

12. FRUIT BREEDING FOR THE SOUTH OF VIETNAM

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ABSTARACT

Fruit breeding program at Southern Horticultural Research Institute (SOFRI) has been conducted and strongly developed from 2001 on some main fruit trees such as Pineapple, Orange, Pummelo, Mango, Dragon fruit, and Longan. By selection of elite individuals one variety of seedless sweet orange, one individual of Da Xanh pummelo variety, two individuals of Long Co Co pummelo variety, four individuals of Queen Pineapple, one individual of Hoa Loc mango, and one individual of Cat Chu mango variety have been selected. Application of gamma rays to induce mutation has been conducted on King mandarin and Hoa Loc mango and Longan. As a result one variety of seedless king mandarin LD6, and one variety of few seeds Duong La Cam pummelo LD4 have been released in December, 2010. Traditional hybridization has been conducted on Dragon fruit, Mango, Longan, Citrus, Pineapple, ect. So far, two varieties of Dragon fruit: LD1 and LD5 dragon fruit with red and pink violet flesh have been released in December, 2005 and December 2010, respectively. In the near future, some new varieties of Pineapple, Mango, Longan and Dragon fruit will be released.

Keywords: Fruit breeding, gamma rays, traditional hybridization

I. INTRODUCTION

During 2006-2011 period, the fruit breeding program at the Southern Horticultural Research Institute focused mainly on pummelo, orange, mango, dragon fruit, longan and pineapple.

There is immense diversity of fruits in Vietnam and their genetic resources are rich. Many of these fruits such as dragon fruit, mango, pummelo, longan, etc. are exported to other countries. However, some of these fruits have shortcomings such as high number of seeds in citrus, thin peel in Cat Hoa Loc mango, only white flesh dragon fruit grown popularly, longan with thin flesh and big seed and fruit shape of queen pineapple, which need further improvement for processing. The fruit breeding program at SOFRI concentrated on improving these traits to enhance their marketability and processing efficiency.

II. MATERIALS AND METHODS

2.1. Research activities

The fruit breeding activities included the following:

- Breeding for cylinder fruit shape and good quality in pineapple;
- Breeding for seedless fruits in citrus;
- Breeding for thick fruit skin and good quality in Cat Hoa Loc mango;
- Breeding for different peel and flesh colors in dragon fruit;
- Breeding for bigger fruit size, smaller seed, thick flesh and sweet in longan.

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2.2. Methods

2.2.1. Selection of elite individuals

The first step included selection of elite individuals from farmers' orchards. These selected individuals were, then, evaluated for three years for growth, yield, fruit quality and reaction to important insect pests, and diseases. Selected individuals with high productivity and good quality were subsequently multiplied for evaluation in trials. The best individual will be certified by the Department of Agriculture and Rural Development (DARD) of provinces as mother plants for mass propagation.

2.2.2. Using gamma rays to improve commercial varieties

The buds and embryos of commercial varieties of different fruits were treated with Gamma rays to create variability for improvement in desired traits which included reduction in number of seeds per fruit in King mandarin, Duong La Cam and Da Xanh pummelo, increasing peel thickness of Hoa Loc mango and flesh thickness in longan, diversifying colours of peel and flesh in dragon fruit and cylindrical fruit shape in Queen pineapple.

2.2.3. Breeding new fruit varieties by traditional hybridization method

This method included the following steps:

- Selection of local, commercial or introduced varieties as parents in hybridization;
- Traditional hybridization, collection of seeds and sowing them in nursery;
- Growing for fast evaluation on the field;
- Screening of good individuals for further trials;
- Value for Cultivation and Use (VCU) trials and Distinct Uniform and Stable (DUS) tests;
- Collection, analysis of data and writing the report.

2.2.4. Analysis of data

Data was analyzed on MS Excel by IRRISTAT 3.1.

III. RESULTS AND DISCUSSION

3.1. Breeding for cylindrical fruit shape and high quality in pineapple

Four individuals of Queen Pineapple were selected and certified for mass production by Tien Giang DARD in 2008. They were selected from farmers' orchards and evaluated for three years for agronomic characteristics, yield and fruit quality.

Traditional breeding in pineapple was initiated in 2007. In 2010, fruits were evaluated for fruit shape and quality characteristics. Three hybrids were selected for trials - Cayenne TL 2 x III/1, Cayenne TL 2 x II/6 and Cayenne GU114 x II/6.

