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Some Blood Parameters Changes for Beef Bulls in Different Seasons

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Abstract: ***This study was carried out in a private livestock farm in Adana, located between latitudes 35 - 38 and longitudes 34 - 46 east, in 2020. Angus and Hereford breeds, aged 13 - 18 months, were studied as animal material. The aim of this study is to compare the changes in blood parameters of Angus and Hereford bulls, which are the most common fattening breeds. The healthy ones among the Hereford and Angus cattle were determined by the responsible veterinarian of the enterprise according to health symptoms such as feed consumption, lameness scores, rumination, and they were taken into separate compartments in order to determine their summer and winter values. During the experiment, the grains were kept in the same compartments and fed with a total mixture ration containing barley malt pulp, apricot pulp and corn silage. Blood samples (10 ml) were taken from the vena jugularis by the farm veterinarian. After the blood samples were kept at room temperature for 1 hour, they were incubated at 3000 rpm for 20 minutes. The serum was separated by centrifugation. Samples were stored in a deep freezer at - 20°C until analysis. Using sera from blood samples a total of 14 parameter analyzes were performed using the appropriate kit and method for each parameter in the Roche Cobas C - 501 Autoanalyzer device. BUN value were calculated using urea nitrojen content (%46). In the differences between blood protein and albumin levels of Angus and Hereford bulls, the interaction effect of breed ($P<0.01$), breed - season interaction was significant ($P<0.01$), and the seasonal effect was found to be insignificant. In the differences between blood cholesterol and triglyceride levels of Angus and Hereford bulls, the effects of breed and interaction were found to be insignificant, while the seasonal effect ($P<0.05$) was found to be significant. In the differences between blood glucose and BUN contents of Angus and Hereford bulls, breed and season effect ($P<0.00$) and interaction effect ($P<0.05$) were found to be significant. In terms of blood Ca content of the yearling bull, the effect of breed was insignificant in the mean difference, and the seasonal effect was found to be significant at the $P<0.00$ interaction level of $P<0.05$. In the differences between blood P and Mg contents of Angus and Hereford breeds, the effect of breed and season ($P<0.00$) and the interaction effect were statistically significant at $P<0.05$ level for P and $P<0.00$ for Mg. that the effect of breed and season on AST and ALP is significant at the $P<0.00$ level, while the interaction effect is significant only at the $P<0.05$ level for the difference between AST values. Statistically significant changes were detected in 5 of the 14 features discussed in this study. Changes were detected in 5 of the 14 features discussed in this study. Decrease in 7 traits and increase in 3 traits were evident, while minor differences were found in the others. The difference in the transition to summer months in the winter months is higher in the Hereford breed, which can be interpreted as the angus having less difficulty. However, it may be possible to give clear results on this subject with more detailed studies.***

Keywords: Blood parameters, season, breed, Angus and Hereford, yearling bulls

1. Introduction

Phenotypic parameters in livestock are determined by genotype and environment. The heritability of daily weight gain is 0.25 to 0.30, and 75 - 80% of it is obtained depending on the care, feeding and herd management practices. Turkey native breed daily weight gain averages is very low. However, culture breeds the daily live weight gain values is also lower than expected values (Göncü, 2003). These values are far from meeting the country's needs. Therefore, in recent years, practices aimed at increasing the yield per unit of livestock have come to the fore. The blood parameters of the bulls in different conditions will give important information. Blood parameters are critical health and disease status parameters, which depend on animals' conditions, age, gender, breed, region, husbandry, geographical differences, seasonal changes, rearing location and diet. Blood parameters reflect the animal's response to environment (Onasanya et al., 2015). But blood test results are interpreted using reference values (Głowińska and Öler, 2013). But there are so many different breeds and production systems. Reference values differ depending on many factors. The reference values is very important for academicians and herd managers for precise interpretion biochemical values in different conditions and breeds (Kaneko et al., 2008; Meyer and Harvey, 2004). The blood parameter values of cattle breeds in different conditions provide important information in the interpretation of the performance characteristics of animals (Campbell, 2004; Ndlovu et al., 2007; Summer et al., 2019; Göncü, 2021) Today, quick and easy results are obtained with the use of special kits developed for blood analysis. But reference value is needed for precise interpretation for better performance. It is possible to prevent losses by transferring technical information to herd management applications (Flamenbaum and Galon, 2010).

