TRADITION AND MODERNITY IN VETERINARY MEDICINE

Online First

Published online: June 11, 2019

SEASON OF DELIVERY, AGE OF FIRST FERTILISATION AND MILKING YIELD DURING THE FIRST LACTATION PERIOD OF HEIFERS

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ABSTRACT

In recent years, in some regions of the Republic of Bulgaria production of cow's milk has been focused on the construction and establishing industrial cow breeding farms (complexes). In order to meet the need to ensure relevant increase of cows population for such large farms, it is important to provide young reproductive animals. The aim of this study is to evaluate correlation between the age of fertilisation versus the birth season (autumn, winter, spring, summer) and the quantity of cow's milk during the 305 lactation days. Many authors share the opinion about impact of the season of birth of female calves and the type nutrition as key factors influencing all these indicators. We have set us the task to find out, what is the role of these issues in a large, industrial, cow breeding complex of 6.270 large ruminants (bovines).

Within our surveys, the age of the first fertilization of the heifers included in reproduction campaign is really dependent on the season of their birth. The earlier is the fertilization of those born in summer-autumn, respective time gap being 24 days compared to those born in the autumn-winter part of the year.

The average milk yield of 616 primers (of first calf) for 305 lactation days is 8.164 kg. This milking rate is by 355 kg more than the one demonstrated by those born during the spring-summer season compared to those born in the autumn-winter season.

Key words: *fertilization, heifers, first lactation, milk yield*

INTRODUCTION

One of the important issues of breeding dairy cattle is the increase in the average annual yield of cow milk. The main factor that ensures the production of milk and meat is the organization of the reproduction process. These issues have been thoroughly studied over the last decades by Baichev (1987). It is undisputable fact that at the beginning of the reforms in agricultural sector, small farms (farms in the private back yard) prevailed. Over the past 20 years, many manufacturers have re-evaluated their position and are targeting industrial production of cows' milk. Modern technologies in dairy farms allow for higher labour productivity in the production of cow's milk and cubs intended for meat production, and, above all, of female calves for performing repairs of the herds Naglis (2019). Industrial cow's milk production is predominantly performed in high level developed concerning bovine-breeding. Van Raden (2004) shares for the increase in the milking rate by 5.997 kg in the United States between 1957 and 2007. To influence these processes in big farms the issues of reproduction come to the fore. To solve the issue of population increase, it is important to provide young reproduction animals. Within the breeding of young reproduction

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Published online: June 11, 2019

animals, it is important to achieve an earlier reproductive age, combined with the necessary growth and body weight (mass). Assessment of reproduction rates could be made by identifying the age of heifers fertilization and their milk yield during the period of the first lactation. The early fertilization of heifers is also preceded by the earlier onset of their puberty. The season, during which the female calf was born, is also very important, Ariend and Ravault (1988), Baichev (2007).

The temperatures of the environment and photoperiodic have their influence through the level of melatonin released round the clock. Schillo et al., (2002), Tortonese and Jnskeep (2002), Rius et al., (2005); Kanchev et al., (2010); Baichev (2008) detailed the circadian rhythm in heifers, presenting their results by years and seasons (autumn, winter, spring, summer). They also share that one of the important factors is melatonin. It should also be borne in mind that fertility of heifers may reach 85-90% and, according to Humblot (2010), Andersen-Ranberg et al., (2005), this fertility depends on the breed and the birth season. According to Kanchev et al., (1999; 2006), melatonin is an important factor in the occurrence of puberty, and this also affects the age of first fertilization when the heifer would be included in reproduction. In addition to exposure to melatonin during the fertile period of puberty, the season of heifer‘s birth also influence hormone release, as well as the age of first fertilization, Jellon and Foster (1985). By prediction of birth photoperiodicity, the appearance of puberty might be modulated Tamatkin et al (1985); Stallflug et al., (1984); Plant (2001).

MATERIALS AND METHODS

In our study we put have the focus on identifying eventual correlation between the age of fertilisation versus the birth season (autumn, winter, spring, summer) and the quantity of cow's milk during the 305 lactation days. We carried out the survey in the period 2015-2018 in cow complex for industrial production of cow's milk in North-eastern Bulgaria. This cow breeding complex accommodated 6.270 large ruminants (lactating cows, pregnant heifers, adolescents and new born male and female calves). The breeding system involved free boxing, in sheds, separated during the winter period by polyethylene partitions. There were 3.864 cows subject to machine milking in 4 halls of carousel type three times a day. The average milking yield for the 305 lactation days ranged between 8.500 and 10.000 kg. Feeding of reproduction animals from their birth to their first fertilization is carried out according to the following scheme: from 1 to 150 days by using wholesome cow's milk, getting them accustomed to alfa-alfa hay and concentrated fodder. The diet within the season of growing up includes all-year feeding by maize silage, Lucerne /alfa-alfa/ hay and concentrated feed. In the spring-summer season, the lactation animal would also have access to green mass. The processes are computerized using an Israeli system.

