

## Abstract

Creating an optimum model for the production of high-quality beef is an opportunity for the and for many family farms, where the direction of agricultural production has not been determined, a chance for their development and additional income.

The study set three research objectives:

- 1) to determine to what extent the Belgian Blue breed can be used for commercial crossbreeding with Holstein-Friesian cattle;
- 2) to develop a beef production model based on commodity crossbreeding of the Holstein-Friesian and Belgian Blue breeds for the climatic and soil conditions of Western Pomerania;
- 3) qualitative assessment of beef from this crossbreeding in terms of its culinary suitability.

The study found that semen from BBB breed bulls could be successfully used in crossbreeding with HO cows. No increased number of difficult births was found in cows giving birth to hybrid calves compared to the group of cows giving birth to purebred calves. The course of parturition, the condition of the cows after parturition and the time of placental exit in both groups of experimental cows were at a comparable level. The hybrid calves (HO x BB) after parturition showed good and very good vitality and no falls were observed in them until the fifth day after parturition.

In extensive rearing, heifers and hybrid bulls up to 18 months of age were significantly lower at the withers and at the sacrum compared to purebred bulls. The hybrids from 6 months onwards also had a smaller thoracic circumference, while the supraspinatus circumference in them was larger compared to purebred bulls. This may indicate that the hybrids had a stronger bone structure. Hybrids of both sexes from birth to 6 months of age in extensive fattening were characterised by better body measurements compared to purebred bulls. This was particularly true for measurements of spiral thigh circumference and thoracic and supraspinatus circumferences, which were significantly larger compared to purebred bulls. This may be due to the fact that up to the age of six months the feeding of the youngsters in the different housing systems is at a similar level. The hybrid bulls from birth to 18 months of age had a better developed hindquarters, as the pelvic dimensions (widths at the hip and ischial tuberosities and pelvic length) in them were significantly larger compared to purebred bulls. The crossbred heifers were also characterised by a better developed pelvic rim, but only up to 6.-months of age did the pelvic dimensions differ significantly compared to purebred bulls. A well-developed pelvic rim provides a larger surface area for the musculature of the hindquarters of cattle, which is important for fattening cattle, as this part of the body in cattle contains the most valuable carcass components. In extensive fattening for the entire experimental period, the highest body weight

(over 510 kg) and the highest body weight gain (0.86 kg) were obtained by hybrid bulls. Hybrid bulls at all measurements gained significantly more body weight compared to purebred bulls and hybrid heifers. This indicates that hybrid bulls (HO x BB) can be successfully fattened in the extensive system, obtaining better development parameters compared to purebred bulls (HO).

In intensive fattening, the hybrid bulls had a significantly larger thoracic and supramaxillary circumference and spiral thigh circumference compared to the other three experimental groups. These body measurements indicate that they are well predisposed to intensive fattening. Both groups of HO x BB hybrids (bulls and heifers) were significantly shorter (height at withers and sacrum and shorter (oblique trunk length) compared to the groups of purebred bulls (HO black and white and red and white). However, the mentioned traits are not important in cattle fattening. The good fattening traits of the hybrids are also evidenced by the pelvic measurements obtained. The hybrid bulls were significantly wider at the hip and ischial tuberosities compared to purebred bulls. However, only slight differences in pelvic length at 18 months of age were shown between all groups. In intensive fattening, the highest body weight (610 kg) and gain (more than 1 kg) were obtained by hybrid bulls. Both figures were significant compared to the other experimental groups. Also, hybrid bulls had the most consistent gains of over 1 kg throughout the experimental period. In contrast, the hybrid heifers achieved a higher final body weight and slightly higher gains compared to the purebred bull groups. This indicates that HO x BB hybrids (especially bulls) are more suitable for intensive fattening.

Comparing selected body conformation indices in extensive and intensive fattening, it was found that the hybrids were more massive, bony and rebuilt compared to purebred bulls. The relationship obtained confirms the thesis of better suitability of hybrids for fattening.

Better physico-chemical properties for storage and heat treatment of LL and LS meat (lower leakage and higher pH) were obtained in hybrid bulls with higher slaughter weights (almost 600 kg). Bulls with lower slaughter weights and heifers had higher leakage and lower meat pH. The magnitudes of the TPA test parameters showed that the meat from the heavier bulls passed the maturation period best. This is indicated by a systematic decrease in hardness, chewiness and gumminess during the storage period up to day 12 and the maintenance of cohesiveness and ductility at comparable levels while increasing elasticity. Sensory evaluation of the muscles indicates that the meat from the heavier bull had the best cooking properties (better colour, marbling, tenderness and juiciness).

In the hybrids, the average slaughter yield in intensive fattening was almost 58% and was significantly higher ( $P \leq 0.05$ ) compared to the two groups of purebred bulls - almost 54%. In

the evaluation of fatness class, carcasses from slaughtered hybrid bulls were less fat (2.12) compared to carcasses from HO bulls. The evaluation of the post-slaughter classification of carcasses in the EUROP system showed that more than 33% of the carcasses from hybrids were classified as U - very good muscling; more than 58% as R - good muscling and only more than 8% obtained O - fairly good muscling, carcasses from HO bulls did not obtain a U grade and only more than 30% had an R grade. The  $\chi^2$  test value (10.671) showed a significant relationship ( $P \leq 0.05$ ) between carcass class and origin. Carcasses from hybrid bulls fattened on intensive diets obtained significantly more favourable indices of post-slaughter slaughter value. The results of the half-carcass dissection confirmed that the crossbreeding of HO x BB breeds improves the slaughter value evaluation indices and carcass quality in the hybrids by increasing the degree of muscularisation, which translates into an increase in the weight of the most important carcass cuts.

**Keywords:** Holstein-Friesian breed, Belgian Blue breed, interbreeding, fattening systems, evaluation indicators

Audrey Gyrova  
03.07.2023