Plant Aurora kinases are required for maintaining the level of endored uplication

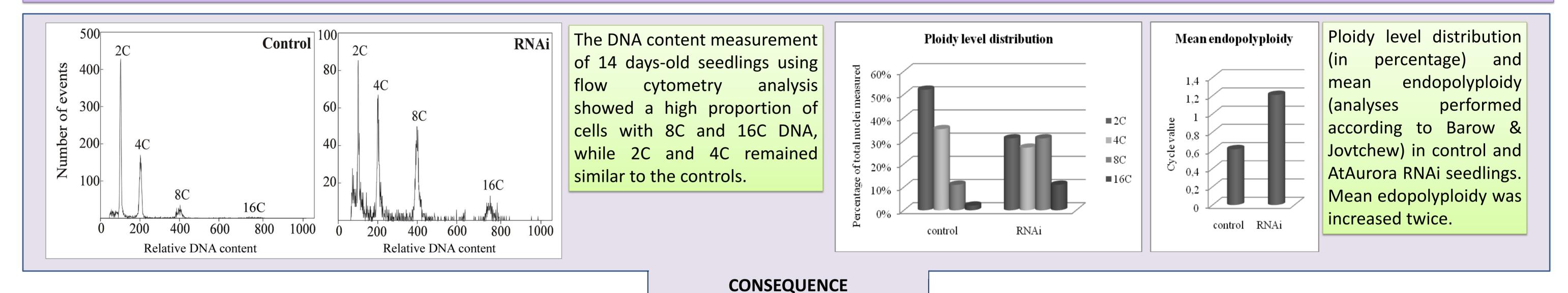
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INTRODUCTION: Metazoan Aurora kinases (A, B and C) belong to the major regulators of cell cycle and cytokinesis and are expressed in many types of cancer cells. In Arabidopsis thaliana (L.) Heynh. three Aurora kinases (1, 2 and 3) were identified. AtAurora 1 and 2 with high level of homology were localized to the interphase nuclei, during mitosis to the spindle and to the cell plate during cytokinesis. AtAurora 3 engages the role of chromosomal passenger-like protein with its localisation to chromosomes. The initiation of endoreduplication process is crucial during development in Arabidopsis thaliana seedlings. RNA interference (RNAi) approach revealed increased level of endoreduplication and requirement of AtAurora kinases for maintaining meristematic activity and controlling the cell differentiation.

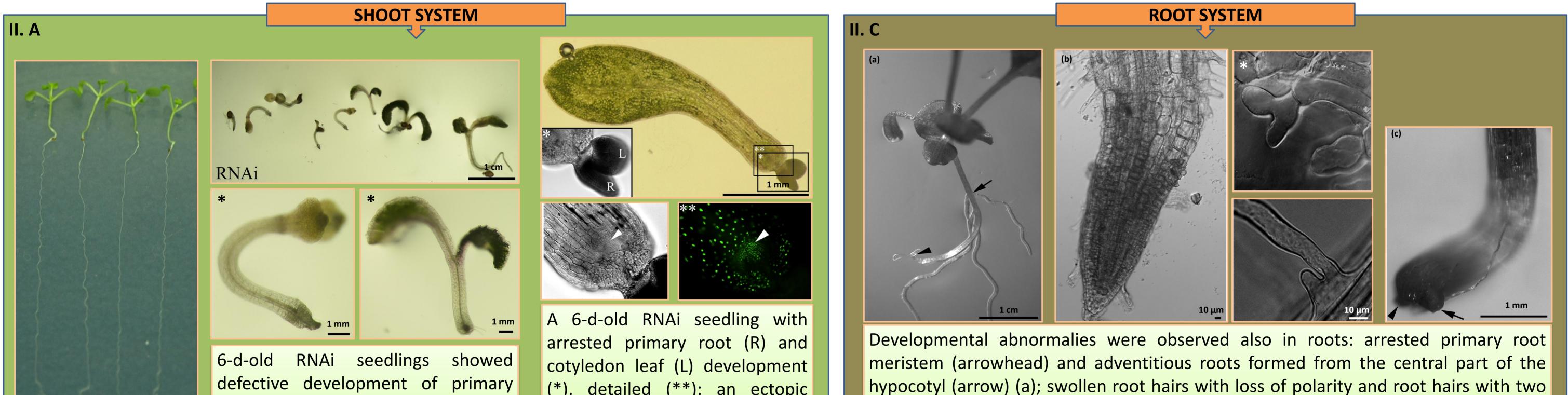
RESULTS:

