their lambs were kept in the yards , at the mid-day the dams brought to the yards for suckling their lambs up to the next morning . After the 1st month , the lambs started to accommodate to be grazed separately of their dams , then started to be grazed with their dams .

the **Weight** in grams (g) and **Height** in centimeters (cm) of each lamb were been recorded At old of (day 1 , day 10 and day 90) after birth . to calculate their **Body Mass Index (BMI) = Mass/(Height)²=g/cm²**

The Lambs Wither height (the highest point measured as the vertical distance from the ground to the shoulder tip) . This was measured with a tape and made with (Vernier or yardstick a special measuring stick made with two arms , one which is held vertically and the other at right angles to it and sliding along it firmly not loosely) . For higher repeatability , the measurement was taken on firm and level ground in a stand position .

The total of sixty (60) ewes Awassi breed (*Ovis aries*) at the age of (≥ 2 - ≥ 5) years old of age in which have being Identification from the Administration & Birth Farm Records information and dentition characteristics , and which having a single male lamb birth (Primiparous native) , According to them Age these ewes were randomly divided into four groups (15) animals for each group (≥ 2 , ≥ 3 , ≥ 4 & ≥ 5) years old were in various stages of lactation (1st, 2nd, 3rd & 4th Lactation) respectively . All animals were housed and maintained according to the farm of animal care at semi-open Sheds . The semi intensive production system was the applied regime , Food was offered in mangers located in free stall barns . The ewes were having a ration of concentrate and roughage , The concentrate ration was composed primarily of barley & wheat bran (50:50) with estimated amount of 1.5kg/ewe/day while the roughage was by ad lib grazing on the pastures of the college . The ration Chemical analysis were be done at the laboratory of Nutrition of Vet.Pub.H. Department at College of Vet.Med. in University of Baghdad ,Iraq , however , chemical analysis of a sample of pasture , no matter how well procured , does not accurately represent the quality of forage actually consumed because of selective grazing by ewes (Cant *et*

al.,2000) . The ration was also supplied with mineral cubes . The clean fresh water was available at all time .

Structured data handling format was prepared and every important information (variable) associated with the overall objective of the investigation was properly gathered and were recorded .

The Clinical Examination and Cases Definition :-

All Ewes of the farm subjected to :-

1-General clinical examination which include temperature, pulse and respiratory rates for detecting of mastitis .

2-Udder examination The mammary glands (two halves) were submitted to local examination to detecting the **Cardinal Signs** of inflammation including namely swelling , hotness heat , redness , pain , loss of function and enlargement of supra mammary lymph node . all ewes were in the lactation stage and were milked by hand , milking hygiene, teat dipping procedures were used . The Cardinal Signs of inflammation may not always be of recognizable intensity in Sub-clinical mastitis . Mammary glands and their milk secretions , which had no detectable abnormalities , but were positive for CMT , examination was considered as Sub-clinically infected glands .

The Sampling Strategy :-

-The Preparation of Udder and Teat and The Collection of Samples :-

To avoid surface contamination of obtained milk samples from the external surface of the mammary gland , the udder surface was brushed to remove dirt , debris and mud , after that the udder washed with water and mild detergent or disinfectant and dried . The teat orifice cleaned with alcohol

76% solution and allowed to dry before stripping samples in to the containers .

From a minimum of Day 10 up to day 90 after lambing of the 60 ewes , a (240) milk samples were being collected from apparently healthy ewes (120 per each of Day 10 and Day 90) , All of milk samples were being taken at the morning of Mid Stream of milking by hand According to Radostitis *et al.*(2007) ; Singh *et al.*(2007) . After discarding the first three strips of the fore milk , about (20-40) ml of milk samples were collected of each ewe individually from half-udder by half-udder separately in a (60 ml vol.) plastic containers , and were transporting to the laboratory of Dairy Products Hygiene of Vet.Pub.H. Department at College of Vet.Med. in University of Baghdad ,Iraq .

