

# Growth Traits of Anatolian and Anatolian x Italian Crossbred Buffalo Calves Under the Village Conditions

Özel Şekerden\*

Mustafa Kemal Üniversitesi, Ziraat Fakültesi, Zootečni Bölümü, Antakya, Turkey

**Abstract:** The study was carried out to compare growth performances of Anatolian and crossbred (Anatolian x Italian) buffalo calves (53 F<sub>1</sub>, 66 Anatolian, 26 F<sub>1</sub>xAnatolian) raised at İlıkpınar Village of Kırıkhan District of Hatay Province. Body measurements were determined in the period of 0-12 months of age. The effects of genotype, sex, birth year effects on each characteristic in each age were investigated using GLM variance analysis. The means of each characteristic in each age for each genotype were calculated. Duncan test was used in comparison of the averages of each characteristic SPSS program was used in the statistical procedures. Genotype created significant variation in live weight at 1 and 6 months of ages respectively and on almost every body measurement almost in every age. Genotype\* birth weight, genotype\*sex, and genotype\*birth year\* sex interactions were found statistically significant in the point of view of various characteristics in various ages. Factors had significant effects on various characteristics in various ages. It can be said that, F<sub>1</sub> growth was the most speedily and Anatolian buffaloes stayed behind of the other genotypes from the point of view of all the traits.

**Keywords:** Buffalo, Anatolian, Italian, Body measurements.

## INTRODUCTION

The most part of increasing in body measurements in male and female animals comes true until 6 months of age [1-3]. Literature knowledges of height at withers

Italian) buffalo calves (53 F<sub>1</sub>, 66 Anatolian, 26 F<sub>1</sub>xAnatolian) raised at İlıkpınar Village of Kırıkhan District of Hatay Province.

**Table 1: Various Body Measurements of Egypt, Bulgaria and Anatolian Buffaloes in Various Ages (cm) (x)**

Age (Month)	Sex (xx)	Height at withers				Body length			
		1	2	3	4	1	2	3	4
1	M	71.2	78.3			55.0	65.0		
	F	69.2	78.1			55.5	64.8		
3	M	85.2	85.7			73.4	71.9		
	F	84.2	83.4			72.3	69.6		
6	M	93.8	93.3	106.0		81.0	80.5	90.8	
	F	89.6	91.8	105.0		79.1	76.9	89.5	
9	M	97.9	94.1		102.8	86.4	82.5		104.8
	F	98.1	92.2			84.6	81.1		
12	M	105.7	100.9	123.0	108.1	95.6	92.8	110.0	111.0
	F	102.2	101.5	121.0		91.7	90.8	109.5	

(x) 1: Şekerden *et al.* [4]; 2: Şekerden and Tapkı [5]; 3: Nigm [6]; 4: Peeva [7].  
(xx) M: Male, F: Female.

and body length of Egypt, Bulgaria and Anatolian buffaloes in Table 1, the ones belong to chest girth, chest depth and shin girth in Table 2 are given.

The study was carried out to compare growth performances of Anatolian and crossbred (Anatolian x

## MATERIAL AND METHODS

The material of the research was formed by a total of 145 calves (53 F<sub>1</sub>, 66 Anatolian (An), 26 F<sub>1</sub>xAnatolian) that were born in the period of 2003-2008 at 11 units of İlıkpınar Village of Kırıkhan District of Hatay Province. Various body measurements (height at withers, body length, chest depth, chest width, chest girth, shin girth) were taken from the calves in the period of 0-12 months of age. In addition live weight

\*Address correspondence to this author at the Mustafa Kemal Üniversitesi, Ziraat Fakültesi, Zootečni Bölümü, Antakya, Turkey;  
E-mail: sekerden@mku.edu.tr

**Table 2: Literature Knowledges Belong to Chest Girth, Chest Depth and Shin Girth of Egypt, Bulgaria and Anatolian Buffaloes (cm) (x)**

Age (Month)	Sex (xx)	Chest girth				Chest depth				Shin girth			
		1	2	3	4	1	2	3	4	1	2	3	4
1	M	75.1	86.1			26.7	29.9			13.5	14.3		
	F	73.4	85.2			26.0	29.3			12.4	13.6		
3	M	104.5	99.3			37.4	34.3			14.7	14.9		
	F	103.5	95.3			37.3	33.4			13.9	13.9		
6	M	121.9	110.3	133	140.2	43.8	39.0			16.2	14.9		
	F	119.3	110.1	131		42.6	37.9			15.1	14.2		
9	M	132.0	119.1		152.7	46.1	40.6		39.3	16.7	15.3		
	F	133.7	121.6			46.2	41.1			16.1	15.3		
12	M	139.4	130.2	161		50.2	45.7		42.7	18.0	16.7		
	F	142.3	134.8	161		49.6	47.3			17.2	16.1		

(x) 1: Şekerden *et al.* [4]; 2: Şekerden and Tapkı [5]; 3: Nigm [6]; 4: Peeva [7].  
 (xx) M: Male, F: Female.

data were also taken from the animals at 1 numbered unit.

