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A comparison of production traits between horned and polled Romanian Brown Cattle

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Abstract. Cattle are subject to a multiple invasive and painful procedures which may have short term and long term consequences. Examples affecting cattle include castration, dehorning, branding and tail-docking. Selection and breeding of polled cattle has been proposed as an alternative because it eliminates animal pain and production expenses associated with dehorning and disbudding. Little literature evidence is available about dairy polled breeds taking into consideration the comparison of some traits between horned and polled individuals. In the present paper were analyzed 25 lactations of horned Romanian Brown Cattle and 39 lactations of polled cattle. All cattle are subject of extensive breeding systems in Maramures County, being in property of different small farms. Our study shows clearly that there are no differences between polled and horned Romanian Brown Cattle for analyzed traits. As future objectives for Romanian Brown Cattle is to develop a breeding programme taking into consideration the genetic merit of the male and female due to genomic selection, identification of PP dominant animals for polled gene and the selection of the desired individuals for reproduction.
Key Words: Cattle, horned, polled, dehorning, disbudding, Romanian Brown Cattle.

Introduction. Dehorning and disbudding of cattle has been accepted for many years as a routine management necessity in many countries around the world. If dehorning is done by cutting the horn, disbudding involves destroying the horn-producing cells of the horn bud. Horn buds are removed without opening the frontal sinus. For this procedure could be used chemical and hot-iron methods to destroy the horn-producing cells, or physical methods like excision.

The methods used at the farm level cause pain and distress and for that it is recommended to be performed under local anaesthetic (Morisse et al 1995; Petrie et al 1995; Sylvester et al 1998; Faulkner & Weary 2000; Weary 2001). Due to a variety of physiological and behavioral measures (Graf & Senn 1999; Stafford & Mellor 1993, 2005), many researches have shown that all methods cause pain. The associations between measures of animal welfare at farm level and farmer's attitudes and empathy toward animals, showed that dehorning is considered by the farmers as being a painful procedure (Kielland et al 2010).

At the same time, dehorning of adult cattle is related with an increased risk of sinusitis, bleeding, injuries or infections. No matter when the procedure is performed, at an early stage (disbudding) or later (dehorning) the restraint remains extremely important for effective and proper procedure. Dehorning in the feedlot increases the cost of production due to increased labor, occasional mortality due to the removal of horns, increased morbidity due to stress and growth retardation (Stookey & Goonewardene 1996; Frisch et al 1980).

Generally there are some advantages in what is considering the use of animals with no horns like:

- reduced risk of injury and bruising of animals;
- prevent financial losses caused by damaged carcasses;
- less feeding space;
- easier to transport;

• gain a price advantage by offering hornless cattle;
• decrease aggressiveness at the feed bunk;
• lower injury risk for handlers;
• easier and less dangerous to handle and transport;
• exhibit fewer aggressive behaviors associated with individual dominance.

All methods used at the farm level must be simple, easy to execute, safe for people and animals, be cost effective, and be acceptable to the personnel involved (Stafford & Mellor 1993; Pentelescu et al 2009).

Taking into consideration that in Europe about 82% of the dairy cattle are dehorned (ALCASDE 2009) we think that is important to take into account some more friendly alternatives to dehorning and disbudding.

Polled beef bulls already demonstrate behavior, growth, carcass quality and reproductive performance equivalent to horned cattle (American Veterinary Medical Association 2012; Mellor & Stafford 2001; Stookey 2006). Little literature evidence is available about dairy polled breeds taking into consideration the comparison of some traits between horned and polled individuals.

Material and Method. The genes which control the horn and poll trait in British and European breeds follow a simple mode of inheritance (Table 1). There are two forms (alleles) of the gene – polled (P) and horned (p). An animal will always have two copies of every gene, one inherited from each parent. In this case, the polled gene is dominant over the horned gene. Polled cattle can have either two copies of the polled gene (PP), or one copy of each (Pp), where P overrides p to result in a polled animal (Northern Territory Government 2009). Horned cattle can only have two copies of the horned gene (pp). The polled gene is located at one of the ends of the Bovine chromosome 1 and there has been many works for this gene identification (Georges et al 1993; Harlizius et al 1997; Brockmann et al 2000; Drögemüller et al 2005).

