Study on some milk production indices of Romanian buffalo

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Abstract. This study evaluated the milk production performances of the Romanian dairy breed of buffaloes from three important areas of Sălaj county from north-western Romania. This county has one of the valuable buffalo herds from Romania. Comparative analysis in the direction of the main characteristics of buffalo milk production were conducted on a herd of 65 buffaloes exploited in extensive traditional conditions. In terms of milk production total lactation it ranks highest value in lactation VIII i.e. 1679.92 kg in area I, 1675.79 kg in lactation VI in area II, respectivelly 1442.53 kg in lactation VI in area III. Differences are less than 1% from normal lactation, with small variations from one lactation to another. These small differences between buffaloes and lactations emphasizes the use of buffaloes for other destinations (traction). The calving interval in buffaloes in this study presents the highest values i.e. 485.26 days in lactation VI, area I.
Key Words: buffaloes, milk, calving interval.

Introduction. Romanian buffalo has breeded in the current Romanian area of approximately 1,500 years. The origins of Romanian buffalo are indian wild buffalo *Bubalus arni*, respectively the domestic buffalo *Bubalus microceros*. Genetically and ecological Romanian buffalo belongs to river type buffalo, respectively Mediterranean buffalo (Velea et al 1983).

In 1987 has been officially recognized Romanian buffalo breed (homologated by professor Velea Constantin). The main directions in exploitation were milk and meat. The continuous process of high dairy animal selection and continuous increasing of buffalo livestock until around 228 000 heads in 1980 (OCP 2004) represented a very important phase of species evolution in Romania. In present, the livestock is about 20,000 heads, which represents only 9.1% from the highest value registered 30 years ago (ANARZ 2009).

Continuous improvement process of dairy production in buffaloes led to obtaining high performances in different areas. Salaj County from the north-western Romania has always been considered an area with high value livestock in dairy buffalo production. Buffalo milk production has an average of about 1400 kg, 8 to 9 months duration and a relatively homogenous breed. The variations in milk yield are given by breeding general conditions and genetic approach of the herds. Studying the buffalo milk traits in this area is required for Romanian buffalo conservation. The actualization of information based on scientific approach in dairy production in Romanian buffalo herds could provide a better understand of selection process of the animals. From Salaj County were sold very valuable dairy buffaloes in other countries as Great Britain and Italy. The breeders are more and more encouraged to increase their livestock. For that, the evaluation of dairy production in buffaloes is required.

Buffalo milk has a high content of fat: 7.2-9.9% with an average of 7.5%, total proteins: 3.8-4.5%, lactose: 4.1% and mineral salts: 0.7% (Moldoveanu et al 1973 cited by Bud 1984; Bud 1984).

Some Romanian buffalo herds have a variable percent of genetic amount from Murrah breed of buffaloes. Dairy production of this herds is higher comparing to the average production of Romanian buffalo (Velea & Margineanu 2006).

In the world, buffaloes have been contributing to about 12% of the world milk production and India is producing 60% of the world's buffalo milk. India ranks first in terms of milk production in the world with a production of 100 million tonnes and buffalo milk contributes to more than 50% of the total milk produced in India (GOI 2006). About 57% of world buffalo population is in India and a growth rate of 1.26 % per year is seen in this decade in India (Prasad et al 2010).

Total duration of the lactation is a parameter which can provide useful information in dairy improvement process. In Romanian buffaloes the average duration of lactation has about 280 days (Velea & Margineanu 2006).

It is important to highlight the significance of the effect of calving year (CY) and calving season (CS) and their interraction. CS had a significant effect on calving interval (CI), with lowest values in rainy season, as also reported by (Mourad et al 1989) and (Bello 2003). CI is considered to be a good one when fits between 12 and 13 months (Shah et al 1991).

Udder and teat characteristics/measurements could be used as a reliable criteria in selection of buffaloes for milk production at the field level as was also opined by Lin et al (1987), Winter (1987) and Gajbhiye et al (2007) for cows that udder measurements could be reliable criteria while selecting cows for milk production. Regarding the reproductive traits, which are directly linked with dairy production, species comparisons showed that through all years and in all areas a significantly larger number of cows were inseminated in spring and summer relative to autumn and winter.