It can be said that buffalo feeding was almost based on pasture in İlkpınar Village.

Genotype, sex, birth year effects on each characteristic for each age were investigated using GLM variance analysis. Therefore the following linear simple model that variation sources which took into consideration were included in it was used.

$$Y_{ijkl} = \mu + B_i + C_j + Dk + e_{ijkl} \dots\dots\dots(1) \text{ Here;}$$

$Y_{ijkl}$ : Phenotypic value belonged to investigated charecteristic (For example height at wither),  $\mu$ : General mean,  $B_i$ : i. The effect of calf genotype (i:1, 2, 3);  $C_j$ : j. Effect of sex (j: 1, 2),  $Dk$ : k. Birth year effect (k: 1, 2, 3, 4, 5, 6);  $e_{ijkl}$ : Residue.

The means of each characteristic in each age for each genotype were calculated. Duncan test was used in comparison of the averages of each characteristic SPSS program was used in the statistical procedures.

**RESULTS AND DISCUSSION**

The characteristics that were effected statistically significant from factors taken into consideration were determinated by using the results of the variance analysis

Genotype created significant variance on live weight at only 6 months of age. But genotypic effect was

significant on almost every characteristic and in every age.

**Means of Body Measurement**

It can be said that  $F_1$ 's growth was the most rapidly from the point of view of all the characteristics investigated (except shin girth). However, Anatolian's stayed at the most behind of other genotypes from the point of view of all the characteristics investigated. Sometimes ( $An \times F_1$ ) were  $> An$ , sime times  $An$  were  $>(F_1 \times An)$ , some times both of genotypes had similar average values (Table 3). Genotypes could be arranged like the following, according to values reached at 12 months of age;

Shin girth:  $F_1 = (F_1 \times An) > An$ ; Chest depth:  $F_1 > (F_1 \times An)$

Chest girth:  $F_1 > (F_1 \times An)$  Chest width:  $An > (F_1 \times An)$

As a conclusion at 12 months of age; it can be said that,  $F_1$ 's had the highest average values from the point of view of live weight, body length, chest depth, chest width; similar averages to ( $F_1 \times An$ ) from the point of view of height at withers, chest girth; slight lower average than ( $F_1 \times An$ ) from the point of view of shin girth. Anatolian's were the most behind in the point of view live weight, height at withers, chest girth and shin girth. ( $F_1 \times An$ )'s were the most behind in the point of view of body length, chest depth and chest width.

Averages of some body measurements of the project material were compared with literature knowledges given in Tables 4 and 5.

Table 3: Averages of Various Body Characteristics of Genotypes

Characteris-tics	Age (month)	Genotype (x)		
		F <sub>1</sub>	Anatolian	Anatolian x F <sub>1</sub>
		$\bar{X} \pm S \bar{X}$	$\bar{X} \pm S \bar{X}$	$\bar{X} \pm S \bar{X}$
Live weight (kg)	1	52.8±3.15 a	47.8±1.76 a	52.6±2.92 a
	3	83.4±3.35 b	72.2±2.48 a	81.7±3.84 ab
	6	112.8±3.88 b	90.8±3.21 a	114.6±5.99 b
	9	140.0±4.04 ab	126.1±4.35 a	143.5±8.56 b
	12	181.0±10.78 a	159.8±12.02 a	164.4±7.18 a
Height at withers (cm)	1	79.2±0.59 c	75.8±0.51 a	77.1±0.62 b
	3	88.7±0.67 b	84.1±0.71 a	87.4±1.02 b
	6	96.3±0.75 b	90.5±0.74 a	95.7±1.11 b
	9	101.4±0.69 b	96.5±0.75 a	97.8±1.36 a
	12	106.3±0.88 b	101.5±0.99 a	106.5±1.80 b
Body lenght (cm)	1	69.1±0.58 c	65.6±0.60 b	63.2±1.08 a
	3	79.8±0.78 c	74.4±0.75 b	71.6±1.21 a
	6	87.9±0.95 b	80.3±0.76 a	78.3±1.24 a
	9	92.8±1.06 c	87.5±0.79 b	83.3±1.54 a
	12	99.6±1.15 c	94.6±1.01 b	89.7±1.49 a
Chest depth (cm)	1	30.0±0.27 b	27.4±0.33 a	27.6±0.43 a
	3	35.8±0.39 b	33.5±0.38 a	33.3±0.62 a
	6	41.1±0.42 c	36.9±0.46 a	38.5±0.65 b
	9	43.7±0.48 b	40.7±0.48 a	40.7±0.76 a
	12	47.7±0.49 b	45.9±0.57 ab	44.2±0.74 a
Chest width (cm)	1	17.4±0.25 c	15.8±0.22 b	14.7±0.45 a
	3	20.2±0.32 b	18.8±0.31 a	18.7±0.60 a
	6	22.5±0.38 b	20.3±0.36 a	20.2±0.59 a
	9	24.5±0.37 b	23.3±0.37 b	21.6±0.62 a
	12	26.6±0.41 b	26.1±0.59 b	23.1±0.71 a
Chest girth (cm)	1	85.5±0.98 b	81.0±0.66 a	85.4±1.19 b
	3	101.9±1.04 b	94.8±1.18 a	100.3±1.56 b
	6	113.0±1.08 b	104.2±1.18 a	114.5±1.72 b
	9	123.9±1.19 b	117.6±1.28 a	120.8±2.16 a
	12	133.3±1.62 b	126.9±1.49 a	133.9±2.22 b
Shin girth (cm)	1	13.3±0.14 b	12.8±0.10 a	13.7±0.15 c
	3	14.4±0.15 b	13.6±0.11 a	14.8±0.20 c
	6	15.0±0.14 b	13.8±0.11 a	15.7±0.22 c
	9	15.6±0.16 b	14.9±0.16 a	16.0±0.24 b
	12	16.9±0.22 b	15.9±0.21 a	17.2±0.31 b

