

Final Report for Insect Resistance in Orchid

	Thailand	Malaysia	Indonesia
1. The selection of starting breeding materials. - Whether it was appropriate or not?	Started with 4 varieties: 1) D. Sonia Bom 17 Red 2) D. Sonia Earsakul 3) D. White Sanan 4) D. Pinkysem “Rinnapa” But after experiments we found out that <i>D. sonia</i> “Earsakul” was appropriate to be the starting material because it is our commercial variety.	Malaysia Malaysia received tissue cultures materials from Thailand (D. Sonia Bom-17) and Indonesia (D. <i>jayakarta</i>) for this project. Malaysia also used a local variety (D. <i>mirbellianum</i>). <i>D. Sonia</i> Bom-17 is already a popular variety in Malaysia. Starting materials 1. Protocorm-like bodies (PLBs) – for D. <i>mirbellianum</i> , D. <i>jayakarta</i> and D. Sonia Red 17 2. Plantlets – for D. <i>mirbellianum</i> only <i>D. Sonia</i> Red-17 is a valuable variety and important to work with. * <i>D. jayakarta</i> is a fast growing orchid	Breeding materials were obtained from Thailand and Indonesia. <i>Dendrobium Sonia</i> ‘Bom 17’, a leading variety from Thailand as the main material, <i>D. Sonia</i> ‘Bom 17’ is a popular hybrid, fast growing, floriferous, bright colour and has long vase life. <i>D. mirbellianum</i> , from Malaysia, could not grow. <i>Dendrobium Jayakarta</i> is a hybrid variety from Indonesia, with white flower and longer vase life. These two varieties, <i>D. Sonia Bom 17</i> and <i>D. jayakarta</i> , are very meaningful for parent stock of orchid mutation breeding program.
2. Irradiation to starting materials. - The determination of the methods, e.g. appropriate dose, stage of the plant, part of the organ etc.	Starting materials: Protocorm like bodies (PLBs), plantlets and back bulbs Methods of irradiation: acute and chronic gamma rays irradiation, with single and split doses LD₅₀ : Only tested in <i>D. Sonia Earsakul</i> PLBs= 70 Gy Plantlets = 330 Gy Back bulbs = 33 Gy	Irradiation methods; 1. Ion beam D. <i>mirbellianum</i> PLB – optimum dose (0.8 – 1.0 Gy) for PLBs D. <i>jayakarta</i> PLB - used optimum dose of D. <i>mirbellianum</i> . D. <i>Sonia</i> Red 17 – used optimum dose of D. <i>mirbellianum</i> 2. Gamma ray D. <i>mirbellianum</i> plantlet– Optimum dose (60 -80 Gy) D. <i>jayakarta</i> PLB – used 3x10 Gy (split dose) and 30 Gy (radiosensitivity test was not done)	The effect of gamma rays was observed both on <i>D. Sonia</i> ‘Bom 17’ and <i>D. Jayakarta</i> Protocorm like bodies (PLBs) of <i>D. Sonia</i> ‘Bom 17 Red’ was exposed to gamma rays for acute and chronic radiation at the doses 30 – 90 Gy. Optimal dose of local variety, <i>D. Jayakarta</i> . was studied by exposing PLBs, plantlets and young shoots at the doses 40, 80, 160, 320, 640 and 1280 Gy. The most sensitive plant material was young shoots, followed by PLBs and plantlets since there was no young shoot, PLBs and plantlets grew after 12 months irradiation at the doses 40, 80 and 160 Gy respectively. Optimal dose for <i>Sonia Bom 17</i> - just used Thailand’s suggested dose
3. Selection or isolation of mutants with insect resistance. - Establishment of selection method of mutants with insect resistance. - Evaluation or characterization of mutants.	Selection method: natural selection Characterization of the mutants: only healthy and fast growing seedlings of M1 were selected to grow in the nurseries under natural infestation of thrips without spraying of insecticide. Infected plants were discarded. The selected plants were kept to grow to M2-M3 for confirmation of thrip resistance. Already obtained some mutants with variations in flower colors, shapes and sizes but still need to confirm in M4 generation.	1. Development of thrip and mite rearing method (Malaysian researchers were trained under Assistant Prof Chitrapan Piluek, KU, Thailand in 2005). Malaysia will try to use the thrip rearing method developed by Indonesia. 2. Development of the <i>in vitro</i> screening method for insect tolerance. 3. Characterization of mutants – Irradiated plantlets that showed no symptom of infection after a complete life cycle of mites (9 weeks) were categorized as potential mutants and were planted in the glasshouse for further screening at flowering stage	Method of mass rearing thrips by using pumpkins as artificial feeding was developed in order to multiply its population. Waiting for plant to bloom and the plans after that are: 1) Selection will be done by inoculating thrips on the flower of promising orchid mutant lines. The most severe flowers attacked by thrips will be the most susceptible mutant lines obtained. 2) Promising mutant lines for thrips tolerance will be characterized by morphology at flowering stage.
4. Publication of the results or registration of developed cultivars.	Tanatip Prerdpraiwong. 2006. Effects of acute and chronic gamma irradiation on orchids, <i>Dendrobium</i> Sonia “BOM 17 Red” and <i>Dendrobium</i> Sonia “Earsakul”. M.S Thesis, Kasetsart University(in Thai with English abstract). Thana K., C. Piluek, T. Tachasinpitak and A. Wongpiyasatid. 2005. Effects of <i>in vitro</i> gamma irradiation on seedling growth of <i>Dendrobium</i> Sonia “Earsakul”. Agricultural Sci. J. 36 5-6 (Suppl): 669-672.	Ros Anita Ahmad Ramli, Zaiton Ahmad, Sakinah Ariffin & Mohd Nazir Basiran (2006). Mass rearing of mites. MINT Research Note 12/06. p1-4. Ros Anita A. R., Zaiton A., Sakinah A. & Mohd Nazir B. (2007). <i>In vitro</i> screening for tolerance towards insect infestation on ion beam irradiated orchids. <i>Asia Pacific Conference on Plant Tissue Culture and Agribiotechnology (APACPA 2007)</i> , Kuala Lumpur, 18-21 Jun 2007.	1. Sutarto, I., I. Dwimahyani, S. Kartikaningrum. 2005. Selection of <i>Dendrobium</i> orchids against thrips from irradiated plants. Proc. Seminar on Application of Isotope and Radiation. CAIRT. Jakarta. p 1 – 7 2. Sutarto, I., I. Dwimahyani, S. Kartikaningrum. 2006. Observation of irradiation doses on <i>D. Jayakarta</i> and the growth of plantlets cv. <i>D. Sonia</i> ‘Bom 17 Red’ against thrips from irradiated plants. Proc. Seminar on Application of Isotope and Radiation. CAIRT. Jakarta. p 1 – 12.

