

Comparison of recording results of purebred and crossbred Limousine cattle in Poland

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Abstract: *Comparison of recording results of purebred and crossbred Limousine cattle in Poland.* The aim of the study was to compare purebred and crossbred Limousine cattle in respect to their compliance with the breeding goals and standards adopted by the Polish Association of Breeders and Producers of Beef Cattle (PABPBC). The study was based on data for the years 2002–2015 from the PABPBC and for the years 1996–2001 from the National Center of Animal Breeding (NCAB). The properties that were evaluated were the average weight of cows (kg), average body weight of calves after birth (kg), average daily weight gain of calves from birth to 210 days (g), average body weight of calves at 210 days (kg) and average milk yield of cows (kg). The average body weight of cows did not differ from the breeding goal for either purebred or crossbred Limousine cows. Purebred cows were always heavier than crossbred cows, but the weight difference was almost 100 kg in 1999 and in 2006, only 20 kg. Body weight after birth for purebred and crossbred bull calves was comparable. Purebred Limousine calves consistently had higher daily weight gain than crossbred calves. The average milk yield of purebred and crossbred Limousine cows was about 2,000 kg, and did not change significantly in any year.

Key words: beef cattle, Limousine, beef cattle recording

INTRODUCTION

In Poland, there are currently 14 registered beef breeds which are recorded and evaluated in terms of their breeding value. Herd books and records are kept by the Polish Association of Breeders and Producers of Beef Cattle (PABPBC). The PABPBC breeding goals for the Limousine breed are maintaining high slaughter parameters, good weight, and easy calving courses as well as maintaining and improving the daily weight gain of calves as an indicator of maternal milk production. The goal for adult cows is a body weight of 600–650 kg with a height of 135 cm to the sacrum, and for bulls – a body weight of 1,100 kg with a height of 145 cm to the sacrum. In the national breeding program for Limousine cattle, the breeding standards entered in the introductory part of the book include the following: the minimum weight gain from birth to 210th day of life should be 850 g, and the minimum weight after the first calving should be 480 kg. The share of purebred and crossbred Limousine cattle in the national beef cattle population is dominant and in 2013 constituted 81.2%. The aim of this study

is to compare selected recorded results of purebred and crossbred Limousine cattle with respect to their compliance to the breeding goals and standards adopted by the PABPBC.

MATERIAL AND METHODS

Recorded results for purebred and crossbred Limousine cattle in Poland were analyzed in this study. A comparison in respect to their compliance to the breeding goals and standards adopted by the PABPBC was made. The study was based on data for the years 2002–2015 from the PABPBC and for the years 1996–2001 from the National Center of Animal Breeding (NCAB). The data set included: *N* – number of animals tested, *min* – minimum values of the studied traits, *max* – maximum values of the studied traits, *AVG* – average values of the studied traits, *SD* – standard deviation. The studied traits were weight of cows (kg), body weight of calves after birth (kg), daily weight gain from birth to 210th day of life (g), body weight of calves at 210th day of life (kg), milk yield (kg), the annual distribution of calving of cows and heifers, the distribution of the population according to the lactation number.

The standardized animal body weight for a given day in an animal's life was calculated according to the following formula:

$$MCS = [(MCB - MCU) / WW] \times WS + MCU$$

where:

MCS – standardized animal body weight (kg);

MCB – average body weight of the animal on the weighing day (kg);

MCU – birth body weight, measured within 48 h post-partum (kg);

WW – average age of the animal when weighed (days);

WS – standardized age of the animal.

The average daily weight gain of the animal from birth to 210th day of life was calculated according to the formula:

$$PDMC = (MCC - MCP) \times 1,000 / (WK - WP)$$

where:

PDMC – increase in daily body weight (g);

MCC – final body weight of the animal on the weighing day (kg);

MCP – initial body weight of the animal on the weighing day (kg);

WK – age of the animal on the final weighing day (days);

WP – age of the animal on the initial weighing day (days).