(x) Different letters in the same age group (at the same line) showed genotypes that were different at a significant degree to each other for each characteristic.

**Table 4: Comparison of Genotypes [(F<sub>1</sub>, An, (F<sub>1</sub>xAn)] in the Project with each other and Some Literature Knowledges Given (x)**

Characteristics	Age (month)		
	1	3	6
Height at Withers	$F_1 > (F_1 \times An) > An > 2 > 1$	$F_1 > (F_1 \times An) > An = 1 = 2$	$3 > F_1 > (F_1 \times An) > 2 > 1 > An$
Body Length	$F_1 > An > 2 > (F_1 \times An) > 1$	$F_1 > An > 1 > 2 = (F_1 \times An)$	$3 > F_1 > 1 > An = 2 > (F_1 \times An)$
Chest girth	$F_1 = 2 = (F_1 \times An) > An > 1$	$1 > F_1 > (F_1 \times An) > 2 > An$	$4 > 3 > 1 > (F_1 \times An) > F_1 > 2 = An$
Chest Depth	$F_1 > (F_1 \times An) = An > 2 > 1$	$1 > F_1 > 2 = (F_1 \times An) = An$	$1 > F_1 > 2 = (F_1 \times An) > An$
Shin girth	$2 > (F_1 \times An) = 1 = F_1 > An$	$(F_1 \times An) = F_1 = 1 = 2 > An$	$1 > (F_1 \times An) > F_1 > 2 > An$

(x) 1:Şekerden *et al.* (2001); 2: Şekerden and Tapkı (2003), 3: Nigm (1996); 4: Peeva (1996).

**Table 5: Comparison of Genotypes [(F<sub>1</sub>, An, (F<sub>1</sub>xAn)] in the Project with to each other and some Literature Knowledge Given (x)**

Characteristics	Age (month)	
	9	2
Height at withers	$4 > F_1 > (F_1 \times An) = 2 > 1$	$3 > 4 > F_1 = (F_1 \times An) > 2 > An = 1$
Body length	$4 > F_1 > An > 1 > (F_1 \times An) > 2$	$4 = 3 > F_1 > An = 1 > 2 > (F_1 \times An)$
Chest girth	$4 > 1 > F_1 > (F_1 \times An) = 2 > An$	$3 > 1 > F_1 = (F_1 \times An) > 2 > An$
Chest depth	$1 > F_1 > 2 > (F_1 \times An) = An > 4$	$1 > F_1 > 2 > An > (F_1 \times An) > 4$
Shin girth	$1 > (F_1 \times An) > F_1 = 2 > An$	$1 = F_1 \times An > F_1 > 2 > An$

(x) 1:Şekerden *et al.* (2001); 2: Şekerden and Tapkı (2003), 3: Nigm (1996); 4: Peeva (1996).

It can be said that F<sub>1</sub>'s followed Egypt buffaloes almost in the point of view of all the characteristics investigated except shin girth. At 12 months of age Egypt buffaloes were in front of Bulgaria buffaloes and F<sub>1</sub>'s, respectively in the point of view of height at withers and body length. Egypt buffaloes were the most before in the point of view of chest girth. Bulgaria buffaloes were the most behind in the point of view of chest depth (Tables 4, 5).

As a conclusion, in the period of until 12 months of age body structure of Bulgaria buffaloes were higher, longer and wider but lower deep. Egypt buffaloes had huger size than F<sub>1</sub>'s, (F<sub>1</sub>xAn)'s and Anatolia's. Anatolian buffaloes had the smallest size in all the

genotypes. The situation can be explained that various buffalo population mentioned had different genotypes, different body characteristics, in addition of different husbandry conditions.

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