

The influence of light quality on the early development of kelp sporophytes

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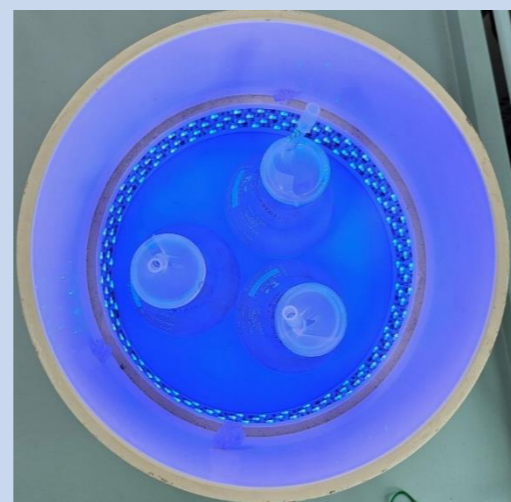
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INTRODUCTION

- In order to increase production in *Saccharina japonica* aquaculture, quick maturation of female gametophytes and high crossing rate are needed
- It is known that blue light has a positive effect on the maturation and growth of *Saccharina japonica*.
- Previous studies exposed meiospores released from the sporophyte stage to blue light and observed the effect of blue light on the growth and development of it.
- However, the aquaculture of *Saccharina japonica* starts from gametophyte stage, not the sporophyte stage. Therefore, the experiment treatments was performed on the gametophytes.

METHOD

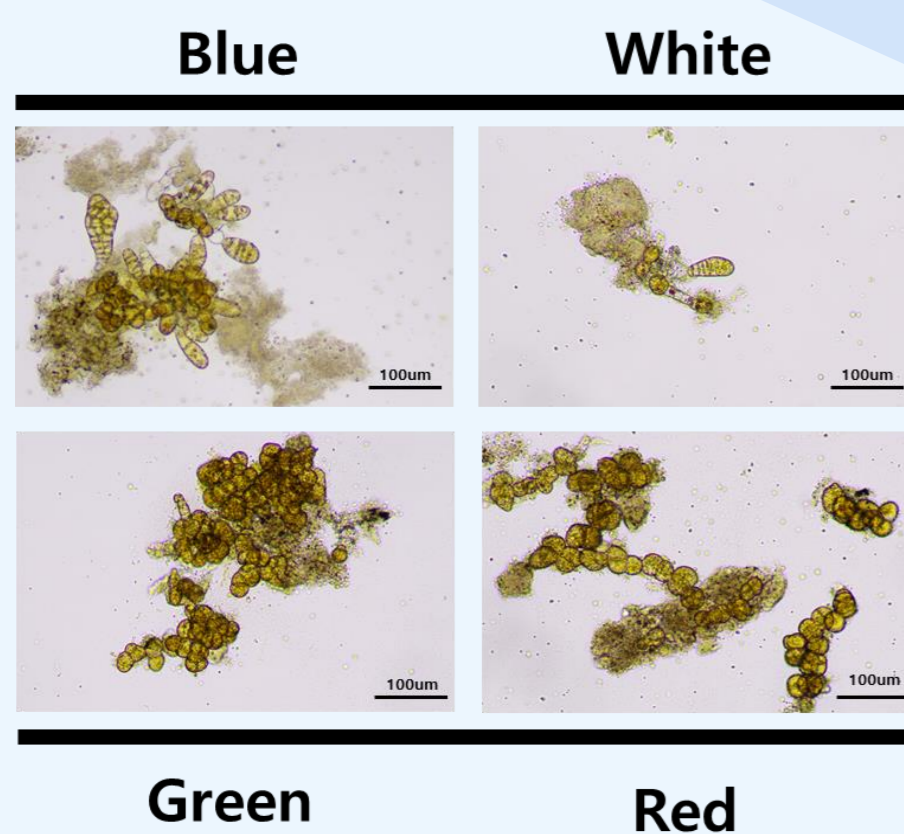
Condition	
Species	<i>Saccharina japonica</i>
Photosynthetically active radiation (PAR)	40 $\mu\text{mol photons m}^{-2}\text{s}^{-1}$
Photoperiod	12 : 12 L : D
Temperature	15°C
Salinity	30 psu
Medium	PES (Provasoli's enriched solution)



The experiment began at the gametophyte stage of *Saccharina japonica*. At the gametophyte stage, there was an adaptation period of 5 days under four different light qualities (blue, red, green, white). Then, male and female gametophytes were cultured with a 1:1 ratio in a 250 mL flask for 14 days.

