

22. RESULTS OF BREEDING TRIPLOID VH13 HYBRID VARIETY

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ABSTARCT

VH13 hybrid mulberry variety was created by the Vietnam Sericulture Research Center, and it was approved as temporary variety for pilot production in some ecological regions by the Scientific council of Ministry of Agriculture and Rural Development in September 2000. Accordingly, it was approved as official national variety in April 2006,

Because of using F1 heterosis and sexual propagation, VH13 hybrid mulberry has a lot of advantages such as: strong growth, high total branch length/tree (60.50m/ tree), short node (3.0-3.3cm), average duration for mature leaves, leaf productivity of 40 tons/ha/ year upwards (in stable mulberry field), increasing by 36% compared with Ha Bac variety, >60% compared with Bau Trang, Bau Den Bao Loc and China introduced ones.

VH13 mulberry tree has less bloom, thick leaf, dark green, short node (3.0-3.2cm), good quality leaves. The protein content in its leaf is 22-24% while in Ha Bac and VH9 variety is 21.24% and 24.40%, respectively. The cocoon yield of silkworm which was fed by VH13 mulberry leaves is 10% higher than that of Ha Bac mulberry leaves and 19% higher than Chinese mulberry leaves. Shell ratio increases by more than 13%, with thicker cocoon shell, higher cocoon quality. 4th and 5th instars growth duration shortens one day. Mulberry consumption per one kg cocoon reduces by 16% compared to Ha Bac. Noted that VH13 mulberry variety generates many leaves in autumn, which is suitable for rearing high quality white cocoon silkworm.

Advantages of VH13 mulberry variety in cultivation characteristics manifest easy leaf plucking, less branch scratch than Ha Bac and VH9, 30% higher harvesting yield than old varieties, VH13 has wide adaptability to different ecological regions, different soil types (river side land, coastal land, hill land and mountainous area), high multiplication coefficient: 300kg mulberry seed per 1 ha parental mulberry garent/1 year, 28% lower material expenses for newly planting, all year round planting season, high planting survival above 90% and higher than planting by cutting. Especially, VH13 mulberry tree can grow quite better in drought region.

VH13 disease ratio, disease index (which caused by some fungal species) are lower than Ha Bac and Chinese mulberry varieties.

VH13 hybrid mulberry variety was approved as national variety by Ministry of Agriculture and Rural Development in April 2006 to be licensed to disseminate in production at the Northern and Central provinces.

Keywords: Hybrid, mulberry, variety, temporary, national.

I. BACKGROUND

Mulberry silkworm (*Bombyx mori* L) is monophagous and its sole food is mulberry leaves. Therefore, the number and quality of mulberry leaves are the main factor impacting on productivity and quality of the cocoons, as well as the silk.

On other hand, according to study results on 60% of Nitescu cost of the production, cost of cocoons are used for planting, management, maintenance and harvesting mulberry leaves, so that productivity and quality of mulberry leaves would be distributed greatly to production costs.

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Mulberry is a perennial crop, its yield and quality is influenced by many external factors such as climate, land care regime, etc... of which mulberry variety is a very important factor. Mulberry may be propagated by asexual and sexual methods. Propagated by sexual method has many advantages, because it uses the F1 heterosis for higher yield. Mulberry has wide adaptation to climatic conditions and soil, very good drought tolerance, high coefficient of similarity (one kg seed can be planting from 3-5 ha). A parental mulberry garden (1ha) can produce over 300 kg seeds. The clonal method has been mainly used for mulberry production areas in Vietnam up to now. This method not only constraints on leaf yield, but also has many disadvantages such as low coefficient of propagation, easily transmitted disease from parents.

With the above mentioned reasons and fact, we carry out the theme: ‘Research, selection and propagation of mulberry VH13 hybrid variety’

The objective of this study is to breed and select mulberry F1 hybrid seed varieties to ensure purity, less fruit, wide adaptation, disease and unfavourable external conditions tolerances the productivity and quality of mulberry leaf are higher than that grown in production, parental varieties has biological characteristics favourable for production of hybrid seeds.