Table 1

Bos taurus horn/poll gene combinations and horn/poll status of the animal (Northern Territory Government 2009)

Polled/horned status of parents	*True poll x true poll*	*True poll x poll*	*True poll x horned*	*Poll x poll*	*Poll x horned*	*Horned x horned*
Genes of parents	PP x PP	PP x Pp	PP x pp	Pp x Pp	Pp x pp	pp x pp
Possible genes of progeny and expected ratio	100% PP	75% PP 25% Pp	100% Pp	25% PP 50%Pp 25%pp	50% Pp 50% pp	100% pp
Expected proportion of horned and polled progeny	All true polled	All polled	All polled	74% polled 25% horned	50% polled 50% horned	All horned

In the present paper were analyzed 25 lactations of horned Romanian Brown Cattle and 39 lactations of polled cattle. All cattle are subject of extensive breeding systems in Maramures County, being in property of different small farms. All the date used in this paper is subject of Official Production Control procedure results that are available in Romania. The graphical and statistical comparison was elaborated taking into

consideration the first three lactations, for the last period of comparison being used data from lactation 4 to 7.

The selected animals are the results of some collective efforts to create a breed of polled type of Romanian Brown cattle (Serban et al 1980). The breeding of polled Romanian Brown Cattle was initiated in the 70's in some selection farms and later adopted in small extensive farms due to contribution of local farms. Today more than 100 cattle are in kept in these small farms motivated mainly by the polled cattle behavior.

For the graphical interpretation and statistical test procedure of data comparison was used Statgraphics Centurion XVI and Minitab 15 software.

Results and Discussion. In literature some papers compared production traits of horned and polled beef bulls for traits associated with female reproduction and growth and found small or little significance (Goonewardene et al 1999a). At the same time behaviorally, the responses to handling and restraint seems to be similar in dehorned and polled cattle of beef and dairy types due to the fact that behavior is ameliorated by dehorning and that breeding for polledness is a welfare friendly alternative to dehorning (Goonewardene et al 1999b).

Our research investigation showed some small differences in what is considering the first (H1) and second (H2) lactation of horned cattle which are having a higher duration of total lactation. On the other side the lactation 4 to 7 of poled cattle (P 4-7) is higher comparing to similar period of horned animals (H 4-7).

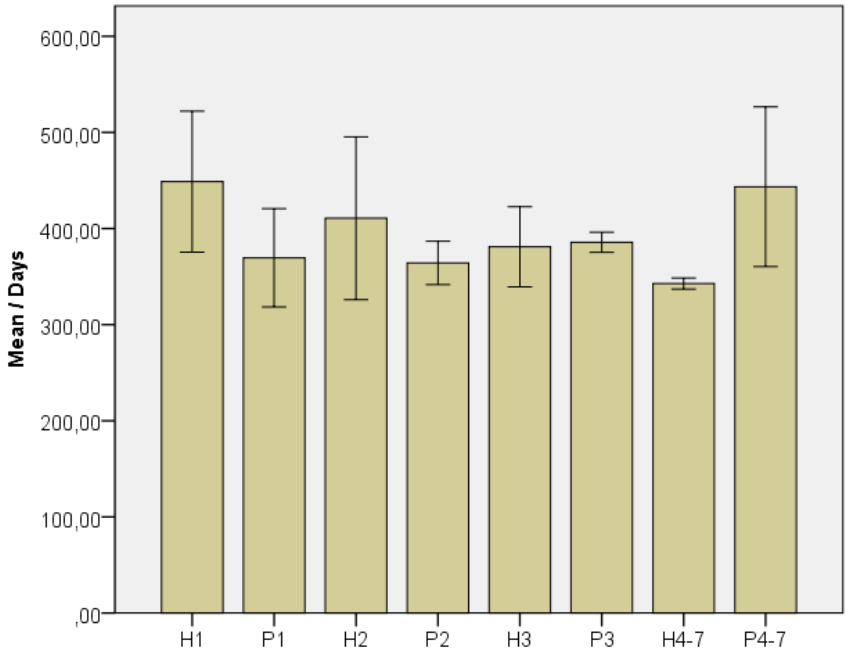

Figure 1. Total lactation duration mean and standard error.