<p>5. Other result and ripple effects of the project, if there are.</p>	<p>Effects of the project: 1) Workshop on Plant Resistance to Disease was organized for trainees from Malaysia and Thailand 2) A scientific TV program was made on the nuclear technology application in orchid research in Thailand by a Japanese private company. 3) A good awareness of technology has been created in orchid industry, at least 2 companies have utilized the technology for orchid improvement.</p>	<p>We have trained 5 university students from 3 universities in Malaysia in various fields of this project.</p> <p><i>Orchid mutagenesis</i></p> <ol style="list-style-type: none"> 1. Monica Danial (9 May- 30 June 2005) Asian Institute of Medicine, Science & Technology (AIMST), Kedah 2. Joanne Tan Pei Chih (8 May-30 June 2006) Universiti Putra Malaysia (UPM), Selangor. 3. Kamariah Abd Karim (8 May-30 June 2006) Universiti Putra Malaysia (UPM), Selangor. <p><i>In vitro</i> insect rearing / screening of mutants for mite tolerance</p> <ol style="list-style-type: none"> 1. Sulaiman Hassan (8 May-30 June 2006) Universiti Kebangsaan Malaysia, Selangor. <p><i>Genetic transformation</i></p> <ol style="list-style-type: none"> 1. Hamimah Muhamad Taib (17 July – 11 Nov 2006) Universiti Putra Malaysia, Selangor. 	<p>Breeding materials of orchid <i>D. Sonia Bom 17 Red</i> are also being used and evaluated by entomologists and plant breeders from CAIRT and IOCRI.</p>
<p>6. Future research plan</p>	<p>The promising mutants will be further tested in collaboration with private nurseries for thrips resistance and good characteristics for cut flower.</p>	<p>Continue with <i>in vivo</i> screening of mutants at flowering stage with 2 target insects (mites and thrips)</p>	<p>To continue selecting <i>Dendrobium</i> orchids towards tolerance to thrips. To improve desirable agronomic characters of <i>Dendrobium</i> orchids To carry out variety improvement of <i>Phalaenopsis</i> sp. orchids through mutation techniques since these varieties are the most valuable and expensive orchids.</p>