



**Government of the Union of Myanmar
Ministry of Forestry
Forest Department
Forest Research Institute
Yezin**



**A Pharmacognostic Study on Ta-Bin-Shwe-Hti
(*Nervilia Aragoana* Gaud.) And its' Commercial Value
(Part -I)**

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တပင်ရွှေထီး (*Nervilia aragoana* GAUD.) ၏ ဆေးဝါးသိမှုနှင့် စီးပွားရေးဈေးကွက်ကိုလေ့လာခြင်း

ခင်ဝင်းမြင့် သိပ္ပံဘွဲ့ (ရုက္ခဗေဒ)
မဟာသိပ္ပံဘွဲ့ (အပင်၏ ဆေးရိုင်းဗေဒ)
သုတေသနအရာရှိ
သစ်တောသုတေသနဌာန

စာတမ်းအကျဉ်းချုပ်

သိပ္ပံအမည်အရ *Nervilia aragoana* Gaud. ဟု သတ်မှတ်ထားသော တပင်ရွှေထီးသည် သစ်ခွမျိုးစုဝင် ဆေးဝင်ပင်ဖြစ်ပါသည်။ ယခုအခါဆေးဝင်ပင် ဈေးကွက်တွင် အမြင့်ဆုံး ဈေးနှုန်းသို့ ရောက်ရှိနေခြင်းကြောင့် လူသိနည်းရာမှ အထူးစိတ်ဝင်စားမှုကို ရရှိနေပါသည်။ ယခုစာတမ်းတွင် ဆေးဝင်ပင် တပင်ရွှေထီး၏ ပြင်ပရုပ်သွင်နှင့်ခန္ဓာဗေဒ ဖွဲ့စည်းတည်ဆောက်ထားမှုကို သိပ္ပံနည်းကျ လေ့လာ တင်ပြထားသည့်အပြင် ပါဝင်သော ဓါတုပစ္စည်းများနှင့် ၎င်း၏စီးပွားရေး ဈေးကွက် သတင်းအချက်အလက် များကိုတင်ပြထားပါသည်။

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Abstract

Nervilia aragoana Gaud., commonly known as Ta-bin-shwe-hti, belongs to the family Orchidaceae. It is interested greatly at present for its' high commercial value, which is on top of the marketing items of medicinal plants on sale. In this paper, the morphology and anatomy of the plant and its' characteristics to the species were scientifically identified. Preliminary test on the phyto-chemical constituents were analysed and market information was also introduced.

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1. Introduction

The genus *Nervilia* belongs to the family Orchidaceae has about 40 species. Although the species *N. aragoana* is an orchid, it does not reveal the characters at a glance. It possesses two types of under ground stem. One which arise from the base of the petiole as a horizontal runner, flank on both sides and produce new corm at each end, and another formed as a vertical corm, which is white, fleshy, rounded (or) irregularly rounded, possessing 3-5 nodes and the maximum diameter about one inch. Each corm produces a single petiole, not exceed more than a foot in length, and bears a single heart-shape leaf, glabrous, brightly green, palmately veined and wavy margin. The genus is easy to recognize by the characters of the leaves as there is no other orchids having similar characteristics. Another character is that the plants do not bear both leaves and flowers at the same time. The inflorescence consist of 6-10 yellowish green flowers which appear first in March, and when they withered the same corm produce a new leaf, in the early of monsoon, and survive till the end of the season. The life cycle of the plant is found to be completed within six months. So far three species are recorded in Myarmar, they are *Nervilia aragoana*, *N. fordii*, *N. crociformis* and *N. plicata*. Out of which only the *N. aragoana* is used as a medicinal plant and is one of the top in market demand.

The distribution of the genus is traced from Africa to India, China and through Malaysia to Australia. In Myanmar it is wildly grown on the Shan Yoma Range (Pyinmana area), Southern Shan State, Taung Dwin Gyi, Minbu, Myawady, Mt. Popa, Pyin Oo Lwin, Katha, Kawlin, Pinlebu and Ann in Rakhine State. Although the distribution ranges from high to low elevation, hot to cold, sandy soil to clay, the plants prefer moist and shady habitat.

The aim of this research paper is to find out the plant products which can best be exploited within a short period. Based on the information from Mandalay and Muse, Ta-bin-shwe-hti is one of the major exporting item to the neighbouring country, with attractive offering of 4760U\$\$ per metric ton.

