ORIGINAL RESEARCH PAPER

Agricultural Science

EFFECT OF STAGE OF LACTATION ON BLOOD PICTURE OF CROSSED (FRIESIAN X LOCAL) CATTLE

KEY WORDS: : the stage of lactation, blood parameters, cattle.

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ABSTRACT

The present study aimed at the evaluation of health status of cows through their blood characteristics in crossed cattle (Friesian x Local) in different lactation stages. A total of 60 blood samples were collected from 20 cows. Ten cows were at the beginning of lactation stage (7-60 days after parturition) and at mid of lactation (61-90 days). The other 10 cows were at the end of lactation stage (150-180 days). Blood samples of 5 ml were taken monthly from all cows to calculate RBC, WBC, Hb, MCV, MCH, MPV, MCHC, PCT, PDW, and RDW. Results showed that WBC count decreased significantly at mid-lactation and at the end of lactation in comparison with that at the beginning of lactation (8.13x103, 7.37x103, and 7.35x103 cell/ml respectively). Acidophil cell percent increased significantly with advanced lactation stages (8.54%, 10.82%, and 10.49% respectively). On contrary, lymphocytes percent decreased from 47.26% at the beginning of lactation to 42.85% at the end of lactation. Stage of lactation did not affect RBC count and Hb%. Platelet level at the end of lactation (478.00 gm/l) was significantly higher than those at the beginning of lactation (401.00 gm/L) and the middle of lactation (397.00 gm/L). RBC volume showed similar values at a different stage of lactation reflecting healthy cows at lactation stages.

Introduction

Physiological stability is maintained mainly by the blood in the body, but many physiological conditions (lactation) may alter this equilibrium (Salem, 2017). Hematologic values are essential indicators of the metabolic state of any nursing animals (Karapehlivan et al., 2007). As well as blood is a vital index of any pathological or physiological alterations in the body. Hence, the hematological values during different physiological situations should be known for the diagnosis of various pathological and metabolic disorders which can adversely affect the productive and reproductive performance of cows leading to heavy economic losses (Mohammad, 2011). Hematological profiles of dairy cattle are important in the evaluation of the health status during the period of transition between late pregnancy and early lactation which presents a huge metabolic challenge to the high-yielding dairy cow (Piccione et al, 2012).

The present study is an attempt at providing a picture of dynamics of selected hematological parameters in dairy cows at a different stage of lactation, aiming of providing useful information about the guidelines for the management strategies during different lactation.

Materials and Methods

The present study was undertaken at the Animal Farm, Agriculture and Veterinary Colleges, University of Basrah. During the period from 1st of December 2016 to 1st of March 2017. Cows were housed in half open stalls. They were fed green alfalfa, wheat bran, dry bread, and straw, it was offered as recommended by NRC (2001). Water was offered 24 hours daily.

Blood samples were collected by the use of a sterilized 10 ml vial. All blood samples were collected between 8-10 hours am in order to standardize the time of collection which may affect certain blood parameters. Blood samples were collected from jugular vein puncture at the monthly interval and at during the experimental period from all animals .The (5ml) of blood collected from each animal were stored in plastic sample test tube containing ethylene diamine tetra an acetic acid (EDTA) anticoagulant for hematological. The RBC count was obtained by the use of hemocytometer (improved Neubauer double) and (Hayme's solution) and special pipette for dilution (Sood 1996). The concentration of Hb was measured by the use of Sahli appliance (Coles, 1986). The microhematocrit method was used to calculate the percentage of PCV by the use of capillary tubes which contain heparin, where one end of which was closed by artificial clay after being filled to 3/4 of its length with blood, and it was put in microcentrifuge on velocity 1200 rotation/minute for five minutes, then the hematocrit value obtained by Service device (Schalm et al., 1975). The Mean Corpuscle Volume MCV (fl) was calculated according to the formula (MCV= PCV x 10/RBC count). The Mean Corpuscular Hemoglobin MCH (Pg) was calculated as (MCH= Hb x 10/RBC count). The Mean Corpuscle Hemoglobin Concentration MCHC (%) was calculated from the hemoglobin concentration and the packed cell volume (PCV %) according to Thompson and Proctor (1984). White Blood Cell Count (WBC) (Cell/mm3) was obtained by the use of hemocytometer (Neubauer improved double) and (Turk's solution) and special pipette for dilution (Dascie and Lew's, 2001). Total Leukocyte counts as the number of WBC in four large squares x 50. After the blood smear was done, air dry the slide was stained with Leishman's stain for 10 minutes then it was washed with water to eliminate the over stain, and left to dry, then examined under oil immersion power to count the percentage of each type of WBC (Schalm, et al, 1975). Data were summarized into mean± sd and was analyzed by using one-way ANOVA (three stages of lactation, early, mid and end of lactation) within the statistical program SPSS (version 22, 2013). Linear and polynomial regression were estimated between stage of lactation and different traits by using Excel program.