II. LOCATION, MATERIALS AND METHODS

2.1. Time and place of study

Hybrid mulberry VH13 was bred in 1996 at the VietHung Sericulture Research Station, Vu Thu District, Thai Binh Province. It has been approved to produce in some the ecological zones since 2000 as follows:

- Some provinces in the Red River Delta and the North such as: Son La; Hoa Binh, Thai Nguyen, Bac Giang, Hai Duong, Ha Nam and Hung Yen and Thai Binh, Nam Dinh and Thanh Hoa.
- Central Coast Region: Quang Nam Province.
- Central Highland: Lam Dong province.
- Udomsay Province (Laos).

2.2. Materials Research

Hybrid mulberry variety VH13 is caused by sexual hybrids between diploid mulberry IA (2n) and triploid variety DB86 (4n).

IA mulberry varieties were introduced in VietNam in 1990. It is characterized by glossy, soft leaves suitable for silkworm rearing, good quality, shrubbery healthy growth, good resistance to brass and silver fungal diseases, but susceptible to damage by aphids.

The tetraploid mulberry variety DB86 ($4n = 56$) was bred by causing Co60 radiation mutation method from Da Thai Ninh mulberry variety. It has good growth and resistance to brass and silver fungal diseases

- The mulberry varieties used as control ones include Ha Bac (local variety that is widely grown in the production), VH9 (F1 hybrid mulberry variety that was bred by Vietnam Sericulture Research Center).

2.3. Research methodology

* Phase 1: Conduct pollination between the father variety DB86 and mother one IA. Harvest mature fruits, remove flesh/pulp for seeds (1996).

* Phase 2: Experiments on preliminary comparison and official comparison (1997-2000). Design RBCD experiment with three replications. Each plot for one variety with a similar area of 42m², density of 1.80m x 0.4 m. Annually apply 20 tons of organic fertilizers and 2,700kg Van Dien NPK fertilizer per hectare. The control mulberry varieties include Ha Bac and Sa Nhi Luan (China).

- Experimental Location: VietHung Sericulture Research Station, Vu Thu, Thai Binh.
- Soil types for experiments is accient alluvial without regularly enrich.

* Phase 3: Regionalize VH13 ecological regions and research and development of F1 hybrid seed variety VH13 production protocols.

III. RESULTS AND DISCUSSION

3.1. Agronomic characteristics of hybrid mulberry variety VH13

Due to using the F1 hybrid heterosis, sexual propagation, VH13 hybrid mulberry has many advantages such as healthy plant growth, large total stem length/plant (60.50m/plant), short internode (3.0 - 3.3cm), medium leaves maturity duration, few flowers, no fruits, thick, dark green leaves, short nodes (3.0 to 3.2 cm), thick, dark green leaves. VH13 hybrid mulberry variety has wide adaptability to various ecological regions, many different types of land (riverside land and coastal hills in the midlands and mountainous areas). A notable feature is that VH13 gives more and prolonged leaves harvest in autumn which facilitates raising silkworm cocoon with high yield and good quality.

3.2. Results of testing mulberry VH13 variety

3.2.1. Some leaf yield components

- Size of leaf: the length of mulberry leaves in Spring - Summer and Autumn are 19% and 16% higher than of VH9 and Habac, respectively. VH13 leaf width increased by 33%, followed by VH9 and HaBac increased by 20%

Table 1: Size and thickness of mulberry leaves

Varieties	Size of leaves (cm)		Weight of 100 cm ² leaf (gr)	
	Length of leaf	Wide of leaf	Weight	Compared to controls
HaBac (control)	14.42 ± 0.18	11.25± 0.12	1.824	100.0
VH13	17.22 ± 0.16	14.98 ± 0.12	2.051	113.0
VH9	16.76 ± 0.14	13.53 ± 0.14	1.927	106.0

Thickness of the leaves show via the weight of 100cm² leaf. VH13 mulberry leaf thickness is the the largest varieties, increased by 13% compared with Ha Bac and 6% compared with VH9.

