CoPro Project: development of a first standardized food supplement from *Cordyceps*

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Introduction

Cordyceps sp. (an entomopathogenic fungus) is one of the most important traditional Chinese medicines which belonging to the class Ascomycetes and been used extensively as a crude drug and a folk tonic food in East Asia.

It contains active components (cordycepin, polysaccharides, ergosterol, mannitol, etc.), and due to its various physiological activities is now used for multiple medicinal purposes (anti-inflammatory, immunomodulatory, anti-tumor/anti-cancer/anti-leukemic, anti-metastatic, anti-oxidant/anti-aging, etc.).

Cordycepin has been widely used as antitumor compound, which has been found to exert antiangiogenic, anti-metastatic, and antiproliferative effects, as well as inducing apoptosis.

The aim of this project was to develop a new *Cordyceps* based food supplement with standardized content of cordycepin (10 mg/g) on an industrial level. As content of cordycepin and other adenosine analogues in most food supplements is mostly unknown or varies greatly (from 0.03 mg/g to slightly above 1.5 mg/g in tested food supplements) we developed a new food supplement with known as well as standardized content of cordycepin and with higher amount compared to any known existing food supplement on the market.

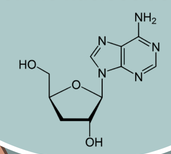
Methods

- ✦ Strain/passage
- ✦ Substrate components/additives (organic, vegetarian, allergen-free)
- ✦ Substrate moisture content
- ✦ Inoculation rate/type
- ✦ Incubation duration
- ✦ Incubation temperature
- ✦ Aeration rate
- ✦ Filling rate
- ✦ Light intensity
- ✦ Mixing during incubation

A HPLC analytical procedure was developed and validated. Samples were extracted in 20% methanol and analysed using BDS Hypersil C18; 2.4µm; 100 mm x 4.6 mm column (Thermo Fisher Scientific) and 0.007 M phosphate/methanol gradient.

Approximately 65 wild and commercial *Cordyceps* strains were screened for cordycepin and adenosine content and their cultivation parameters optimized through series of experiments.

Cordycepin, or 3'-deoxyadenosine derivative of the nucleoside adenosine

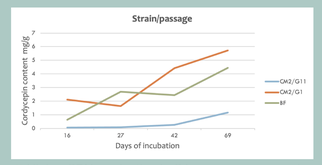


As strain degeneration rate plays a very important role, many steps were taken to use undegenerated strains and preserve them against degeneration.

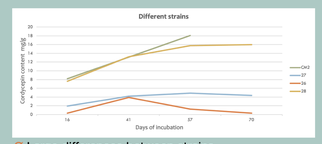
Optimized cultivation parameters include substrate type, its moisture content and particle size distribution, filling rate of cultivation vessels and substrate weight, cultivation vessel volume, its dimensions and type (bag, PP box, PP bag), type and size of breathing filters, temperature and RH in growing rooms, light regime and intensity during overgrowth and fructification.

Results

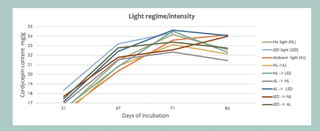
After 86 cultivation/extraction experiments and more than 2100 samples tested, a new standardized food supplement named **Cordyvit® Pro K** was developed containing concentrations of cordycepin higher than 10 mg/g.



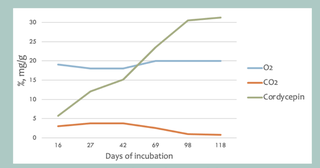
- ∅ Higher CPN production in G1 passage compared to G11 on standard substrate
- ∅ 40-fold decrease in degenerated strains



- ∅ Large differences between strains



- ∅ Overgrowth at lower and cultivation at higher illumination intensity stimulates CPN production



- ∅ Measurement of CPN, O_2 and CO_2

Cordyceps products, Cordyvit, **GOBA®** trade mark.

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