The milk quantity per total lactation was higher in the case of polled cattle for second (P2) and 4 to 7 lactation (P4-7). None or insignificant changes on first and third lactation demonstrate that perhaps from a genetically and environmentally point of view there are no major differences.

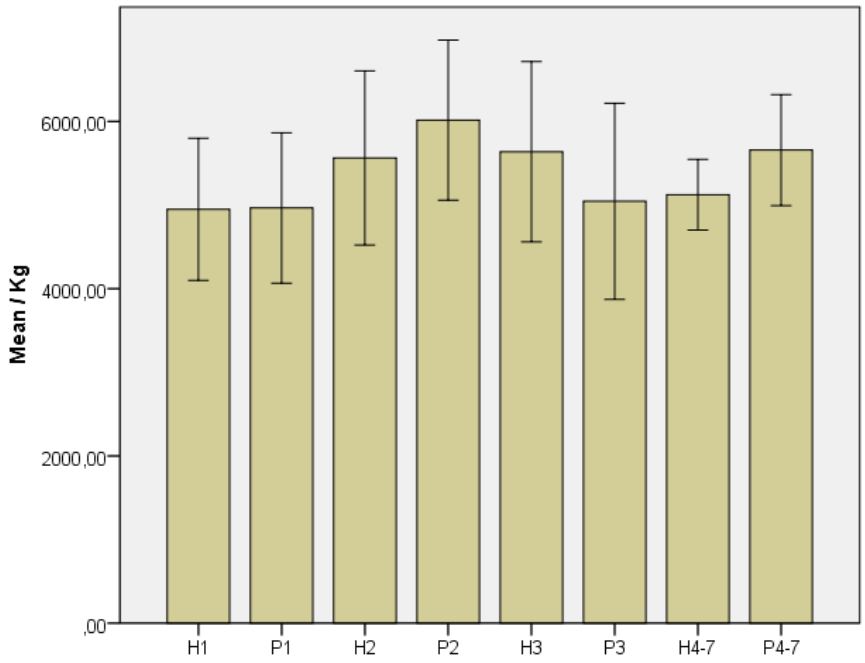

Figure 2. Total milk production mean and standard error.

For a better interpretation of the results we used the interval plot to illustrate both a measure of central tendency and variability of the data by the spread of error bars. The error bar plot plots of the means of each trait reflects the variety thru the lines extending one standard error above and below the means.