Material and Method. The study was conducted to characterize the main features of milk production in buffalo population bred in private farms from Salaj County, stating that investigations were conducted on three different growth areas: area I - Surduc and Brâglez - 23 heads; area II - Buciumi and Zalha - 20 heads, respectively area III - Cuzăplac and Almaș - 22 heads.

In order to characterize the direction of the main characteristics of buffalo milk production in the study were submitted a total of 65 buffaloes in eight lactations. Aims pursued following traits: milk quantity (kg) on total duration of lactation and normal lactation interval (in days), the percentage of fat in milk, calving interval (CI) dynamics and resting breast (RB) interval.

The biological material included in this study has registered in Official Control of Production (OCP). In terms of working methodology used to determine the direction of milk production skills, specific methods were used for official control of the milk production.

In all cases, obtained results were statistically processed and interpreted. In order to establish differences and their significance we used the Prism program.

Results and Discussion. Among the main indicators of milk production which have a major influence in quantitative production of milk is overall duration of lactation, showing lowest values in following lactations: 278.15 days in lactation III - area I, 287.38 days in lactation I - area II and 251.48 days in lactation II - area III (Figure 1). The range of variation in days of total lactation length is between 251.48 days in lactation II area III and a maximum of 352.34 days in lactation VI area II.

Lactation length is an important trait influencing the lactation milk yield in buffaloes. The overall lactation length in Murrah buffaloes ranged from 245 days to 355.39 days (Singh & Barwal 2010). However, in Nili Ravi and Surti buffaloes average lactation length ranged from 300 days to 356 days. In Bhadawari, Marathwada and Nagpuri buffaloes, the over all lactation length was 376, 310 and 200 days respectively (WBC).
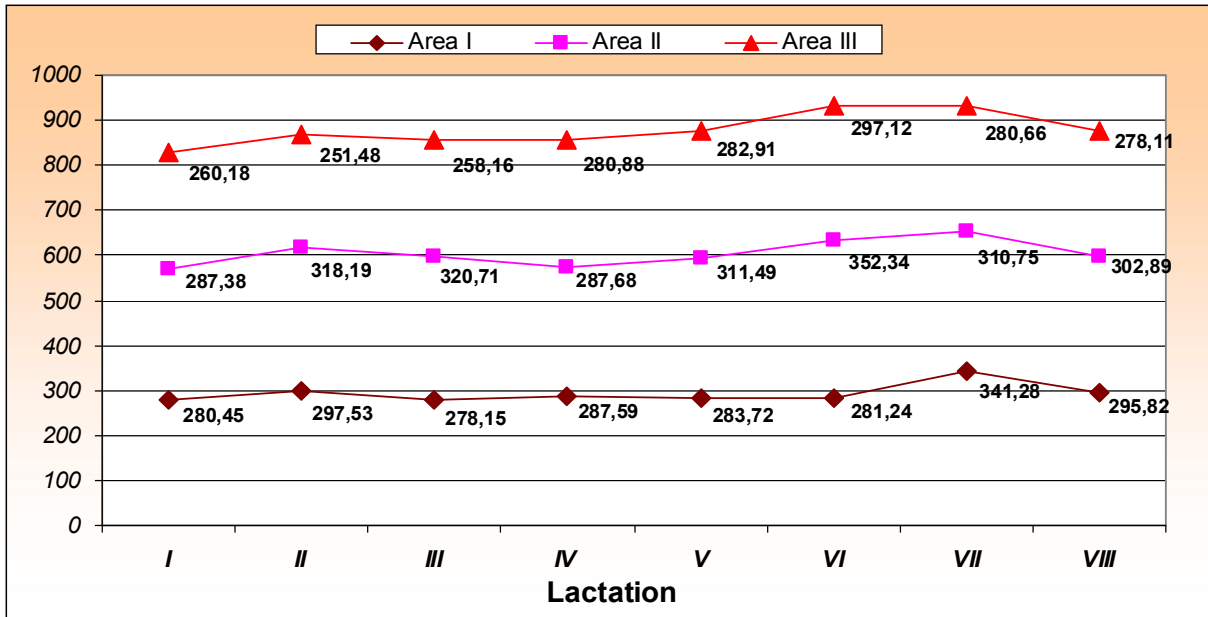
Figure 1. Total lactation length (in days).

