BREEDING AND DEVELOPMENT OF RICE VARIETIES AT THE INSTITUTE OF AGRICULTURAL SCIENCE FOR SOUTHERN VIETNAM *(1991 – 2006)*

Rice plays an important role in social-economic issue of Vietnam. Since 1989, from the country of insufficient food, Vietnam has become a main rice exporter in the world. Duration of 1985-2000, total rice production increased double times, in which Mekong River Delta (MRD) enhanced 2.43 times, occupied 51.3% of total rice production and more than 90% of national rice export (National Statistics, 2000). The increase of production is mainly due to application of semi-dwarf rice varieties with high yield and short duration. The modern varieties requested well-irrigation systems, intensive utilization of fertilizers, pesticides. During 1990-1995 in MRD, because of Plant Brown Hopper epidemics, resistant varieties having medium quality were sharply released into production. Since 1996, due to the requirement of domestic and international markets, the higher quality varieties with intermediate resistant to pests have bred and developed popularly. Recently, high quality and aromatic rice varieties have been requested for production in MRD. To meet the demand of production and consumers, rice breeding programs have to create many varieties with multi-objectives and different applied methods.

Objectives: to breed new varieties with good quality, high yield, tolerant to adverse conditions (acid sulphate soil, salinity, drought), resistant to BPH and Bl.

Methods: application of different breeding methods as introduction, hybridization, mutation, pure line selection.

Newly developed mutant varierty

HIGH YIELDING, SHORT DURATION VARIETIES

Introduced varieties

1991-1998, **IR 50404-57** was selected (from IIRON-VE, IRRI, 1990) and developed popularly in Southern Vietnam, especially in MRD. During that period, some provinces planted this variety with 32-41% of cultivated area (PHTI, 1999). After 12 years releasing, IR 50404-57 has still occupied large area in Vietnam with 783,526 ha in 2004 (CNTCC, 2005). The reason is the variety has outstanding characters as: short duration (90-96 days), high and stable yield, resistant to diseases (BL, BLB) and insects (BPH) and adverse conditions (acid sulphate and drought).

From 1994 to 1995, **IR 59606-119** was selected and released. The variety is suitable to acid sulphate soil and can be cultivated for 2-3 crops per year. The quality of this variety is better than IR50404. Recently, the variety is cultivated for some provinces in MRD and South Eastern Zone.

Mutant varieties

VND95-20, VND99-3, VND95-19, VND404 are mutant rice varieties which had been selected through radiation induced mutation with Co.60 of gamma rays at 200 Gy dose, 2800 Gy rate. **VND 95-20** was released as national variety (1999) and has been popularly cultivated in Southern provinces and considered one of 5 key rice varieties of Vietnam from 2000 until now in production. The variety is cultivated with an area of more than 280,000ha in 21 provinces such as: Long An, Dong Thap, Tien Giang, Can Tho, Tay Ninh etc. In some locations, VND 95-20 occupied an area of 50.1%, for examples Long An (Nguyen Thi Khoa, 1999). As compared to wild genotype VND95-20 is shorter duration (90-102days), higher yield (4-9ton/ha), better suitability to acid sulphate soil and the same quality as IR64.

VND95-20, a key variety for rice cropping structure

VND99-3 is another mutant variety which was selected from 1998 by induced mutation of gamma rays. The variety addresses improved characters as short duration (94-102 days), high yield (4-9 ton/ha), resistant to BPH, BL and tolerant to acid sulphate soil. While the wild genotype Nang Huong, a popular landrace exhibits very long duration (160-170 days), photo-periodical sensitivity, low yield. VND 99-3 was approved as the pilot-production variety in 2004 and the new variety in 2006.

Aromatic varieties

The varieties have developed through different ways as introduction (Jasmine 85, VNN 97-6), pure line selection (Nang Huong 2, Nang Thom Cho Dao 5), hybridization (KSB 199), mutation (Tam Xoan, Jasmine mutant).

