

様式 A-1
(FY2025)

2025 年 12 月 17 日

サイエンス・ダイアログ 実施報告書

1. 学校名： 福島県立安積高等学校
2. 講師氏名： Dr. Md. Nuruzzaman
3. 講義補助者氏名： なし
4. 実施日時： 2025 年 12 月 10 日（水） 14:15 ～ 16:05
5. 参加生徒： 3 年生 36 人、 年生 人、 年生 人（合計 36 人）
備考：(3 年 SSH クラスの生徒)
6. 講義題目： コールラビの塊茎形成の遺伝的メカニズム
7. 講義概要： コールラビの塊茎形成のメカニズムを遺伝子解析によって行った
8. 講義形式：
対面 ・ オンライン（どちらか選択ください。）
 - 1) 講義時間 50 分 質疑応答時間 30 分
 - 2) 講義方法（例：プロジェクター使用による講義、実験・実習の有無など）
プロジェクター使用による講義
 - 3) 事前学習
有 ・ 無（どちらか選択ください。）
使用教材： プロジェクター、スクリーン
9. その他特筆すべき事項：
いつも大変お世話になっております。本校のような地方の学校では、生徒が接触できる外国人は決して多くなく、Science Dialogue はとても貴重な機会となっています。今後ともどうぞよろしくお願いいたします。

Form B-2
(FY2025)
Must be typed

Date (日付) 15 / 12 / 2025
(Date/Month/Year: 日/月/年)

Activity Report -Science Dialogue Program-
(サイエンス・ダイアログ 実施報告書)

- Fellow's name (講師氏名): Nuruzzaman Md (ID No. P24400)
- Name and title of the lecture assistant (講義補助者の職・氏名)

- Participating school (学校名): Asaka High School
- Date (実施日時 10 / 12 / 2025)
(Date/Month/Year: 日/月/年)
- Lecture title (講義題目):
Genetic Mechanism of Tuberization in Kohlrabi (*Brassica oleracea* var. *gongylodes*)
- Lecture format (講義形式):
◆ Onsite ・ Online (Please choose one.)(対面 ・ オンライン)((どちらか選択ください。))
◆ Lecture time (講義時間) 35 min (分), Q&A time (質疑応答時間) 30 min (分)
◆ Lecture style (ex.: used projector, conducted experiments)
(講義方法 (例: プロジェクター使用による講義、実験・実習の有無など))
Using projector, Powerpoint presentation, Oral presentation _____

- Lecture summary (講義概要): Please summarize your lecture within 200-500 words.
Kohlrabi (*Brassica oleracea* var. *gongylodes* L.) is an important vegetable crop of Brassicaceae having round to cylindrical shaped fleshy stem tuber which is the main edible part and key determinant of yield and quality of this crop. Therefore, the dissection of genetic mechanism of tuberous stem formation is the foundation for the improvement of tuber quality and yields through molecular breeding. Tuberization in kohlrabi is a complex biological process of cell division and expansion, carbohydrates, phytohormones and transcription factors. Consequently, we identified some genes under the above-mentioned categories which are involved in tuber formation in kohlrabi as well in other brassica and related species. The profound cambial activity was observed in kohlrabi stem compared to broccoli. Effect of endogenous and exogenously applied major phytohormones like auxin, gibberellin and cytokinin have been reported during tuber formation in turnip, stem mustard, sweet potato and radish. Thus, the profiles of six major phytohormones were studied during tuber formation in kohlrabi. The lower level of IAA, absence of GA4 and higher concentration of cytokinin are crucial for kohlrabi stem tuber formation. Four significant QTLs for

radial enlargement of kohlrabi stem, namely, *REnBo1*, *REnBo2*, *REnBo3* and *REnBo4* were detected on four different chromosomes; C02, C03, C05 and C09, respectively. The QTLs *REnBo1* and *REnBo2* were further reconfirmed using a different backcross population derived from DH lines of kohlrabi and broccoli. As *REnBo2* was repeatedly detected for both stem diameter and stem grade traits in both populations, we focused on the fine mapping of this QTL. Consequently, *REnBo2* was delimited to a 87.5-kb interval having three annotated genes. The gene structure and expression analyses of the candidates, along with the transcriptome and endogenous phytohormone profiles led to the identification of CBL-interacting protein kinase 6 (*CIPK6*) as a promising candidate for *REnBo2*. The knockdown mutant of *CIPK6* reduced acropetal and basipetal auxin transport and the mutant exhibited swollen hypocotyls with reduced expression of auxin transporters compared to the wild type. Thus, we transformed the SALK_080951 knockdown mutant line of *Arabidopsis* with broccoli *CIPK6* allele and observed that the hypocotyl of transgenic plant is non-swollen type, which prove that *CIPK6* control swollen or non-swollen hypocotyl in *Arabidopsis*. To further find out the exact role of *CIPK6* in tuberization of kohlrabi through functional analyses, which includes the complementation experiment by transforming the kohlrabi genome with the broccoli *CIPK6* allele. We expect that the transgenic kohlrabi plant having broccoli *CIPK6* allele will possess non-swollen stem as like broccoli or reduced swollen type stem like grade 1 or 2.

◆Other noteworthy information (その他特筆すべき事項):

- Impressions and comments from the lecture assistant (講義補助者の方から、本プログラムに対する意見・感想等がありましたら、お願いいたします。):



Thank You Everyone

安積高校

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