Laboratory test results are interpreted based on accurate and reliable reference intervals. There are different reference values (ranges) for each test. Reference intervals are indispensable in assessing the status of each individual. Reference values are obtained from a sample group of healthy individuals for that test. Reference intervals indicate a group containing only 95% of the values obtained. In other words, 2.5% of the reference ranges below the lower limit and above the upper limit remain outside. Reference range calculations are mandatory with test kits. However, this situation also includes some difficulties. Because each condition requires separate reference ranges. It should not be expected to be valid everywhere due to the genetic and environmental differences of the reference population in which the reference intervals are determined. Therefore, more specific results obtained in a sample group are needed. If a reference range for the studied population is not available, general values are used (Stojević et al., 2008). Also, the difference between the lower limit and the upper limit of the reference intervals should be narrow. Widely distributed reference values reduce the success of the estimation. Reference values must be obtained from a large number of samples to be meaningful. Therefore, there is a need for a large number of reference values obtained under all conditions. To identify anomalies in a herd, values from blood analysis are generally compared with the population average or ranges of standard values (Herdt, 2000). However, many reference values have been published for cattle or cow (Bishop et al., 1992; Russell and Roussel, 2007; Kaneko et al., 2008). In the literature review, the number of studies on blood parameters was 14 for cattle (Onasanya, et al.2015; AL - Saeed, et al.2009; Bah, et al.2016; Bide and Tumbleson, 1976; Ekman, 1976; Ghadhbam, ve ark.2009; Gartner et al.1966; Grünwaldt et al.2005; Hammond, 1997; Hawley and Peden, 1982; Kirk and Davis, 1970; Morris et al.2000; Ndlovu et al.2007; Xuan, et al 2018) 6 for bull (Bailey et al.2011; Bishop et al.1992; Głowiñska and Oler 2013; Pavlík et al.2010; Rennó et al., 2019; Stojević et al.2008); It was determined that there were 3 studies for castrated animals (Adeyemi, et al.2019; Hayden et al.1993; Ndlovu, et al.2009). The number of studies, especially in cows, is much more than these. The developmental stage and physiologic periods of animal effect blood parameters. the developmental stage and physiologic periods of animals, effect blood parameters. Further understanding into the relationship of blood parameters with yields is very important aspect of productivity. Technologies to be developed by using the reference values of the animal's blood values and the relations between yields can make a significant contribution to productivity, as in dairy cattle breeding.

The identification and use of specific ranges for breeds of animals are required to establish reference sites specific to regions where animals are raised and to their breed values (Altintas and Fidanci, 1993; Braun et al., 2010; Meyer and Harvey, 2004). Since these parameters are vital for animal health and management may vary depending on different variables.

For these reasons, this study was carried out with the aim of contributing to the literature by examining the changes in blood values during the fattening activities carried out in the same farm in 2 seasons.

2. Materials and Methods

This study was carried out in a fattening enterprise with a capacity of 5000 heads in Adana during February and June. Adana located between 36.95° North Parallel and 35.21°. Adana which has a typical Mediterranean climate, with warm and rainy winters and hot and dry summers (Table 1). The fattening enterprise are built in the form of free barns (and there are 70 heads of bulls in each padok. The bedding is not used in the compartments and when manure accumulates, it is cleaned with tractors.

This study was approved by Cukurova University Animal Experiments Local Ethics Board (Approval no: 28.11.2017/10 - 2).

Table 1: Climate data of Adana province for many years (Anonymous, 2022)

Months	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Highest temperature (°C)	26, 5	26, 7	32, 0	37, 5	40, 6	41, 3	44, 0	45, 6	43, 2	39, 4	33, 3	30, 8
Average highest temperature (°C)	14, 9	16, 2	19, 5	23, 8	28, 2	31, 7	33, 8	34, 6	33, 1	29, 0	22, 5	16, 8
Average temperature (°C)	9, 6	10, 5	13, 5	17, 5	21, 7	25, 6	28, 1	28, 5	25, 9	21, 3	15, 5	11, 2
Average lowest temperature (°C)	5, 5	6, 1	8, 5	12, 1	15, 9	20, 0	23, 2	23, 5	20, 4	15, 9	10, 7	7, 1
Lowest temperature (°C)	−8, 1	−6, 4	−3, 6	−1, 3	5, 6	11, 2	11, 5	14, 8	9, 3	4, 8	−4, 3	−4, 4
Average precipitation (mm)	109, 8	84, 8	67, 8	54, 7	47, 6	19, 8	7, 0	5, 3	17, 6	40, 6	72, 7	126, 7

Adana, which is essential in agricultural production, is among the provinces where stress conditions are effective due to high temperature and humidity. high temperature and humidity significantly affect the production and production style, especially in summer. (Figure 1.).