The California Mastitis Test (CMT)

The CMT was conducted to diagnose the presence of Mastitis in all mammals even in human beings (Habasha,2014) . This Screening test was performed according to the procedure given for mastitis by Quinn *et al.*(2002) . Initially a white plastic paddle with four receptacles into which equal volume from milk and CMT reagent to be mixed gently , but due to the large numbers of the collected milk samples they were being collected in a Plastic Vial (5ml) and The result was

scored as (0 , T± , 1+ , 2+ or 3+) depending on the intensity of reaction . Samples with CMT result score of (-ve & T±) were considered as negative (healthy) , while those with score of (1+) were taken as positive (Sub-clinical Mastitis) . The score of (2+&3+) were taken as positive (Clinical Mastitis) (Schalm and Noorlander,1957 ; Miller and Kearns,1967 ; Coles,1967;1974;1980;1986 ; Schalm *et al.*,1971 ; Radostitis *et al.*,2000;2007 ; Najim *et al.*,2012a;b ; Najim,2014) .

The Direct Microscopic Somatic Cell Count (DMSCC) :

is completed as follows :-

1-The Breed Staining Techniques :-

As described by Najim *et al.*(2012a;b) ; Najim,(2014) by using the **Stage Micrometer** only .

2-The Measurements Techniques :- by Superimposed (Ocular&Stage) Micrometers for the Microscope Type : (OLYMPUS ((CX)21) Educational Light Microscope . As described by Heidcamp,(2011) .

Results

The SCC and the Study Parameters Correlation(r) and Total Correlation(R) Values for the Days 10 , 90 and (10&90) between the study Ewes Milk SCC and Lambs Growth Parameters (r) and (R) Values were represent at Table (1) .

Table, (1) The Total Estimated Values of the of the Ewes Milk SCC & Lambs Growth Calculated Parameters .

	Ewe no. Age	Lamb no. Birth date	Day	\bar{y} B.wt.	\bar{y} B.h.	\bar{y} B.M.I.
G1	1-15	1-15				
	2012/2011	1-31/12/2013	Day 1	3750	29.8	4.222
			Day 1-10	5355	31.48	5.403
			Day 10-90	18200	45.0	8.987
			Day 1-90	18200	45.0	8.987
G2	16-30	16-30				

	2010	1-31/12/2013	Day 1	3810	31.6	3.815
			Day 1-10	5510	33.18	5.004
			Day 10-90	19110	45.9	9.070
			Day 1-90	19110	45.9	9.070
G3	31-45	31-45				
	2009	1-31/12/2013	Day 1	3880	31.9	3.812
			Day 1-10	5610	33.5	4.998
			Day 10-90	19480	46.3	9.087
			Day 1-90	19480	46.3	9.087
G4	46-60	46-60				
	2008-2007	1-31/12/2013	Day 1	3925	32.4	3.738
			Day 1-10	5694	34.0	4.925
			Day 10-90	19850	46.8	9.063
			Day 1-90	19850	46.8	9.063

\bar{y} = Means .

$$\text{-B.M.I.} = \text{mass (g)} / (\text{height (cm.)})^2 = \text{g/cm}^2$$

The Days (10) , (90) & (10&90) Correlation Values between SCC& Lambs Growth Parameters Correlation.

1-SCC&B.W. :-

As showing in Figure 1,2&3 the Body Weight (BW) were with Highly significant differences ($P \leq 0.01$) (r.) values (0.867 & 0.910) for The Days 10 & 90 respectively , and with non significant (R.) value (0.344) for The Days (10&90) .