Information on the uses of the species is very sparse. Even most of the Myanmar indigenous medicine practitioners are not accustomed to it. Only two practitioners mentioned that the tuber of the plant can be used as anticancer, antitumor, effective on heart and gall bladder and found to possess narcotic effect. Literature Review from Vietnam and China cited that the leaves are used in treating pulmonary tuberculosis, cough and furunculosis. They may also be used as a depurative, and painful inflammation.

This study is intended to provide information to those who wish to join trade on medicinal plants successfully and to enhance the income of local communities through plantation establishment of Ta-bin-shwe-hti. In order to carried out this research paper, field trips have been made to Ywa-ngan, Pintaya, Aungban, Kalaw, Yetashay, Le-way, Mandalay, Pyin Oo lwin, Lashio, Kut-khai and Muse for collection and discussion with local communities and traders of Ta-bin-shwe-hti.

2. Botanical Studies

Materials and Methods

Materials were collected mainly from Shan Yoma. The species was also reported in the following areas:

- (1) East Yoma Range
- (2) Ye-ta-shay area
- (3) Taungdwingyi

- (4) Minbu
- (5) Kanma
- (6) Ywa-ngan
- (7) Pintaya
- (8) Pyin Oo Lwin
- (9) Myawady

Botanical and chemical analysis were applied according to the

- (1) The Orchids by Carl and Withner.
- (2) ABC of Orchids growing by Watkino.
- (3) Plant microtechnique by Johansen was used for anatomical studies.
Hand sections were made from fresh tubers. The staining combination used in this work was saffranin, alcohol, and glycerine. Macerated materials of the plant parts were studied by using equal volumes of hydrogen peroxide and glacial acetic acid.
- (4) One line drawings of the vegetative and reproductive parts of the species were also presented.
- (5) Detection of chemical constituents was made by preliminary Phyto-chemical Test.

