

# CONSERVATION AND USE OF *Aquilaria crassna* IN VIETNAM: A CASE STUDY

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## Introduction

*Aquilaria crassna* (Thymeleaceae) is medium-sized evergreen tree growing to a height of 15–20m and a diameter at breast height of 40–50cm. *A. crassna* trees start flowering at an age of 6–8 years, between the months of March and April. Fruiting takes place between June and July in the same year (Vu Van Can & Vu Van Dung 1992). It is a light-demanding species, which can regenerate under the forest canopy but requires canopy openings for subsequent growth. In its natural habitat, *A. crassna* (and other members of the *Aquilaria* genus) sometimes produces a resinous heartwood known variously as agarwood, eaglewood or aloeswood (*tram* in Vietnamese). This highly valuable product is used in Chinese and Southern Asian medicine as well as for incense and cosmetics in the Middle East. In 1990, one kilogramme of *tram* cost between US\$800 and US\$1000 (Nguyen Hong Lam 1990).

*A. crassna* grows on deep sandy clay soils at elevations of 300–800m. In Vietnam, where it has been heavily exploited for *tram*, *A. crassna* is now found only in scattered stands with low numbers of trees. These stands are located mainly in the southern coastal forest fringes adjacent to the Cambodian border, and the western part of Da Nang province along the border with Lao PDR. Of particular importance are the coastal belts: Quang Ninh, Ha Bac, Hoa Binh, Tuyen Quang and Phu Quoc Island. The other main localities are in the central highlands, namely, Ha Tinh, Kon Tum, Quang Nam-Da Nang, Binh Dinh and Gia Lai (Le Mong Chan & Vu Van Dung 1992). In 1996, the Vietnam Red Data Book identified *A. crassna* as an endangered species (category E of the IUCN classification), in need of protection and conservation.

Since 1986, local people in Ha Tinh province in the central part of Vietnam have collected seedlings of *A. crassna* from natural forests and planted them in home gardens. Good incomes can be earned from selling whole trees for *tram* extraction. In 1997, a plantation trial of *A. crassna* was established as pure and mixed stands with *Aleurites montana* and coffee in Ha Tinh province. Initial trial results show good growth of trees, suggesting that *A. crassna* can be grown easily in plantations and is also suitable for under-canopy planting in agroforestry systems.

## Conservation strategy

In order to conserve and use the valuable genetic resources of *A. crassna*, the Vietnam Tree Seed Project has conducted a number of studies and established a demonstration seed orchard in cooperation with Central Forest Seed Company. The aim of these efforts is to promote the use of this species in non-timber plantations as an *ex situ* conservation model. This will offer the following advantages:

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- Reduced exploitation pressure on natural populations because *tram* can be harvested from plantations.
- More effective management of gene conservation efforts is possible in plantations.
- Public awareness of the importance of gene conservation can be raised by demonstrations in seed orchards.
- Cultivation can contribute to local incomes and help to alleviate poverty.
- Plantations provide a basis for further research and tree improvement.

In tree improvement activities, the yield of *tram* is used as a criterion of selection. In natural forests, however, it is difficult to use this criterion to select plus trees because the yield of *tram* from standing trees can only be estimated. According to local collectors and traders, trees which yield large quantities of *tram* usually have cracks in their bark of varying forms and depths. This trait has to some extent been confirmed by plantation studies. Such cracks, therefore, could be used as an indirect means of selecting high-yielding plus trees in natural forests.

Using this criterion, 34 plus trees were selected in Huong Khe district of Ha Tinh province in 2000. However, improved techniques are needed to determine the *tram* content of bark samples and to test progenies and clones. It is important to identify the level of inheritability of this trait for vegetative propagation and tree breeding purposes.

### ***Seed research***

At the same time as plus trees were selected, samples of fruits and seeds were collected and studied. The seed of *A. crassna* is oval in shape, with a diameter of 0.5–0.8cm. One end of the seed is pointed; the other has a black aril 2–3cm long with a white stripe.

The moisture content of fresh *A. crassna* seeds is 49%. Desiccation with silica gel to reduce the moisture content to 40%, 35%, 25%, 15% and 8% shows that the seeds can maintain normal germination rates (33%) at a moisture content of 25%. Seeds with varying moisture contents were stored at 8°C, 15°C and ambient temperatures (20–25°C). The optimal conditions were found to be a moisture content of 25% stored at a temperature of 8°C, which produced a germination rate of 22% after a two-month period of storage (CFSC in press).

### ***Vegetative propagation and establishment of seed orchards***

*A. crassna* trees are rare and it is difficult to obtain large amounts of seeds. Studies of vegetative propagation have demonstrated rooting rates of up to 90% for cuttings from young trees treated with the Chinese rooting powder ABT1. The average number of roots in each cutting was 10.9, with an average root length of 2.9cm per cutting. Successful propagation by cuttings provides opportunities for large-scale production of planting material of this species.

The Vietnam Tree Seed Project has established a breeding orchard of *A. crassna* to provide an improved seed source and carry out *ex situ* gene conservation. The orchard also serves as a plantation model for other valuable tree species in the country. The orchard is three hectares in size and is situated in Bo Trach district of Quang Binh province.

To establish the breeding orchard, seeds from 34 selected plus trees were collected separately and germinated to create 34 half-sib families. Each family was planted in a group of nine trees at a spacing of 2m x 2m with 19 replicates (plots). The groups were randomly arranged in the field, with the exception of neighbouring groups of the same family, which were separated.

Planting density was 1989 trees per hectare. The groups will be rogued to leave only one tree, and the final density will be 221 trees per hectare.

### Future activities

*A. crassna* is an indigenous tree species with great economic potential for non-timber plantations. In order to conserve the genetic resources of this species, and develop its end uses, we recommend that the following activities be carried out:

- Continue seed research to determine the best time to collect fruits;
- Improve vegetative propagation methods;
- Maintain the established orchard;
- Conduct phenological studies in the orchard and in natural forests;
- Establish trials at larger scales to identify the best provenances and sites for plantations; and
- Disseminate research results and other information on *A. crassna*.

### References

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