3.2. Breeding for seedless fruits in orange, pummelo

3.2.1. Selection of seedless orange and pummelo individuals

From 2005-2009, the following citrus varieties/individuals were selected - seedless sweet orange variety in 2008, one individual of Da Xanh pummelo in 2009 and two individuals of Long Co Co pummelo in 2008.

- The seedless orange variety has the following characteristics - spherical fruit shape, yellow green skin and yellow flesh, sour sweet in taste with TSS 8% and high quantity of juice (40-42%). Seedless sweet orange was certified by MARD for mass propagation and production in 2008.

- Characteristics of Da Xanh pummelo (certified individual): Spherical fruit shape, green skin when mature and pink red flesh, sweet in taste with TSS 11% and high edible ratio (55-60%) with few seeds in fruits. Da Xanh pummelo was certified by Ben Tre DARD in 2009 for propagation in production.

- Characteristics of Long Co Co pummelo (certified individuals): Spherical pyriform fruit shape, green skin when mature with covering of soft hairs and pink red flesh, sweet in taste with TSS 10% and high edible ratio (52-57%) with few seeds in fruits. Da Xanh pummelo was certified by Tien Giang DARD in 2008 for propagation in production.

3.2.2. Breeding for seedless citrus by treating scions with gamma rays

The scions of King mandarin and Duong la cam pummel were treated with gamma rays to select genotypes with no or very few seeds. One seedless King mandarin individual- LD6 and one individual of Duong la cam LD4 with few seeds were released in 2010.

- Characteristics of seedless King mandarin variety: Spherical fruit shape, yellow green skin and orange flesh, sweet and light sour in taste with TSS 7.5-8% and high juice (40-42%) with no seeds in fruits. Seedless King mandarin was certified by MARD for mass propagation and production from 2010.

- Characteristics of few seeds Duong la cam pummelo LD4: Short pyriform fruit shape, yellow skin when mature and light yellow flesh, sweet in taste with TSS 12-13% and high edible ratio (55-60%) with a few seeds in fruits. Few seeds Duong la cam pummelo variety was certified by MARD for propagation and production in the Southeast provinces.

3.3. Breeding for thick peel and high quality in Cat Hoa Loc and Cat Chu mango

3.3.1. Selection of Cat Hoa Loc and Cat Chu mango individuals

From 2002-2010, one individual each in Cat Hoa Loc mango (HL27) and Cat Chu mango (C37) having thick peel and high quality was selected. These were certified by Tien Giang DARD for propagation and production in 2010.

- Characteristics of Cat Hoa Loc mango HL27: Strong growth, high fruit set ratio, fruit weight 418.5-456.0 g, thick fruit skin (1.3-1.4 mm) and high flesh ratio (73.6-79.2%) in comparison to control (CT1).

- Characteristics of Cat Chu mango C37: Strong growth, high fruit set ratio, average fruit weight 386.2g, thick fruit skin (1.28 ± 0.13 mm) and high flesh ratio (79.5%) in comparison to control (CD2).

3.3.2. Treatment of scions of Cat Hoa Loc mango variety with gamma rays

Gamma rays were applied for increasing thickness of fruit peel in Cat Hoa Loc mango variety. Two mutants in Cat Hoa Loc mango coded 4.5-15 and 4.5-23 were identified for trials. They have thickness of fruit peel: 1.72 mm in 4.5-15 clone and 1.70 mm in 4.5-23 clones.

3.3. Traditional hybridization

Traditional hybridization program in mango was conducted from 2001. Two hybrids XL-049 and XL-034 were selected for trials. They have good quality and fruit peel thickness ≥ 1.5 mm.

3.4. Breeding for purple, pink or pale red flesh color in dragon fruit

Breeding activity was initiated in 2005 to develop a dragon fruit variety having pinkish purple flesh and good quality by traditional hybridization. For this, a total of 1,855 hybrids were evaluated for fruit quality and 11 promising hybrids from H10 x white flesh BT and H14x CG were selected for VCU and DUS tests in Tien Giang, Long An and Baria-Vungtau from May 2009 to Oct. 2010. In r DUS trial observations recorded on 51 characters (vegetative, flower and fruit ones) for 12 months showed distinctness among 11 hybrids. After 15 months, VCU trials indicated that 11 hybrids had good growth, low to mild attack of insect pests and diseases and good bearing. Among them, T9 (coded name: H14 xCG-005) showed the best characteristics such as good fruit skin colour and bracts; firmness, medium juiciness and pinkish purple colour in fruit flesh in comparison to 'Red flesh LĐ1' variety. In addition, this hybrid also produced high fruit yield and had low to mild insect pests and diseases attack, especially of anthracnose disease.