Observations

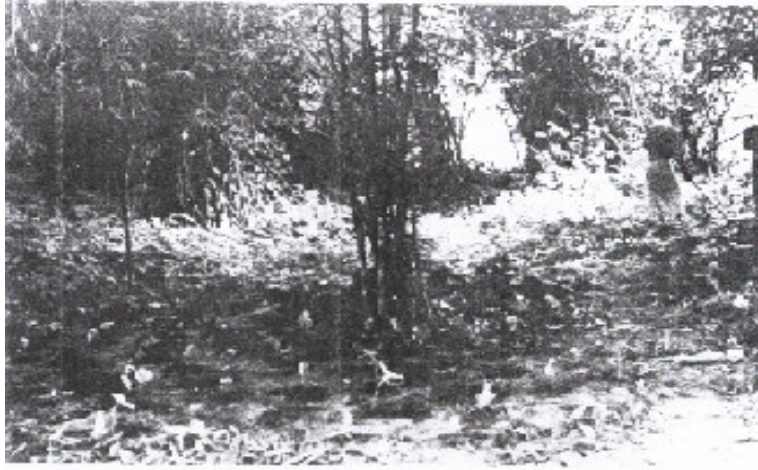
Taxonomy

Generic Description

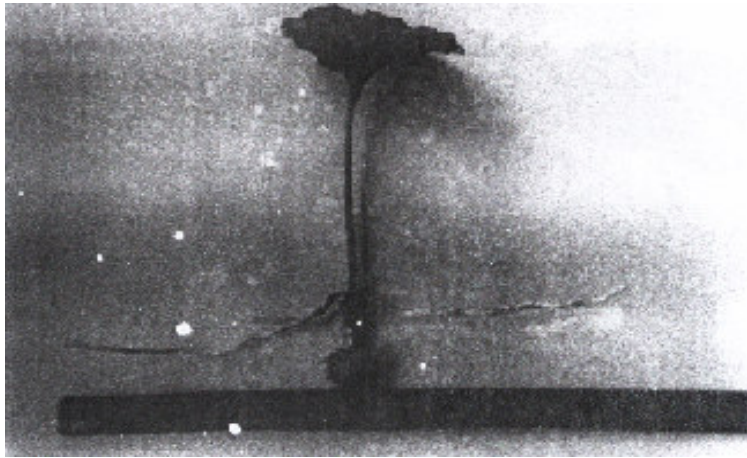
***Nervilia* Gaud.**

A terrestrial one-leaved herb with annual aerial part and perennial underground stem of two types, horizontal running stem and the other in the form of corm. Leaf simple, solitary, arise from the tip of corm, shape broadly cordate, tip acuminate to cuspidate, base cordate, many-nerved, margin undulate, surface smooth, green with dark purple spots, when young. Petiole short or long inflorescence racemose. Flowers 6-8, drooping, yellowish green, lanceolate sepals and petals, nearly equal in shape and size, free, but connivent, rarely expanded. Lip slightly 3-lobed, middle-lobe large, side lobes small, attached to the base of elongated column with clavate tip, and terminated by a lid-like anther. Capsule pendulous.

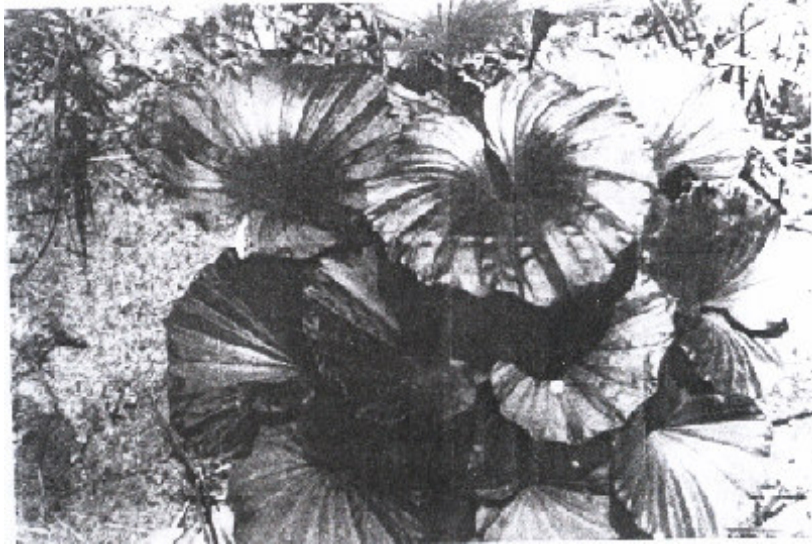
As the leaves and flowers do not appear at the same time, two keys are provided for this genus, one based on the leaf characters and one on flowers.



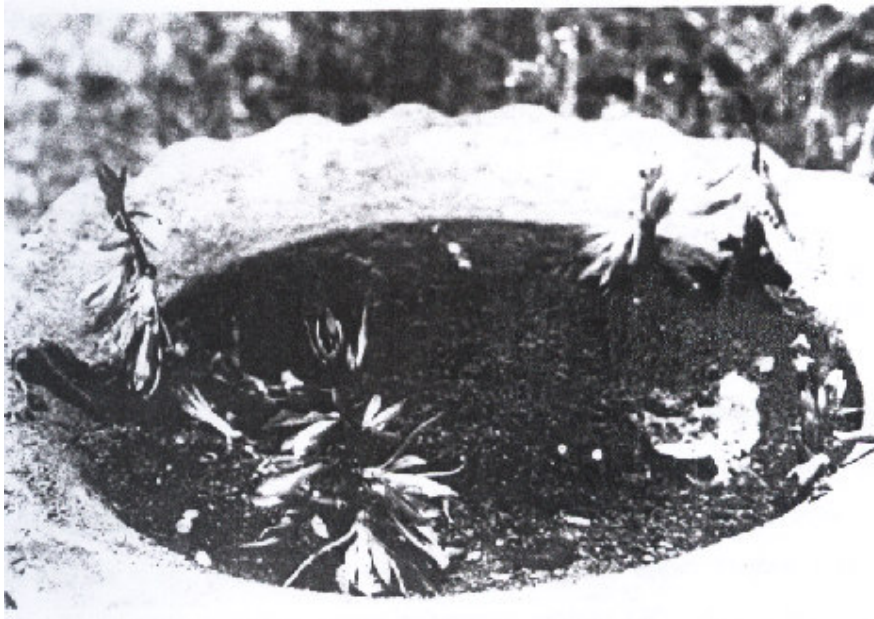
Plants (Ta-bin-shwe-hti) in natural habitat



A plant with a corm and elongated runner.



