Fungal medium optimization for production of blue pigment

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Introduction

Natural pigments produced by fungi are gaining attention as sustainable alternatives for synthetic dyes. The pigment is a secondary metabolite and is located in the biomass. The only way to obtain this pigment, is to extract it from the biomass. The medium that is currently used is complex and expensive. The medium will be optimized by using Design of Experiments (DoE).

Research aim: Optimize the medium using Design of Experiments (DoE) to enhance both growth and pigment production.

Method

- DoE design → Central Composite Design (CCD) (Figure 1)
  - **Cube points** are minimum- and maximum concentrations
  - **Star points** are extreme low and extreme high concentrations
  - **Center points** are concentrations in between min. and max. values

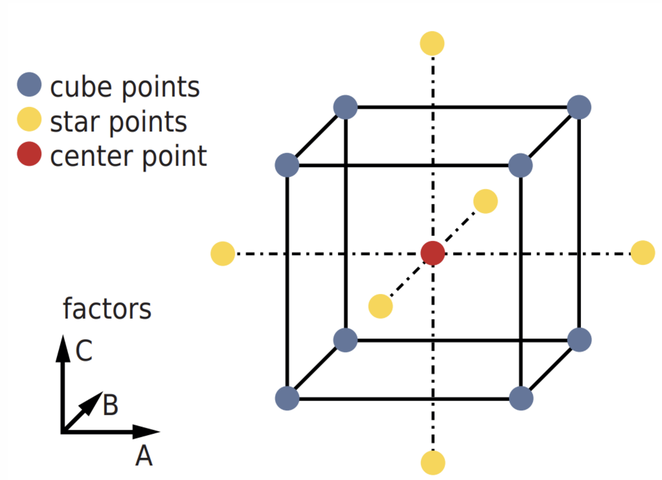

Figure 1: Design of Experiments Central Composite Design [1].

- 5 nutrients have been selected that will vary in concentration according to CCD. The other nutrients stay constant.
- 45 DoE runs will be carried out. Each DoE run has different concentrations of the selected nutrients in the medium and is inoculated with the same fungi.
- After 14 days of growth, the biomass is freeze dried and measured.
- The results are analysed with statistical software.

Results

The coefficients plot (Figure 2) shows that glucose and malt have a positive effect on the growth of biomass. The factor peptone is not statistically significant as the error bar intersects 0. The interaction between glucose and malt has a positive effect on the response.

