PERFORMANCE OF FIVE ULVA STRAINS: PRODUCTIVITY, CHEMICAL COMPOSITION AND NUTRIENT DYNAMICS AND SELECTION CRITERIA FOR FARMING PRACTICES AND ECOSYSTEM INTERACTIONS

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Introduction

Seaweeds are often mentioned as a promising product that can contribute to the growing global demand for food, feed and bio-based products. The increasing interest is reflected by their production, which has expanded at 8% annually in the past decade. The majority of seaweed production occurs in Asian countries, but the establishment of numerous research projects, shows the expanding interest of European countries in exploring the potential of seaweed cultivation.

Seaweed cultivation results in seaweed-ecosystem interactions. Seaweeds can, for example, be used as biofilters for removal of excess nutrients from land run-offs or fish farms. However, when densities exceed the carrying capacity, nutrient extraction may result in nutrient limitation with cascading effects to other trophic levels. Evaluating ecosystem interactions therefore warrants a good understanding of nutrient uptake and assimilation rates of seaweeds.

So far results published in literature present a large range in terms of growth rates, content and nutrient dynamics within seaweed species. Estimating the production potential and environmental interactions is therefore difficult. It is unknown to what extend the varying results can be attributed to environmental conditions and/or specific characteristics of the seaweed species used in each study, including genetic differences.

The aim of the current study was to investigate the differences in productivity, chemical composition and nutrient uptake for different Ulva spp. strains cultivated under standardised (environmental) conditions.

Material and Methods

Five Ulva spp. strains were cultivated in outdoor tanks (600L, n=5 per strain), from June till October 2017. Each strain was collected from a different location in the Eastern Scheldt area. Environmental conditions were standardised among all tanks, so differences in performance could be attributed to (genetic) origin of the strains. On a monthly basis the biomass of Ulva was reduced to 250 gram wet weight per tank, in order to prevent growth inhibition due to overstocking. Growth was measured bi-weekly, and monthly samples were collected for analysis of the chemical composition. Nutrient uptake rates were measured every month from August to October. Environmental conditions were measured continuously (light, temperature) or at regular intervals (nutrient concentrations).

Results and Discussion

Remarkable differences were observed between the five strains. Two strains showed very low growth and tanks/seaweed quickly became over grown with epiphytes. Growth of the remaining three Ulva spp strains also varied within the season. Similarly, chemical composition and nutrient uptake capacity varied between strains and within time.

Results will be presented on productivity, total nitrogen, carbon, amino acids, carbohydrate, fatty acid concentrations and specific leaf area (leaf area per unit leaf dry weight) of the Ulva strains. Two different methods for defining protein content will demonstrate the protein concentrations through time. The differences between strains highlight the importance for selection of strains in aquaculture settings as these might greatly influence production performance for commercial seaweed farms.

Differences in nutrient uptake between strains indicate that selection should be taken into account when quantifying seaweed-ecosystem interactions as some strains have significantly higher uptake rates than others. Relations between nutrient uptake, growth and chemical composition will be discussed.