The quantity of milk production on total lactation varied depending on the lactation of reference, namely: if the first area has the lowest value of 1210.72 kg in lactation I and the highest of 1679.92 kg in lactation VIII in area II, lowest value for lactation I is a quantity of 1450.35 kg in highest lactation VI to 1675.79 kg (Figure 2). The buffaloes from area III had the lowest value in milk quantity in total lactation V i.e. 1285.56 kg and the highest of 1442.53 kg in lactation VI.
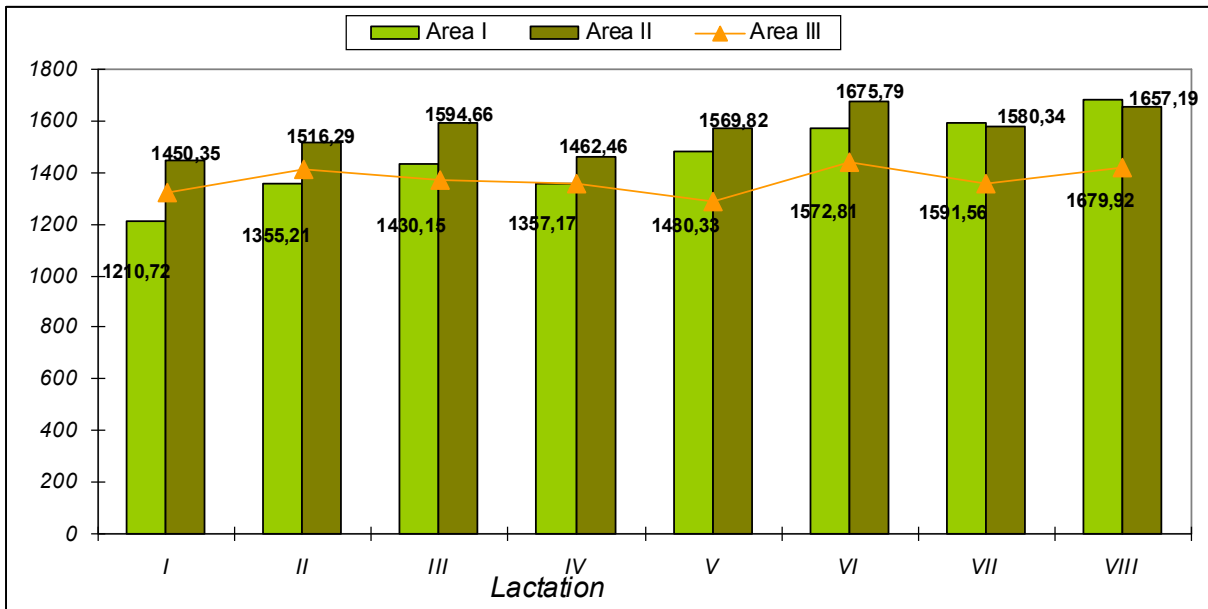

Figure 2. Milk quantity in total lactation (kg).

Milk quantity in normal lactation varied in thin limits. The general aspect is given by an ascendant curve from lactation I to VIII to all areas (Figure 3). The highest milk quantity has observed in area II lactation VIII of 1546.31 kg, which can be considered a very good one.
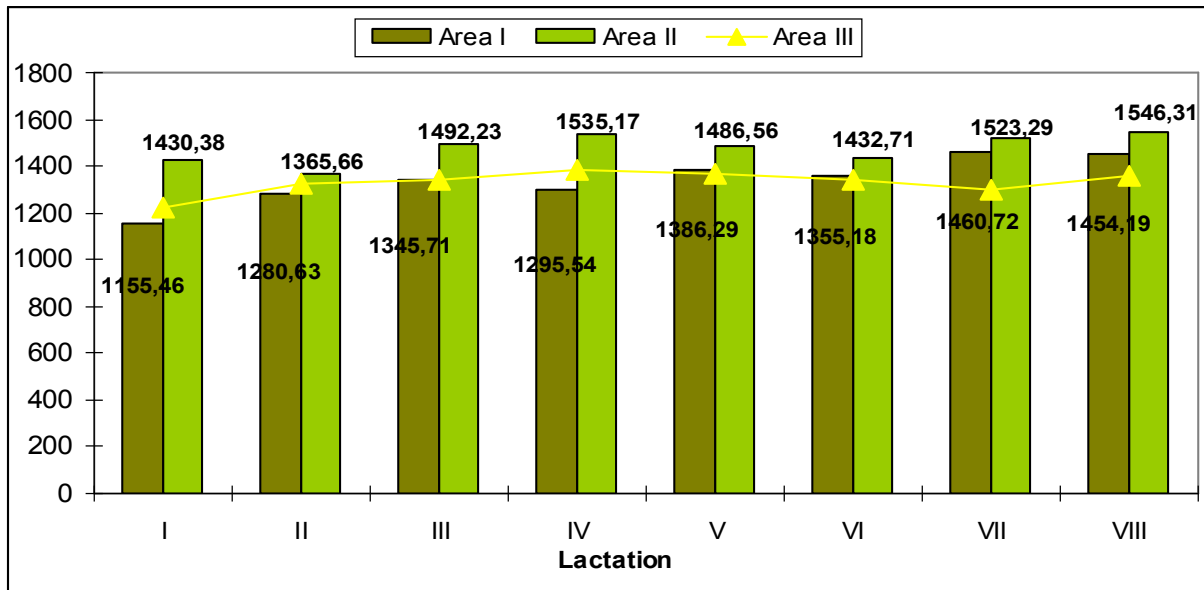
Figure 3. Milk quantity on normal lactation (kg).

