Effects of Isoquinoline Alkaloids-based Product in Lactating Dairy Cows

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Objectives: Improving animal health and welfare with low/no chemical input while achieving high milk yield is a difficult task in modern dairy production systems. To this end, many solutions have been tested with uncertain results. Plant-derived products have been favorably used in several species, but scarce data are available on their effects in dairy cattle. The purpose of this study was to evaluate the effects of a plant-based product derived from *Macleaya cordata* containing standardized concentrations of isoquinoline alkaloids (IQs) on milk production, but also udder and uterine health of lactating dairy cows.

Materials and methods: Primiparous (PRIM; n = 84) and multiparous (MULT; n = 602) cows from 18 commercials herds in France were evaluated. Cows were matched by lactation number, previous lactation milk yield and SCC (MULT) within farms, and were randomly allocated to receive two boluses containing IQs (IQS; n=343) or to serve as a control (CON; n=343). Boluses were designed to release an equivalent of 37.5 mg/d of IQs for 60 days, and 18.75 mg/d of IQs thereafter for three months following administration. Boluses were administered during the close up period, approximately 21 days before the expected date of calving. Data (milk yield, fat and protein, urea, SCC) from the first five official milk test-days were collected and analyzed retrospectively. In an independent set of five herds (n=52 cows in each group), mammary, uterine, hematological, and biochemical (NEFA, BHBA, haptoglobin) data were collected during the first three months of lactation. Statistical analyses were performed using R software (v3.5.1).

Results: Records show that raw and energy-corrected milk yields were higher (Two-way ANOVA, $p < 0.05$) in IQS cows, with a mean increase over than 1.5 kg in the set of 18 herds. No difference in milk fat, protein, and urea concentrations were noticed. Overall, mean SCC was lower (50×10^3 cells/mL; Two-way ANOVA, $p<0.05$), and the prevalence of cows with subclinical mastitis (SCC $\geq 250\times10^3$ cells/mL) was also lower ($p < 0.05$) in the IQS group on milk test-days during the first three months of lactation. The effect of IQs supplementation is more pronounced in high-producing PRIM cows and improved milk yield in the two lowest quartiles. The number of clinical mastitis was lower in IQS cows ($p<0.05$). No difference for retained placenta or endometritis between IQS and CON were noticed in the first 45 days post-partum. No difference of NEFA, BHBA, or haptoglobin measured in the first week of lactation or fat:protein ratio thereafter could be detected, indicating that improvement cannot be solely explained by changes of the metabolic profile in early lactation.

Conclusions: These results show that administration of a plant-based product with standardized concentrations of IQs increased milk yield and improved udder health. IQs supplementation can be regarded as a strategy to improve productivity and to reduce SCC in dairy cows.