Milk yield in beef cows is expressed in kg of milk in conversion to calf's body weight, according the formula:

$$WMM210 = McOds \times 1,700 / calf\ age$$

where:

WMM210 – amount of milk which was used during the 210-day lactation by calf of the initial birth weight of 35 kg, which consumed 10 kg milk daily during the first 3 months, and 8–9 kg during 4–8 months;

McOds – actual weight of the calf at weaning (kg);

calf age – actual age of the calf at the time of weaning (days).

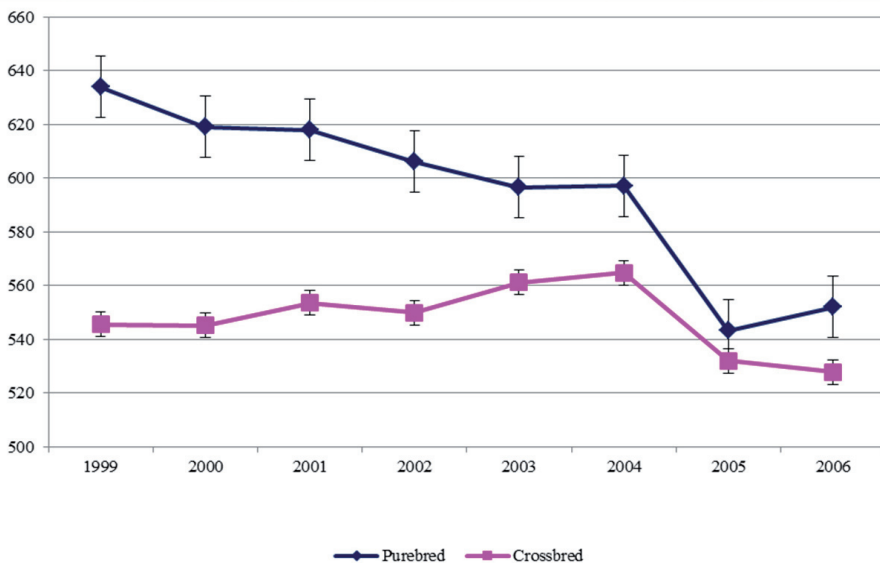
RESULTS AND DISCUSSION

The average body weight of purebred and crossbred cows is shown in Figure 1. The optimum weight of a cow depends mainly on the cattle production system (Fitzhugh 1978, Nogalski et al. 2000, MacNeil 2003, Funston and Deutscher 2004, Drennan 2008). The genotype and weight of mother cows are always given as two of many factors responsible for the normal growth and development of calves. Many studies have shown that the weight of the cow has a significant impact on calf birth weight, as well as calves' daily weight gain during rearing (Przysucha et al. 2002). Therefore, the weight of a cow in adulthood is an important aspect to be considered in breeding programs (Funston and Deutscher 2004). According to the breeding goal given by the PABPBC, the body weight of adult

Limousine cows should be 600–650 kg. According to breeding standards, the minimum weight after the first calving is 480 kg.

The results given in Figure 1 show that the average body weight of cows did not differ from the breeding goal for either purebred or crossbred Limousine cows. Purebred cows were always heavier than crossbred cows, but the weight difference was almost 100 kg in 1999 and only 20 kg in 2006.

Figures 2 and 3 present the average body weight of purebred and crossbred calves after birth. Many authors have shown that calf body weight at birth has a significant effect on calf body weight at weaning at the age of 210 days. Calves with the highest body weight at birth also typically have the highest body weight at the end of rearing (Przysucha et al. 2002, Przysucha et al. 2005). Nogalski et al.



1999–2004: all cows; 2005–2006: cows after the first calving.

