

Production Systems

Reproduction ability of autochthonous cattle breed, bred in different production systems

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Abstract. *The reproduction ability of the autochthon primitive breed Rhodope Shorthorn cattle (RShC), bred in different production systems was studied. It was established that the RShC raised for milk are late maturing cows (first-calving age - 861 ± 28.3 days) and have a relatively long calving period (405.3 ± 13.3). Wide range variation has been observed within the two characteristic features and the variant distribution is close to normal. When traditionally raised, the cows calve all year long, mainly during the first six months, whereas free-range cows, raised only for calving, tend to follow clearly defined calving seasonality, mainly in February-March. Transition to seasonality takes place during the very first years after passing over from traditional to free-range cattle breeding. Breeding cattle under industrial conditions with regulated reproduction leads to a complete seasonality loss thus the greatest number of calves are born in the most favourable milk period - from May to September.*

Key words: cattle, autochthon breed, reproduction.

Introduction

Genetic diversity is highly treasured on our Earth and preserving it for the generations to come is of primary significance for mankind. Part of this diversity is observed with farm animals. Though achieved by man, it is as essential as that of wildlife and according to FAO (2007), reasonable management of world genetic resources of farm animals under threat is a great challenge to the World Community. At present, around 20 percent of breeds are classified as risky. For the last 6 years one breed has been disappearing every month on the average (FAO 2007). Both autochthon breeds have been preserved in Bulgaria – the Bulgarian Grey and the Rhodope Shorthorn cattle - the latter with lower chances to survive.

The RShC is an extremely primitive breed variant of *Bos taurus* brachyceros. According to Hlebarov (1940 – 1941) it is closer to the "... fossil domestic cattle from the Neolithic age (the peat cattle) than to the Alpine Brachycera races. These are the last remains of the prehistoric cattle breed in Europe ...". The RShC is small – the average height at the withers is 104.3 cm, slanting body length – 121.2 cm and the chest girth is 145.3 (Stoyanov and Nickolov, 2004). The average lactation milking is 800-1200 l, with milk fat of 4.5% (Tzonev and Vasilev, 1962).

As indicated in FAO classification (FAO, 2007), the RShC refers to the endangered-maintained breeds - the animals are under the control of the Association for Breeding Indigenous breeds in Bulgaria (ABIB) with a specially developed breeding programme (Nikolov, 2004). The latter is particularly based on sources from the 1940s and 1960s – the time when the breed was studied and described. This

programme lacks any information about the breed's main characteristics. Among these are the reproduction features of extreme importance to define the breeding policy factors.

The objective of this paper is to study the main reproduction features of RShC, reporting the production breeding scheme.

Material and method

The study is based on the data received after RShC herds monitoring was carried out by us. Animals were bred in their natural habitat in the Rhodopi mountain. The whole study was carried out within the ABIB and covers the period 2003-2008. At present, fifteen herds of 184 cows and 13 bulls have been under the control of the Association in 11 rural settlements. Information from the villages of Koushla (№1), Stomanovo (№2), Dve topoli (№3), Gorno Pole (№4) and Tamrazh (№5) has been used for the analysis of reproduction abilities.

The cattle in the village of Koushla have been raised in accordance with the breed-typical method (variant I). Farm families keep from 1 to 5 cows, raised both for milk and meat. After calving the baby calves are left two nipples to suckle, the other two being milked. Milking and suckling are done simultaneously which often results in lactation ceasing after weaning. The cows are used for work, mainly in field ploughing. The cattle are exclusively grass-fed on grazing grounds. Meadow hay, straw and oak leaves fodder are used in winter. Only newly-calved cows are fed on energy concentrated forage – 1-2 kg per day, as well as on potatoes in the winter season.

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The cows put under selection control have been artificially inseminated since 2002.

The cattle breeding farm in the village of Stomanovo is of an industrial type (variant II). 25-30 cows are raised there, 10-12 of which belong to the RShC breed. In winter the cows are tied up indoors and left free-ranging outdoors in summer. They are mainly fed on meadow hay, alfalfa hay and pasture grasses. Special combined forage for milking cows is used for balancing the ration which is given 0.350-0.400 kg/milk litre. Cows are artificially inseminated.

The are 3 farms raising 34 cows in the village of Dve topoli and in Gorno Pole – 3 farms with 42 cows living in herds. The cows in both villages are used only for calving and are not milked (variant III). They are free-ranging in groups, sheltered under light sheds and in other buildings used only in bad weather. The livestock graze outdoors all year long and they are partially fed on meadow hay and straw in winter. Insemination is achieved in a natural way. 12 cows are bred in Tamrazh following the pattern in Dve Topoli and Gorno Pole. The farm there was opened in 2006 when the cows were bought from Koushla and some other villages in the region (variant IV) and are bred in the traditional way. Insemination was done in a natural way.

