

Abstract

Phytohormone auxin plays an important role in regulating plant development. Directional (polar) cell-to-cell auxin transport creates auxin gradients within plant tissues, which trigger a specific developmental response. The vast majority of available data concerns angiosperms. Lower land plants have been much less explored in this regard, but the important auxin-related mechanisms (including polar auxin transport) are already present in mosses. To uncover the origins of auxin action, one must focus on green algae, especially of clade *Streptophyta*, which are the direct ancestors of all land plants.

In this study, the possible effects of auxins, both native and synthetic, were investigated on two algae: basal, unicellular *Chlorella lobophora* and advanced, filamentous *Spirogyra sp.* The latter received comparably more attention, since it belongs to a clade now acknowledged as a sister group to land plants. *Chlorella lobophora* culture growth was irresponsive to synthetic auxin NAA. The average *Spirogyra sp.* cell length was, however, changed by auxins at high concentrations. By conducting accumulation assays of radioactively labelled auxins and HPLC analysis, auxin metabolism and transport was investigated in *Spirogyra sp.* This alga was able to metabolize the plant-native IAA, but not synthetic auxins NAA and 2,4-D. Auxin efflux, if present, was unaffected by land-plant auxin efflux inhibitors. By contrast, there was inhibition of auxin influx, which is presumably driven by ABC carriers. ABC family are evolutionary ancient and diverse transporters. Using available transcriptomic data for *Spirogyra* genus, an incomplete gene sequence orthologous to *Arabidopsis thaliana* ABCB19 auxin efflux carrier was identified. A partial sequence orthologous to *AtABCB19* was isolated from *Spirogyra sp.*

While no effect of auxin on *Chlorella lobophora* was observed, *Spirogyra sp.* is able to metabolize IAA, but not NAA and 2,4D. Furthermore, it contains an auxin influx mechanism and its cells responded to high exogenous auxin concentrations by changes in cell elongation. These results suggest that some of the mechanisms of auxin action are already present in the streptophyte *Spirogyra sp.*

Keywords: auxin, auxin transport, green algae, *Spirogyra*, *Chlorella*, cell length, metabolism, ABC, IAA, NAA, 2,4-D