Polar auxin transport is integrated in diploid generation of sporophytic tissue but not in haploid gametophytic shoots in mosses

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The control of auxin distribution, regulated by synthesis, metabolism and polar auxin transport (PAT), is important for various physiological phenomena and morphogenesis of shoots in diploid generation of angiosperms. There are, however, few literatures about the regulation of auxin distribution in mosses. Mosses develop a shoot-like structure, the gametophore in the haploid generation, although this shoot-like structure evolved independently of the diploid shoots of angiosperms. In their diploid generation, mosses generate a rather simple structure, the sporophyte, which does not develop lateral organs. It is intriguing to discover how the distribution of auxin is regulated and how it controls physiology and morphogenesis in the development of the gametophore and sporophyte of mosses.

To reveal the distribution of auxin and responses to it in mosses, we fused the promoter of auxin-inducible gene, *GH3* from soybean to *GUS* reporter gene and introduced it into *PpMADS2* locus to create *GH3:GUS* transgenics of *Physcomitrella patens*. We examined the expression pattern of the *GUS* reporter gene in the transgenic plants. We also tested PAT directly by using conventional agar-block methods with ^{14}C-IAA in gametophores and sporophytes in some mosses.

Neither the polar movement of ^{14}C-IAA nor the effect of auxin transport inhibitors was detected in gametophores. In contrast, PAT was detected in sporophytes, which was suppressed by auxin transport inhibitors, as seen in angiosperms. Drastic change was observed in GUS staining pattern during embryogenesis of sporophytes, and the treatment of auxin transport inhibitor caused abnormal development of embryos. These results suggest that PAT plays significant roles in embryogenesis of the sporophyte generation, whereas it does not appear to play a role for the development of gametophores in mosses.