Certificate of Attendance

This is to certify that

Widi Sunaryo

has participated : **as poster presenter**

in

The International Symposium
on Human Development and Sustainable Utilization of Natural Resources
in Asian Countries

and

"The 6th Korea - Thailand - Indonesia
Joint Symposium on Biomass Utilization and Renewable Energy"

held at Balikpapan, Indonesia, July 9 .2012

Organizing Committe,
chair

Dr. Rudianto Amirta

KNOX function during lignification in Arabidopsis

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Introduction

KNOX genes (Knotted1-like genes e.g. *KNAT1*, *KNAT2*, *STM*), which comprise a small gene family with eight members in *Arabidopsis thaliana*, are key-players of differentiation control. In vascular development *KNAT1/BP* (*BREVIPEDICELLUS)* has been shown to regulate the lignification of procambial derivates (Mele et al., 2005) and it was suggested that *KNAT1/BP* is playing a similar role as a repressor of differentiation in the procambium as *STM* plays in the shoot apical meristem. Here, we address the role of *KNAT1/BP* during secondary growth in the Arabidopsis hypocotyl.

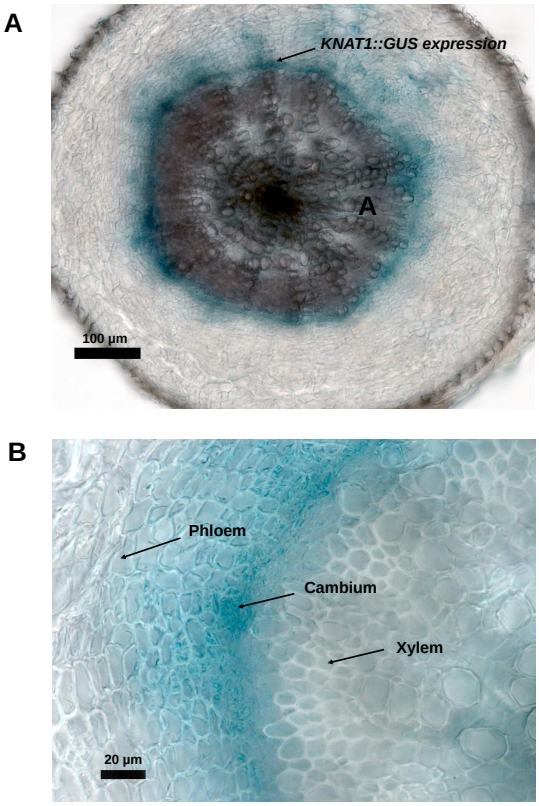

Figure 1. Expression of ***KNAT1::GUS*** in Arabidopsis hypocotyl. A. 10x magnification B. 40x magnification. Blue colour: **KNAT1::GUS** activity.

Materials and Methods

Plant material and growth condition

Homozygous *knox* mutant plants (SALK lines) were identified by screening on kanamycin and genotyping by PCR. Wild-type *Arabidopsis thaliana Columbia-0* (*Col-0*), *knox* mutants, *KNAT1-overexpressor* (*35S::KNAT1*) and *KNAT1::GUS* plants were grown on soil in long-days (16-h light, 8-h dark) for 3-4 months in a greenhouse.

GUS expression assays and lignin staining

Hypocotyls of 12 week old *KNAT1::GUS* plants were incubated in GUS staining solution containing the GUS substrate X-GlcA for 3 hours and afterwards hand-sectioned, fixed in FAE and mounted in chloralhydrate:glycerol. Phloroglucinol staining was performed on cross sections of the oldest inflorescence stem segments and on the hypocotyls of 12 week old plants.

