Macedonian Journal of Animal Science, Vol. **3**, No. 1, pp. 3–7 (2013)
139 In print ISSN 1857 – 6907
Received: July 10, 2012 On line ISSN 1857 – 7709
Accepted: November 25, 2012 UDC: 636-2.082.28(560)
Original scientific paper

COMPARISON OF SOME REPRODUCTIVE TRAITS OF ANATOLIAN AND F_1 CROSSBRED (ANATOLIAN×ITALIAN) BUFFALOS UNDER VILLAGE CONDITIONS IN TURKEY

Özel Şekerden

Department of Animal Science, Faculty of Agriculture, Mustafa Kemal University, Antakya, Turkey
sekerden@mku.edu.tr

This study compares reproductive traits of Anatolian and Anatolian×Italian F_1 crossbred buffalos in Ilıkpınar Village of Kırıkhan District of Hatay Province, Turkey. Previous studies of the same genotype compared growth characteristics, milk yield and somatic cell numbers in milk and this present study has dealt with some reproductive traits. The study material involves various breeding control records of Anatolian and Anatolian×Italian crossbred female buffalos. The buffalos in various lactation orders were from two buffalo herds of Ilıkpınar Village of Kırıkhan District, Hatay Province. The records cover periods from 2001 to 2011 and 2003 to 2011, respectively, for Anatolian and crossbred buffalos. The numbers of Anatolian and F_1 crossbred buffalos in terms of traits and genotype were respectively 12 and 10 for the first calving age; 87 and 21 for the calving interval; and 20 and 5 for two gestation period. The effects of the genotype and the calving year on the examined features were determined by the GLM variance analysis and mean values were calculated by using the SPSS Programme. It was concluded that there was no significant difference between Anatolian and Anatolian×Italian F_1 crossbreeds in terms of the examined reproductive traits.

Key words: buffalo; Anatolian; Italian; crossbred; reproductive traits

СПОРЕДБА НА НЕКОИ РЕПРОДУКТИВНИ СВОЈСТВА НА АНАДОЛИСКИТЕ БИВОЛИ СО F_1 МЕЛЕЗИ (АНАДОЛИСКИ×ИТАЛИЈАНСКИ) ВО СЕЛСКИ УСЛОВИ ВО ТУРЦИЈА

Во студијата се споредуваат репродуктивните својства на анадолискиот бивол и мелезите помеѓу анадолискиот×италијанскиот бивол од F_1 генерација во селото Ilıkpınar, област Kırıkhan во провинцијата Хатај во Турција. Во претходните студии врз истиот генотип се споредувале карактеристиките на растежот, млекопродукцијата и бројот на соматските клетки во млекото, додека оваа студија се занимава со одредени репродуктивни својства. Опитниот материјал вклучува различни одгледувачки контроли кај женки од анадолискиот и мелези помеѓу анадолискиот×италијанскиот бивол. Биволите од различна лактација беа од две стада, од селото Ilıkpınar, област Kırıkhan во провинцијата Хатај. Податоците ги опфаќаат периодите од 2001 до 2011 и од 2003 до 2011, соодветно за анадолискиот бивол и биволите мелези. Бројот на анадолискиот бивол и на мелезите од F_1 генерација во однос на својството генотип беше 12 и 10, соодветно при првото телење, 87 и 21 во меѓутелидбениот период и 20 и 5 во гестацискиот период. Ефектите на генотипот и годината на телење врз испитаните особини, утврдени со варијабилната анализа GLM и средните вредности се пресметани со користење на програмата SPSS. Констатирано е дека не постои значајна разлика меѓу анадолискиот бивол и мелезите помеѓу анадолискиот×италијанскиот бивол во однос на испитаните репродуктивни особини.

Клучни зборови: биволи; анадолиски; италијански; мелез; репродуктивни својства

INTRODUCTION

The main factors affecting profits in milk herds are the productive and reproductive yields. However, there is an inverse relationship between milk yield and reproductive traits [1]).

