

RGC Ref.: M-CUHK410/13

(please insert ref. above)

**The Research Grants Council of Hong Kong
SRFDP & RGC ERG Joint Research Scheme
Completion Report**

*(Please attach a copy of the completion report submitted to the Ministry of Education
by the Mainland researcher)*

Part A: The Project and Investigator(s)

1. Project Title

Ethylene-induced subcellular re-distribution of EIN2 and its functional implications
乙烯誘導的EIN2亞細胞定位模式重新分布及其功能

2. Investigator(s) and Academic Department/Units Involved

	Hong Kong Team	Mainland Team
Name of Principal Investigator <i>(with title)</i>	Prof. JIANG, Liwen	Prof. GUO, Hongwei
Post	Professor	Professor
Unit / Department / Institution	School of Life Sciences, The Chinese University of Hong Kong	School of Life Sciences, Peking University (China)
Contact Information	ljiang@cuhk.edu.hk	hongweig@pku.edu.cn
Co-investigator(s) <i>(with title and institution)</i>	Dr. ZHAO, Qiong (Postdoc) School of Life Sciences, The Chinese University of Hong Kong	
PhD student(s) (with period of involvement)	Name: Ms. WANG, Xiangfeng Mr. ZENG, Yonglun Institution: School of Life Sciences, The Chinese University of Hong Kong Period from <u>1 Jan 2014</u> to <u>31 Jul 2015</u>	Name: Mr. LI, Wenyang Mr. JI, Yusi Institution: School of Life Sciences, Peking University, China Period from <u>1 Jan 2014</u> to <u>31 Jul 2015</u>

Note: The Hong Kong project team must involve at least one research postgraduate student pursuing a Doctor of Philosophy degree at the UGC-funded university (PhD student) at any time throughout the project period.

3. Project Duration

	Original	Revised	Date of RGC/ Institution Approval (<i>must be quoted</i>)
Project Start date	1 Jan 2014		
Project Completion date	31 Dec 2016		
Duration (<i>in month</i>)	36 months		
Deadline for Submission of Completion Report	31 Dec 2017		

Part B: The Completion Report

5. Project Objectives

5.1 Objectives as per original application

1. To study the functional significance of EIN2 speckle in ethylene signalling.
2. To isolate the possible association proteins and mRNAs of EIN2 speckles.
3. To uncover the role of EIN2 in P-body formation and overall translation regulation.
4. To study the formation dynamics of EIN2-containing P-Body.
5. To promote collaborative research between Universities in Hong Kong and Mainland China.

5.2 Revised Objectives

Date of approval from the RGC: _____

Reasons for the change: _____

- 1.
- 2.
3.

6. Research Outcome

Major findings and research outcome
(maximum 1 page; please make reference to Part C where necessary)

1. We have demonstrated that ethylene specifically induced the formation of EIN2 speckle through its signaling pathway in a very short time. Then we propose that EIN2 forms P-Body speckles to inhibit the general (or selected) translational process, and the

- formation of EIN2 speckle is necessary for the function of EIN2 in mediating the quick transcription-independent ethylene signaling.
2. Through study of ethylene induced EIN2-containing P-body formation in different mutants of ethylene signalling components, we found that ethylene-induced redistribution of EIN2-GFP dots pattern is dependent on its signalling perception. Interestingly, we also found that EIN3/EIL1 are essential for ethylene-induced redistribution of EIN2-GFP dots because EIN2-GFP failed to form dots in *ein3eil1* mutants with ACC treatment.
 3. To our surprise we found that in *ein2* mutant, EIN2 C-terminus forms dots in response to ACC treatment, suggesting that ethylene-induced redistribution of EIN2-GFP dots pattern is dependent on EIN2 C-terminus.
 4. We are currently in preparation of a manuscript through joint communication and academic discussion.

Potential for further development of the research and the proposed course of action
(*maximum half a page*)

N.A.

7. The Layman's Summary

(*describe in layman's language the nature, significance and value of the research project, in no more than 200 words*)

Plant hormone ethylene regulates a wide range of plant response to developmental and environmental signals. Extensive genetic and biochemical evidences have established the largely linear framework of ethylene signal transduction pathway. ER-localized positive regulator EIN2 mediates almost all ethylene responses as loss of function *ein2* mutant confers completely ethylene insensitivity. Studies about ethylene growth kinetics found that ethylene responses are composed of an early quick transcription independent response phase (phase I) and a late slow transcription dependent phase (phase II), and EIN2 is essential for both phases. EIN2 locates at the endoplasmic reticulum (ER) membrane. Based on our study here, we propose that in a very short time period (15mins), ethylene specifically induce the subcellular redistribution of EIN2 from ER into cytoplasmic foci, which forms speckles in the P-bodies and thus repress translation. This scenario represents a completely novel mechanism in ethylene signaling and plant hormone response. Through these joint-research efforts, we have studied the nature and function of EIN2 speckle in ethylene signalling, identified certain components of EIN2 speckles, thus providing information for bio-improvement of plants to control ethylene-regulated process.

Part C: Research Output

8. **Peer-reviewed journal publication(s) arising directly from this research project**
(*Please attach a copy of each publication and/or the letter of acceptance if not yet submitted in the previous progress report(s). All listed publications must acknowledge RGC's funding support by quoting the specific grant reference.*)

The Latest Status of Publications				Author(s) <i>(bold the authors belonging to the project teams and denote the corresponding author with an asterisk*)</i>	Title and Journal/ Book <i>(with the volume, pages and other necessary publishing details specified)</i>	Submitted to RGC <i>(indicate the year ending of the relevant progress report)</i>	Attached to this report <i>(Yes or No)</i>	Acknowledged the support of this Joint Research Scheme <i>(Yes or No)</i>	Accessible from the institutional repository <i>(Yes or No)</i>
Year of publication	Year of Acceptance <i>(For paper accepted but not yet published)</i>	Under Review	Under Preparation <i>(optional)</i>						
			2017	Zhao Q, Guo H and Jiang L	Formation of EIN2 speckle is necessary for the function of EIN2 in mediating the quick transcription-independent ethylene signaling	No	No	Yes	No

9. Recognized international conference(s) in which paper(s) related to this research project was/were delivered *(Please attach a copy of each delivered paper. All listed papers must acknowledge RGC's funding support by quoting the specific grant reference.)*

Month/Year/Place	Title	Conference Name	Submitted to RGC <i>(indicate the year ending of the relevant progress report)</i>	Attached to this report <i>(Yes or No)</i>	Acknowledged the support of this Joint Research Scheme <i>(Yes or No)</i>	Accessible from the institutional repository <i>(Yes or No)</i>
Apr/2014/Korea	Suppressors screening for identification of new components involved in protein trafficking and organelle biogenesis in Arabidopsis	East Asian Cell Biology Workshop 2014 Conference	No	Yes	Yes	No

Jul/2015/France	Fast-suppressor screening identified SOF10 and SOF100 in FREE1-regulated protein trafficking, organelle biogenesis and plant growth in Arabidopsis thaliana	The 26th International Conference on Arabidopsis Research (ICAR)	No	Yes	Yes	No
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10. Student(s) trained *(Please attach a copy of the title page of the thesis.)*

Name	Degree registered for	Date of registration	Date of thesis submission/ graduation
WANG Xiangfeng	Ph.D	Aug 2009	Jan 2015
ZENG, Yonglun	Ph.D	July 2010	Jan 2016

11. Other impact *(e.g. award of patents or prizes, collaboration with other research institutions, technology transfer, etc.)*

NIL