FIGURE 1. Average cow body weight (kg)

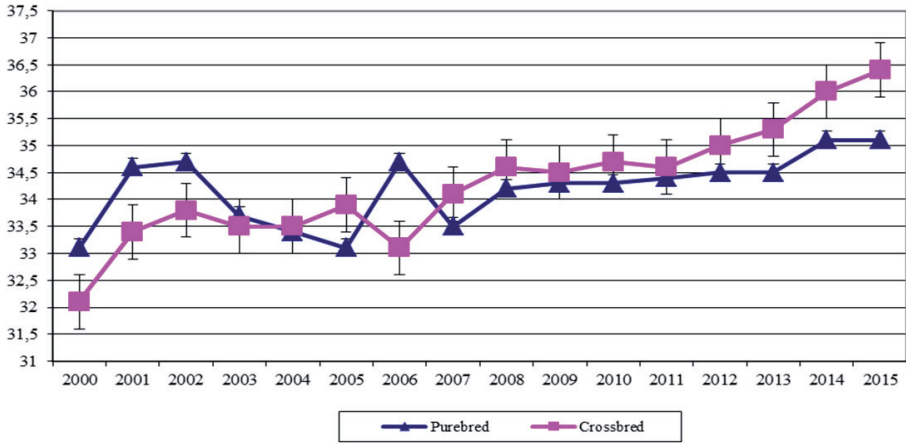


FIGURE 2. Average calf body weight at birth – heifer calves (kg)

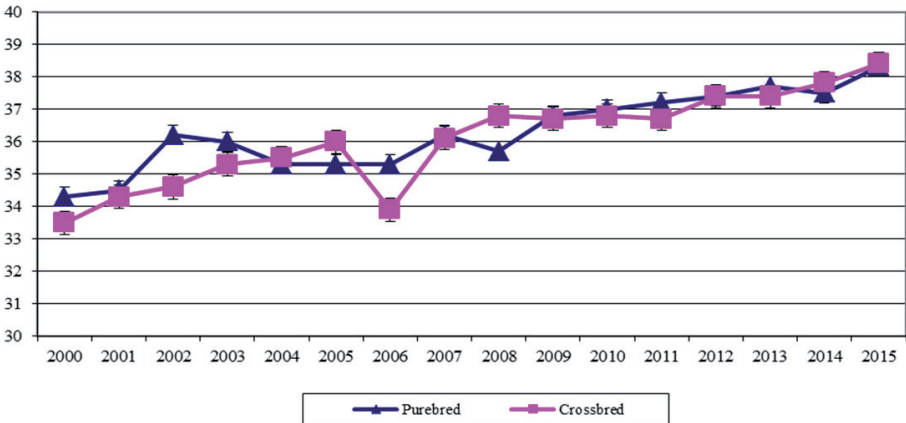


FIGURE 3. Average calf body weight at birth – bull calves (kg)

(2000) reported a greater mortal rate of small, less vital calves. They also noticed that the mothers of dead calves had been significantly lighter and in worse condition during pregnancy, and consequently created worse conditions for the development of the fetus, and were less prepared to make effort in delivery.

Figure 2 shows that since 2007, crossbred heifers were heavier than purebred ones. In 2015, the difference in weight

was about 1.5 kg. The body weight after birth of purebred and crossbred bull calves was comparable. Bull calves, shown in Figure 3, were about 2–3 kg heavier than heifer calves in both populations. The significant effect of calf sex on birth weight is broadly described and proved by many authors. Differences in the body weight of bulls and heifers have been found to be between 1 and 5 kg, depending on the study (Bellows et

al. 1987, Riha et al. 2001, Jakubec et al. 2003, Choroszy et al. 2011).

The average daily weight gain of purebred and crossbred calves up to the age of 210 days is shown in Figures 4 and 5. It should be emphasized that the average daily weight gain of calves increased considerably in the last years of analysis.

The presented data show that the calves had high body weight gain during rearing: 900–1,010 g respectively for heifers and 970–1,100 g for bulls. Purebred Limousine calves consistently had higher average daily weight gain than crossbred calves.