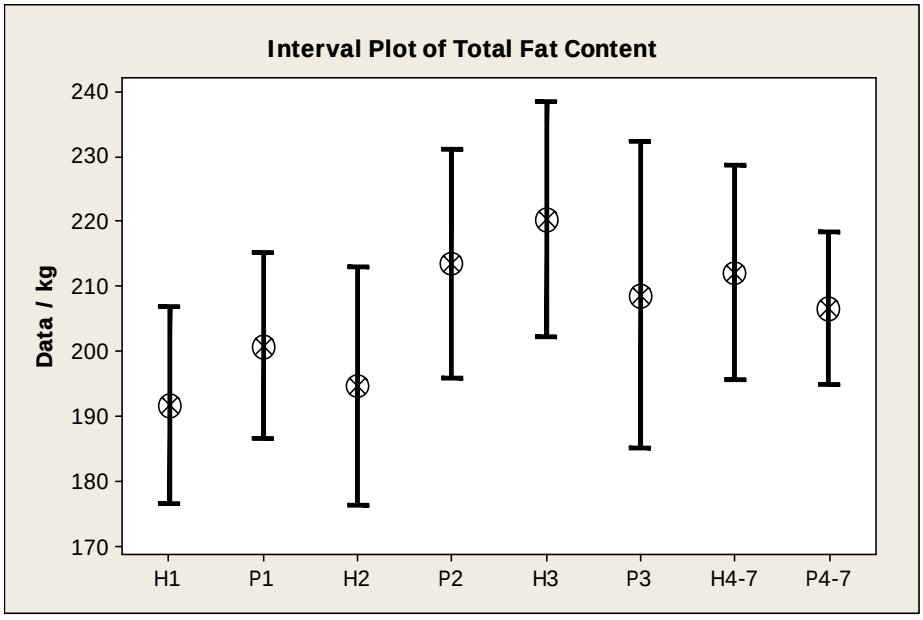

Figure 3. Interval plot of the total fat content in horned and polled cattle.

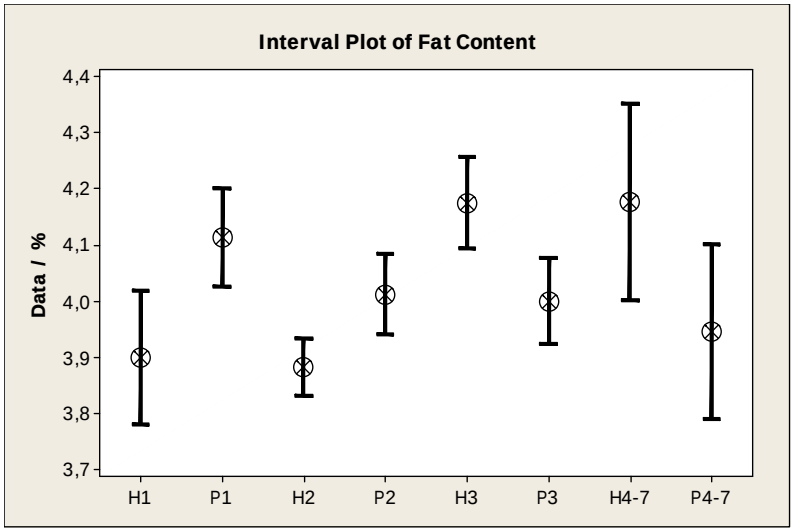

Figure 4. Interval plot of the fat content in horned and polled cattle.

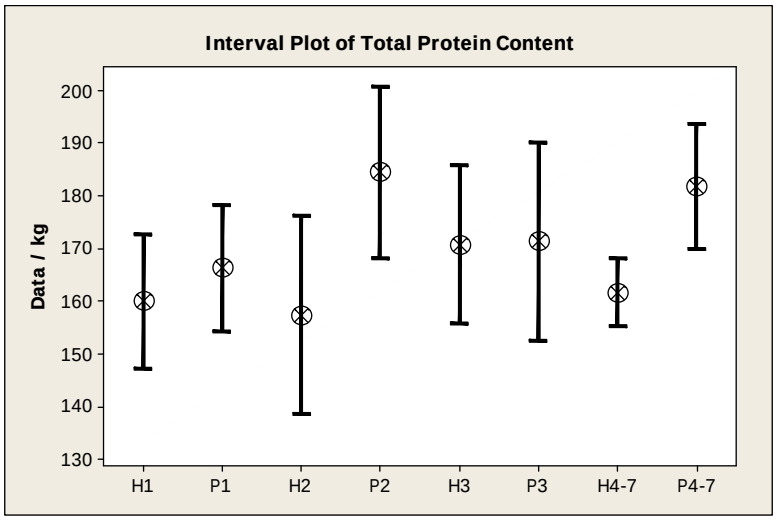

Figure 5. Interval plot of total protein content in horned and polled cattle.