We have conducted the survey on all the 778 female calves born in 2015 (Holstein-Friesian breed), with presented the results of 701 fertilised heifers. For data collection and data processing, we have used the inquiry method, including the births throughout the year 2015, including the heifers entered into reproduction and those successfully fertilised, the date of their fertilisation, and determination of the age on that same date. The average milking yield broken by the season of birth we extracted from the computerised system.

For processing the statistical data we had to use the software named StatSoft program, the comparisons and analysis being performed using the method named ANOVA, LSD test.

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RESULTS AND DISCUSSION

Table 1 shows that a total of 778 calves have been born in the cattle-breeding complex in 2015, of which 701 were females.

Table 1: Age of fertilisation of heifers and their milk yield during the 305 location days with first lactation

Season of birth	Number of animals born in 2015	Number of heifers successfully fertilised	Age of fertilisation in days	Number of animals that have lactated for 305 days	Milking yield for the all 305 days (kg)
Autumn	260	237	465±17,5	211	8143±28,2
Winter	157	141	579±23,6	129	7829±24,6
Spring	84	72	474±21,7	63	8423±32,5
Summer	277	251	504±18,3	213	8261±31,4
Total	778	701	505±182	616	8164±17,3

The value of the age of fertilisation is the highest (579±23,6 days) with the ones born in the winter season. Lowest are these values (465±17,5 days) with the ones born in autumn. Within the autumn-winter period, where the dark part of the day-and-night period is the longest, this value is 526±19,4 days. During the year periods of longest brightness (spring and summer) this average age is 489±22,4 days. The average milk yield of the heifers at the very end of their 305 days lactation period is 8164±17,3 kg over all the 616 first-calved heifers. These results are graphically presented on figures 1 and 2.

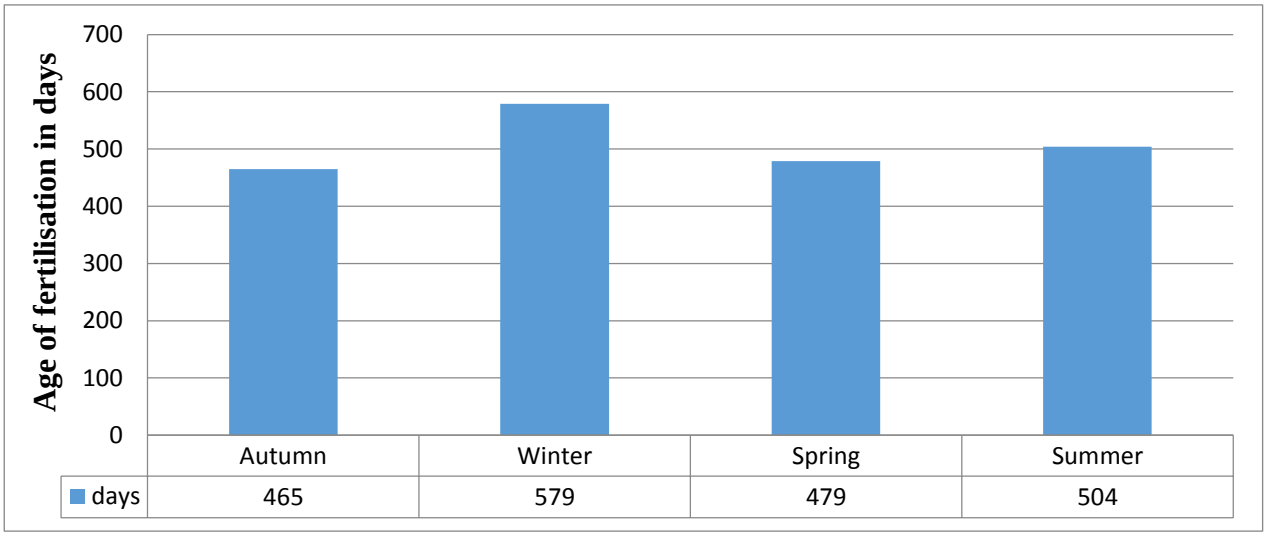

Fig. 1: Graphical representation of the seasonal correlation between the time of birth and the age of fertilisation.