It should be noted that Figure 5 shows that since 2002, bulls exceeded a daily

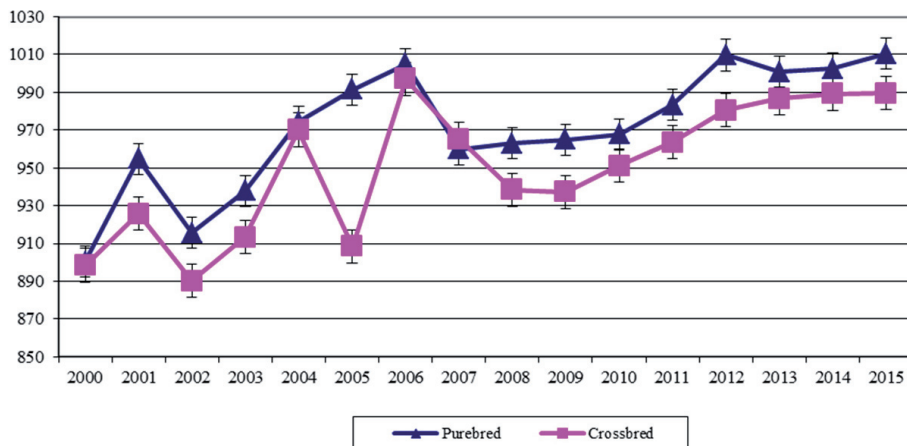


FIGURE 4. Average daily weight gain from birth up to the age of 210 days – heifer calves (g)

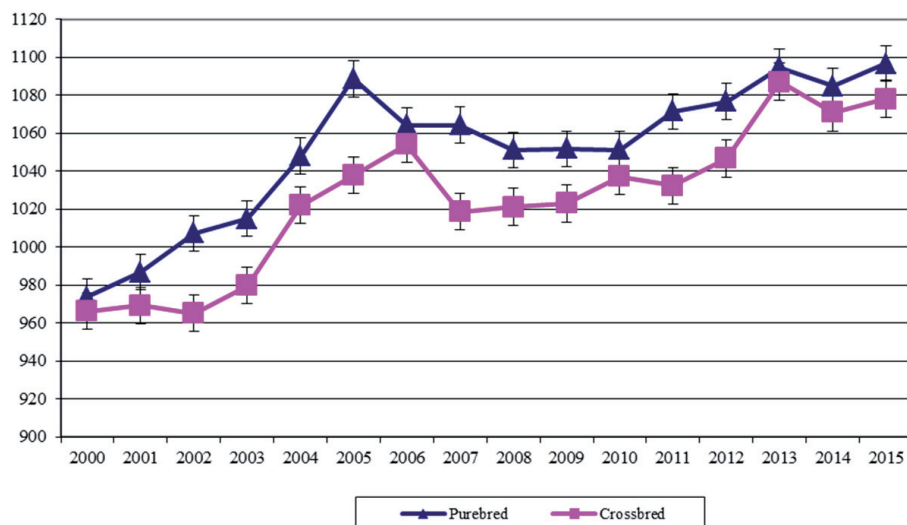


FIGURE 5. Average daily weight gain from birth up to the age of 210 days – bull calves (g)

weight gain of 1,000 g. This amount of weight gain means that after a short period (about 1 month) of supplementary fattening, bulls with a body weight of approx. 300 kg previously eliminated from breeding can be sold for export at a good price. The weight gain set out in

the breeding standards is considerably higher for bull calves than heifer calves. This is to ensure that after weaning, with proper nutrition, bull calves obtain the required body weight for mating at the age of 15 months (Przysucha et al. 2002). In Poland calves' mortality is significantly

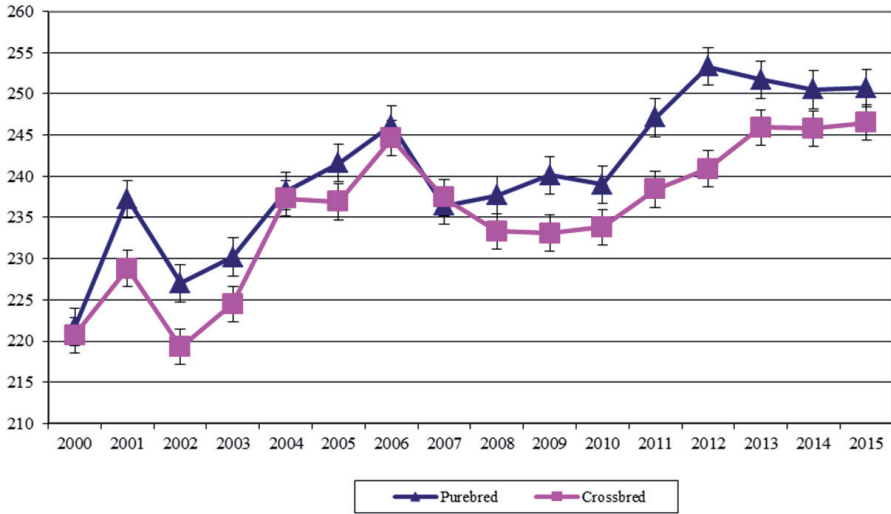


FIGURE 6. Average body weight of heifer calves at the age of 210 days (kg)