The following characteristics of reproduction have been used: age at first calving (N=47), calving dynamics (N=229) and

intercalving period (N=178). Because of limited information cows have to be grouped according to the length of the intercalving period, following the age principle – between 2 and 3 years of age, between 3 and 4 years of age, etc. The data have been processed statistically using the variational method.

Results and discussion

According to the RShC breeding programme, the age at first calving is 24 months ranging from 22 to 25. Our research shows that it should be higher for this breed. The average age at first calving (AFC) is 861±28.3 days (28.7 months) and is in wide variation range (CV=22.5%). The majority of cows calved at 29-31 months of age (± 1), 74.5% of the cows having calved in the 23-35-month period (Fig.1). The distribution of variants is close to normal. It has been slightly moved to the "+" variants which proves that the selection favours first calving at a higher age. The cows grouping according to the length of calving period (CP) is close to normal (Fig.2). It used to be 405.3± 13.3 days on the average and varies together with the first calving age (CV=20.6%). Cows with CP 400-420 days are the greatest in number and the greatest number of variants are in the "-" spaces on the x-axis.

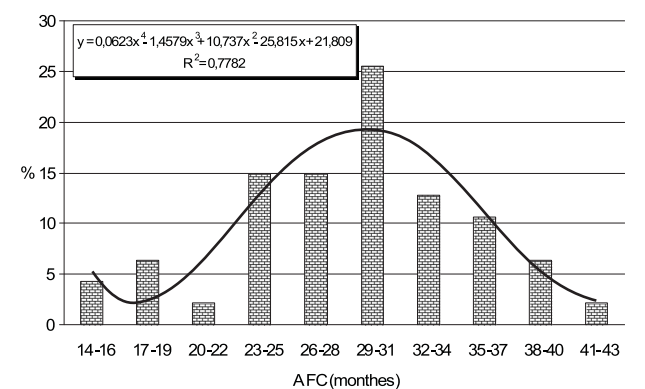


Fig. 1 Distribution of RShC breed cows according to first-calving age.

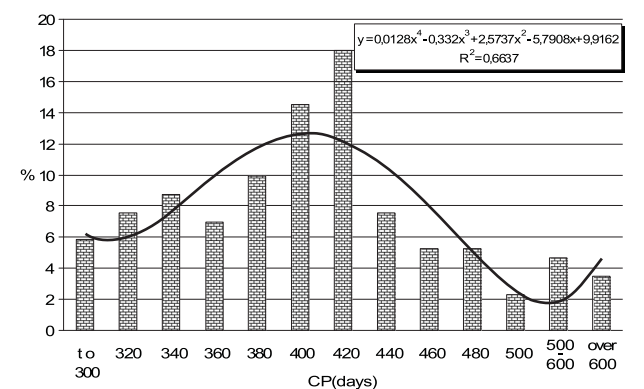


Fig. 2 Distribution of RShC breed cows according to the length of intercalving period.

Table 1. Duration of calving period of RShC breed cows of various age groups.

Ages	N	C P (days)			Ages	N	C P (days)			Ages	N	X
		X	±Sx	CV			X	±Sx	CV			
2-3	16	410	26,0	24,5	8-9	11	391	18,2	14,7	14-15	1	390
3-4	23	423	18,8	20,8	9-10	10	432	38,3	26,6	15-16	2	471
4-5	22	389	17,0	20,1	10-11	11	394	19,3	15,5	16-17	1	330
5-6	20	387	17,4	19,6	11-12	9	446	45,2	28,7	17-18	2	479
6-7	22	395	16,1	18,7	12-13	5	400	19,9	10,0	18-19	1	451
7-8	18	398	17,4	18,0	13-14	3	461	84,0	25,8	19-20	1	383

The age of cows does not influence ($P>0.05$) the length of CP in a significant way (Table 1). Insufficient number of variants and strong group variations may appear as a result. Clear tendencies are visible. The cows, separated at an early age (2-3-year olds), have the longest CP. The shortest CP has been observed in the next age group – 3-4 years of age; as age approaches 10-12, the CP becomes longer. The number of cows over 12 years of age is not enough for making conclusions. On the other hand, it is evident that some of the animals preserve good reproduction ability until they become 19-20 years old.

Particular interest is placed on the clearly outlined season calving (Fig.3) of cows raised within production system III – variant (No.3 and No.4), along with the observed close to normal distribution of AFC and CP. Cows calved from January to May, before or after this period there are only isolated calving cases. February-March-born calves are the greatest in number. The observed phenomenon raises many queries related to the process of domestication

(Belyaev, 1972, 1974), its mechanisms, sustainability of selection-supported characteristics, reversibility potential, etc.

