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# STUDY OF MORPHOLOGICAL AND MILK PRODUCTION TRAITS OF A ROMANIAN BLACK AND WHITE COW POPULATION FROM THE SOUTH-WESTERN ROMANIA

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**Key words:** morphological traits, milk production, parity, Romanian Black and White, cows

**Abstract.** The aim of the paper was to investigate the influence of the parity on the milk production and morphological traits in the Romanian Black and White cow population. Cows were divided into three groups: first, second, and third and over lactations. Morphological traits were measured in 66 cows out of which 15 primiparous cows, 22 cows at the second lactation and 29 cows at the third or higher lactation. The body measurements were: height at withers, height at back, height at rump, oblique trunk length, chest depth, trunk depth, chest width, hips width, pins width, rump length, body length, heart girth and shinbone circumference. Body weight was determined with a special tape. Four body indices were calculated: lateral body format index, height difference index, chest depth index, and rump shape index. For the milk production, a total number of 925 normal lactations were processed, out of which 323 first lactations, 354 second lactations, and 248 third and over lactations. Differences among the three age groups were tested using analysis of variance. Body sizes of the Romanian Black and White cows were significantly influenced by the parity ($p<0.05$), increasing as animals grew older. Generally, the highest growth of body regions was observed between the second and third lactations. Body indices were not significantly influenced by the age of cows ($p>0.05$), except for the rump shape index that was higher in older cows ($p<0.05$), meaning that the rump width at hips was 5.69% higher than rump length. Milk production per normal lactation was 4056.3 kg milk with 3.873% butterfat and 3.055% protein. This production was 5-6% significantly lower ($p<0.05$) than milk produced by older cows.

## INTRODUCTION

Knowledge of the factors that influence the milk production represents a primary condition to produce larger yields with superior biologic value and hygiene (Cziszter, 2003). Age is one of the major influence factors affecting the milk production (Acatincăi, 2004). Economically, the most valuable cows are those reaching the maximum production at a young age, maintaining the high production as long as possible and producing in the first lactation milk yield as closer as to the maximum yield (Stanciu, 1999).

Morphologically, the Holstein Friesian cows have a high precocity. The somatic maturity is reached at four years of age, and heifers are first inseminated at 16-17 months of age (Stanciu et al., 2005).

The aim of the paper was to investigate the influence of the parity on the milk production and morphological traits in the Romanian Black and White cow population raised in the farms belonging to the Didactical Station Timişoara.

## MATERIAL AND METHODS

Researches were carried out on the active cow population belonging to Romanian Black and White from the Didactical Station Timișoara, in year 2007.

The morphological traits were measured on 66 cows out of which 15 primiparous cows, 22 cows at the second lactation and 29 cows at the third or higher lactation. The following measurements were measured: height at withers, height at back, height at rump, oblique trunk length, chest depth, trunk depth, chest width, hips width, pins width, rump length, body length, heart girth and shinbone circumference. Body weight was determined with a special tape. Based on these measurements four body indices were calculated, as follows: lateral body format index (oblique trunk length x 100 / height at withers), height difference index (height at rump x 100 / height at withers), chest depth index (chest depth x 100 / height at withers), and rump shape index (hips width x 100 / rump length).

The milk production traits were collected from the official milk recording system. A total number of 925 normal lactations were processed, out of which 323 first lactations, 354 second lactations, and 248 third and over lactations. The milk production traits were: milk yield, butterfat percentage, butterfat yield, protein percentage and protein yield.

Averages and dispersion indices were calculated for all the traits for first, second and third+ lactations. Differences among the three age groups were tested using analysis of variance.

## RESULTS AND DISCUSSIONS

Table 1 presents the average values for body dimensions of the cows. Generally, all the body dimensions increased with age of the cows ($p<0.05$). Exceptions to this rule are the oblique trunk length (166.6 cm in first calving cows and 168.97 cm in third calving cows) and the shinbone circumference (19.1 cm in primiparous cows and 19.46 in adult cows), which remained unchanged, as animals grew older.

