

Fig. S1. Effect of dimethylformamide (DMF) on chloroplast auto-fluorescence. CLSM micrographs of *Zygnema S* (A, B) and *Klebsormidium crenulatum* (C, D) filaments before (A, C) and after (B, D) incubation in DMF. Bars = 10 μ m.

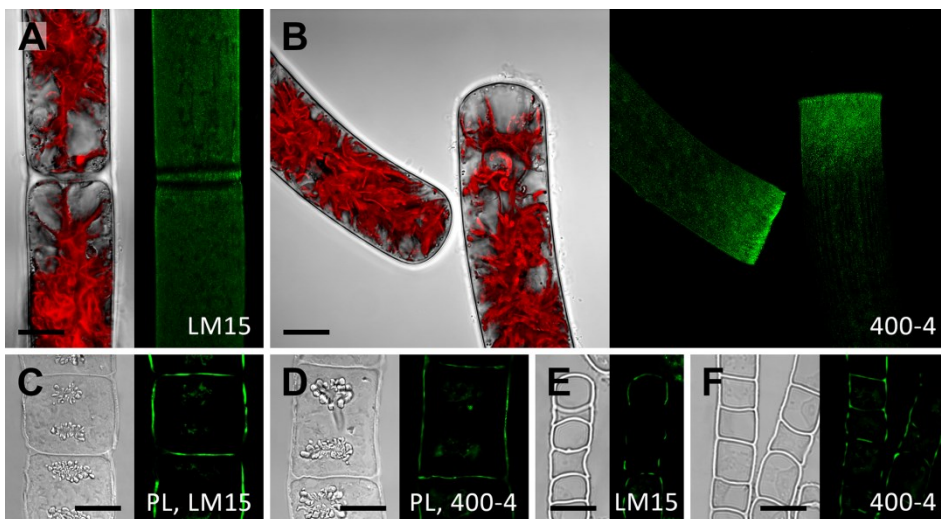


Fig. S2. Immunolabelling of whole cells and semithin sections (CLSM micrographs). *Zygnema S* (A-D) and *Klebsormidium crenulatum* (E, F) filaments labelled with the monoclonal antibodies LM15 or 400-4. Whole cell labelling (A, B), labelling of semithin sections (C-F). Red autofluorescence is shown. (A) Weak fluorescence in outer and cross cell walls. (B) Recently fragmented filament with fluorescence close to terminal cross cell walls. (C-F) Labelling in outer and cross cell walls. Bars 10 = μ m