Dynamics of normal lactation length is shown in Figure 4. Normal lactation has an increasing aspect with age. Buffaloes growing in age determine a longer period of lactation, although Cady et al (1983) reported that lactation length decreased with increase in parity in Nili Ravi buffaloes. Azfal et al (2007) presumed that lactation length did not differ among buffaloes of different parities in Nili Ravi buffaloes.
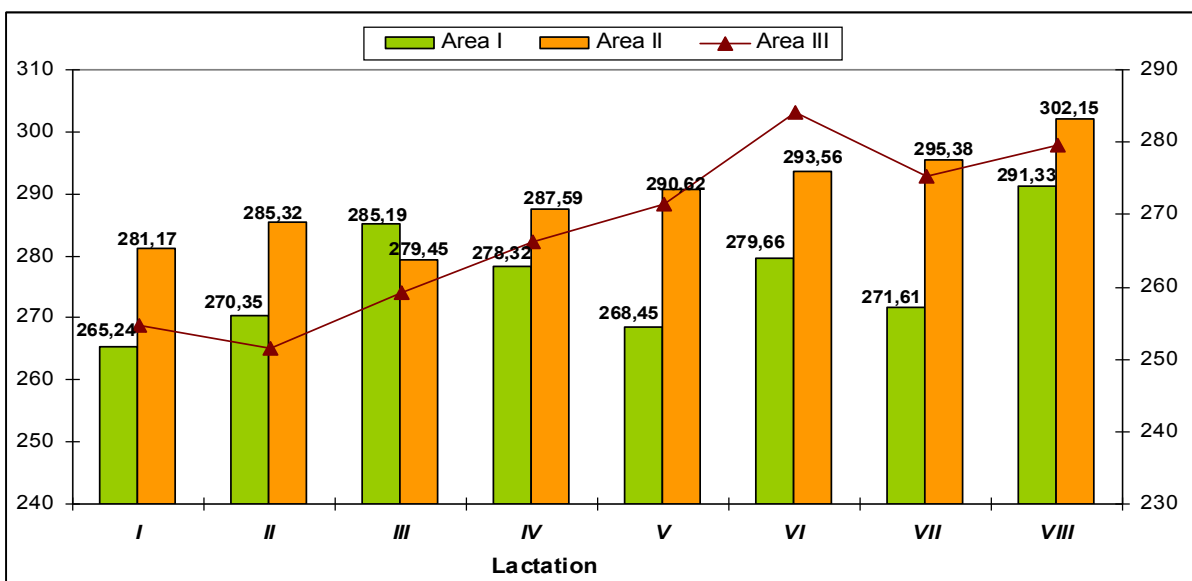

Figure 4. Normal lactation length (days).

Regularity in conception and a short calving interval are the most important factors in order to achieve a high life-time milk production (Högberg 2003). The calving season, weight loss after calving, nutritional status and management affects the reproductive performance. A number of measurements can be taken to control the length of calving interval. Improvement, especially adequate *oestrus* detection is a prerequisite which has to be done in summer and spring seasons. Delayed cyclic activity can be restored by hormonal treatment. In winter the intensity of *oestrus* detection should be increased. Nutrition should be optimal in the *post partum* period.