Table 1

Body dimensions (average±SEM) of the Romanian Black and White cow population

| Trait | Lactation | | |
|---|---|---|---|
| | 1 (n=15) | 2 (n=22) | 3 and over (n=29) |
| Height at withers (cm) | 133.80±0.527$^{a}$ | 135.47±0.900$^{b}$ | 137.60±0.754$^{ab}$ |
| Height at back (cm) | 136.27±0.995$^{a}$ | 136.57±0.991$^{b}$ | 139.38±0.813$^{ab}$ |
| Height at rump (cm) | 136.63±0.895$^{a}$ | 137.16±0.918$^{b}$ | 139.57±0.857$^{ab}$ |
| Oblique trunk length (cm) | 166.60±1.687$^{a}$ | 167.25±1.989$^{b}$ | 168.97±2.042$^{c}$ |
| Body length (cm) | 146.27±1.761$^{a}$ | 147.47±2.184$^{b}$ | 153.02±1.408$^{ab}$ |
| Chest depth (cm) | 74.40±0.747$^{a}$ | 75.38±0.655$^{b}$ | 76.79±0.602$^{a}$ |
| Trunk depth (cm) | 78.70±0.733$^{a}$ | 79.89±0.630$^{b}$ | 80.52±0.635$^{a}$ |
| Chest width (cm) | 40.60±0.498$^{ab}$ | 42.61±0.566$^{a}$ | 42.76±0.677$^{b}$ |
| Hips width (cm) | 51.73±1.178$^{a}$ | 52.43±0.736$^{b}$ | 56.64±0.699$^{ab}$ |
| Pins width (cm) | 32.33±1.352$^{ab}$ | 36.00±0.767$^{a}$ | 37.36±0.907$^{b}$ |
| Rump length (cm) | 51.57±0.730$^{a}$ | 52.91±0.645$^{b}$ | 53.67±0.440$^{a}$ |
| Heart girth (cm) | 193.87±2.797$^{a}$ | 197.73±1.927$^{b}$ | 203.00±1.481$^{ab}$ |
| Shinbone circumference (cm) | 19.10±0.332$^{a}$ | 19.11±0.296$^{b}$ | 19.46±0.182$^{c}$ |
| Body weight (kg) | 597.07±25.448$^{a}$ | 605.45±17.421$^{b}$ | 681.86±14.321$^{ab}$ |

Values on the row with the same letters superscript differ significantly ($p<0.05$)

There were no significant differences for body dimensions between the first and second calving cows ($p>0.05$), except for chest width that was 2.01 cm ($p<0.05$) and pins rump width that was 3.67 cm ($p<0.05$) higher in the second than in the first lactation cows.

Irrespective of the animals' age, the height at back and rump was higher than the height at withers, which described an animal with the upper line slightly ascending from front to rear (Figure 1). In adult cows the height was 137.6 cm at withers, 139.38 cm at back and 139.57 at rump.

The largest growth of the height from the first to the third lactation was observed in height at withers that significantly increased ($p<0.05$) with 3.8 cm, from 133.8 cm to 137.6 cm.

Body length, measured with the tape from the highest point of the withers to the pins, was 6.75 cm ($p<0.01$) and 5.55 cm higher ($p<0.05$) in adult cows (153.02 cm) compared to the first and second parity cows, respectively.

