Oxidative stress parameters affecting fertility of Bulgarian Murrah buffalos depending on age and season

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The study of oxidative damage and protection against it has become increasingly important last years. Research on the role of oxidative stress in the physiology and pathology of ruminants has also been relatively recent. Some data show that oxidative stress has a negative effect on the reproductive process in mammals. It is therefore desirable to determine and control their oxidative /antioxidant status in order to prevent pathological changes leading to problems in fertilization, embryonic development and survival of the offspring. In ruminants, the activity of oxidative stress biomarkers can also be affected by the season, which in turn can have major effects on their reproductive capacity.

**Aim:** In the present study we determined the degree of influence of oxidative stress on the fertility of buffaloes and buffalo heifers of the breed Bulgarian Murra during non-breeding and breeding season. For this purpose, some final products of oxidation of lipid and protein were elevated, such as malondialdehyde (MDA) and protein carbonyl content (PPC) as biomarkers of oxidative status and the levels of antioxidant enzymes –superoxide dismutase (SOD) and glutathione peroxidase (GSH-Px) were established, as well.

**Materials and Methods:** The study included 24 multiple-born buffaloes> 40 days postpartum and 30 buffalo heifers of the Bulgarian Murra breed. The animals were kept on the buffalo farm of the Agricultural Institute, Shumen (Northeastern Bulgaria, latitude: 43.28N, longitude: 26.93E). The ration included concentrate fodder for lactating buffaloes, beer porridge, alfalfa hay, straw, and constant access to water. The buffaloes weighed from 460 kg to 650 kg, aged from 2 to 6 years and lactating milk 1800 - 2100 kg with daily double milking. The buffalo heifers had a body weight of 450 - 470 kg and an age of 820 - 840 days. The ration consisted of concentrated fodder, alfalfa hay, straw and constant access to water. Group of buffaloes (n = 24), non-breeding (spring and summer) season (n = 8) and breeding season (autumn and winter) (n = 16); Group of buffalo heifers (n = 30) non-breeding season (n = 17) and breeding season (n = 13).

To determine the biomarkers, blood samples were obtained from v. jugularis by means of a vacutainer on the day of starting the estrus synchronization program. Subsequently centrifuged and the serum was stored at -20°C until the study.

All biomarkers characterizing the oxidative status in buffalo heifers MDA and PPC were statistically significantly higher compared to buffaloes (p <0.001). Increased oxidative stress was registered in buffalo heifers during the breeding season, compared to buffaloes in both seasons due to the reduced activity of SOD and GSH-Px. Lipid peroxidation (MDA) products were also statistically significantly increased in buffalo heifers during the breeding season, followed by the non-breeding season, and in buffaloes from both seasons, followed by statistically significantly increased in SOD. Elevated levels of malondialdehyde and superoxide dismutase were reported in non-pregnant buffalo heifers, but without a statistically significant difference. However, buffalo heifers were found to have better fertility, probably due to more active antioxidant protection as an adaptive mechanism against oxidative stress.

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