Table 2: growth of mulberry trees in a year

Variety	Total length of branches/plant (m)	The length of internode (cm)	Size of branch level 1 (cm)
HaBac (control)	26.70 ± 2.75	3.78	1.89
VH13	37.11 ± 2.20	3.23	2.64
VH9	35.10 ± 2.85	3.66	2.60

The total length of branches on trees and internode length is an important factor governing yield mulberry leaves. Mulberry variety VH13 has many branches and vigorous growth, so the total length of branches reaches the highest, increasing by 39% compared with HaBac. Starting material for breeding VH13 mulberry variety are DB86 and IA which both have short internodes.

***Leaf yield of mulberry**

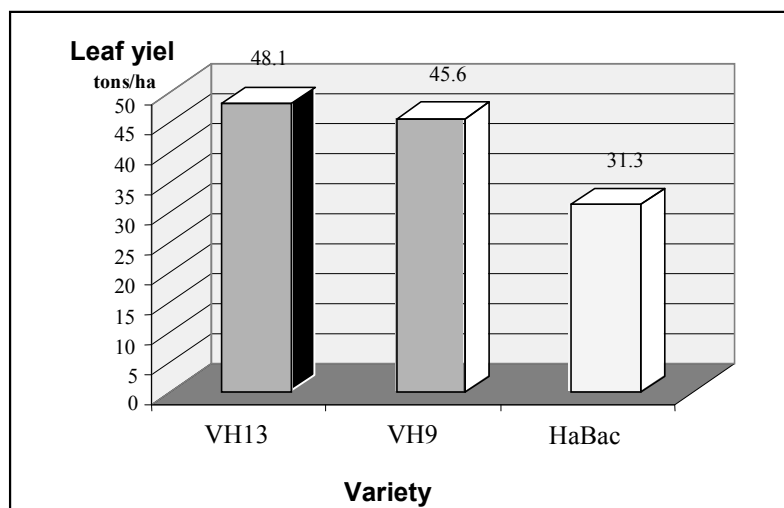


Figure 1: The average leaf yield within 5-years of mulberry varieties

Average leaf yield within five years of mulberry varieties showed that VH13 gave the highest leaf yield at 42.10 tons/ha, increasing by 53% compared with HaBac 9% compared VH9.

3.2.2 The quality of mulberry leaves

*** Assessment of mulberry leaf quality by biochemical methods**

Protein supply material for constituting the silkworm silk is mainly absorbed from mulberry leaves. Over 70% of worm proteins are absorbed from mulberry leaves. Depending on the age of sexual maturity stages that require different silkworm protein content of mulberry leaves. Generally, at the young age of silkworms, it requires mulberry leaves with higher levels of proteins than at mature silkworms age.

Table 3: The biochemical components in mulberry leaves (% dry matter)

Varieties	Spring season		Summer season		Autumn season	
	Protein	Reducing sugar	Protein	reducing sugar	Protein	Reducing sugar
Ha Bac	21.24	27.29	20.82	27.78	21.53	27.19
VH13	22.94	27.91	22.54	30.26	22.71	27.71
VH9	21.40	26.77	22.68	30.11	21.33	26.67

Protein content in mulberry leaves of VH13 in the spring-summer and autumn are higher than those of the mulberry leaf of HaBac and VH9.

*** Assessing quality of mulberry leaves by silkworm rearing**

Table 4: The quality of mulberry leaves with cocoon productivity

(Unit: gram/300 silkworm age 4)

Varieties	Cocoons yield in Spring season		Cocoons yield in Autumn season	
	Yield of cocoon (gr)	Compared control (%)	Yield of cocoon (gr)	Compared control (%)
Ha Bac	503.33 a	100.0	420.00 ab	100.0
VH13	565.00 c	112.0	466.67 c	111.0
VH9	547.00 b	109.0	440.00 bc	105.0

Silkworms eat more mulberry leaves of VH13 and 11% and 5% higher yielding cocoons than HaBac and VH9.

3.2.3. Resistance to pests and diseases

The possibility of fungal resistance to silver brass (*Phyllactina mori* cola) in VH13 mulberry rather than Ha Bac and VH9. It is caused by genetic traits of the parent breeds.