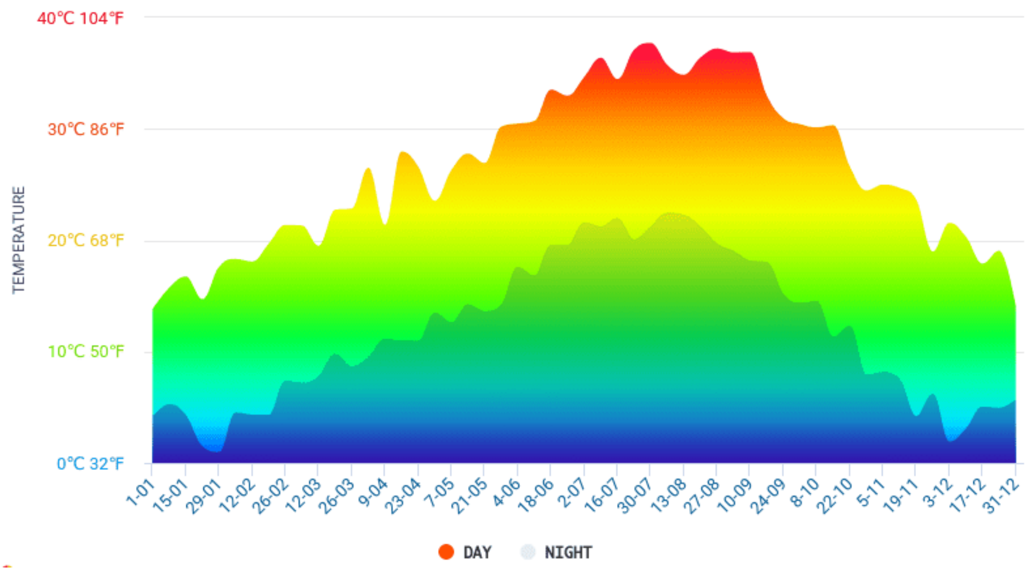

Figure 1: Monthly temperature changes in Adana province

Experimental bulls were taken to adaptation period for facility ration and pen - mates one month before the experiment. The animals were kept in the same compartment in semi open feedlot throughout the experiment. All animals were subjected to health observation by the veterinarian. In the health observation, symptoms such as rumination, rumen fullness, body condition, lameness, runny nose and eye cough were taken into account. Healthy Hereford and Angus bulls in the farm were selected by the farm veterinarian and included in the experiment. Thirty - five bulls, initially weighing 323 ± 58 kg (mean+standard deviation) and 242 ± 23 days of age and were taken to experiment. The blood samples were taken selected among those of similar age and live weight.

All bulls were fed freely twice a day with a total mixed ration containing barley, malt pulp, apricot pulp, and corn silage. Fresh and clean water was constantly supplied.

Feedstuff was analyzed using 0.5 kg samples taken from the feed bunk. Dry matter, crude protein, crude oil, and crude ash analyzes were performed according to the Weende Method, while NDF, ADF, and crude cellulose analyzes were performed by Van Soest et al. (1991), using the cellulose bag technique, was performed on Ankom Fiber Analyzer (Ankom200 Fiber Analyzer, ANKOM Technology Corp., Fairport, NY). The analysis results of the feedstuff are given in Table 2.

Table 2: Analysis of nutrient content of feed raw materials given to animals during the Fattening Period (%)

	Barley Malt	Apricot Pulp	Corn Silage	TMR
Dry Matter	22, 74	14, 88	31, 47	53, 05
Crude Protein	21, 06	12	7, 23	13, 98
Ash	11, 55	24, 62	5, 9	10, 37
Raw Cellulose	12, 3	14, 64	18, 57	17, 94
Raw Oil	8, 52	3, 43	3, 15	3, 1
Acid Detergent Fiber	25, 22	24, 44	24, 78	24, 11
Neutral Detergent Fiber	61, 46	30, 47	43, 91	45, 48