MEASUREMENT

Microscopic observation was conducted every 2 days within 14 days and performed on sporophytes in 100 μL seawater taken by pipette. The early development process of the sporophyte was classified into four grades.



4 cells grade includes sporophytes of 2 to 7 cells, 8 cells includes sporophytes of 8 to 16 cells, 16 cells includes sporophytes of 16 to 31 cells, and 32 cells includes sporophytes of more than 32 cells.

RESULT

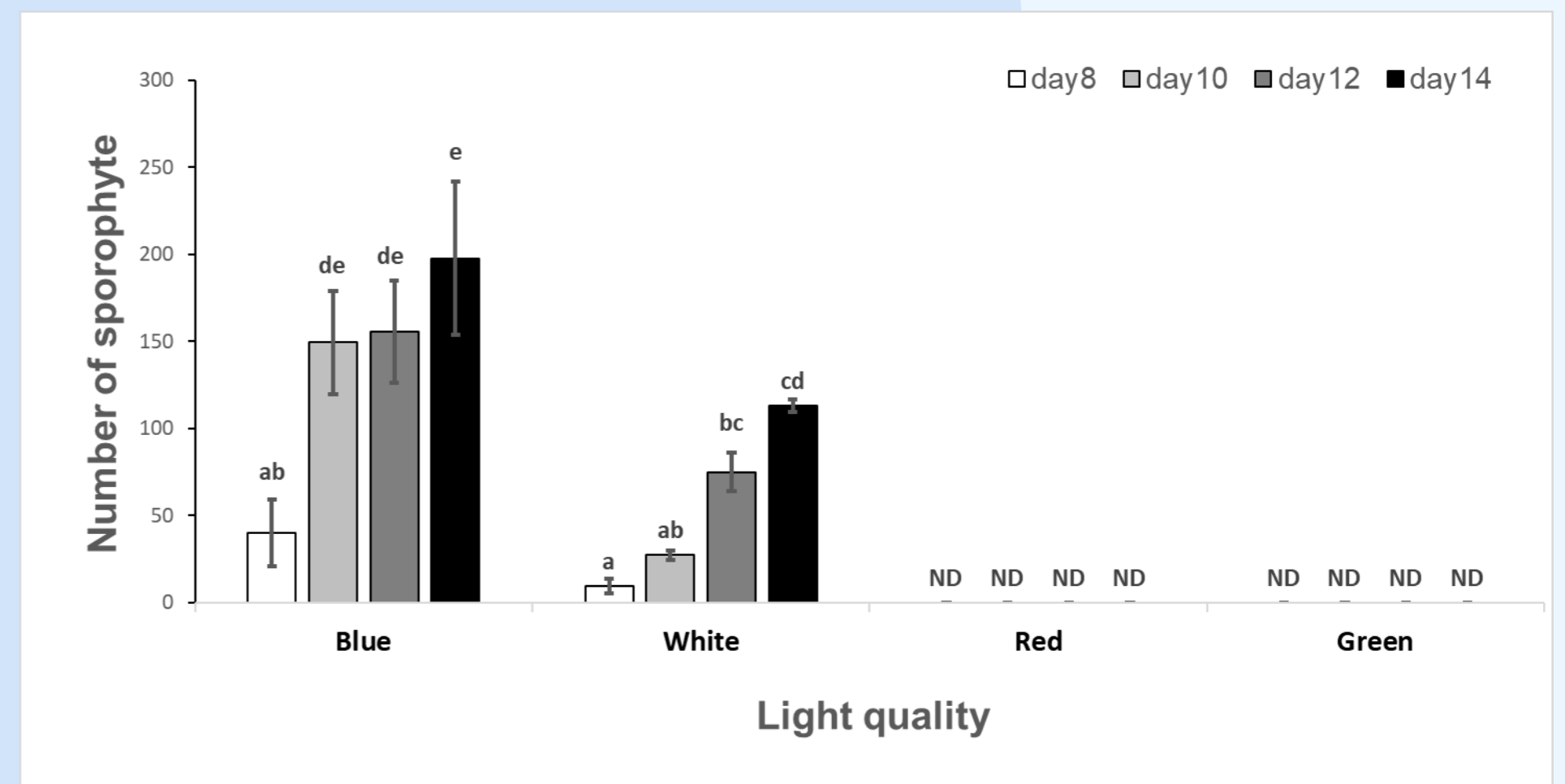


Fig.1 number of all sporophytes contained in 100 μL seawater. During 14 days of microscopic observation, the sporophyte of 4 cells grade were firstly observed under blue light and white light on day 8. By the 10th day, the number of sporophytes under blue light significantly increased compared to those under other light qualities. Under red light and green light, no sporophytes were found and the female and male gametophyte states were maintained.

