university of groningen

Rhodomonas Unravelled

PhD thesis

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by

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Preface

The work described in this thesis was carried out at the Aquaculture research group at the HZ University of Applied Sciences (NL), during the period December 2017 to December 2021. The main supervisor was Professor Klaas. R. Timmermans and the co-supervisors were Prof. Dr. Anita Buma and Dr. Jasper van Houcke.

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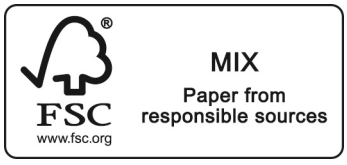

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Abstract

In 2050, the expected food demand will be twice as high as now due to the growing world population. As a result, there seems to be more demand for high-quality proteins such as seafood. However, along with aquatic animal production, the need for aquaculture feed is increasing. On the other hand, consumers seem to be concerned about sustainability and animal welfare in aquaculture. Microalgae have illustrated the potential to meet the need for more sustainable food and feed production.

This thesis focuses on *Rhodomonas salina*, a cryptophyte of great importance in aquaculture, due to its fatty acid profile and phycoerythrin concentration. The aim of the study is to optimize the production and biochemical composition of *R. salina* to obtain successful large-scale cultivation for biomass or specific biochemical components production. To achieve this goal, the effect of different growth factors on biomass productivity and quality of *R. salina* was investigated. Factors such as light intensity and quality, nutrients availability, pH, and salinity have varied in different experiments.

R. salina demonstrated higher biomass productivity when it was cultivated under green light illumination, due to the higher photosynthetically usable radiation. However, the phycoerythrin concentration of R. salina was higher in light conditions which were poorly absorbed by the pigment. Furthermore, *R. salina* has the ability to accumulate fatty acids and triple their concentration when cultivated under N-starvation conditions. In this thesis, *R. salina* was also cultivated in semi-large scale tubular photobioreactors under sunlight. In that experiment, the effect of pH on biomass productivity and taste of *R. salina* was investigated. *R. salina* taste was identified with high umami taste, compared to other commercial seafood organisms, such as seaweed, making it potentially a useful umami source in the development of plant-based products.

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