Attachment IV-1

Improvement of Banana for *FUSARIUM* Wilt Resistance and High Fruit Quality through Mutation Induction

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Abstract

Popular local banana cultivar called Berangan (*Musa sp*p. AAA) was selected as the starting material for mutation induction using gamma rays. Radiosensitivity test was carried out by irradiating meristem tips obtained from suckers with a series of gamma ray doses of 0, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100Gy. Data for radiosensitivity test was determined by 3 parameters, such as 1) Plant height (shoot height), 2) Percentage of survival of irradiated explants and 3) Multiplication or Growth Rate. Based on the percentage survival of irradiated explants, LD_{50} and LD_{100} obtained for cultivar Berangan were 50Gy and 80Gy respectively. Using selected effective doses of 20, 30, and 40Gy, all in vitro shoots derived from irradiated meristems were subcultured from M1V1 upto M1V5 and rooted. These rooted in vitro plantlets were used to screen for tolerance/resistance against *Fusarium* wilt disease. Four artificial screening techniques for *Fusarium* wilt disease had been developed, such as 1) Dipping of in vitro shoots in *Fusarium oxysporioum* suspension (10_6 spores/ml) for 1-2 hrs and later transferred to sterile sand media in the greenhouse, 2) Double tray method by inoculating in vitro plantlets that had been planted in sand media, 3) Nursery screening method, whereby rooted in vitro plantlets that had been hardened for 4-8 weeks were transferred to media that had been pre-inoculated with *Fusarium oxysporioum* spore suspension (10_6 spores/ml) for 2 weeks and 4) Direct field screening, whereby rooted plantlets that had been dipped in *Fusarium oxysporioum* suspension (10_6 spores/ml) for 1-2 hrs were planted directly in the field. Based on the results obtained after screening of treated plants using artificial inoculation of *Fusarium oxysporioum* in the field, three potential mutants had been identified, such as 1) Tolerant/resistant mutant, 2) High yielding mutant and 3) Early flowering mutant. These mutants will be further screened in the field for multi-location trials.

Keywords: Artificial inoculation, gamma irradiation, *Fusarium* wilt, in vitro mutagenesis, meristems.

Attachment IV-2 Agreement and Request for the Extension of Banana Subproject

Conclusions

1. All participating countries such as Philippines, Vietnam and Malaysia have successfully achieved the objectives of the project by identifying promising mutant lines which are disease resistant (BBTV, *Fusarium* and Nematode).
2. Achievement from this project will be published as proceedings and protocols for irradiation and screening for *Fusarium*, BBTV and Nematode.
3. As a new member of this sub-project of banana, Bangladesh can adopt all the developed disease screening methods by other participating countries.
4. The protocol for anther culture developed by Bangladesh can be adopted by other member countries.

Recommendations

All participating countries agreed to extend this project until 2010 as Phase II towards achieving the final goal of obtaining resistant new varieties of banana based on the following reasons:

Bangladesh

- will adopt mutation breeding technologies which has been established by other participating countries (Philippines, Vietnam, Indonesia, Malaysia) since Bangladesh just started the program last year in 2007
- Bangladesh has established a good protocol for anther culture which can be adopted by other participating countries

Malaysia

- already identified 3 promising mutant lines of variety 'Berangan' banana which are resistant to *Fusarium wilt* with improved agronomic characters such as early flowering, dwarf and high yielding
- will be screened for multi location trials at 3 sites for 2 cropping season (in collaboration with commercial plantations)
- mutants will be registered and micro-propagated for tissue culture plantlet production

Philippines

- already identified 5 promising mutant lines of variety 'Lakatan' which are resistant to BBTV and will screen for multi location trials (farmer's plot) for 2 cropping seasons
- mutants will be registered for plant breeder's right as new varieties
- mutants will be propagated for commercialization

Vietnam

- already identified 2 promising mutant lines of variety 'Tay' banana which are resistant to *Fusarium wilt*
- will be screened for multi location trials at 2 sites (north and central)
- mutants will be propagated for production