3.5. Breeding in longan

The breeding objectives in longan are thick flesh, small seed, and sweet taste. To achieve these objectives, the following steps were followed:

- Selection of elite individuals: One individual each from Xuong Com Rao longan and Xuong Com Vang longan was certified as mother plant for propagation by Ba Ria Vung Tau DARD.
- Treating buds and embryos with gamma rays to produce mutants: Xuong Com Vang longan and Tieu Da Bo longan varieties were used in irradiation.
- Traditional hybridization in longan was started from 2003. Up to now, a lot of hybrids have been made. Two of these longan hybrids will be released in 2012.

IV. CONCLUSIONS AND SUGGESTIONS

From the fruit breeding efforts during 2006 to 2011 at the Southern Horticultural Research Institute, the following significant results/products were obtained.

- Four individuals of Queen pineapple, 01 individual of Da Xanh pummelo, 02 individuals of Long Co Co pummelo, 01 individual of cat Hoa Loc mango, 01 individual of Cat Chu mango, 01 individual of Xuong Com Vang longan, 01 individual of Xuong Com Rao longan were certified as mother individuals for propagation by Tien Giang, Ben Tre, and Baria Vung Tau DARD as well as 01 seedless sweet orange cultivar was certified by MARD.

- Breeding by induced mutation and traditional hybridization: 01 individual of Duong La Cam pummel with few seeds LĐ4 (5.45-6.62 seeds/fruit), 01 dragon fruit cultivar LĐ5 with pink purple flesh colour, 01 individual of seedless king orange LĐ6 were certified by MARD for propagation in December 2010.

REFERENCES

- Dao Thi Be Bay, Ho Ngoc Hai, Tran Thi Oanh Yen And Nguyen Minh Chau. 2010. *Research to breed thick skinned and good quality mango varieties*. In: Results of Science and Technology Research 2006-2010. Proceedings of science and technology conference. Hanoi, 5-6 November 2010. Agricultural Publishing House. 409-414
- Nguyen Ngoc Thi, Tran Thi Oanh Yen And Nguyen Minh Chau. 2010. *Results on breeding and trials of Pink purple Dragon fruit variety*. Report for certification and release of new variety in December, 2010. Ministry of Agriculture and Rural Development.

Pham Thi Muoi, Nguyen Van Hung, Tran Thi Oanh Yen, Bui Xuan Khoi. 2010. *Performance of individual of Duong la cam and Oi pomelo through budwood irradiation with gamma ray in the Southeastern region of Viet Nam. In: Results of Science and Technology Research 2006-2010. Proceedings of science and technology conference. Hanoi, 5-6 November 2010. Agricultural Publishing House. 358-362.*

Tran Thi Oanh Yen. 2010. *Study to exploit and develop gene resource of specialty Pomelo varieties as Da xanh and Nam roi in 2 provinces of Ben Tre and Vinh Long for domestic consumption and export. In: Results of Science and Technology Research 2006-2010. Proceedings of science and technology conference. Hanoi, 5-6 November 2010. Agricultural Publishing House. 375-379.*

Tran Thi Oanh Yen, Nguyen Ngoc Thi, Nguyen Nhat Truong And Nguyen Minh Chau. 2010. *Improving on characteristics of seed number per fruit in King mandarin by treatment of Gamma rays on dormant buds. In: Results of Science and Technology Research 2006-2010. Proceedings of science and technology conference. Hanoi, 5-6 November 2010. Agricultural Publishing House. 370-374*

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13. BIOLOGICAL CHARACTERISTICS, POPULATION DYNAMICS AND CONTROL MEASURES OF LITCHI FRUIT BORER CONOPOMORPHA SINENSIS BRADLEY (LEP. GLACILARIIDAE)

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ABSTRACT

Study on biological characteristics, population dynamics and control measures of litchi fruit borer (LFB) *Conopomorpha sinensis* Bradley, one of the most serious pests in litchi growing areas in the northern of Viet Nam, was carried out in 2009 to 2011 at Luc Ngan district, Bac Giang province. Obtained results show that its life span was completed in 27.16 – 33.47 days at 21.66 – 30.200C and 76.25 – 77.90% relative humidity. The population dynamics of LFB adults were closely related to fruit phenology. Their highest population density peaks occurred when fruit-stalk started changing its colour from green into red in both early and main crop seasons. Efficacy on LFB adults of 5 insecticide, 3 bio-insecticides

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