Results and Discussion

RBC and parameters related

RBC count, Hb%, HCT%, MCV, MCH, MCHC and RBC variation (RDW-cv and RDW-SD) did not show any significant differences due to a different stage of lactation (table, 1). However, hematocrit% and platelets concentration revealed significant ($P<0.05$) values at a different stage of lactation. Hematocrit% at the beginning of lactation recorded the highest value (31.47%) in comparison with mid-lactation (28.60%). As well as platelets concentration at the end of lactation (472.00 gm/l) exceeded ($P<0.05$) those at the beginning of lactation (401.00 gm/l) and at mid of lactation (397.00 gm/l). These results are in full agreement with those of Mohammad (2011). Measurement of RBC size variation reflected the animal health when there is blood anemia an increase in RBC volume and a decrease in MCV indicates Fe deficiency. An increase in both RBC volume and MCV is a result of vitamin B12 deficiency, while an increase in RBC variation with different volume of MCV is an indication of a deficiency of both Fe

and vitamin B12 (Roland et al, 2014).

Figure (1) shows the non-linear relationship between HCT and stage of lactation. HCT level decreased by 8.21% from the beginning of lactation to the mid of lactation. After that, there was a gradual increase from mid-lactation to the end of lactation (1.78%). Figure (2) shows the different non-linear relationship between platelets and stage of lactation. Platelets concentration decreased with advancing lactation stage till mid-lactation by a mean of 122.50 gm/l and then increased by a mean of 39.5 gm/l after mid of lactation to the end.

Table (1) Mean of RBC count and some blood parameters at different stages of lactation

Traits	Stage of lactation (day)		
	Early (7-30)	Mid (31-60)	End (150-180)
RBC count (x 106/ml)	6.00±0.58	5.68±0.47	6.35±0.69
Hb %	8.30±0.79	8.03±0.84	8.69±0.67
Hematocrit (HCT %)	31.47±1.22 a	28.60±1.20 b	29.29±1.23 ab
MCV (ppm/l)	49.77±1.63	50.22±2.04	49.73±0.84
MCH (pgm)	13.81±0.79	13.97±1.06	13.84±1.10
MCHC (gm/dl)	39.40±1.37	39.30±1.29	38.40±1.22
Platelets (gm/l)	401.00±10.12 b	397.00±9.89 b	472.00±10.47 a
RDW-CV	16.37±0.80	16.92±1.05	16.56±1.00
RDW-SD	32.18±2.05	33.42±2.04	32.69±0.95

***Means with a different letter of each row differ significantly at 5%**

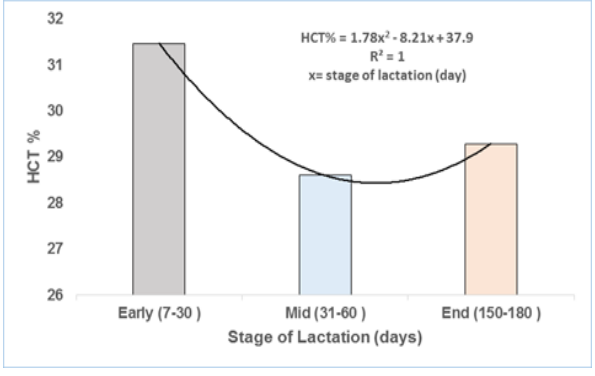

Fig (1) Relationship between stage of lactation (days) and HCT%

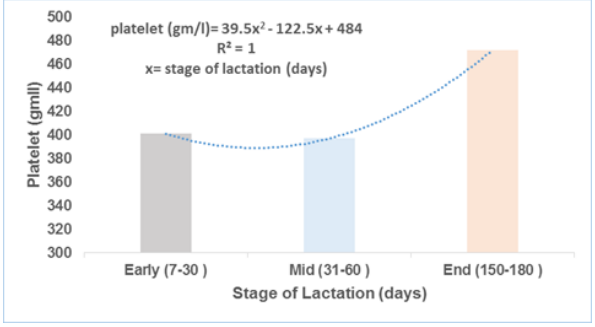

Fig (2) Relationship between stage of lactation (days) and platelet (gm/l)