Potted plants



Plants with racemose inflorescence.

Specific Description

Nervilia aragoana Gaud.

A perennial herb, 12-28 cm high aerial parts annual, perennial underground stem corm, globose or ovoid, reveals 3-5 nodes, fleshy, white, 1.5, 3.0 cm across, from which arise numerous protuberances 1-2 mm long. Underground horizontal stem 4-180 cm long, 1-4 mm across, 3-16 nodes and internodes at an interval of 1.0, 2.5 cm, white, wavy. Leaves simple, one leaved, broadly cordate orbicular 50-(100-120)-180 cm wide, palmately 10-50 nerved, glabrous, upper surface dark green, sometime, with purplish blotches, lower palegreen; petiole 140-290 cm long, 2-7 mm across distinctly ribbed, palegreen or sometime purplish green. Inflorescence racemose; scape about 15 cm tall, arise from the tip of the corm, purplish red when young and gradually turns to green by age. Flowers 6-10, greenish yellow with brownish red spots, not widely open, more or less pendulous, pedicel and ovary about 7 mm long; bracts linear about 5mm long, sepal lanceolate 5-7 mm long, 2-3mm wide, tip acute, narrow to the base, petal linear lanceolate, 4-6 mm long, 1.5-2.0mm wide; lip shorter than the sepals, white with purplish green veins, side lobes small, triangular, middle lobe ovate with incurved edges.

Anatomy

Transverse Section of the underground stem (Corm)

In transverse section the corm understudied was about 12 mm in diameter.

Dermal Tissue System: In surface view the epidermal cell 4-6 sided, cell wall thin, 100-(150-200)-250 μ in length, 100-(120-150)-200 μ in breadth. In transverse section epidermal cells tangentially flattened, 80-(10-120)-150 μ in length, about 20 in breadth. Hair like structures present, rare, unicellular, long, slender 200-(300-400)-500 μ in length, 20-30 μ in breadth. Cuticle thin, warty.

Ground Tissue System: Parenchymatous type of cells 4-6 sided, compact 150- (250-300)-400 μ in length, 100-250 μ in breadth, cells a little larger towards the center mostly hexagonal. Starch grains numerous, oval or rounded, 30-40 μ in diameter.

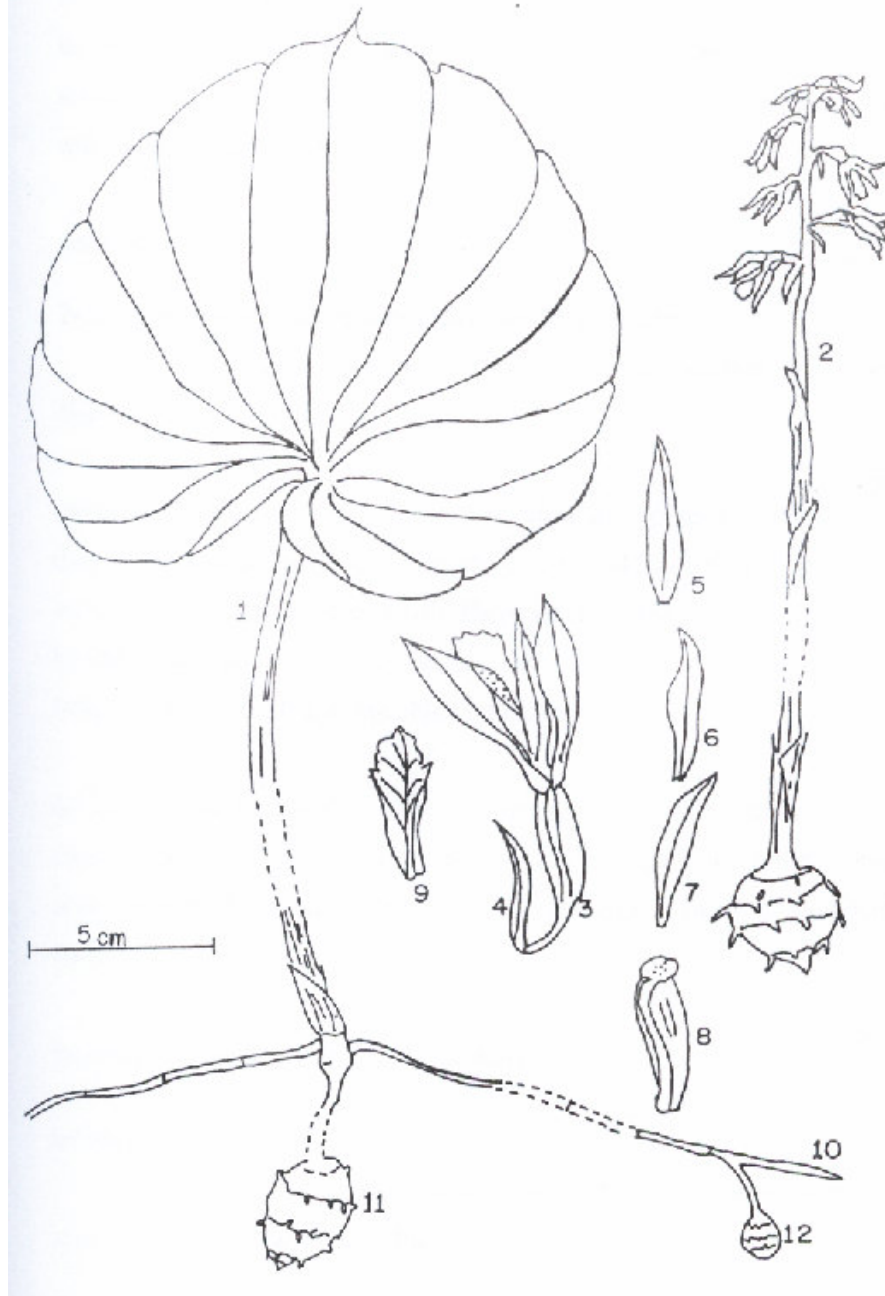
Vascular Tissue System: Not identified.