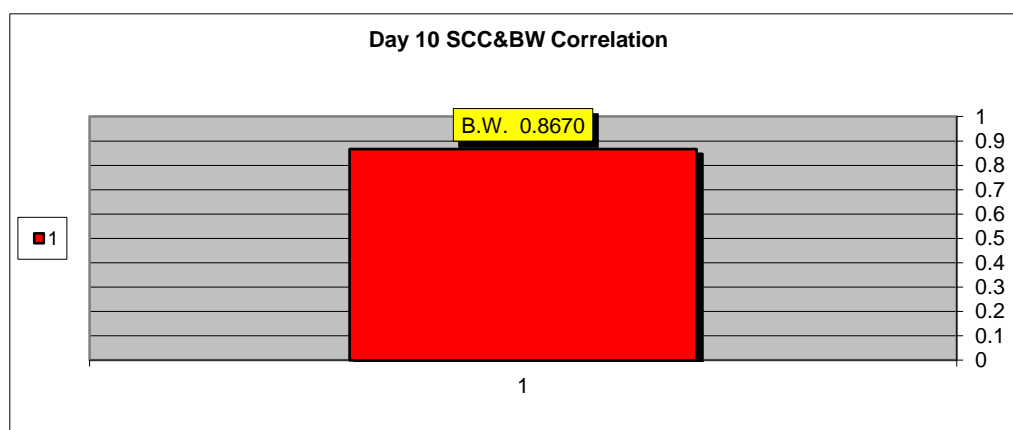


Figure (1) Histogram of the Highly Significance ($p < 0.01$) **Strong (+ve) Correlation between SCC&B.W. of Lambs at Day 10 .

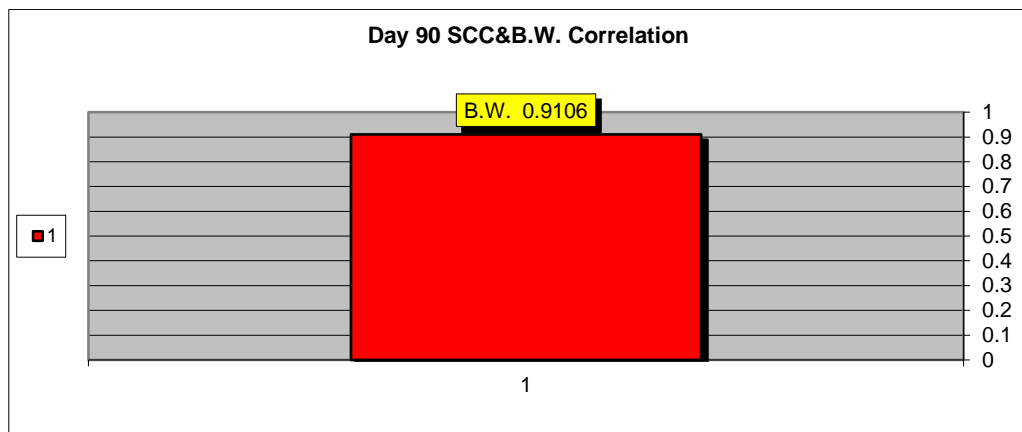


Figure (2) Histogram of the Highly Significance ($p < 0.01$) **Strong (+ve) Correlation between SCC&B.W. of Lambs at Day 90 .

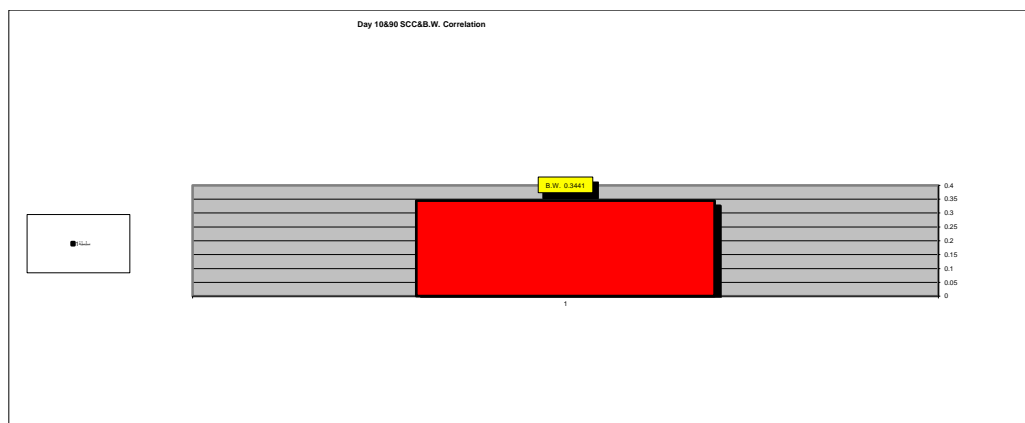


Figure (3) Histogram of the Non Significance (+ve) Correlation between SCC&B.W. of lambs at Day (10&90) .

