**Purpose:**

* To reinforce the understanding of different types of mutations and application of mutagenesis to obtain a new trait
* To reinforce the understanding of inheritance pattern of a new trait
* To reinforce the understanding of identification of mutants

**Keywords**: Mutagenesis, anther culture, herbicide resistance, point mutation, chromosomal mutation, base substitution, transition, transversion, silent, missense, nonsense mutations

**References:** CG **Mutations and Variation** Module 9

**CG ALA-9\_ Mutations and Variation Module 9**

1. Rice plants resistant to bispyribac-sodium (BS), the active compound of an acetolactate synthase (ALS)-inhibiting herbicide was obtained by mutagenesis through anther culture in the presence of BS (Okuzaki et al., 2007. A novel mutated acetolactate synthase gene conferring specific resistance to pyrimidinyl carboxy herbicides in rice, Plant Molecular Biology 64:219-224).

a. What experiments would you conduct to determine the inheritance of the BS resistance trait obtained through mutagenesis?

b. What data would you collect and what analyses would you perform to determine the inheritance?

c. How would you interpret the experimental results?

d. Sequencing of the mutants and the wild type indicated that the 284th nucleotide of the *ALS* gene has changed from G to C, which caused amino acid substitution of the 95th glycine to alanine. Answer the following:

Is the mutation a point mutation or chromosomal mutation? Explain your answer.

Is the base substitution a transition or transversion? Explain your answer.

Is the mutation a silent, missense or nonsense mutation? Explain your anwer

2. Assuming a BS-resistant mutant plant is obtained for a strictly out-crossing species

a. What would you do to determine the inheritance of the herbicide resistance trait?

b. Based on your answer to question a, are out-crossing species suitable for mutagenesis breeding? Explain your answer.