Lamina

The lamina studied was about 100 mm across. Thickness in transverse section was about 40 μ .

Dermal Tissue System : The leaf blade composed of numerous short, blunted protuberances a long the margin, brownish in colour. In surface view, the upper epidermal cells parenchymatous, compact, 4-6 sided, 40-60 μ across, wall thin. Starch grain numerous, single, variable in shape and size. Needle-like crystals in bunches, lengthen 40-70 μ . Lower epidermal cells parenchymatous, mainly hexagonal, about 50 μ across. Stomata anomocytic.

Nervilia cragoana Gaud. (Orchidaceae) Syn. *Pogonia nervilia* Bl.



- | | |
|---------------------|----------------------|
| (1) Habit | (7) Lateral sepal |
| (2) Flowering plant | (8) Column |
| (3) Flower | (9) Lip |
| (4) Bract | (10) Horizontal stem |
| (5) Dorsal sepal | (11) Mother corm |
| (6) Petal | (12) Daughter corm |

Ground Tissue System: In transverse section the thickness of the leaf is about 400 μ . Cuticle thick. Upper epidermal cells outer walls flat, inner walls concave, length 40-60 μ , breadth 30-40 μ . Lower epidermal cells oval or rounded 30-40 μ across. Bulliform cells and stomates present occasionally. Palisade cells compact, cylindrical, length 150-180 μ , breadth 80-110 μ , chloroplast abundant. Spongy cells 4-6 layers in thickness, cells compact, mostly rounded, 40-60 μ in diameter. Needle-like crystals numerous.

Vascular Tissue System: Vascular bundles not well developed. 2-3 xylem cells present.

Transverse Section of the Petiole

Petiole undertaken was about 5 mm in diameter, length about 150 mm, cylindrical, consisting 10 to 12 ridges and furrows, and a large hollow pith in the middle. Thickness of ridges 500-800, furrows 400-500 μ .

Dermal Tissue System: Cuticle slightly thick, underlying epidermal cells irregular in shape and size, outer walls, convex, thick, suberized. Sclerenchyma patches in ridges and occasional bulliform cells in furrows.

Ground Tissue System: Composed of 6-7 layers of cell, 400-500-800 μ in thickness, cells parenchyma, mostly rounded, 50-70-100 μ across, intercellular spaces thin.

Vascular Tissue System: Vascular bundles collateral, located under the ridges and as much as the number of ridges. In t.s vascular bundles small, composed of 1-2 xylem cell per bundle 10.0-12.5 μ across, phloem cells not distinct. The bundles capitated by 8-12 layers of sclerenchymatous patches flanked on both side of the bundles, 110- 130 μ thick, connected with a bundle sheath.