Reproductive traits of buffalos are affected by climatic conditions, genotype, nutrition and herd management [2]. Genotype is the main factor affecting reproductive traits, since factors such as sexual maturity, the first mating age, calving interval, service period, whether the oestrus period passed clearly or silently and reactions to feed and feeding systems vary between breeds and individuals in the same breed.

Buffalos have low heredity of reproductive traits, demonstrating that such traits are affected

by many environmental factors. Therefore, reproducetive traits in buffalos show significant variance [3, 4, 5, 6].

Various climatic factors and their interactions, climatic alterations are effective in reproduction and milk yield performance [7, 8]. Although buffalos can adapt perfectly to hot and humid climates, they show great stress indications under hot weather when directly exposed to the sun. Heat stress reduces the oestrus period and its clarity negatively affects feed and energy intake [9].

Aziz et al. [10] determined the significance ($P<0.01$) of the effect of the calving year on the calving interval in Egyptian buffalo. However, Prakash et al. [11] about Murrah buffalos and Afifi et al. [3] about Egyptian buffalos reported that this effect was not significant.

Feeding and herd management are the most important environmental factors affecting the reproductive yield of buffalos. In case of insufficient energy intake, sexual maturity is delayed and conception rate decreases; in case of protein deficiency in rations, appetite reduces, and therefore sexual maturity is delayed and the days open increases [12]. Improving feeding level reduces both the service period and the calving interval in any lactation order in all animals [13].

Previous studies of the reproductive performance of buffalos reported significantly different results due to genetic diversity and different environmental conditions [14].

The first calving age was reported as 1075 days in Anatolian buffalos [15], and as 50 and 40.3 months in Murrah and Nili-Rarvi buffalos, respectively [16]. The first calving age was reported in Egyptian buffalos as 38 months by Afifi et al. [3]; in Australian buffalos 39, in Malaysia buffalos 42–48 months by McCool [17]; in Italian buffalos 36 months by Larsson [18]. In a study, Fooda et al. [19] reported the first calving age of Egyptian buffalos as 29 and 31 months in 1st and 2nd farms; of Egypt×Italian crossbreeds as 27 months and 31 months in 1st and 2nd farms.

The calving interval was 470.4±19.0, 423.0±21.5 and 564.6±98.5 days in 1st, 2nd and 3rd calving interval orders respectively in Anatolian buffalos [20]; 437.2 days in Romanian buffalos [21]; 512.7 ±9.4 and 538.3±11.4 days in Murrah and Surti buffalos respectively in India [22]; 455±5 and 481±30 days in Murrah and Nili-Ravi buffalo, respectively, in another study [16]; 500 days in Egyptian buffalos by Afifi et al. [3]; 15 months and 13–36 months in Australian and Malaysian buffalos, respectively by McCool [17]; 400–500 days in Italian buffalos by Larsson [18]; 395 days and 418 days in 1st and 2nd farms of Egyptian buffalos, and 429 and 433 days in 1st and 2nd farms of F_1 by Fooda et al. [19].

The gestation period was found 320±1.20 days in Anatolian buffalos by Uslu [20]; 308 days in Bangladesh buffalos by Faruque [23]; 307–316 days in Egyptian buffalos by Metry [25]; 308–314 days in river buffalos by McCool [17]; 317 days and 315 days in 1st and 2nd farms of Egyptian buffalos and 314 days and 313 days in 1st and 2nd farms of Egyptian ×Italian crossbreds F_{1s} by Fooda et al. [19].

In a comparison of reproductive traits of Egyptian buffalos and Egyptian×Italian crossbred F_1 buffalos in 2 different farms, Fooda et al. [19] reported that all reproductive traits (calving interval, service period, the days open), except the first calving age in crossbred buffalos, are greater than the ones of Egyptian buffalos and the reproductive traits of Egyptian buffalo are better than Italian×Egyptian F_1 crossbred buffalos.