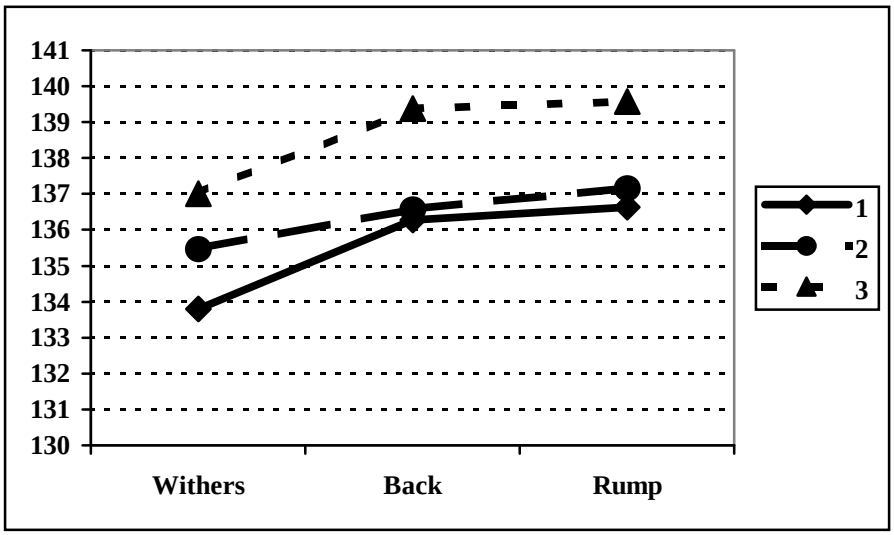


Fig. 1 The three heights of the body according to the age
in the Romanian Black and White cows

Both chest and trunk depths were significantly higher in adult cows compared to primiparous cows. Thus, chest depth was 2.39 cm higher ($p<0.05$) and trunk depth was 1.82 cm higher ($p<0.05$) in adult cows compared to primiparous cows.

Body chest significantly increased ($p<0.05$) from 40.6 cm in primiparous cows to 42.61 cm in the second parity and to 42.76 cm in third and over parities.

Rump was 16-19 cm wider at hips compared to pins (Table 1 and Figure 2). Rump width at hips was similar ($p>0.05$) in first and second parities and significantly different ($p<0.001$) between the other age groups. Rump width at pins was similar ($p>0.05$) between the second and third parities, while was significantly different ($p<0.05$) between the other age groups. This is leading to the conclusion that the pins width is reaching the maturity earlier than hips width that is growing mostly after the second parity.

Heart girth was 203 cm in adult cows, being 9.13 cm significantly higher ($p<0.01$) than in first parity and 5.27 cm significantly higher ($p<0.01$) than in second parity.

Body weight was similar in the first and second calving cows (597.07 kg and 605.45 kg, respectively, $p>0.05$), while third and over parities were significantly heavier ($p<0.01$) by 84.79 kg and 76.41 kg, respectively.

Body indices of the Romanian Black and White cows are presented in Table 2. Age of cows did not have a significant influence ($p>0.05$) on the body indices in cows.

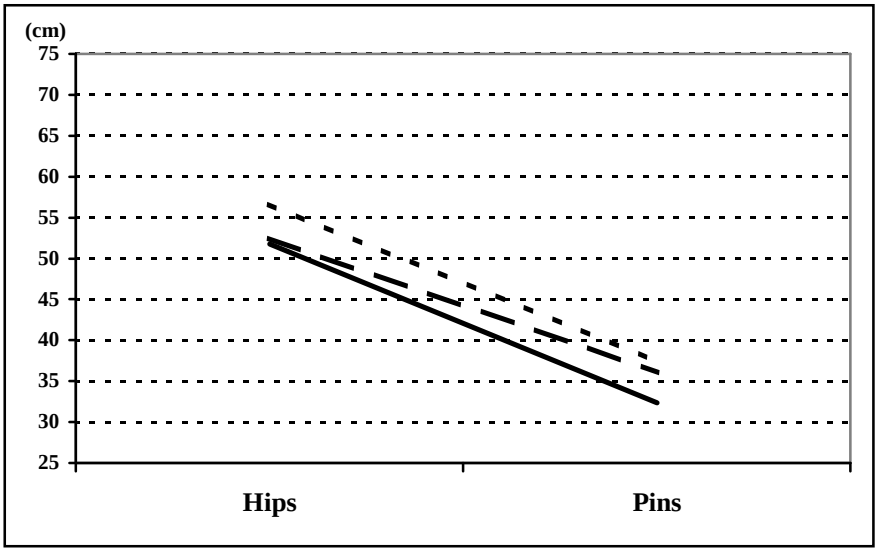


Fig. 2 Hips and pins rump width according to the age
in the Romanian Black and White cows

A lateral body format index ranging from 122% and 124% described a dual-purpose cow population with high specialization in milk production. This index decreased slowly with age, showing a transformation of the type towards a specific milk type as cows became adult.