Calving intervals and milk production records of 1000 Nili Ravi buffaloes from the Okara Group of Government Farms were obtained. These farms are adjacent to each other under one management with total herd size of about 5000 milking buffaloes. The length of calving interval with the highest yearly income was defined as optimal. Losses due to the forced replacement were calculated by a model by Renkema & Stelwagen (1979) and Dijkhuizen et al (1985).

The first calving interval in Murrah and Nili Ravi buffaloes varies between 480-573 days (Singh & Barwal 2010). In Bhadawari buffaloes it was 525 days. Average calving interval (ACI) in Surti buffaloes was 462 days. Buffaloes continue to come in heat regularly in all months, highest being in October and lowest in April.

However, Singh & Barwal (2010) reported that around 75 percent of total calving took place during July to January (the most calving season) and 25 percent during February to June (the least calving season) suggesting that buffaloes are seasonal breeder. Buffaloes come in *oestrus* in cold month and are sub-fertile during hot month. Sub-fertility in the buffaloes it is also induced by poor nutrition.

In the same time it is appropriate to highlight that if the total duration of lactation is positive, the interval between births is high, exceeding the duration of 485.26 days for buffaloes in the area I - lactation VI, 482.19 days for buffaloes in area II - lactation V, respectively 479.28 days - area III in lactation VI (Figure 5).
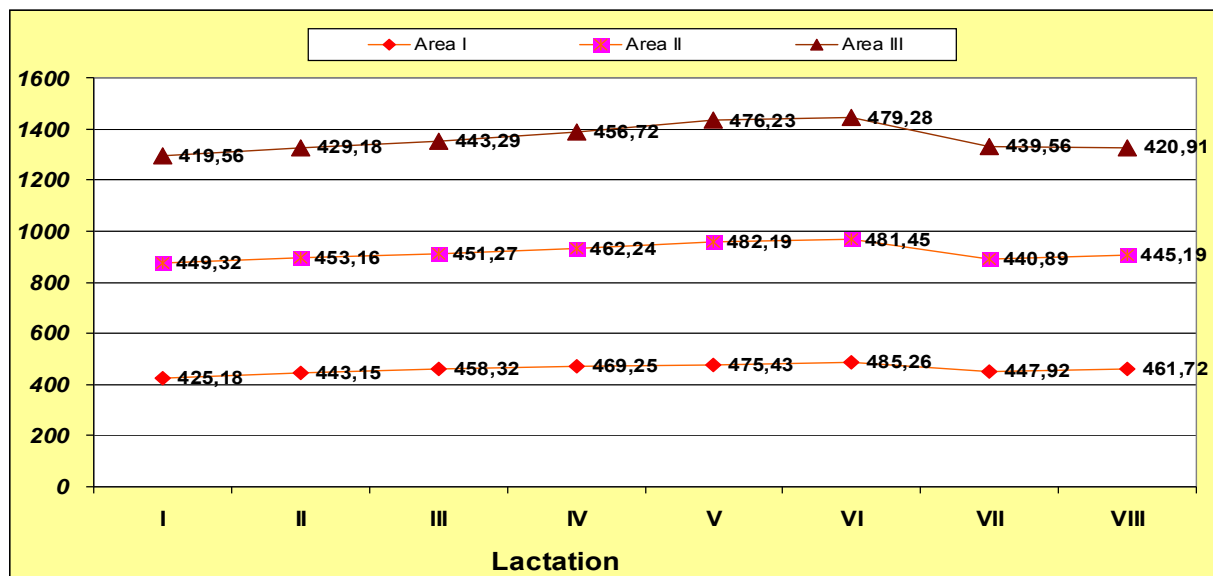

Figure 5. Calving interval to buffaloes according to the areas (days).

The optimal CI for dairy buffaloes is found to be 12-13 months. The persistency of the lactation curve has a strong influence on the losses due to longer calving intervals as compared to change in milk prices (Shah et al 1991).

In the autumn season, which is usually hot and humid, the occurrence of *estrus* in the buffalo starts to increase sharply while in cows it is decreasing (Shah et al 1989).