2-SCC&B.H. :-

As showing in Figure 4,5&6 the Body Height (BH) were with significant differences ($P \leq 0.05$) (r.) values (0.761) for The Days 10 & Highly significant differences ($P \leq 0.01$) (r.) values (0.918) for The Days 90 , and with non significant (R.) value (0.390) for The Days (10&90) .

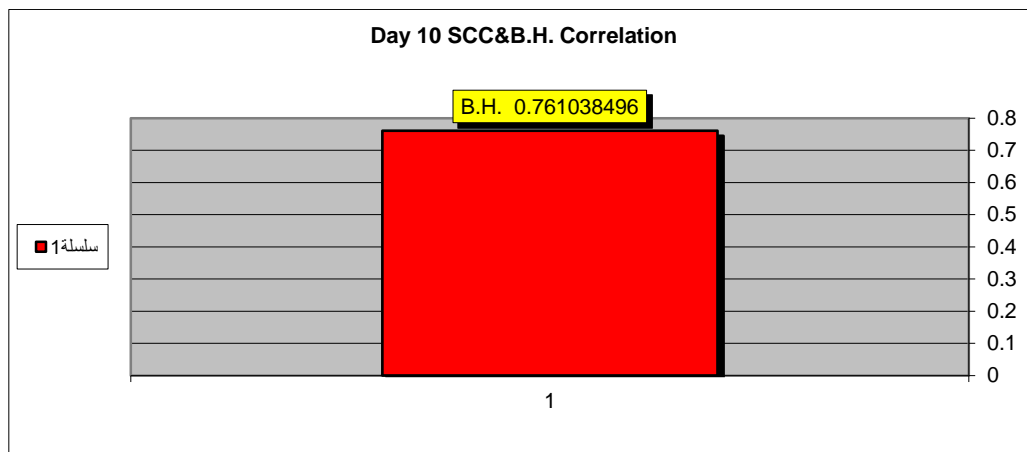


Figure (4) Histogram of the Significance ($p < 0.05$) * (+ve) Correlation between SCC&B.H. of lambs at Day 10 .

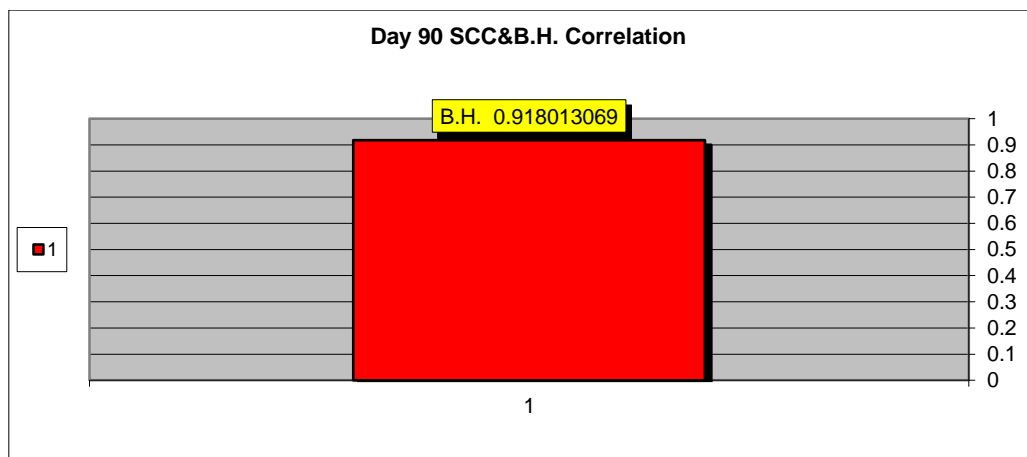


Figure (5) Histogram of the Highly Significance ($p < 0.01$) **Strong (+ve) Correlation between SCC&B.H. of lambs at Day 90 .