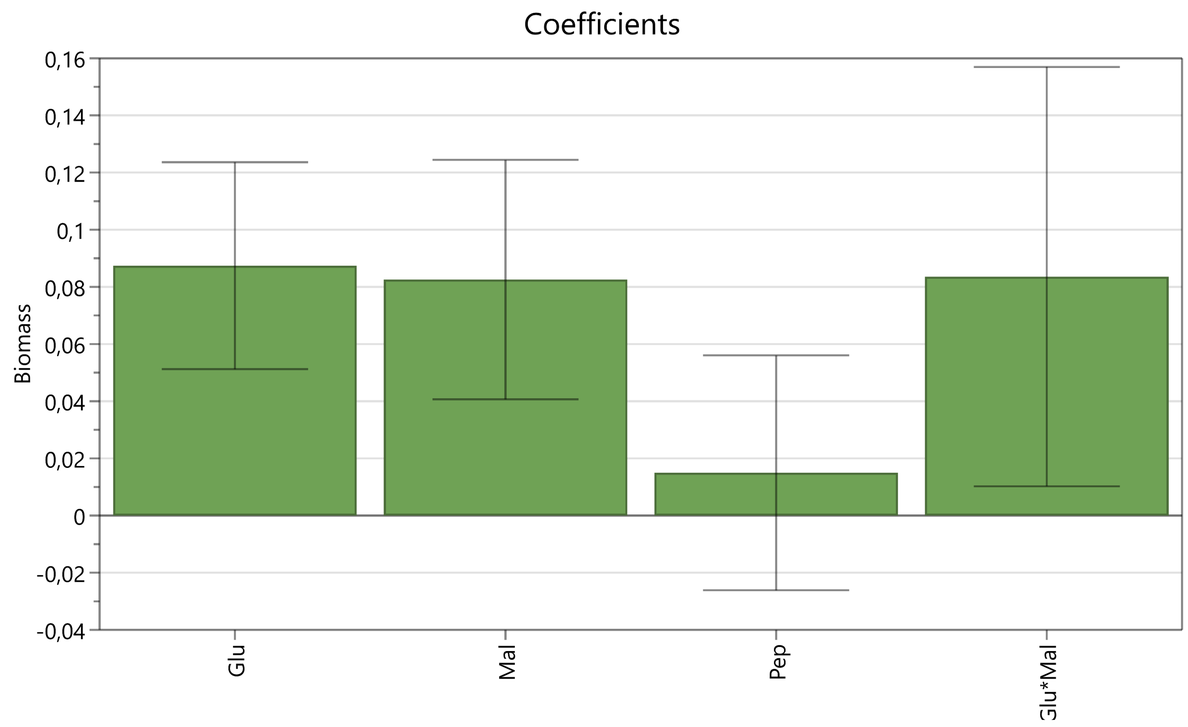

Figure 2: Coefficients plot.

The response surface plot (Figure 3) displays the predicted response values. A positive interaction between glucose and malt is observed. High glucose and high malt results in the most biomass.

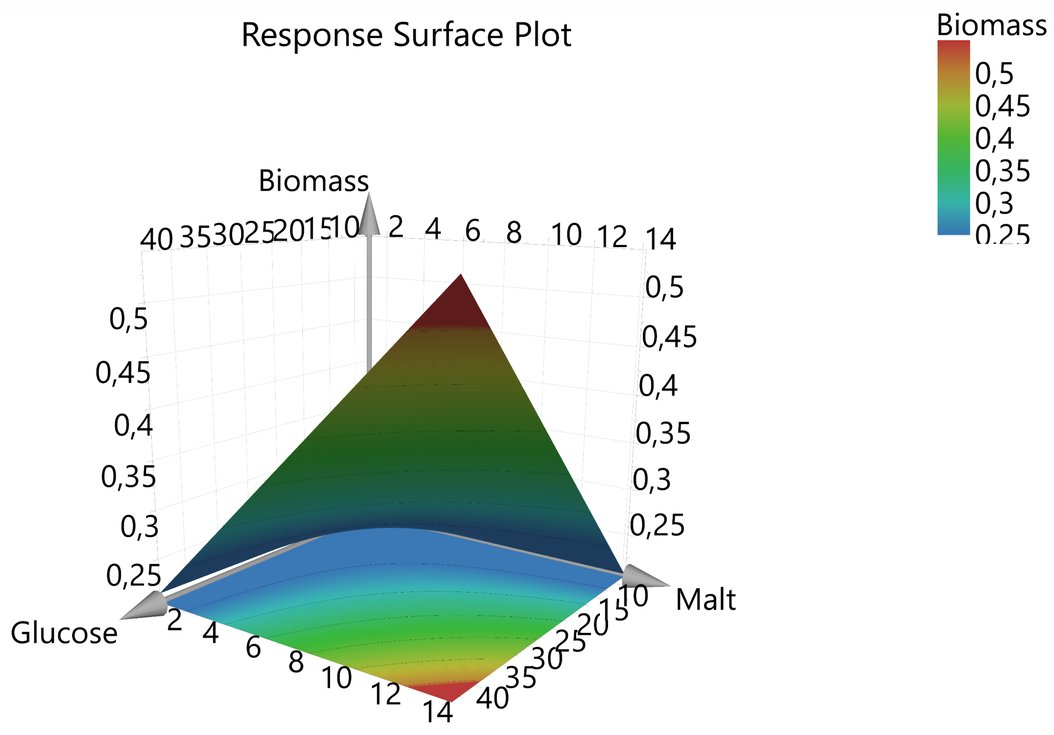

Figure 3: Response Surface plot.

Current findings & next steps

Current findings from the DoE study show that glucose and malt positively influence biomass growth, while peptone appears to have no significant effect.
The next step is to analyse how nutrient composition affects pigment production. These findings will be used to further optimize the medium for improved biomass growth and enhanced pigment yield.

References

[1] 'Schema of a central composite design with three factors, A, B and C. It... | Download Scientific Diagram'. Available on: https://www.researchgate.net/figure/Schema-of-a-central-composite-design-with-three-factors-A-B-and-C-It-consists-of-a_fig1_275971176