The higher values of the age of fertilization of those born during the darker part of the year (longer-lasting darkness) could be explained by the fact that those born in autumn and winter enter at 3 to 6 months of age into the season of the greatest light emission. This is the period of lowest levels of melatonin synthesis produced by the pineal gland of the growing up animals.

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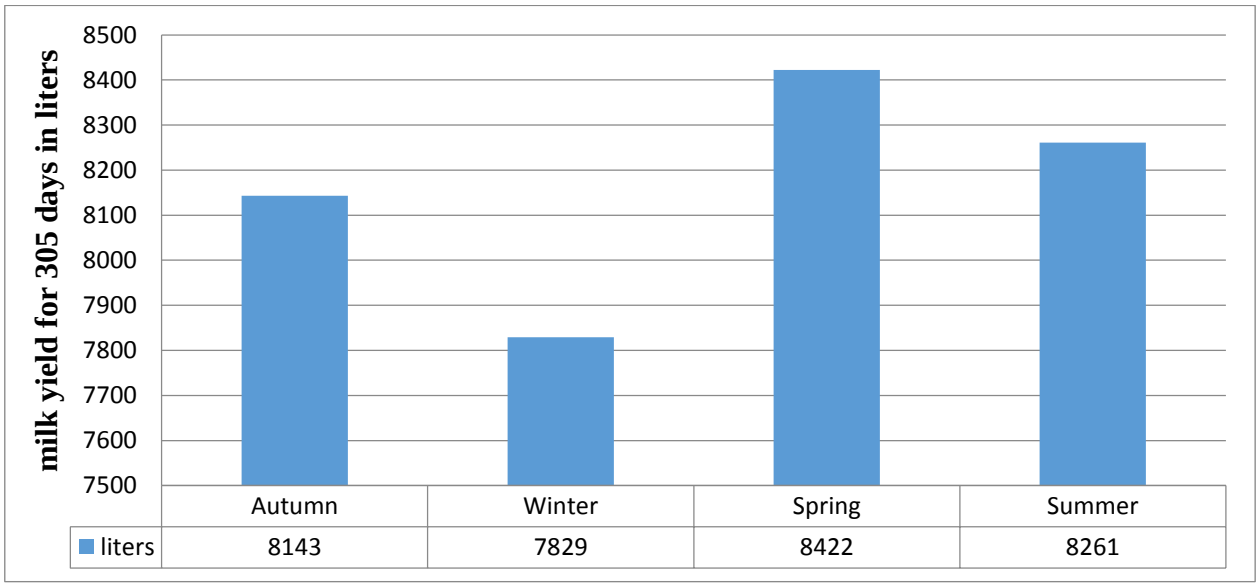

Fig. 2: Graphical representation of the average milk yield of 616 lactation first calved heifers for the whole 305 days lactation period

Melatonin as the main and best studied pineal gland hormone and it is also regulating agent of reproduction. During the times of the year of greater light emission, the central brain (cerebrum) of mammals, „the growing up /adolescent/ calves, in this case, is under the influence of various surrounding factors accepted through the optic nerve. This suppresses the subcortex (the midbrain and pineal gland), the sexual centre is at rest and negatively affects sexual growth and development. On the contrary, the females to become heifers, which are born within the lighter part of the year, have the opportunity during their most active growing up period, after reaching 6 months of age, to be grown up at higher rates of melatonin emission. This also results in activation of their sexual system. These differences in the age at the first fertilisation due to the season of birth depending are well presented on Figure 1.

Figure 2 presents the data of the average milking yield of the first-calved heifers during the first lactation period (of 305 days) depending on the season of their birth. For those born in the spring-summer season, this milking yield is 8341 ± 27.3 kg, while the ones born in the autumn-winter season give 7986 ± 20.8 kg. We have noted the substantial difference of 355 kg, which could not be explained by circadian rhythm. In this case, the lactation season of the first ones coincides with the more abundant feeding combined with the inclusion of green mass (freshly cut alfalfa) typical for the area around the industrial, cow breeding complex.

CONCLUSIONS:

The age of first fertilization of heifers included in reproduction depends on the season of their birth. Earlier is the fertilization of those born in summer-autumn by 24 days, compared to this of the ones born in the autumn-winter part of the year. Having an average milk yield of 616 primers /first calved heifers/ to be 8.164 kg for the all 305 lactation days, we can calculate it as being more than 355 kg higher with the ones born in the spring-summer season compared to one demonstrated by those born in the autumn-winter season.

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