RELACS
IMPROVING INPUTS FOR ORGANIC FARMING

FiBL THÜNEN

New vitamin B2 producing wild-type yeast strain (GMO-free)

Problem

Supplementation of vitamin B2 (riboflavin) in poultry feed is essential. For organic farming, non-GMO derivative riboflavin is required. The only products on the market that are not produced with the help of GMOs are more expensive than the conventional products, and their legal status still needs to be clarified at the EU level.

Solution

Screening non-GM wild-type yeast strains overproducing riboflavin is the first step in developing GMO-free riboflavin production lines that ensure a continuous supply of riboflavin for organic livestock.

Applicability box

Input used

☐ Copper	☐ Anthelmintics
☐ Mineral oil	☐ Antibiotics
☐ Fertilisers	x Vitamins

Geographical coverage
Europe

Application point
Production of premixes and animal feed

Target
Feed safety; animal welfare and health

Outcome

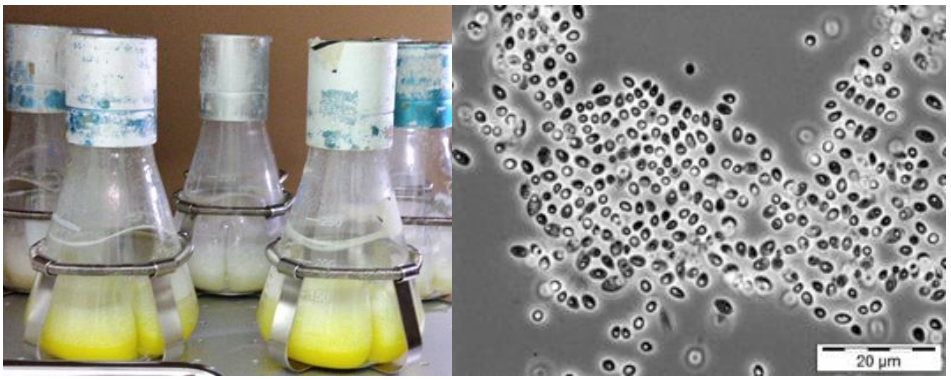
Out of 51 strains tested (incl. 37 isolated from special habitats), the wild-type yeast strain *Meyerozyma guilliermondii* produced the highest riboflavin concentration in the screening procedure. A fermentation strategy at a laboratory scale is provided, where a yield of 30 mg riboflavin per g dry matter of yeast cells was achieved.

Practical recommendations

The wild type yeast *M. guilliermondii* was purchased from the German Collection of Microorganisms and Cell Cultures (DSMZ, Braunschweig, Germany). This strain was chosen for further investigations to achieve a higher level of riboflavin than that observed in the screening procedure, using bioprocess engineering and without metabolic engineering. *M. guilliermondii* is a yeast species widely present in the environment. It is classified in Risk Group 1 and thus is an organism with low individual and low community risk, meaning it is very unlikely to cause disease.

To provide a feasible and affordable certified vitamin B2 supplement, the possibility of minimising expensive media components was evaluated at the scale of the shake flask (pictured below). The upscaling of the fermentation process from shaking flasks to a 1 L-bioreactor was evaluated. The air supply, the dissolved oxygen content, and the feeding rate during a fed-batch cultivation mode play a crucial role in the cultivation of *M. guilliermondii* to produce riboflavin.

So far, the highest reached concentration of riboflavin during a fed-batch cultivation was 317.6 mg/L after nine days. In conclusion, a yield of 30 mg riboflavin per g dry matter of yeast cells was achieved.



Pictures: Cultivation of *Meyerozyma guilliermondii* in shake flasks (left) and its corresponding morphology (right) (Anja Kuenz, Thünen-Institute).

On-farm application

System approach

The possibility of using the wild-type strain *M. guilliermondii* to achieve higher levels of riboflavin by means of bioprocess engineering through a fermentation process and without metabolic engineering was demonstrated. The selected strain bears potential for far higher concentrated riboflavin than currently available. The adoption of this strain by feed additive producers will diversify the sources of vitamin B2 produced without the help of GMOs. In the medium-term, this should increase the availability of non-GMO derived vitamin B2 for organic feed production.

The wild type yeast *M. guilliermondii* is not yet authorised as a feed additive for organic feed. To do so, it will first have to be registered as a feed additive under the EU's horizontal legislation on feed additives (EC) 831/2003. Subsequently, it will have to be authorised specifically for organic production. This process usually takes a couple of years.

Further information

Further readings

RELACS Practice Abstract "Recommendations for Vitamin B2 supplements in organic slow-growing broilers", available at: https://relacs-project.eu/wp-content/uploads/2021/05/RELACS_PA_06_VitB2_broilers_FiBL_final.pdf

RELACS Practice Abstract "Vitamin B2 supplementation for laying and parent hens in organic poultry systems", available at: https://relacs-project.eu/wp-content/uploads/2021/05/RELACS_PA_02_VitB2_hens_FiBL_final.pdf

Check the linked publication for the full study.

Weblinks

Check the Farm Knowledge Platform for more practical recommendations.

About this practice abstract and RELACS

Publishers:
Research Institute of Organic Agriculture (FiBL)
Ackerstrasse 113, Postfach 219, CH-5070 Frick
Phone +41 62 865 72 72, info.suisse@fibl.org, www.fibl.org

IFOAM Organics Europe
Rue du Commerce 124, BE-1000 Brussels
Phone +32 2 280 12 23, info@organicseurope.bio, www.organicseurope.bio

Thünen Institute of Agricultural Technology
Bundesallee 47, 38116 Braunschweig
Phone: +49 531 596 4102, at@thuenen.de, www.thuenen.de/en/at/

Authors: Anja Kuenz, Florian Leiber

Editors: Mathilde Calmels, Joelle Herforth-Rahmé, Lauren Dietemann, Bram Moeskops

RELACS: 'Replacement of Contentious Inputs in Organic Farming Systems' (RELACS) builds on results of previous research projects and takes far-advanced solutions forward. As a system approach to sustainable agriculture, organic farming aims to effectively manage ecological processes whilst lowering dependence on off-farm inputs. The RELACS partners will evaluate solutions to further reduce the use of external inputs and, if needed, develop and adopt cost-efficient and environmentally safe tools and technologies.

Project website: www.relacs-project.eu

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