Blood samples (10 ml) were taken from the vena jugularis by the farm veterinarian at the weighing place of the farm between 10: 00 and 15: 00 during the day. After the blood samples were kept at room temperature for 1 hour, they were incubated at 3000 rpm for 20 minutes. The serum was separated by centrifugation. Samples were stored in a deep freezer at - 20°C until analysis. Analyses using sera from blood samples A total of 14 parameter analyzes were performed using the appropriate kit and method for each parameter in the Roche Cobas C - 501 Autoanalyzer device. Phosphomplybdate Formation / UV for Phosphorus, Cresolphthalein Complexone for calcium, End Point (Biuret reaction) for total protein, IFCC - Aminomethylpropanol Buffer - AMP for ALP, IFCC for GGT: Gamma - Glutamyl - 3 - carboxy - 4nitroanilide, UV for ALT and AST (without P5P addition), Enzymatic Colorimetric for triglyceride, Cholesterol Oxidase for cholesterol, Enzymatic for creatinine, Urease for urea, UV, Hexokinase for glucose, Enzymatic Colorimetric endpoint for magnesium, Bromcresol Green (BCG) for albumin were used. BUN value were calculated using urea nitrojen content (%46).

The descriptive statistics for the blood parameters were mean, standard deviation, standard error, minimum values and maximum values. The values for the concentration of each blood constituent that were used for statistical analyses were the means of the values obtained for each breed.

According to the results of the normality analysis, some data were excluded from the analysis. For this reason, there are different numbers of blood sample results in each race in each period. In case of the possibility of mixing the live weight effect of the grains in the study with the period tested in the research, the live weights were analyzed as the corvariant, and the race and period were analyzed as the main factors.

Analyses were performed with the aid of IBM SPSS Statistics 23.0 v. The significance levels of the data in the study were evaluated as p<0.05 and p<0.01.

3. Results and Discussion

The mean, standard error and analyze results of winter and summer blood samples of Hereford and Angus bullocks are summarized in Table 3.

Table 3: The mean, standard error and analyze results of winter and summer blood samples of Hereford and Angus bullocks

Parameters	Angus (N=31)		Hereford (N=41)		Covariant	Breed (B)	Period	Interaction
	Winter (N=16)	**Summer** (N=15)	Winter (N=26)	**Summer** (N=15)				
Glucose	79, 20±8, 60	72, 40±13, 51	79, 75±18, 80	71, 88±15, 57	0, 73	0, 97	0, 13	0, 86
Protein	6, 93±0, 31	7, 19±0, 29	6, 93±0, 54	7, 21±0, 49	0, 09	0, 99	0, 20	0, 76
Albumin	3, 36±0, 22	3, 53±0, 17	3, 07±0, 31	3, 25±0, 22	0, 09	0, 00	0, 08	0, 82
Urea	14, 47±3, 58	31, 67±4, 27	15, 81±2, 54	25, 08±4, 11	0, 02	0, 00	0, 00	0, 00
Creatinin	1, 23±0, 15	1, 41±0, 16	1, 06±0, 12	1, 35±0, 15	0, 01	0, 00	0, 00	0, 06
Cholesterol	122, 07±20, 73	105, 00±15, 45	127, 31±18, 40	108, 54±18, 96	0, 74	0, 32	0, 00	0, 83
Trigliserid	22, 80±5, 63	18, 80±5, 24	23, 38±6, 50	20, 88±5, 54	0, 13	0, 28	0, 23	0, 69
AST	89, 93±15, 26	81, 13±9, 84	100, 63±13, 55	84, 58±10, 78	0, 70	0, 02	0, 00	0, 25
ALT	27, 80±5, 06	25, 20±4, 38	28, 00±4, 44	23, 96±3, 30	0, 11	0, 52	0, 00	0, 58
GGT	18, 67±3, 42	15, 73±2, 49	16, 50±3, 86	15, 88±2, 69	0, 02	0, 12	0, 00	0, 07
ALP	148, 13±50, 41	117, 27±29, 55	138, 19±25, 53	97, 69±25, 37	0, 06	0, 09	0, 01	0, 42
Mg	2, 31±0, 16	2, 11±0, 18	2, 35±0, 23	1, 95±0, 14	0, 50	0, 17	0, 00	0, 02
Ca	10, 50±0, 55	10, 33±0, 34	10, 14±0, 52	10, 07±0, 53	0, 02	0, 02	0, 72	0, 85
P	7, 77±0, 68	7, 51±0, 48	8, 04±0, 65	7, 37±0, 47	0, 06	0, 51	0, 05	0, 09

In this study, breed effected albumin (P<0.00), urea (P<0.00), creatinine (P<0.00), AST (P<0.02), and Ca (P<0.02). Period effected on urea (P<0.00), creatinine (P<0.00), cholesterol (P<0.00), AST (P<0.00), ALT (P<0.00), GGT (P<0.00), ALP (P<0.01) and P (P<0.05) and Mg (P<0.00). The interaction effect, was found to be effective on urea (P<0.00) and Mg (P<0.02). The live weights included in the analysis as covariant were found to be statistically effective on blood values of Urea (P<0.02), Creatinine (P<0.01), GGT (P<0.02) and Ca (P<0.02).