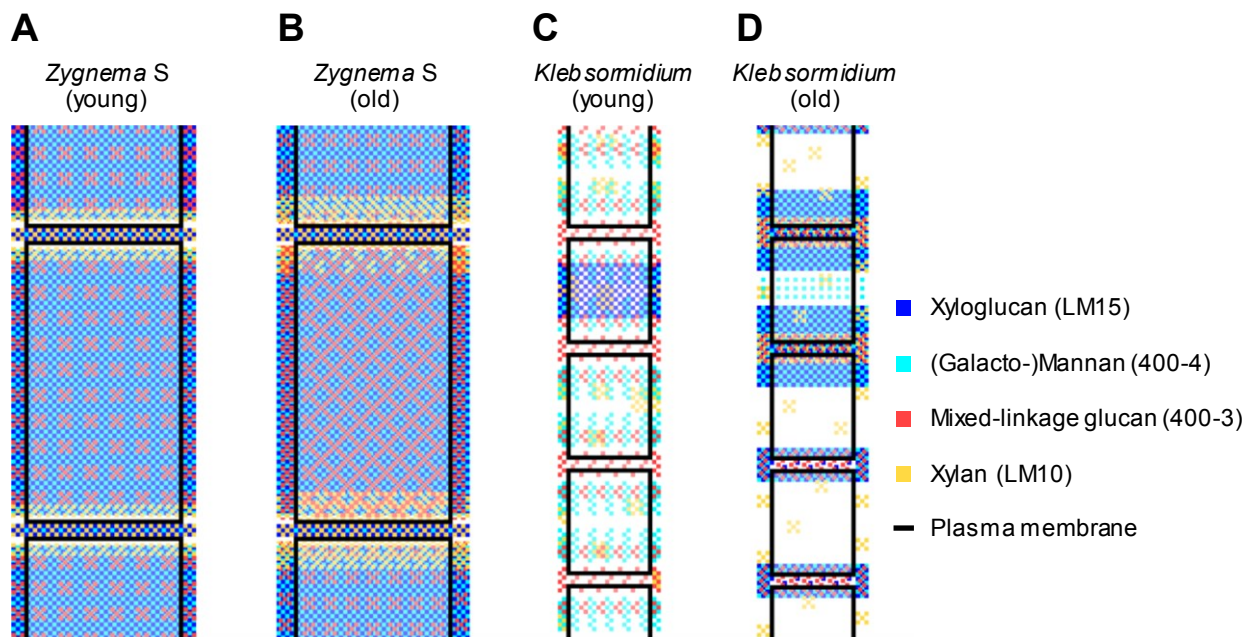


Fig. S3. Hemicellulose distribution in filamentous charophytes. Schemes are based on immuno-localisations of hemicellulose epitopes (antibody names in brackets) in young (1 month) and old (12 months) filaments of (A, B) *Zygnema S* and (C, D) *Klebsormidium crenulatum*.

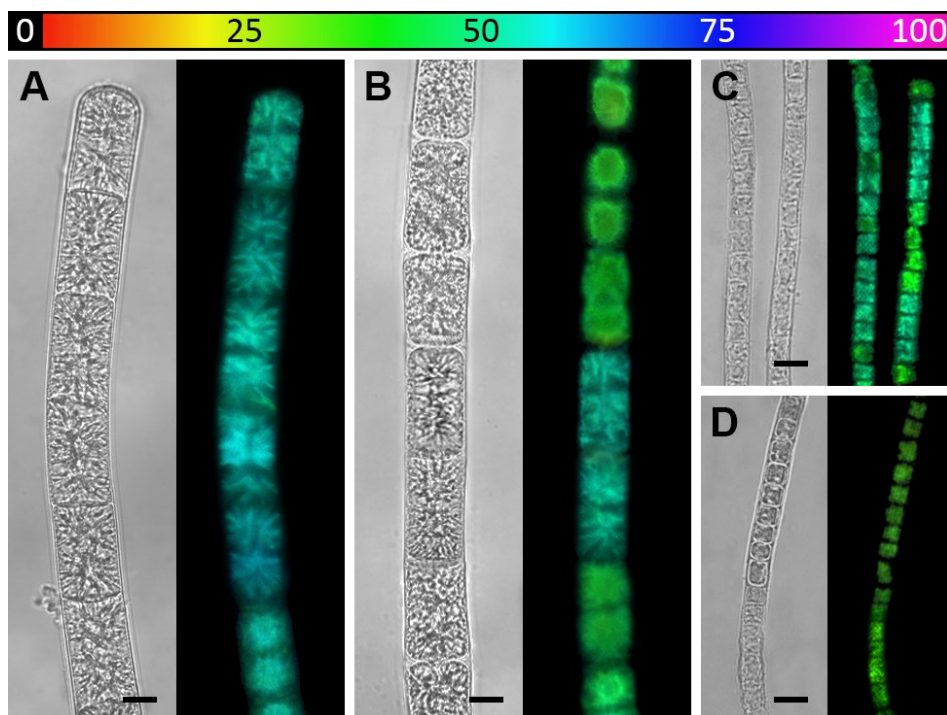


Fig. S4. Photosynthetic performance of *Zygnema S* and *Klebsormidium crenulatum*. NIR and corresponding Y(II) images (false colour) of young (A, C) and old (C, D) filaments of *Zygnema S* (A, B) and *Klebsormidium* (C, D). The colour bar at the top indicates the relative Y(II) as a percentage. (A) Vacuolated cells containing two stellate chloroplasts and high Y(II) values (~ 0.64). (B) Akinete cells dominate old filaments and exhibit a lower Y(II) (i.e. ~ 0.41) than younger (i.e. vacuolated, thin-walled, growing) cells within the same filament (~ 0.6). (C) Cells of young filaments with a higher Y(II) ($\sim 0.48-0.59$) than cells of old filaments (D) (~ 0.3). Bars = 10 μm .