***Modern varieties*:**

Jasmine 85 was introduced since 1992 from IRRI. The variety cultivated with 268,897 ha (CNTCC, 2005) in alluvial soil of MRD (An Giang, Tien Giang, Dong Thap, Long An, Can Tho) and South Eastern Vietnam. Jasmine 85 is short duration (95-105 days), high yield (4-8 ton/ha), good quality. Its shortcoming trait is susceptible to some diseases and insects (BPH, BL, BLB). Other aromatic varieties as **VNN97-6** (intermediate resistant to BLB), **KSB 199** (intermediate resistant to BPH) have been developed in some specific areas.

Local varieties:

Due to continuous cultivation for many years, local varieties have faced problems as poor genetic purification e.g. Nang Thom Cho Dao with a percentage of 12.1 – 14.3% (Thinh, 1998). Among population, individual plants without aroma can not be recognized by visual evaluation. Usually, farmers select new plants with good yield components combined very often with poor quality.

Aromatic rice Nang Thon Cho Dao

By pure line selection, Nang Huong 2, Nang Thom Cho Dao 5 obtained grain yield of 19.0-35.0% and 13.3-40.4% higher than their wild populations, respectively. Selected lines exhibited quality properties (aroma, softness, amylose, protein content) as the same or better than original populations. Now farmers are extending the selected lines in large scale areas (for example 25-40% area covered by NTCD 5 in Can Duoc, Long An).

VARIETIES ADAPTED TO ADVERSE CONDITIONS

Varieties tolerant to acid sulphate and saline soils

Acid sulphate soils in MRD occupies 1,5000,000 ha, mainly in Dong Thap Muoi (Plain of Reeds) and Long Xuyen Quadrangle. Saline soil covers in coastal zones with 808,749ha (21% in MRD) (Xuan, 1998). Promising varieties developed by IAS exhibited tolerance to acid sulphate are VND 95-19, VND 99-3, KSB 140, KSB 218. In comparison to the control, these varieties gained higher and more stable yield when growing in soil pH<4.5, with toxicity by iron, aluminum and phosphorous deficiency. VND95-19 is good plant type and high tolerance to acid soils. This variety can yield more than 10 ton/ha in some locations of MRD and Central Highlands. FRG 67, VNN92B, VNM97-2, Mahsuri-6 are highly tolerant to saline soils and good quality, they are cultivated in coastal areas of Southern Vietnam.

Upland varieties

Upland rice variety LC

Vietnam has about 150,000 ha of upland rice, which concentrated in mountainous zones where minority people are living and growing traditional varieties. Local upland rice varieties are low yield (1-1.5 ton/ha), long duration (150-180 days). Previously, IAS released some upland varieties as: LC88-66, LC88-67, LC 90-4, LC 90-5. These varieties were approved as national varieties and cultivated in some mountainous zones in Northern and Southern Vietnam. Recently, new promising varieties as LC 214, LC226, LC 227, LC403 have been released with high yield, tolerant to Bl, good quality suitable to local consumers. These varieties are developing in Central Highlands (Daklak, Gialai) where food shortage has frequently been threatened to people.

For 15 past years, IAS has released more than 20 new varieties adapted to different agro-ecologically zones in Southern Vietnam:

- Short duration, high yielding varieties: IR50404-57, IR59606-119, VND95-20, VND95-19, VND404, VND99-3, KSB218, KSB140-5.
- Medium duration varieties: VN92B, VNM97-2, Mahsuri-6
- Aromatic varieties: Jasmine 85, NH2, VNN97-6, NTCD5, NTCD1.
- Tolerant varieties to adverse conditions: FRG67, LC88-66, LC88-67, LC90-4, LC90-5.
- Application of induced mutation by gamma rays, Co.60 sources, dose of 200 Gy and 2800 Gy rate created many mutants with desirable characters as good plant types, early maturity, tolerant to acid sulphate soil, BPH and Bl.
- Mutant varieties have stable yield, good quality and tolerant to adverse conditions and maintained for long time in large scale areas.
- Pure line and mass selection are required to improve the situation of aromatic rice especially landraces for their uniformity.