Ekman (1976) reports the bovine blood protein reference value as 6.3 - 8.3 g/dl, and the result of this study is in agreement with these reference reports. Also, AL - Saeed et al. (2009) . Protein values of Hereford yearling bull is less than Bide et al. (1973) 's protein value (Hereford - Castrated), while Gartner et al. (1966) greater than the total protein value. The protein value of Angus yearling bulls, was recorded as less than the protein value reported by Rennó et al. (2019) . Protein values of Angus and Hereford bulls, Bailey et al. (1990) total protein level. Albumin value of Angus bulls, is greater than the albumin value reported by Rennó et al. (2019) ; Bailey et al. (1990) ; Bah et al. (2016) . The end - feeding albumin value of Angus steer was found to be higher than the first albumin levels. Albumin value of Hereford breeds of bulls, Gartner et al. (1966) 's albumin levels (Hereford - Cattle); It is higher than Rowlands (1980) 's albumin level. In addition to being dependent on the development of the animal, plasma protein can also change with age (Neumann et al., 2016). It has been reported that total protein values (depending on the gamma - globulin fraction) in blood parameters increase with age (Ekman, 1996). In addition, high consumption of concentrated feed causes an increase in the total protein level.

In the differences between blood cholesterol and triglyceride levels of Angus and Hereford bulls, the effects of breed and interaction were found to be insignificant, while the seasonal effect (P<0.05) was found to be significant. The values determined in this study are Ekman's (1976) cholesterol reference value (66.89 - 298.88 mg/dl); It was found to be compatible with the triglyceride reference level of 12 - 31 mg/dl. Cholesterol level of Hereford yearling bull, Bide et al. (1973) , Bailey et al. (1990) Cholesterol level of Angus yearling bulls higher than that of Rennó et al. (2019) and Bailey et al. (1990) cholesterol value. Triglyceride value of Hereford breeds of bulls, Bailey et al. (1990) and less than the value of Browning and Leite - Browning (2013) (Hereford - castre). Triglyceride value of Angus bulls, Bailey et al. (1990) was found to be more than the value. Głowińska and Oler (2013) did not find a significant effect of breed on blood triglyceride levels. The absorption of fats, their processing and production in the liver, also absorption by the cells are influenced by various factors. These factors cause blood levels to be different as well. Cholesterol and triglyceride levels occur under the influence of genetics and environment. Therefore, although the genetic structure of the living entity is important, the environmental effect is also a very important factor. Excessive intake of fiber - dense feeds reduces the cholesterol content in blood serum (Xuan et al., 2018).

The concentration of total protein and protein fractions is an indicator of the functional state of the liver as well as the individual health status (Savić et al., 2011). Serum protein concentration is particularly affected by albumin and total calcium concentration (Russell and Roussel, 2007). Albumin is a protein synthesized in the liver and is mainly responsible for the oncotic pressure in the plasma (Russell and Roussel, 2007). Albumin is closely related to body weight and nutritional status as an important indicator of the metabolic status of animals (Roil et al., 1974). Albumin reflects the long - term protein status, and plasma albumin levels may change during certain diseases due to liver function, protein and energy intake, age, and protein losses (Xuan et al., 2018).

Glucose reference value 45.04 - 77.47 mg/dl (Anonymous, 2020a), 40 - 100 mg/dl (Anonymous, 2020c); BUN reference value is 10 - 23 mg/dl (Ekman, 1976), 7 - 18 mg/dl (Anonymous, 2020b) and it was determined that it is within these reference ranges as a result of this study. In the differences between creatinine and urea blood levels, the interaction effects of breed and season were found to be insignificant. Glucose value of Hereford yearling bull, Bide et al. (1973) ; Browning and Leite - Browning (2013) 's Angus Yearling bull glucose value, Bailey et al. (1990) ; Rennó et al. (2019) glucose levels were determined to be lower.