Number of WBC and differential

Number of WBC influenced significantly (P<0.050 by stage of lactation (table, 2). The highest number (8.13 x 103 cell/ml) was recorded at the beginning of lactation, then it decreased at mid and end of lactation (7.37 & 7.35 x 103 cell/ml respectively). Furthermore, the proportion of WBC differential differed significantly at a different stage of lactation (table, 2). Acidophil percent increased (P<0.05) as the stage of lactation proceed and recorded a value of 8.54% at the beginning of lactation then it increased to reach 10.82% and 10.49% at mid and end of lactation respectively. Neutrophil percent decreased significantly (P<0.05) from 40.21% at the end of lactation to 34.53% at mid-lactation, its value at the beginning of lactation (36.89%) came in between. A different trend was shown by lymphocytes as it decreased significantly (P<0.05) from47.26% at the beginning of lactation to 47.86% at the mid-lactation and to 42.85% at the end of lactation. Stage of lactation had no significant effect on monocytes and basophils.

Table (2) influence of stage of lactation on WBC counts and differential percentages

Traits	Lactation stage (days)		
	Early (7-30)	Mid (31-60)	End (150-180)
WBC number (x 103/ml)	8.13±0.31 a	7.37±0.81 b	7.35±0.66 b
Acidophil %	8.54±0.20 b	10.82±0.40 a	10.49±0.34 a
Basophil %	0.90±0.01 a	1.20±0.04 a	0.80±0.01 a
Neutrophil %	36.89±2.36 ab	34.53±1.24 b	40.21±1.35 a
Lymphocytes %	47.26±1.37 a	47.86±1.28 a	42.85±1.33 b
Monocytes %	6.41±0.37 a	5.59±0.29 a	5.65±0.22 a

***Means with a different letter of each row differ significantly at 5%**

Monitoring dairy cow health comes at the first priority of herd management, in order to guarantee good health and high welfare as well as to diagnose the infected organism which directly reflected on milk yield (Radkowska and Herbut, 2014). Ruminant blood parameters depend on many factors related to animal physiological status and management system (nutrition and health), therefore, the basic objective of blood tests is to monitor health and nutritional status of animals (Brucka-Jastrzebska et al, 2007). These parameters also used to evaluate stress level faced by the animals and their welfare (Kessel et al, 2008). Blood parameters influenced by milk yield (Ruginosu et al, 2011), especially lymphocytes and total WBC (Botezatu et al, 2014).

A polynomial relationship was shown (fig, 3 and 4) between stage of lactation and number of WBC and lymphocyte%. These relations were significant (P<0.05). The mean decrease in the number of WBC from the beginning of lactation to mid-lactation was 1.87 x 103 cell/ml, then it increased at the end of lactation by 0.37 x 103 cell/ml. Whereas lymphocytes% increase from the beginning of lactation to mid-lactation by 9.015%, the percent finally gradually decreased by 2.805%.

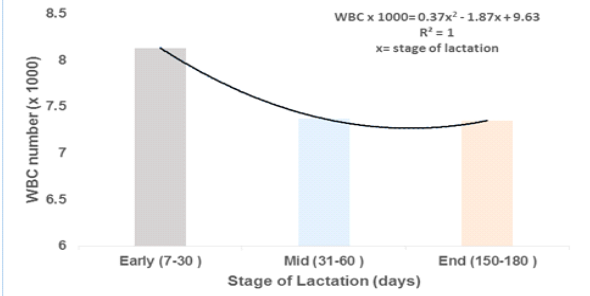

Fig (2) Relationship between stage of lactation (days) and WBC count

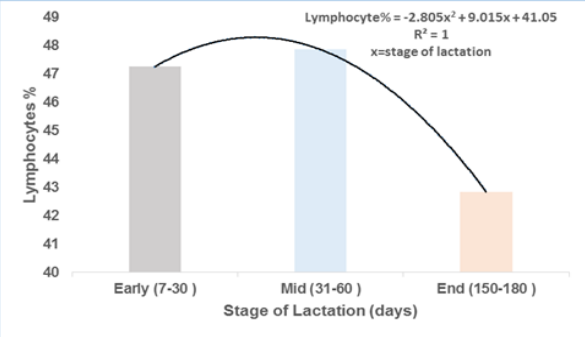

Fig (2) Relationship between stage of lactation (days) and lymphocytes%

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