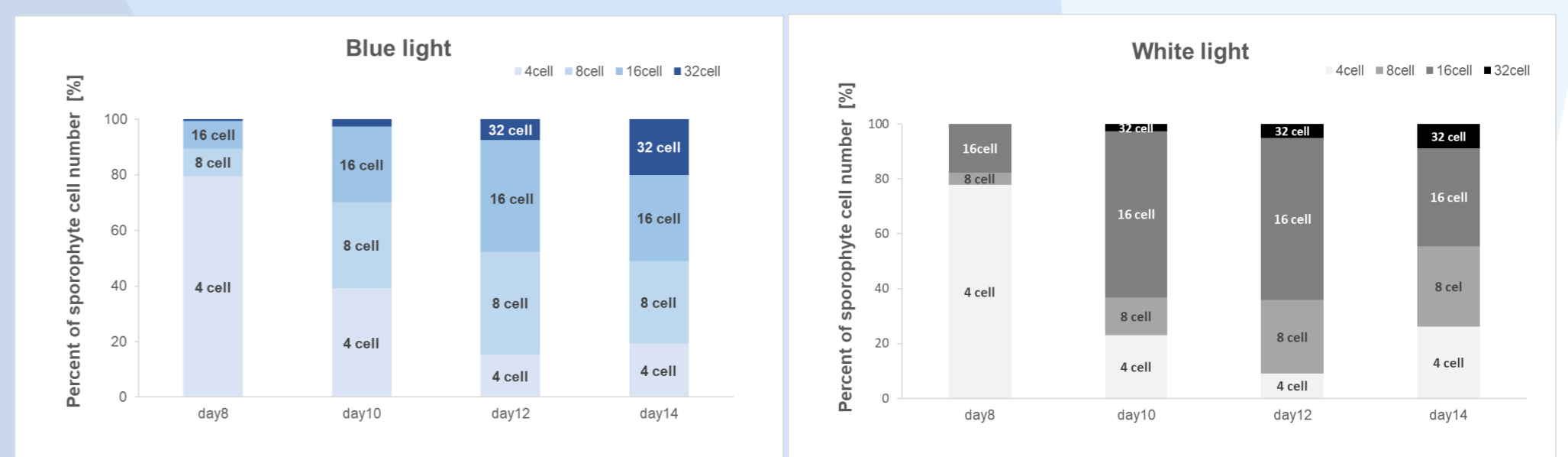


Fig.2 number of all sporophytes into percentiles to express the proportions at each stage (4 cells, 8 cells, 16 cells and 32 cells).

There was no significant difference in the proportions of each stage under blue light and white light.

CONCLUSION

Saccharina japonica germination and early development of sporophytes were most effective under blue light. There was no reproduction at all under red light or green light. However, The developmental stage of sporophytes was not affected by light quality.

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- Wang, W. J., Sun, X. T., & Wang, F. J. (2010). Effect of blue light on early sporophyte development of *Saccharina japonica* (Phaeophyta). *Marine biology*, 157, 1811-1817.

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