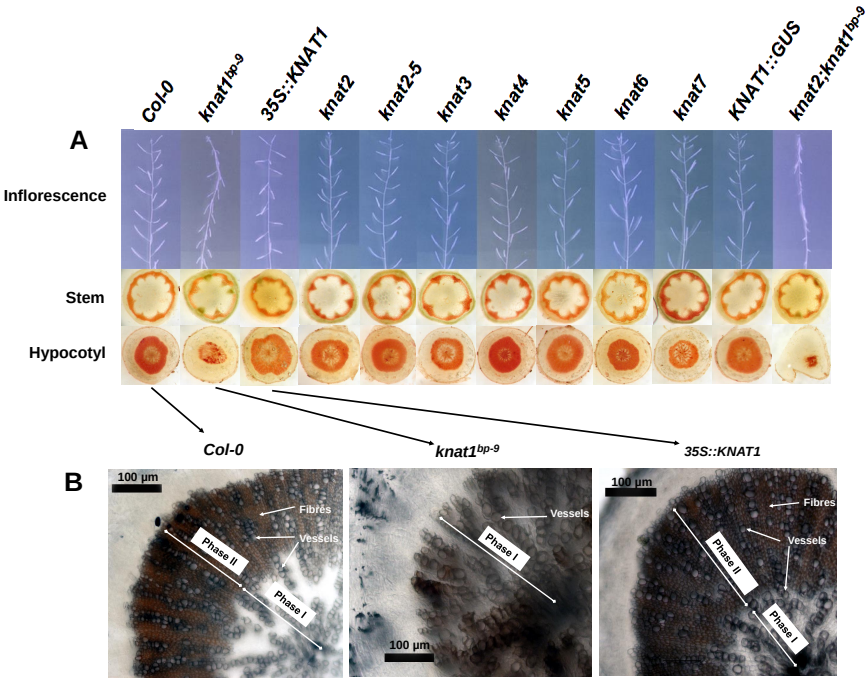

Figure 2. Lignification in Arabidopsis *knox* mutants. A. In inflorescence stem and hypocotyl, B. Lignin deposition and secondary xylem development in hypocotyl of wild type (*Columbia-0*), *knat1*$^{bp-9}$, and *Overexpressor 35S::KNAT1.*

Results and Conclusion

KNAT1::GUS was specifically expressed in cambial cells and the developing phloem (Figure 1A and B) suggesting an important role of *KNAT1* in secondary growth. Wild-type secondary growth in the hypocotyl can be divided into two phases; during phase I xylem vessels and parenchyma and during phase II xylem vessels and fibers are formed (Chaffey et al., 2002). The null-mutant *knat1*$^{bp-9}$ displayed severe defects in the organization of secondary xylem formation in hypocotyls (Figure 2A and B). Phloroglucionol staining in the hypocotyl showed that in the *knat1*$^{bp-9}$ vascular development was arrested in phase I and xylem fibers were almost completely absent (Figure 2A and B). In the other *knox* mutants similar phenotypes could not be observed (Figure 2A) indicating that these *KNOX* genes are not or only redundantly required for the differentiation of xylem fibers. Double mutant analyses will enlighten their contribution.

Literature

Chaffey N, Cholewa E, Regan S and Sundberg B, 2002. Secondary xylem development in *Arabidopsis:* a model for wood formation. Physiologia Plantarum 114,594-600.

Mele G, Ori N, Sato Y and Hake S, 2005. The knotted-like homeobox gene *BREVIPEDICELLUS* regulates cell differentiation by modulating metabolic pathways. Genes & Development 19, 2088-2093.

Acknowledgment

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The International Symposium
on Human Development and Sustainable Utilization of Natural Resources in Asian Countries
and
The 6th Korea-Thailand-Indonesia Joint Symposium on Biomass Utilization and Renewable Energy

June 25th, 2012

INVITATION LETTER

Dr. Widi Sunaryo
Faculty of Agriculture
Mulawarman University
Indonesia

Dear Dr. Widi Sunaryo,

We would like to invite you to attend The International Symposium on Human Development and Sustainable Utilization of Natural Resources in Asian Countries and The 6th Korea-Thailand-Indonesia Joint Symposium on Biomass Utilization and Renewable Energy on July 9, 2012 in Mulawarman University, East Kalimantan, Indonesia.

We do hope very much if you could attend the symposium and present your poster in the symposium. If you have any question or you need any information, please do not hesitate to contact us. I am looking forward to see you at the Symposium. Thank you very much for your attention.

Sincerely yours,

Rudianto Amirta
Chairman of the Symposium

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The International Symposium on Human Development and Sustainable Utilization of Natural Resources and Energy in Asia Countries

and

6th Korea - Thailand - Indonesia Joint Symposium on : Biomass Utillization and Renewable Energy

Balikpapan-Derawan, East Kalimantan, Indonesia
8 - 14 July, 2012

Ministry of Industry
REPUBLIC OF INDONESIA

INTRODUCTION

The 6th Korea – Thailand – Indonesia Joint Symposium on Utilization of Biomass and Renewable Energy is an annual seminar organized by Consortium of Korea, Thailand and Indonesia universities, namely Korea University, Chulalongkorn University, Naresuan University, Mulawarman University, and Brawijaya University.

We are pleased to invite you to attend the 6th KTI 2012 on 8–11 July, 2012 in Samarinda, East Kalimantan, INDONESIA.

The Symposium will be held at the Le Grandeur Hotel Balikpapan

We seek a diverse audience of influential attendees from academe, government, and industry who are place to shape and promote future Resource Efficiency and Advance Technology on Biomass Utilization and Renewable Energy. The Symposium will become a platform of science and technology forum among scholars, researches and practitioners in the field of biomass utilization and renewable energy, and related topics through paper presentations and invited speakers.

For more information or to register please contact to our email :

isymposium2012@yahoo.com

TOPICS

- Renewable energy resources and alternatives
- Lignocellulosic material and the future of raw material for bioethanol industry
- Wood supply and sustainable forest management system
- Enzyme production and application on biofuel-bioenergy industry
- Pulp and paper Technology
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CALL FOR PAPERS

The symposium will feature oral and poster presentations.

Author are invite to submit abstract via:

isymposium2012@yahoo.com

Accepted oral and poster presentantion are required to submit the full-paper version. The abstract and papers will be included in the symposium proceeding.

IMPORTANT DEADLINE

Abstract Submission : **June 14, 2012**
Full Paper Submission : **June 28, 2012**