Previous studies of the same genotype compared growth characteristics [25], and milk yield and somatic cell numbers in milk [26]; and this present study examined the reproductive traits of Anatolian and Anatolian×Italian F_1 crossbred buffalos in village conditions in Turkey.

MATERIALS AND METHODS

The study was conducted in 2 farms representing buffalo herds of Kırıkhan Ilıkpınar Village of Hatay Province. The study material consists of various breeding records of Anatolian and Anatolian×Italian crossbred buffalos in various lactation orders*. The records cover the periods from 2001 to 2011 for Anatolian and 2003 to 2011 for F_1 buffalos**.

Ilıkpınar Village has an appearance like a big buffalos farm with approximately 150 breedable buffalos. Almost all feeding is based on the gra-

*The material of the study (Anatolian and F_1 crossbred) was formed by buffalos conceived and calved inseminated artificially after being synchronized the oestrus, and their progenies. F_1 were obtained in the Turkish–Italian Cooperative Project on Genetic Improvement (Genetıc Improvement of Anatolian Buffalos by Crossing with Italian Buffalos) that, was supported by FAO.

**The first inseminations were made in April, 2002 within the scope of the Project with Turkish-Italian cooperation. Therefore, the records of F_1s have been kept since 2003.

zing land of the village. In one of the study units, a limited amount of silage is produced and additional feed is given after the return from pasture. In the other farm, the feeding level is lower. Births generally occur during March and April.

Breeding records of Anatolian buffalos have been kept by the author since 1996. Inseminations were started in April, 2002, within the scope of an Anatolian×Italian Crossbreeding Project, and the first crossbred calves were born in 2003. Since the animals studied were from the village herd, the animals were artificially inseminated after their oestrus was synchronized. Therefore, gestation periods could be calculated only in Anatolian and F_1 buffalos within the Project. Table 1 shows the data evaluated according to the examined features. The evaluation was made in combination of the data of some years there were a few data, with others for each trait (Table 1).

Table 1

Baseline data for the evaluation of the features examined in this study (x)

Environmental factor	First calving age		Calving interval		Gestation period	
	Subgroup	N	Subgroup	N	Subgroup	N
Genotype	Anatolian	12	Anatolian	87	Anatolian	20
	Crossbred F_1	10	Crossbred F_1	21	Crossbred F_1	5
Calving Year	2001 and 2002	7	2001 and 2002	19	2003, 2004	11
	2003, 2004, 2006	6	2003,2004	21	2005,2006,2007	7
	2007, 2008, 2009	9	2005, 2006	15	2008, 2009, 2011	7
			2007, 2008	20		
			2009, 2010, 2011	33		
Total		22		108		25

The effects of the genotype and the calving year on the examined features were examined through GLM (General Linear Model) analysis of variance (ANOVA). To that end, a simple linear model (Equation 1) including variance sources considered for each feature was used;

$$Y_{ijm} = \mu + G_i + C_{yearj} + (G \cdot C_{year})_{ij} + e_{ijm}. \quad (1)$$

where; Y_{ijm}: Examined feature (for example gestation period), μ: General average, G: Genotype effect (i: Anatolian, F_1), Cyear: The effect of the calving year (j: 1, 2, 3, 4, 5), $(G \cdot C_{year})_{ij}$: The interaction between the genotype and the calving year, e_{ijm}: Error term.

Averages were calculated for the examined features for each genotype. SPSS was used in all statistical analyses.

RESULTS

Table 2 shows ANOVA results of various features and Table 3 shows averages of investigated characteristics.

Table 2

Analysis of variance of calving interval, first calving age and gestation period

Variance Source	Calving interval			First calving age			Gestation period		
	f.d.	F	Significance	f.d.	F	Significance	f.d.	F	Significance
Genotype	1	0.368		1	0.696	0.416	1	0.150	0.703
Calving year	4	2.659*	0.037	2	1.004	0.387	2	2.815*	0.084
Genotype*Calving year	1	0.774	0.381	1	0.535	0.474	1	0.218	0.645
Error	101			17			20		
Total f.d.	108			22			25		
The average of error square	21164.949			18743.881			77.143		
R^2	0.116			0.224			0.221		

*P <0.05, Coefficient determination of model

Table 3

Average calving interval, first calving age and gestation period (days) (x).

