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Table of Contents

1. Executive summary.....	5
2. Dissemination activities related with the Deliverable.....	6



1. Executive summary

Vitamin supplements in organic livestock must be considered as contentious inputs if they are either of synthetic production or of GMO-based origin. The former is mostly true for all lipophilic vitamins (A, D, E), the latter can be an issue in the production of B-vitamins. In the case of B-vitamins, GMO-free production is feasible, but under pressure due to higher costs compared to GMO-based vitamins on a level, which is economically relevant.

Therefore, it is a target to reduce the inputs of such vitamins in the nutrition of organic livestock. However, this must never compromise health and welfare of the animals. For this reason, reductions in the supplementation levels must be carefully based on experimental evidence for health security of the chosen dosages.

Within the RELACS project, supplementation levels for Vitamin E to dairy cows and Vitamin B2 to poultry have been reassessed. With regard to Vitamin and dairy cows this was based on a systematic review of the scientific literature. Based on this literature review, including cattle responses to vitamin E supplementation, typical roughage-based diets in organic farming, and Vitamin E concentrations in various fresh and conserved forages, a proposal for Vitamin E supplementation to organic dairy cows was developed, which implies partial reduction of the supplementation levels, compared to current European and US recommendations.

The supplementation of Vitamin B2 to organic poultry was reassessed with four experimental approaches including broiler chicken, breeder hens, and layers. Compared to the current practice in European organic poultry feeds, the experiments indicated potential for a rather substantial reduction of vitamin B2 supplements.

Both approaches, however need validation under practice conditions. In the case of vitamin E for dairy cows, the validation was conducted as a survey on two Norwegian organic dairy farms. For vitamin B2, the situation allowed a different approach: due to organic regulations in Switzerland, the vitamin B2 level supplemented to poultry is restricted to 4mg/kg feed. This is the safe threshold of supplementation, which follows from our experiments, and is recommended as a result of the project; and it is substantially lower (30-50%) than the levels currently supplemented in other European countries' practice. Therefore, we used the Swiss organic poultry system as a long-term validation study and conducted an interview survey among producers and feed mills regarding the occurrence of any signs of vitamin B2 deficiency in Swiss organic poultry herds.

The survey on two Norwegian dairy farms regarding the Vitamin E status of dairy cows used milk a-tocopherol concentrations of respectively 12 dairy cows during all lactational and seasonal stages, which included typical alterations in the feeding regime. The milk a-tocopherol concentrations were considered as proxies for the vitamin E status of the cows. Subject to latest outstanding feed tocopherol analyses, it can be concluded that the provision of the cows with vitamin E from feed was always on a high level and milk a-tocopherol levels were always within a completely usual range.

The basis for the in-practice validation of the recommendations regarding riboflavin (vitamin B2) supplementation to poultry was the current situation of the Swiss organic poultry production sector. Based on an inquiry of 4 farms with a total of 18550 animals, 4 feed mills with a total of 275 organic poultry farms in their service and two veterinarians serving 110 organic poultry farms, which all reported that no riboflavin deficiency signs occurred in the past two years, it can be safely stated that a riboflavin supplementation level of 4 mg/kg feed is feasible without endangering animal health in organic poultry production.

Both parts (Vitamin E and Vitamin B2) will be published separately as short communications in publicly available depositories or journals in English during 2022.

The details from both parts are presented in a draft manuscript – confidential until the submission and acceptance of the short communications – temporarily referred to by:

Håvard Steinshamn, Florian Leiber (*in progress*) On-farm confirmation of revised requirement definitions for Vitamin E and Vitamin B2 in organic livestock production.



2. Dissemination activities related with the Deliverable

There have been no dissemination activities with regard to the on-farm validations, yet.

Both parts (Vitamin E and Vitamin B2) will be published separately as short communications in publicly available depositories or journals in English during 2022 under the temporary titles:

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Florian Leiber (*in progress*) On-farm confirmation of revised requirement definitions for Vitamin B2 in organic poultry production