Ability to resist rust fungus (*Aecidium mori*) and bacterial (*Pseudomonas*) between mulberry varieties for not much difference.

3.3. Results of hybrid mulberry variety VH13 approval

VH13 mulberry varieties were widely grown in the provinces of Thai Binh, Nam Dinh, Ha Nam and Hung Yen, Hai Duong, Bac Giang, Thai Nguyen, Hoa Binh, Son La, Thanh Hoa, Quang Nam, Lam Dong and Udomsay (Laos).

Collected data and evaluations of some Provincial Department of Agriculture and Rural Development, Provincial Department of Science and Technology and professional bodies in the provinces that have planted mulberry variety VH13 variety confirm that:

+ Yield and quality of VH13 mulberry leaves were higher than local varieties such as HaBac, White Bau and VH9, better resistance to pests and diseases than HaBac and VH9.

+ VH13 mulberry hybrid variety were grown popularly in Quang Nam. With conditions of Quang Nam where production is annually affected by storms and flood, VH13 mulberry variety have adapted well in waterlogged conditions to 15 days. Rate of mulberry killed by flooding accounted only 5-7%.

In addition to resistance to flooding, because VH13 mulberry roots are deep in the soil therefore it also has protective effect of land against erosion, runoff.

3.4. Seed production technology of VH13 variety

Based on the research results, a diagram for planting parental mulberry varieties in order to produce F1 hybrid seed F1-VH13 according to the ratio of 4:1 (4 mother rows of plants, one father row of plants). Due to later flowering characteristics of mother varieties, it is needed to apply techniques for promotion of early flowering of mother plants and inhibitory for later flowering for father plants so that the flowering time for mother and father varieties (IA and DB86) are the same. As a result, yield would be higher. Applications of developed technological protocols for parental mulberry production has given a yield of 250 kg/ha after 2 years of plantation, and this figure will be higher in coming years.

IV. CONCLUSION

1. VH13 is a triploid mulberry F1 hybrid seed variety which is characterized by healthy plant growth, large total length of branches, the short internodes, few flowers, no fruit, thick, dark green leaves, high yield of 35-40 tons/ha, an increase of 36% compared with Ha Bac (control), >60% compared with Bau Trang, Bau Den Bao Loc and 20% compared with triploid mulberry No.12.

2. Leaf quality of VH13 shows through silkworm rearing gives 10% higher cocoon yield than Ha Bac with good cocoon quality, thick cocoon flesh. The rate of consumption of mulberry leaves / kg cocoon decreased by 16% compared with Ha Bac.

3. VH13 is largely adaptable in different ecological regions and soil types, particularly drought tolerance.

4. VH13 mulberry variety was approved as official national variety by Scientific Council of Ministry of Agriculture and Rural Development in April 2006 and disseminated to the provinces in northern and central provinces. VH13 hybrid mulberry variety had been awarded the Gold Cup in 2007 and agriculture VIFOTEX award in 2010.

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23. APPLICATION OF BIOTECHNOLOGY IN ANIMAL HUSBANDRY IN SOUTHERN PROVINCES

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SUMMARY

Application of biotechnology in animal husbandry has been encouraged by governmental policies. Our initial results in this aspect showed that reproductive biotechnologies including sexed semen, ovum pick-up can be used into in vitro embryo production in order to produce high quality animal breed; molecular biology have been applied successful to detect pathogen of serious disease (PRRS) or congenital genetic disease (BLAD). Our research trends focus on (i) combining reproductive biotechnology with gene assisted selection for producing high quality animal breed (ii) combining genotype selection (MAS, GAS, SNPs) with phenotype selection (BLUP) in animal selection and breeding programmes, especially on improving quality of animal products (iii) combining molecular biology with conventional methods in diagnosis of animal diseases, especially on genetic diseases.

Keywords: Porcine Reproductive and Respiratory Syndrome, Bovine Leukocyte Adhesion Deficiency, Gene Assisted Selection, Best Linear Unbiased Prediction, Ovum Pick-Up, In Vitro Embryo Production

I. INTRODUCTION

Application of Biotechnology in animal husbandry (2008-2020) has been confirmed by

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