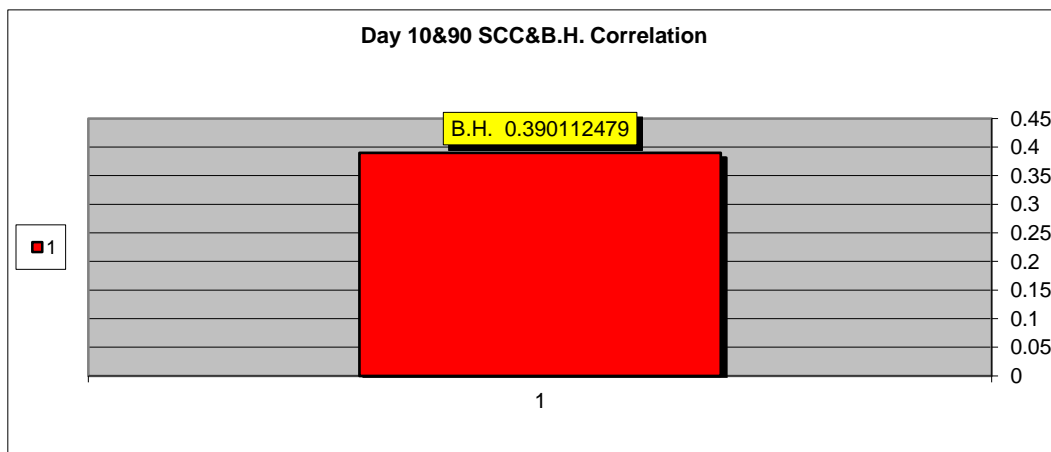


Figure (6) Histogram of the Non Significance (+ve) Correlation between SCC&B.H. of lambs at Day (10&90) .

3-SCC&B.M.I.= Mass/(Height)2=g/cm2 :-

As showing in Figure 7,8&9 the Body Mass Index (BMI) were with negative significant differences ($p>0.05$) (r.) value (-0.658) for The Day 10 , and with significant differences ($P\leq 0.05$) (r.) value (0.699) for The Day 90 , and with non significant (R.) value (0.274) for The Days (10&90).

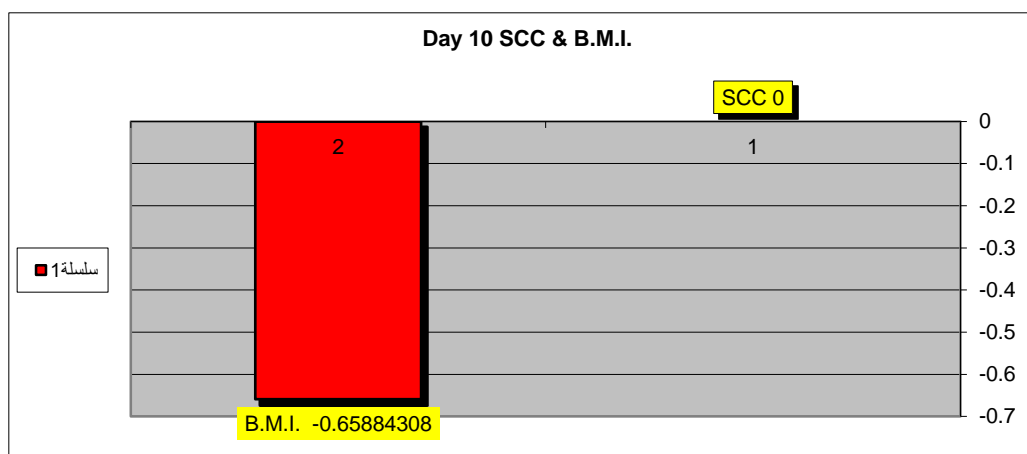


Figure (7) Histogram of the Significance ($p>0.05$) * (-ve) Correlation between SCC&B.M.I. of lambs at Day 10 .