This breed was raised in the traditional way until the 1960s-1970s and was described as typical of the village of Koushla. The studies from that period show that the RShC were raised for milk and that the cattle had bad meat producing qualities. Using cows for work and calving is a new 30 or 40-year-old tendency. When cattle are raised for milk, calving seasonality is purposefully eliminated. Although the RShC is a primitive breed, for many centuries it has been selected by this pattern. February-March calving is the worst calving season for the region of the Rhodopi mountains. At the end of the winter period forage is usually insufficient and grass appears 2-3 months later.

As shown in fig.3, clear season calving is observed in traditional breeding (No.1) – more calves are born in the first half of the year. In comparison with farms No.3 and No.4, the period is extended to June-July and calving takes place all year long.

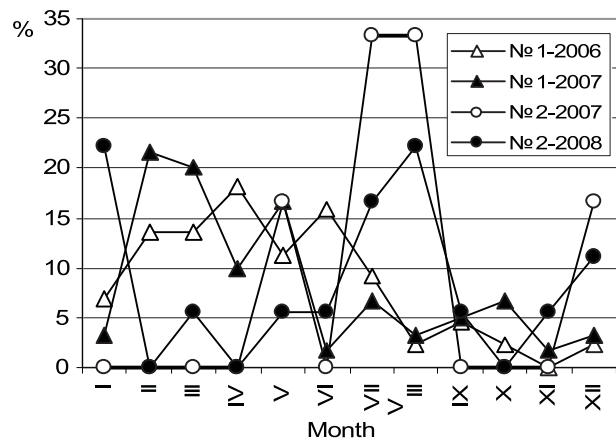
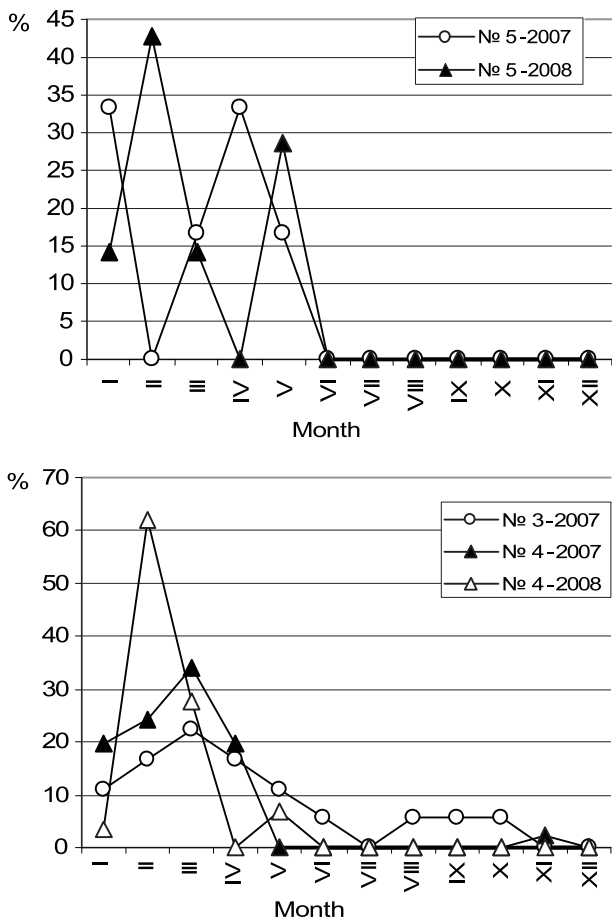


Fig.3. Distribution of calvings throughout the year for cows raised under various production systems.

Breeding cattle under industrial conditions with a possibility for reproduction regulation via artificial insemination leads to a complete seasonality loss (farm No.2). The greatest number of calvings is observed during the most favourable high-yield milk period V-IX.

The calving dynamics in the village of Tamrazh is of particular interest (No.5). The farm was opened in 2006. Calving seasonality was observed the very next year (2007) and two years later (2008) the calving distribution curve moves in favour of the free-range cattle (No.3 and No.4).

Conclusion

The autochthonous RShC raised for milk are late maturing cows (first-calving age 861 ± 28.3 days) and have a relatively long calving period (405.3 ± 13.3). Wide limit variation has been observed within the two characteristic features ($CV=20-22\%$) and the variant distribution is close to normal. When traditionally raised, the cows calve all year long, mainly during the first six months, whereas free-range cows, raised only for calving, tend to follow clearly defined calving seasonality, mainly in February-March. Transition to seasonality takes place during the very first years after passing over from traditional to free-range cattle breeding. Breeding cattle under industrial conditions with regulated reproduction leads to a complete seasonality loss thus the greatest number of calves is born in the most favourable milk period - from May to September.

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