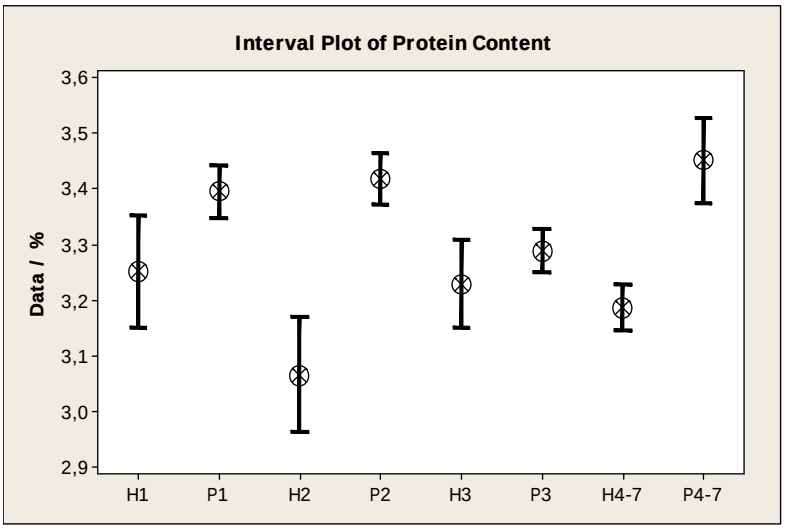

Figure 6. Interval plot of protein content in horned and polled cattle.

The total fat content is highest in the third lactation for horned cattle (H3) and second lactation for polled (P2) (Figure 3). At the same time the variability between varieties appears to be large relative to the variability within varieties, as there is some distance between some of the error bars for the different varieties. The interval plot for the rest of the traits showed some differences between lactations. For example for polled cattle the second lactation is representative beside quantity for fat content (P2 – Figure 4), total protein (P2 – Figure 5) and protein content (P2 – Figure 6). On the other hand horned cattle show a more obvious trait positive differentiation on third lactation for total fat (H3 – Figure 3) and fat content (H3 – Figure 4) or later for milk quantity (C4-7 Figure 2), total protein (C4-7 – Figure 5) and protein content (C4-7 – Figure 6). To better understand if there are any statistically differences between the horned and polled cows under investigation a t-test was used to test a specific hypothesis about the difference between the means of the populations from which the samples come. The test was designed to take into account a comparison of horned cattle against polled on every lactation. In this case, the test has been constructed to determine whether the difference between the two means equals 0.0 versus the alternative hypothesis that the difference does not equal 0.0. Since the computed P-values were higher than 0.05, we cannot reject the null hypothesis the differences being insignificant for all traits taking into consideration (Table 2). These results assuming that the variances of the samples are equal.

Table 2

Statistical t-test to compare means of traits of horned and polled cattle

Lactation	*Lactation 1*		*Lactation 2*		*Lactation 3*		*Lactation 4-7*	
Trait	*TL*	*NL*	*TL*	*NL*	*TL*	*NL*	*TL*	*NL*
Lactation duration (days)	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
Milk quantity (kg)	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
Total fat (kg)	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
Fat (%)	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
Total protein (kg)	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
Protein (%)	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.

n.s. – insignificant, TL – Total lactation, NL – Normal lactation of 305 days.

Our study shows clearly that there are no differences between polled and horned Romanian Brown Cattle for analyzed traits.

Conclusions. Breeding polled cattle have a number of advantages like:
- reduced costs with labor associated with dehorning;
- no infection of wounds;
- reduced growth rates while wounds are healing;
- positive perception of the beef industry;
- positive consumer perception;
- reduced stress for animals.

Our study shows clearly that there are no significant differences for analyzed traits between polled and genetically horned cattle kept in extensive breeding systems. At the same time polledness combined with good productivity could be a desirable combination in dairy cattle. As future objectives for Romanian Brown Cattle is to develop a breeding

programme taking into consideration the genetic merit of the male and female due to genomic selection, identification of PP dominant animals for polled gene and the selection of the desired individuals for reproduction.

Widespread introduction of polled genetics will require active involvement and cooperation of producers, artificial insemination suppliers, researchers, and breed associations (Collie 2006; American Veterinary Medical Association 2012). The use of polled cattle seems to be an alternative for researches, farmers but also for consumers who are ready to accept this as a natural phenomenon (Windig et al 2009).

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