In general, our results are similar to those reported by other authors in similar conditions, indicating a strong seasonality in buffalo herds (Figure 5). Calving interval (CI) reflects reproductive or management problems, related with decisions in culling of unproductive animals.

The gestation period for buffaloes averages 308 to 318 days. The age of the heifer at her first calving is usually around 37-40 months (3 to 3.5 years). Calving interval is closely related to lactation length and milk yield. The longer the calving interval, the longer the lactation and the higher the lactation yield.

However, total life time yield will be substantially less comparing with a buffalo with short calving intervals (Högberg 2003). In buffaloes, the highest milk yield is seen in

the fourth lactation whereafter it declines. The shape of the lactation curve depends on factors such as feed, management, milking frequency, diseases among others. The optimum lactation length in the Murrah has been reported to be 262 to 295 days (Högberg 2003).

An interesting aspect is the milk fat content in the sense that its lowest point is observed to the herd of buffaloes from area III, 6.23% comparing to 6.52% in the area II and 6.83% in area I. The differences are due mainly to nutrition techniques, particularly structural changes in the ratio from one period to another. Graphical representation of the fat content according to lactation and the reference is shown in Figure 6. Fat content is quite low, the main causes are not of genetic origin, but mostly due to particular feeding technique and the fact that these buffaloes are used for traction purposes also.
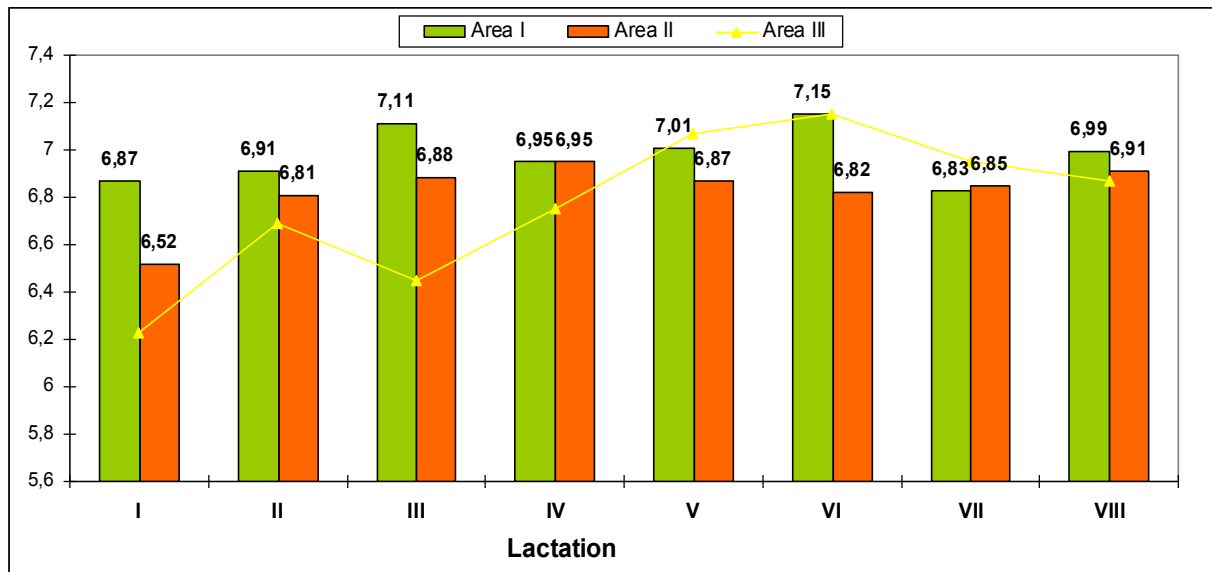

Figure 6. Buffalo milk fat content according to lactation and areas (%).

Resting breast (RB) is one of the most important indicator of dairy production. Shortening RB to a minimal value elongates the economical exploitation of dairy buffaloes. The shortest RB is present in area I and the highest in area III (Figure 7). On lactations, starting with second lactation RB is reduced to a minimal value which can be considered a good one (79.35 days in lactation II area I). In lactation VIII in area I the RB has a value of 60.15 days, statistically significant comparing with buffaloes from area II, respectively area III. In general has observed a shortening of RB after the second birth. Excepting area I, RB is above 100 days, considered too long even for traditional breeding system.