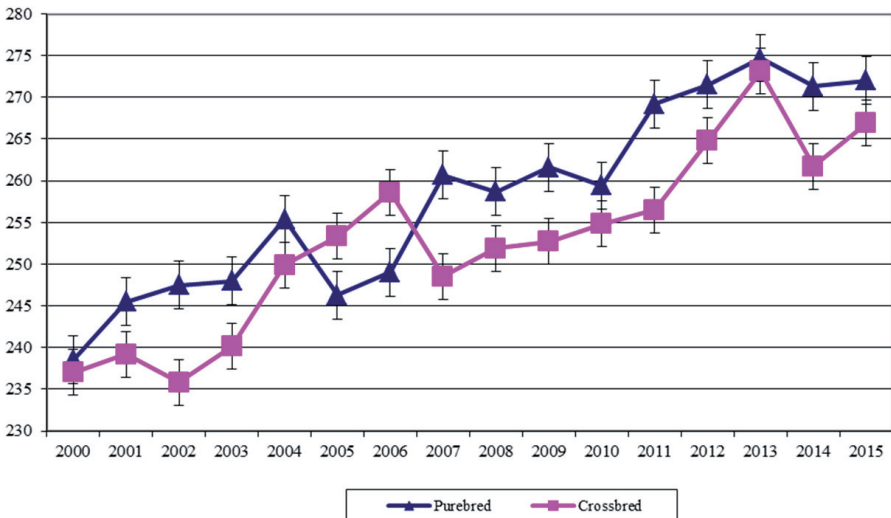


FIGURE 7. Average body weight of bull calves at the age of 210 days (kg)

lower than in France. Limousine calves are also characterized by rapid growth and development, and vitality (Przysucha et al. 2002). In a study by Pogorzelska et al. (1998), the daily weight gain of Limousine bull calves from birth to weaning was more than 1,000 g, and at the age of 3–4 months, these calves had a body weight of approx. 170 kg.

The average body weight of purebred calves at the age of 210 days is presented in Figures 6 and 7. Body weight at this time was nearly always higher for purebred animals. From 2012, the weight of purebred heifers exceeded 250 kg and the weight of bulls exceeded 270 kg. This means that according to breeding standards, body weight at weaning for both heifer and bull calves were at a medium level. The average weight of bull calves was approx. 20 kg higher than the average weight of heifer calves of the

same age in both purebred and crossbred populations.

The milk yield of suckler cows is one of the most important factors affecting the growth rate of calf weaning weight. According to Minick et al. (2001), Quintans et al. (2010) and Cortés-Lacruz et al. (2017) suckler cows' dairy performance is responsible for 60% of daily calves' growth during that period. Many studies indicate that the highest milk yield is provided by Simmental cows, the average milk yield by Limousine cows, and the lowest by Hereford (Gregory et al. 1995, Quintans et al. 2010, Silva et al. 2015). Figure 8 shows the average milk yield of cows over the analyzed years. As can be seen, the average milk yield of purebred and crossbred Limousine cows were about 2,000 kg and did not change significantly in any year. In 2005 the significant drop in milk perform-