Environmental factor	Subgroup	Calving interval		First calving age		Gestation period	
		N	X ± SX	N	X ± SX	N	X ± SX
Genotype	Anatolian	87	599.2±15.27	13	1210.4±35.38	20	313.3±2.06
	F_1	21	545.2±38.5	10	1126.4±44.37	5	314.0±4.21

DISCUSSION

The effect of the genotype was non-significant for 3 of the examined features. The calving year is related to significant variance in calving interval and gestation period (Table 2). The significant effect of the calving year may be due to climatic changes that occurred during the 10-year period of the study. Since the feeding depends on grazing areas in the village, the change in the feeding system is an anticipated outcome. On the other hand, feeding is one of the most influential environmental factors on reproductive traits [2, 12, 13]. While some studies in the literature reported that the calving year significantly affects the calving interval [10], others found that this effect was insignificant [3, 11].

While the averages of the calving interval, the first calving age and the gestation period are shorter in F_1s (Table 3), the differences between Anatolian and F_1s for these features are not significant (Table 2). It may be stated that average gestation period is the same in both genotypes (Table 3).

The averages of the calving interval, the first calving age and the gestation period obtained from this study can be compared with those in literature as follows:

The average calving interval determined for the Anatolian breed is longer than the reported one in both other studies in the literature [20], and those reported for various breeds in different countries. The average calving interval determined in this present study for F_1 crossbreeds is close to the result of one study in the literature (Neog et al. [22] in Murrah and Surti breeds), a little shorter than the value of 3rd calving order given for the Anatolian breed in the literature [20], and longer than other results.

The first calving age average calculated for the Anatolian breed is older than the results of some studies [3, 19, 20], shorter than the results of some studies (Anonymous [16] for Murrah breed; McCool [17] for Malaysian buffalos), and similar to the results of some studies (Anonymous [16] for Nili-Ravi buffalos; McCool [17] for Australian buffalos; Metry [24]; Larsson [18]) in literature. The first calving age average calculated for F_1 genotype is smaller than the results of some studies (Anonymous [16] for Murrah and Nili-Ravi buffalos; Afifi et al. [3]; McCool [17] for Australian and Malaysian buffalos), greater than the result of one study (Fooda et al. [19]), and similar with the results of some studies (Uslu [20]; Metry [24]; Larsson [18]) in literature.

The averages of the gestation period in Anatolian and F_1 ones are similar in this study. The gestation period determined for Anatolian×Italian F_1 crossbreeds is the same as that determined for Egyptian×Italian F_1 crossbreeds by Fooda et al. [19]; the gestation period average determined for the Anatolian breed is slightly shorter than that determined for Egyptian buffalos by Fooda et al. [19]. The gestation period averages determined for Anatolian and Anatolian×Italian F_1 crossbreeds is similar to the results of only one study (close to the top level stated by McCool [17] for river buffalos) in the literature apart from the study by Fooda et al. [19], which is shorter than the result reported by Uslu [20]) for the Anatolian breed and longer than the results of Faruque [23].

It would be expected that the averages found in this present study for reproductive traits would differ from the results of most studies in the literature. This variation is due to the genetic diversity and different environmental conditions, such as feeding and herd management (Borghese et al. [14]; Thevamanoharan et al. [4]; Ramos et al. [5]; Jabalkandi [6]; Perera [2]). This outcome may be explained because the present study was conducted in village conditions, in which feeding was almost entirely dependent on grazing lands, whereas the

other studies in the literature were conducted in different countries and regions, in different research herds and under different climatic conditions. Thus, the previous results for the Anatolian breed [20] were obtained from a study conducted at the Afyon Buffalo Research Institute.

In conclusion, the present study found no significant difference between Anatolian breed and Anatolian×Italian F_1 crossbreeds in terms of the examined reproductive traits.

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