The height difference index demonstrates that the upper line of the trunk is ascendant from fore to rear end of the body. However, the value of this index is decreasing with age because of the significant growth of the height at withers from lactation to lactation.

Table 2

Body indices (average±SEM) in the Romanian Black and White cow population

| Index | Lactation | | |
|---|---|---|---|
| | 1 (n=15) | 2 (n=22) | 3 and over (n=29) |
| Lateral body format index (%) | $124.57\pm1.327^{a}$ | $123.45\pm1.216^{b}$ | $122.72\pm1.064^{c}$ |
| Height difference index (%) | $102.14\pm0.551^{a}$ | $101.26\pm0.438^{b}$ | $101.11\pm0.374^{c}$ |
| Chest depth index (%) | $55.62\pm0.549^{a}$ | $55.65\pm0.388^{b}$ | $55.82\pm0.363^{c}$ |
| Rump shape index (%) | $100.23\pm1.349^{a}$ | $99.24\pm1.377^{b}$ | $105.69\pm1.507^{ab}$ |

Values on the row with the same letters superscript differ significantly ($p<0.05$)

Chest depth index was similar in all the three age groups. The value of this index was over 55%, showing a very good chest depth in the analyzed cow population.

The rump shape index describes the shape of the rump seen from above. The ideal value of this index is 100%, meaning that the length and width of the rump are equal. This was the case of the first and second calving cows, the index being 100.23% and 99.24%, respectively. In the adult cows this index was 5.46% and 6.45% significantly higher ($p<0.05$) than in the first and second calving cows, respectively. Functionally, this is very good only if the rump is wide both at hips and pins.

Milk production traits are presented in Table 3. Milk production significantly increased from the first to second lactation by 5.5% for milk yield ($p<0.01$), 6.5% for butterfat yield

($p<0.01$) and 8.5% for protein yield ($p<0.001$). From the second lactation milk production remained unchanged ($p>0.05$).

In the first lactation, the milk yield was 4056.3 kg representing 94.5% from the second lactation and 92% from the maximum milk yield.

Table 3

Milk production traits (average±SEM) in the Romanian Black and White cow population

| Trait | Lactation | | |
|---|---|---|---|
| | 1 (n=323) | 2 (n=354) | 3 and over (n=248) |
| Milk yield (kg) | 4056.3±67.169$^{ab}$ | 4280.0±61.007$^{a}$ | 4408.4±67.979$^{b}$ |
| Butterfat percentage (%) | 3.873±0.0113$^{a}$ | 3.899±0.0110$^{b}$ | 3.909±0.0132$^{a}$ |
| Butterfat yield (kg) | 156.20±2.452$^{ab}$ | 166.37±2.324$^{a}$ | 171.83±2.595$^{b}$ |
| Protein percentage (%) | 3.055±0.0133$^{a}$ | 3.108±0.0116$^{a}$ | 3.089±0.0152$^{b}$ |
| Protein yield (kg) | 122.23±1.781$^{ab}$ | 132.64±1.894$^{a}$ | 135.46±2.011$^{b}$ |

Values on the row with the same letters superscript differ significantly ($p<0.05$)

In the first lactation, the butterfat percentage was significantly lower (3.873%, $p<0.05$) than that observed in the third lactation (3.909%), and the protein percentage was significantly lower (3.055, $p<0.01$) than that observed in the second lactation (3.108%).

## CONCLUSIONS

Body dimensions of the Romanian Black and White cows were significantly influenced by the parity ($p<0.05$) increasing, as animals grew older. Generally, the highest growth of body regions was observed between the second and third lactations.

Body indices were not significantly influenced by the age of cows ($p>0.05$), except for the rump shape index that was higher in older cows ($p<0.05$), meaning that the rump width at hips was 5.69% higher than rump length.

Milk production per normal lactation was 4056.3 kg milk with 3.873% butterfat and 3.055% protein. This production was 5-6% significantly lower ($p<0.05$) than milk produced by older cows.

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