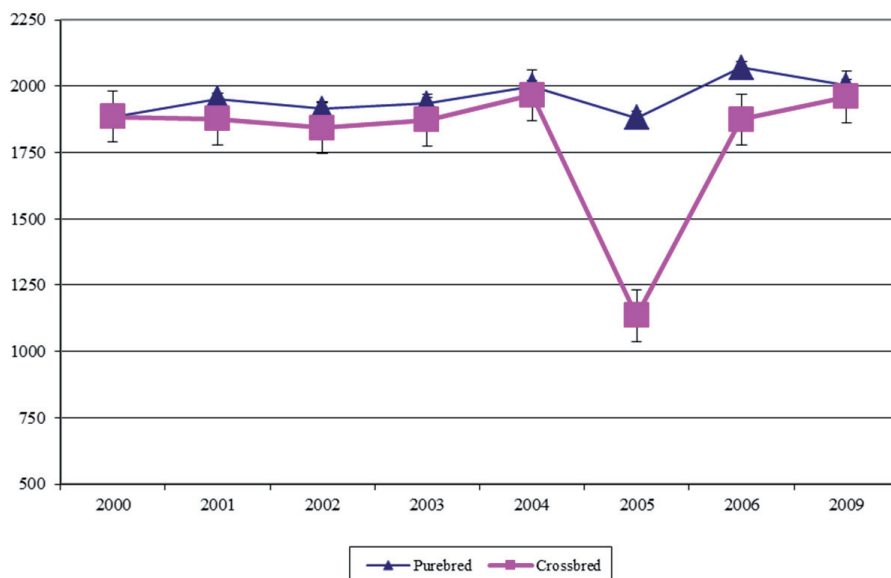


FIGURE 8. Average milk yield (kg)

ance of suckler cows was noticed, which can be explained by forage shortage caused by poor weather conditions and lack of water. However, the data should be approached with great caution because milk yield is calculated based on the weight gain of calves, and as we know, calves in a herd may approach the udders of cows other than their mothers or may be fed by the breeder. For this reason, from 2010, evaluation of this feature was ceased.

CONCLUSIONS

The results obtained from our study indicated changes in Limousine population in Poland until 2008. The number of purebred cows overwhelmed number of the crossbreeds. Study revealed that average cow's body weight significantly decreased for both purebred and crossbred females. However opposite trend in calf body weight was stated. Together with the heavier birth weight the body weight of calves at the age of 210 days was also increased. Also, the season of calving had the influence on calved growth rate. The better beef cattle daily growth gain could be explained by more advantageous distribution of cows calving in recent years.

REFERENCES

- BELLOWS R.A., SHORT G.P., KITTO G.P., STAIGMILLER R.B., MacNEIL M.D. 1987: Influence of sire, sex of fetus and type of pregnancy on conceptus development. *Theriogenology* 34: 941–954.
- CHOROSZY Z., CHOROSZY B., ŁOPIEŃSKA M., GRODZKI G. 2011: Analiza parametrów wzrostu cieląt rasy Limousine, Charolaise, Hereford w stadach hodowlanych objętych kontrolą użytkowości. *Rocz. Nauk. Zoot.* 38 (2): 137–147.
- CORTÉS-LACRUZ X., CASASÚS I., REVILLA R., SANZ A., BLANCO M., VILLALBA D. 2017: The milk yield of dams and its relation to direct and maternal genetic components of weaning weight in beef cattle. *Livestock Sci.* 202: 143–149.
- DRENNAN M., Mc GEE M., KEANE M.G. 2008: The value of muscular and skeletal scores in the live animal and carcass classification scores as indicators of carcass composition in cattle. *Animal* 2 (5): 752–760.
- FITZHUGH H.A. 1978: Animal size and efficiency, with special reference to the breeding female. *Anim. Prod.* 27: 393–401.
- FUNSTON R.N., DEUTSCHER G.H. 2004: Comparison of target breeding weight and breeding date for replacement beef heifers and effects on subsequent reproduction and calf performance. *J. Anim. Sci.* 82: 3094–3099.
- GREGORY K.E., CUNDIFF L.V., KOCH R.M. 1995: Genotypic and phenotypic (co)variances for production traits of intact male populations of purebred and composite beef cattle. *J. Anim. Sci.* 73: 2227–2234.
- JAKUBEC V., SCHLOTE W., RIHA J., MAJZLIK I. 2003: Comparison of growth traits of eight beef cattle breeds in Czech Republic. *Archiv. für Tiererzucht.* 46: 143–153.
- MacNEIL M.D. 2003: Genetic evaluation of an index of birth weight and yearling weight to improve efficiency of beef production. *J. Anim. Sci.* 81: 2425–2433
- MINICK J.A., BUCHANAN D.S., RUPERT S.D. 2001: Milk production of crossbred of high and low milk EPD Angus and Hereford bulls. *J. Anim. Sci.* 79: 1386–1393.
- NOGALSKI Z., KLUPCZYŃSKI J., MICIŃSKI J. 2000: Przebieg porodu, wielkość i żywotność cieląt w zależności od wymiarów ciała krów. *Rocz. Nauk. Zoot.* 27 (3): 43–57.
- POGORZELSKA J., ROMANOWSKI A., PUCHAJDA Z. 1998: Analiza użytkowania rozplodowego i rozwój importowanego z Francji bydła limousine i charolaise. *Zesz. Nauk. AR Wrocław* 19 (336): 143–148.
- PRZYSUCHA T., GRODZKI H., BRZOZOWSKI P., ZDZIARSKI K. 2005: Wpływ wybranych czynników na przebieg porodów krów rasy Limousine. *Med. Wet.* 61 (9): 1036–1038.