Conclusions. We believe that the total duration of lactation is normal and good. Alimentation is a major factor influencing the dairy production. Romanian buffalo alimentation in traditional breeding system has a lean energetic-protein ratio and low mineral intake during the whole year, which should be improved. There should be mentioned another factor which led to decreasing of milk production: traction usage of the buffaloes.

Although a large number of valuable buffaloes from Salaj County have been sold in countries like Great Britain, Italy and Germany, the livestock still have good milking productions. Milk quantity in total lactation (kg) has a lower value (1464.6 kg) than previous data reported (1500 kg in 1991 by Velea 2006). This fact suggests that the breeders have included this criteria of selection in their aims. Official Control of Productions in Romania has been made mainly for quantity of milk.

Calving interval has an average above 450 days (454.02 days), which is considered a normal one for Romanian buffalo. For optimal exploitation in dairy buffaloes it is recommended a shorter calving interval.
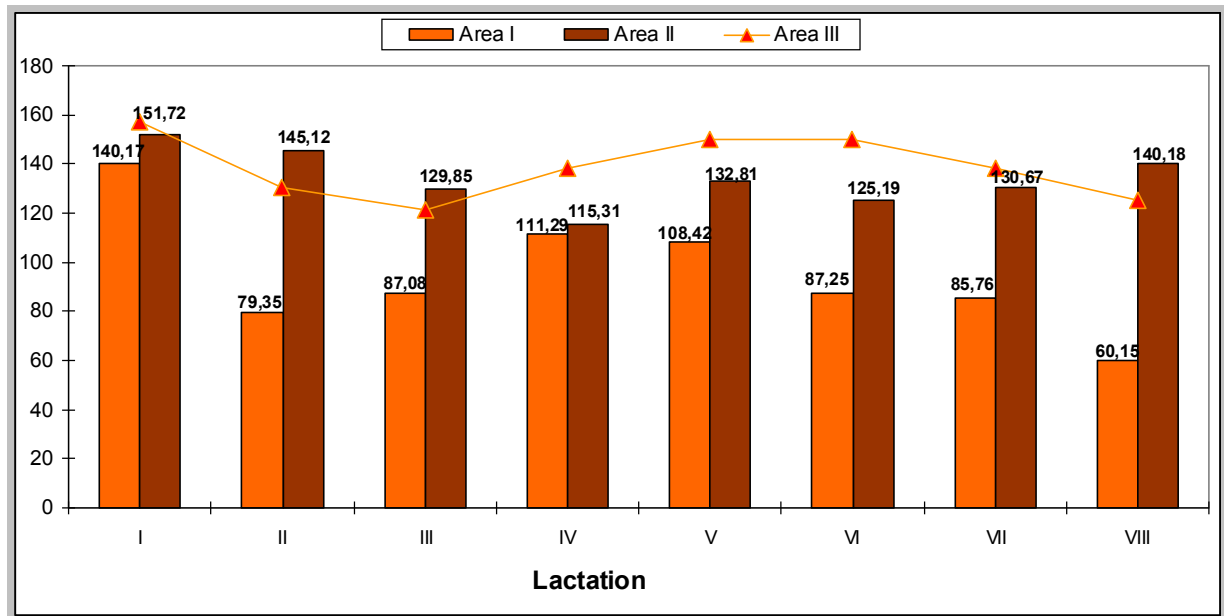

Figure 7. Resting breast according to lactation and areas (days).

Resting breast has an average value of 122.54 days. Buffaloes from area I seemed to be selected for reproductive traits. For the buffaloes from area II and III resting breast should be included in an improvement process of selection, in order to reduce it.

A less positive aspect is the milk fat content which has the lowest percentage of fat by 6.23% for buffaloes in lactation I from area III and that also has a rather large individual variability. Alimentation technologies and energetic intake of fodder could raise up fat content of buffalo milk.

Because lately herds of buffaloes were sharply certain programs that are necessary to encourage farmers to protect the buffalo species by providing grants and subsidies should be encouraged. Salaj County still has a strong genetic variety of Romanian buffalo. For maintaining this livestock there are required special measurements and strong associations of buffaloes. The official control of production in buffaloes is done in a very low percentage of about 1%. In this case, genetic conservation of the Romanian buffaloes is needed.

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