I. Level of endoreduplication was higher in RNAi seedlings compared to wild-type.



II. Plant AtAurora kinases are implicated in maintaning meristematic cells.

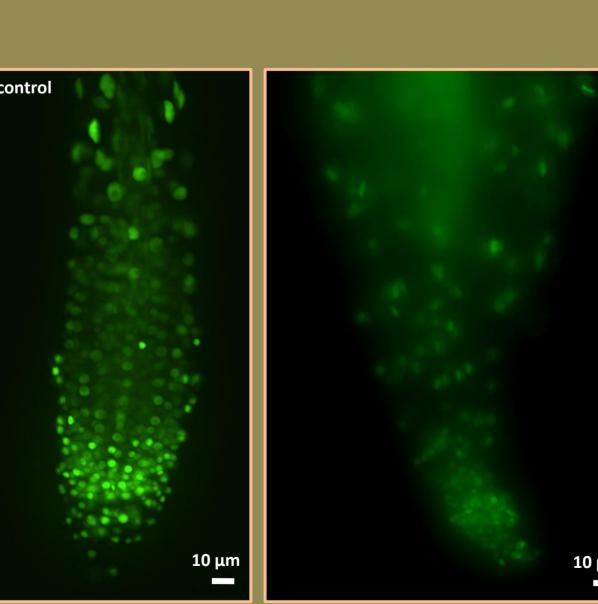
root, detailed in (*), and shoot

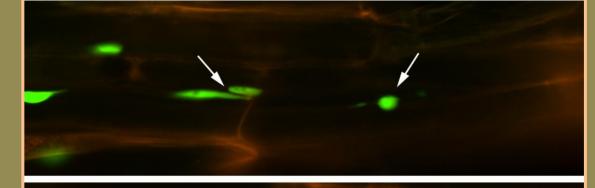


(*), detailed (**): an ectopic meristem formed from the base of a cotyledon leaf (arrowheads).

growth axes (*) b); the lateral root meristem (arrow) initiated close to the arrested primary meristem (arrowhead) (c).