- PRZYSUCHAT., GRODZKI H., CHARŁAMPOWICZ A., ZDZIARSKI K. 2002: The effect of selected factors on growth rate of Limousine calves. Anim. Sci. Pap. Rep. 20 [Suppl. 1]: 221–228.
- QUINTANS G., BANCHERO G., CARRIQUIRY M., LOPEZ-MAZZ C., BALDI F. 2010: Effect of body condition and suckling restriction with and without presence of the calf on cow and calf performance. Anim. Prod. Sci. 50: 931–938.
- RÍHA J., JAKUBEC V., GOLDA J., MAJZLÍK I. 2001: Comparison of preweaning growth traits of six beef cattle breeds in Czech Republic. Czech J. Anim. Sci. 46: 152–158.
- SILVA L.N., GASPARINO E., TORRES JÚNIOR R.A.A., EUCLIDES FILHO K., SILVA L.O.C., ALENCAR M.M., SOUZA JÚNIOR M.D., BATTISTELLI J.V.F., SILVA S.C.C. 2015: Reproductability and genotypic correlations of reproductive and productive traits of crossbred beef cattle dams. Genet. Mol. Res. 14: 5310–5319.

Streszczenie: Porównanie wyników oceny użytkowości czystorasowej i mieszańcowej populacji bydła limousine w Polsce. Celem pracy było porównanie wybranych wyników oceny użytkowości czystorasowej i mieszańcowej populacji rasy limousine w odniesieniu do ich zgodności z celem hodowlanym i standardami rasowymi przyjętymi przez Polski Związek Hodowców i Producentów Bydła Mięsnego (PZHiPBM). Przedmiotem analiz były wyniki oceny użytkowości francuskiej rasy bydła mięsnego limousine w Polsce z lat 2002–2015 i Krajowego Centrum Hodowli Zwierząt z lat 1996–2001. Oceniane cechy to:

średnie masy ciała krów (kg), średnie masy ciała cieląt po urodzeniu (kg), średnie przyrosty dobowe masy ciała do wieku 210 dni (g), średnie masy ciała cieląt w wieku 210 dni (kg) i średnia mleczność krów (kg). Przeciętne masy ciała zarówno krów czystorasowych, jak i mieszańców nie odbiegały od przyjętych standardów dla obu genotypów. Krowy czystorasowe były cięższe od mieszańcowych we wszystkich latach oceny, ale różnica prawie 100 kg w 1999 roku zmniejszyła się do 20 kg w 2006 roku. Masy ciała cieląt po urodzeniu były zbliżone w obu porównywanych populacjach. Cielęta czystorasowe miały zawsze większe przyrosty dobowe masy ciała od mieszańcowych. Średnia mleczność krów czystorasowych i mieszańców wynosiła ok. 2000 kg i nie ulegała znaczącym zmianom w kolejnych latach oceny.

Słowa kluczowe: bydlę mięsne, limousine, ocena użytkowości

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