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Light effects on the calcification and morphology of *Padina spp.*

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Padina pavonica is one of the common macro-algae that inhabit coastal inter-tidal zones around the world. It is one of the two brown algae known to science today that calcifies. *Padina spp*. is an extracellular calcifying macroalgae with microscopic morphology of aragonite ($CaCO_3$) needle-shaped, seeing mainly on the ventral side of the thallus as a white stripes. There are some theories about the benefits of the aragonite needles, such as protection against grazers, mechanical support in turbulent water, high radiation protection during low tides, and more. In order to understand the benefits and the evolutionary adaptation of the aragonite needles, we conducted several light gradient experiments on *Padina spp*. Samples *Padina pavonica* were collected at Tel Baruch Beach, Israel (32°N34°E). The results show that under high light the algae possessed more $CaCO_3$ (% Wt) and with it, the color of the reproduction cells on the dorsal side of the thallus, right behind the aragonite strips, become brighter and transparent. The reproduction cells also released earlier to the water column, and their essentiality seems to be damaged. We also found that during full moon light, the aragonite stripes are 40% wider than under new moon. To conclude, this alga is well adapted to light under low tide and to the Israeli sun radiation which shines most of the year. Furthermore, the calcification of the needle-shaped aragonite in the thallus of *Padina spp*. could possibly be an adaptation to the high light energy allowing the algae to settle and dominate the coastal regions.

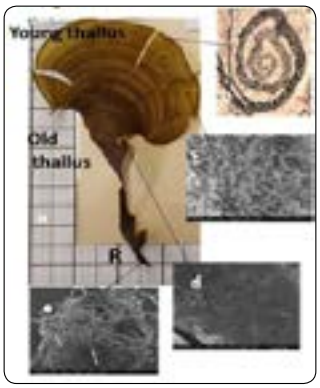

Figure 1: Macro and micro morphology of *Padina pavonica*. a. Part of a thallus of a full grown alga. b. The apical young part of the thallus showing inrolled margin, Axio Z1 light microscopy after histology protocol. c. Needle shaped CaCO3 crystals precipitation in the young parts of the thallus, Ouanta FEG 250 ESEM. d. Amorphous CaCO3 precipitation in the old parts of the thallus, Ouanta FEG 250 ESEM. e. The rhizoids. A roots-like filaments which helps the algae to attached to a solid surface, Ouanta FEG 250 ESEM.

Recent Publications

1. Sherman A, Rubinstein M, Eshed R, Benita M, Ish Shalom M, Sharabi Schwager M, Rozen A, Saada D, Cohen Y and Ophir R (2015) Mango (Mangifera indica L.) germplasm diversity based on single nucleotide polymorphisms derived from the transcriptome. BMC Plant Biology 15:277.
2. Benita M, Dubinsky Z and Iluz David (2018) *Padina pavonica*: morphology and calcification functions and mechanism. American Journal of Plant Science 9(6):1156-1168.

Biography

Miriam Benita has her BSc in Life Science at the Open University, Israel; MSc in Marin Biology at Bar Ilan University, Ramat-Gan, Israel, and a present PhD Marine Biology student at Bar-Ilan University. Her research is on the macro-algae *Padina spp*. which grows on abrasion platforms on the Israeli shores. Her research focus on the morphology of the *Padina spp*. and the unique pattern in which the algae precipitate $CaCO_3$ in the young part of the frond compare to the old part, and the evolutionary necessity of this precipitation.

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