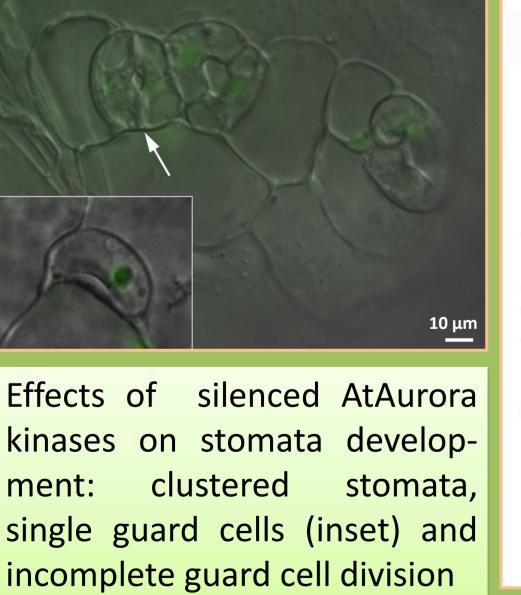
II. D



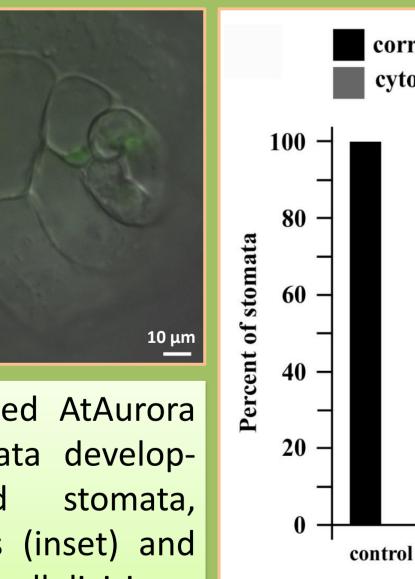




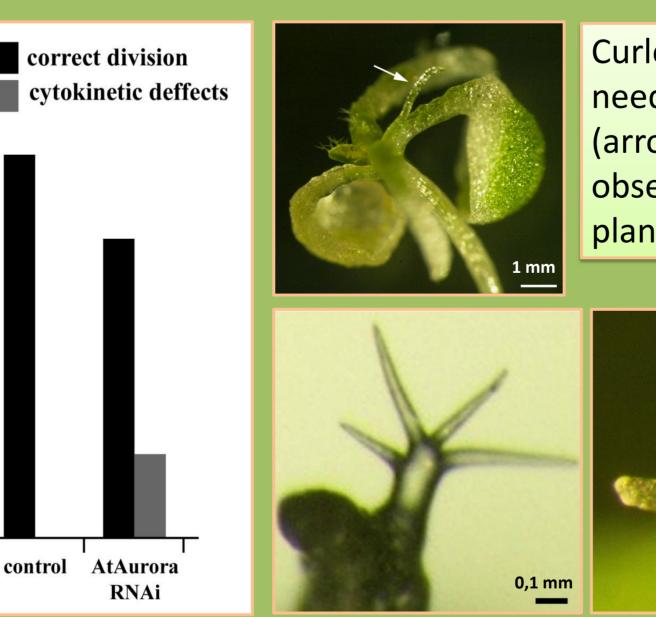
Nuclei of hypocotyl cells in RNAi plants formed into spindle-like strangulated shape (arrows).



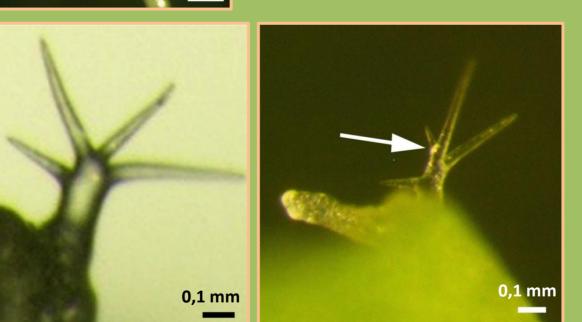
II. B



meristems.



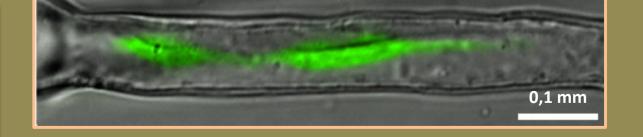
Curled, fragile and needle-like leaves (arrow) were often observed in RNAi plants.



(arrow). Frequencies of stomata with cytokinetic defects in RNAi plants were higher compared to the control (graph).

Irregular shape trichome with OŤ increased branch points number (arrow) indicates increased level of endoreduplication.

Development in meristematic zone was impaired: irregular division of cell files and nuclei in roots of At Auroras downregulated plants of Arabidopsis thaliana.



RNAi root hairs with filamentous nuclei.

CONCLUSION: Phenotypic analysis of RNAi plants revealed developmental defects in both root and aerial parts. Defective cell division, arrested primary meristems, ectopic meristems, trichoms with supernumerary branches, cells with large nuclei or cells with several nuclei of irregular shape were often observed. Down-regulating Aurora kinases in Arabidopsis thaliana plants also resulted in higher levels of endoreduplication. Thus it can be assumed that defects in cell division and primary meristematic proliferation are accompanied by entry into endored uplication programme. Results of this study reveal the importance of plant AtAurora kinases in the control of cell division, their requirement for maintaining of meristematic activity and for the switch from meristematic cell proliferation to the differentiation and endoreduplication.

REFERENCES: Petrovská et al. (2012). Plant Aurora kinases play a role in maintenance of primary meristems and control of reduplication. New Phytologist 193: 590–604; Barow, M., and Jovtchew, G. (2007). Endopolyploidy in plants and its analysis by flow cytometry. 349-372. In: Doležel, J., Greilhuber, J., Suda, J. (eds.): Flow Cytometry with Plant Cells., Pp. 454. Wiley-VCH Verlag GmbH & Co. KGaA, Weinheim, 2007.



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nuclei

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