APPLICATION OF NUCLEAR TECHNIQUES IN FOOD AUTHENTICITY STUDIES

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The stable isotope ratio in milk of cow (and other mammals) is governed by the food, the water isotope pattern as well as by the environmental conditions (temperature, humidity, stress). Knowing the distribution of the source (food, water) isotopic pattern it is possible to predict the stable isotope signature in milk. The set or database of the stable isotope ratio makes possible to distinguish the geographical origin of dairy products.This feature is important for struggling against the trade fraudulence as well as it strengthens dairy producers to confirm the origin of their own production.

The aim of this study is to make the first attempt to create a database of stable isotope ratios in Belorussian milk. For this purpose milk, water and forage samples were collected across Belarus during summer and winter seasons. Carbon and nitrogen isotope ratios were measured in milk, while the oxygen isotope ratio was measured in drinking water and milk water.

The stable isotope ratios of light elements (carbon, nitrogen, oxygen) in Belorussian milk and farm water were reported for the first time. $\delta^{13}C$ and $\delta^{15}N$ values in the milk ranged from -30.2 ‰ to -20 ‰ and from +3.63 ‰ to +5.66 ‰, respectively. The Mogilev region was characterized by the most negative $\delta^{13}C$ values. It can be related to the pasture type, when cows were fed in the field on the C_3 type plants.

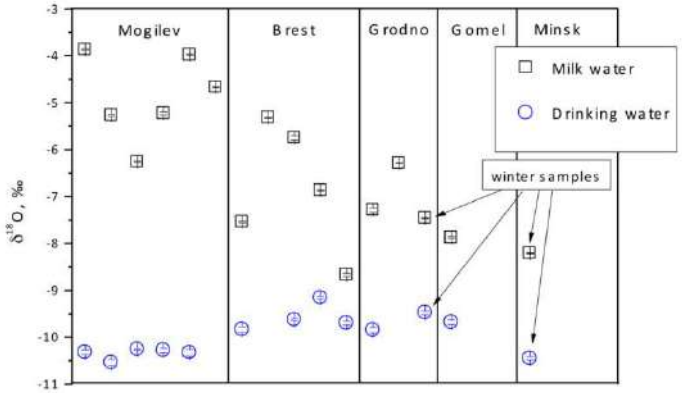

Figure 1. – $\delta^{18}O$ values in the water and milk water from different regions in Belarus

Cows in other regions had some amount of C_4 plants in their diet. It is confirmed by the $\delta^{13}C$ values of the forage, where $\delta^{13}C$ values reached -14.57 ‰. Nitrogen isotope

values showed no visible trend and were scattered across the investigated geographical regions. $\delta^{18}O$ values in the drinking water were of the similar values, with the mean value of -9.83±0.63 ‰. Milk water $\delta^{18}O$ values were distributed differently across regions, with the most positive ones registered in the Mogilev region (Fig. 1). This could be related to the feeding regime, when part of the water came to the animal from the grass, which usually had enriched $\delta^{18}O$ values.

$\delta^{13}C$ values in the milk are different for the summer and winter seasons in the same geographical region. It can be related to the change of the diet, when cows were kept in the shelter during the winter season and had a different forage composition compared to the summer season.

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СИСТЕМА МОНИТОРИНГА СОСТОЯНИЯ СЕЛЬСКОХОЗЯЙСТВЕННЫХ КУЛЬТУР В МАСШТАБЕ СЕЛЬСКОХОЗЯЙСТВЕННОГО ПРЕДПРИЯТИЯ ПО ИНФОРМАЦИИ ВРЕМЕННОГО РЯДА РАЗНОРОДНЫХ ДАННЫХ ДИСТАНЦИОННОГО ЗОНДИРОВАНИЯ ЗЕМЛИ

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Особенностями растениеводства Республики Беларусь (по отношению, например, к странам Европейского Союза, Северной Америки) являются: сопоставимая норма внесения минеральных удобрений при более низкой (не менее чем в два раза) средней урожайности сельскохозяйственных культур; малые размеры полей (средний размер составляет около 10 га), что обуславливает более низкую эффективность применения сельскохозяйственной техники. Как следствие, повышение (или по крайней мере поддержание на приемлемом уровне) рентабельности растениеводства является одной из ключевых задач сельскохозяйственного производства Республики Беларусь.

Решение указанной задачи во многом зависит от внедрения инновационных разработок, направленных на более рациональное использование имеющихся ресурсов. Одним из таких инновационных направлений и является применение технологий дистанционного зондирования. Цель достигается за счет адаптации технологий возделывания и уборки сельскохозяйственных культур к реально