Glucose shows the energy status of the organism (Russell and Roussel, 2007). It has been stated that the amount of glucose in the blood may decrease with age in cattle and BUN values in cattle are used to evaluate protein and energy status (Hammond, 1983). In case of high protein content in the diet, an increase in BUN level is observed (Hammond, 1997; Thornton, 1970; Hammond, 1983). It has been explained that the content of the ration affects the values of blood metabolites and that there is a relationship between protein intake and urea - N concentration in the blood (Ekman, 1976). Apart from the ration, the animal's health status, physiology, breed, and growth and development accelerators are also effective factors on BUN concentrations, although other factors are not as effective as the ration, except for the disease state, and may differ in some herds. BUN concentration increases in case of prolonged malnutrition or disease (Hayden et al., 1993). BUN concentration below 15 mg/dL in rapidly growing cattle may be due to protein deficiency in the ration (Hammond, 1997). Minerals Ca reference value is 8.42 - 11.22 mg/dl (Anonymous, 2020a), P 4.56 - 8.15 mg/dl (Anonymous, 2020a) and it has been determined to be within these reference ranges as a result of this study. However, Mg values detected in Angus breeds during the summer months during this study were 6.55±0.6 (5.37 - 7.74) 1.8 - 2.3 mg/dl Mg reference values were found in Altıntaş and Fidan (1993) as 1.8 - 2.3 Anonymous with mg/dl report was found to be higher than (2020b) 's 2.2 - 3.1 mg/dl report.

Calcium value of Hereford breed bulls, Kirk and Davis (1970) ; Bide et al. (1973) ; Gartner et al. (1966) calcium value of Angus bulls, Pavlík et al. (2010) was determined to be less than the calcium value. The phosphorus level of Hereford yearling bulls stated by Rowlands (1980) ; the phosphorus level of Angus yearling bulls stated by Hawley and Peden (1982) is less than stated by Pavlik et al. (2010) which is smiliar to represented in current study. Phosphorus levels may decrease with increasing age in cattle. Angus yearling bulls‘ magnesium level stated by Adeyemi et al. (2019) is greater than magnesium level stated by Ndlovu et al. (2009) less than Pavlík et al. (2010) (3rd period). Magnesium value of Hereford breeds of bulls, Gartner et al. (1966) . was determined to be less than the magnesium value. Changes in calcium concentration level may be related to metabolic changes and nutrition (Stojević et al., 2008). It has been reported that low calcium levels in cattle may indicate the possibility of hypocalcemia, but symptoms may not always be observed (Grünwaldt et al., 2005). It has been reported that the phosphorus level can be affected by the ration, the low level of phosphorus in the blood is due to the low mineral content in the ration, and the chemical content of the feed should be checked (Grünwaldt et al., 2005). It has been reported that the changes in the blood components of the animals are less dependent on the season, but the age - related changes may be significant, and it has been noted that especially inorganic phosphorus has a negative correlation with age in dairy cattle (Ekman, 1976). It has also been reported that hypomagnesemia may begin in cattle when blood magnesium levels are lower than 0.7 mml/L and symptoms may occur when it falls below 0.4 mmol/L (Grünwaldt et al., 2005).

AST reference values determined in this study were 44 - 153 U/L of Anonymous, (2020a); ALT reference values of Ekman (1976) <60 U/L; It is within the limits of GGT Anonymous (2020a) 's 11 - 51 U/L, ALP Anonymous, (2020a) 's 25 - 127 U/L and Altıntaş and Fidan (1993) 's <200 U/L reports. Angus strain AST results Pavlík et al. (2010) 's Ndlovu et al. (2009) and Adeyemi et al. (2019) AST levels, Hereford yearling bull's ALP value is higher than the ALP stated by Hawley and Peden (1982). Fattening end GGT value obtained from Angus sprouts, Morris et al. (2000) 's GGT level; Neumann et al. (2016) (hybrid - castre) GGT value is less.

4. Conclusion

The blood parameters of the bulls in different conditions will give important information. Studies on breeds that can be fattened economically in hot conditions are continuing. The number of studies on the blood values of common fattening breeds in different conditions is limited. Blood parameters reflect the animal’s response to environment. In this study, blood changes of two different races were determined in two different seasons. Statistically significant changes were detected in 5 of the 14 features discussed in this study. Changes were detected in 5 of the 14 features discussed in this study. Decrease in 7 traits and increase in 3 traits were evident, while minor differences were found in the others. The difference in the transition to summer months in the winter months is higher in the Hereford breed, which can be interpreted as the angus having less difficulty. However, it may be possible to give clear results on this subject with more detailed studies.

Conflicts of Interest

The authors declare no conflict of interest.

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