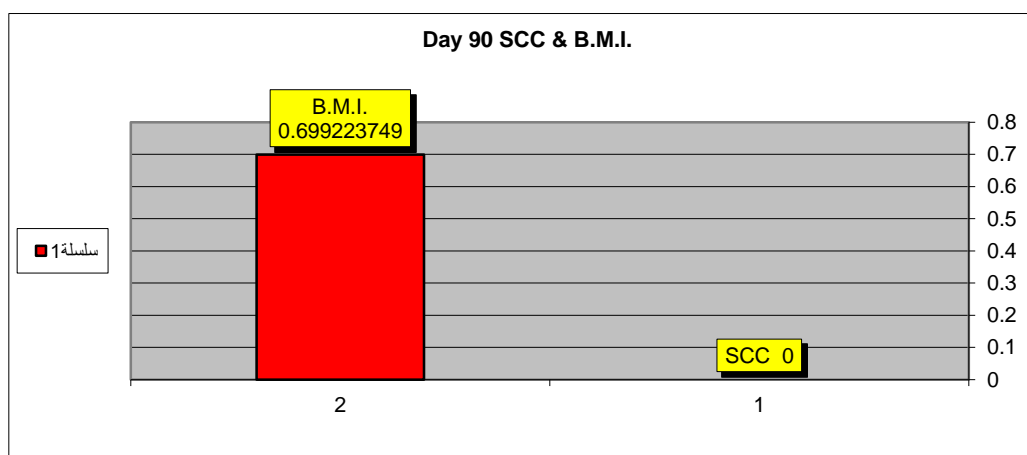


Figure (8) Histogram of the Significance ($p<0.05$) * (+ve) Correlation between SCC&B.M.I. of lambs at Day 90 .

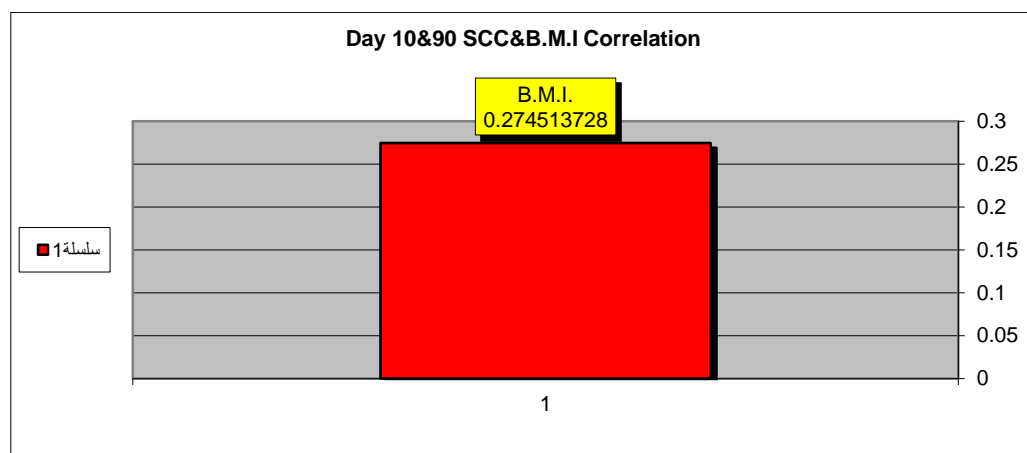


Figure (9) Histogram of the Non Significance (+ve) Correlation between SCC&B.M.I. of lambs at Day (10&90) .

Discussion .

The study revealed that The threshold SCC level Value for each of Healthy , Sub-clinical and Clinical Ovine Mastitis were (≤ 175.000) , (>175.000 to $\leq 1.150.000$) and ($>1.150.000$) cells/ml. of milk , respectively in Iraqi *Awassi* Breeds of the ewes of the study . The overall percentage of Ovine Sub-clinical mastitis infection of the ewes of the study was found to be 46.66% , 73.33% and 60.00% for each of Day 10 , Day 90 and both of Day (10&90) respectively . There were No Statistical Significant Differences between the SCC and the Study parameters value of Ovine Sub-clinical mastitis in both Left and Right halves of the udder and they were equally Bi-infected with Sub-clinical mastitis of the ewes of the study . The Ovine Sub-clinical mastitis occurred more frequently in ewes between age of (≥ 4.0 & ≥ 5.0) years old i.e. (3rd & 4th) Lactation of the ewes of the study . The Total Correlation value(R) between SCC and both of ages and the lactation cycles of Ewes of the study was (0.925) with Highly significant differences ($P \leq 0.01$) .

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