3. Phyto-chemical Survey on Ta-bin-shwe-hti Leaves

Ta-bin-shwe-hti (*Nervilia aragoana* Gaud.) is not a well known medicinal plant in Myanmar and so also internationally. Few informations were received from U Maw, (a practitioner in medicinal plant), and some literature from China and Vietnam which gives some account on the uses of it, but lack of information on chemical analysis. Thus, a preliminary phyto-chemical survey was undertaken and the results were as shown in Table 1.

Phyto- Chemical Survey on the Leaves of Ta-bin-Shwe-Hti

Sr. No.	Group of Compound	Material	Results	Remark
1	Alkaloid	(1) Mayer's reagent (2) Dragendorff's reagent (3) sodium picrate solution (4) Wagner's reagent	White ppt. brick red ppt. yellow ppt. brown ppt.	present present present present
2	Glycoside	10% lead acetate	White ppt	present
3	Reducing sugar	(1) Fehling's solution (2) Benedict's solution	Red orange ppt.	absent
4	Saponin glycoside	Distilled water	sponge	present
5	Cyanogenetic glycoside	sulphuric acid	colour does not discharged	absent
6	Terpene	(1) acetic anhydrate (2) sulphuric acid (conc.)	green	present
7	Phenolic compound	iron III chloride	colour discharged	present
8	α -amino acid	Ninhydrin solution	deep pink	present
9	Carbohydrate	10% α naphthol & sulphuric acid	brown ppt.	present
10	acid-base neutralization	bromocresol green	acid	present
11	Tannin	(1) iron III chloride (2) acetate solution	ppt.	present
12	Flavarnoid	(1) benzene solution (2) ferric chloride	yellow	present

Table.1 Percentage of moisture, ash and solubility.

Sr.No.	Test	%	Remark
1	Moisture Content	7	
2	Ash content	15	
3	Water solubility	15.96	
4	Ethanol solubility	6.0	
5	Petroleum solubility	2.25	

4. Discussion and Conclusion

Morphology

The morphology of both the vegetative and reproductive parts of the plants growing wild in the natural forest of East Yoma Range has been studied and described.

The outstanding characters such as the underground stem or corm which is rounded in shape, white and fleshy in nature. Solitary and orbicular or heart-shape leaf, many nerved, petioles not exceed more than 30 cm, hysteranthous (development of leaves after the flowers) and the racemose type of 6-10 drooping flowers, greenish-yellow not larger than 7 mm in length. Linear-lanceolate to lanceolate shape of sepals, petals and purplish green peduncles are found to be useful in the identification of the species.

Anatomy

Observations on the anatomical characters of the corm reveals thin cuticle and warty surface. Ground tissue consists of 5-6 sided parenchyma cells with numerous starch grains.

The petiole composed of 10-12 ridges and furrows and a large hollow pith occupying $\frac{3}{4}$ of the petiole. Vascular bundles located in the ridges and occasional bulliform cells in the furrows.

The most distinct character of the leaf is the numerous, short, blunted, brownish protuberances along the margin and bunches of needle-like greyish acicular crystal on the upper epidermal cells, and anomocytic type of stomata.

Chemical analysis

Preliminary chemical test on the leaves reveals, that the plant consisted mainly of alkaloids, glycosides, saponin glycosides, phenolic compound, α -amino acid, carbohydrate, acid, base, neutrals, tannins and flavanoids.

Moisture percentage was 7 %, ash 15%, purity 15.96 %, solubility in alcohol 6.0% and 2.25% in petroleum ether.

Soil Analysis

As the plants were collected mainly from the East Yoma Range, the soil of their natural habitat was analysed as follows.

Soil pH	Total N ₂	Extractable Nutrient			Texture			Remarks
		K%	Ca%	Mg%	Sand %	Silt %	Clay %	
7.52	0.289%	0.0245	0.293	0.106	85	8	5	Sandy soil

Growth rate study

The underground stem or corms of previous year were used in this study. They were planted in pots and kept under shady places. Measurements were taken on 100 selected plants as soon as the new shoots appear. This was started from 24-4-2001. The growth rate was found to be fast, and reached to the maximum height on 13-5-2001. Based on the measurements, the maximum height was 20 cm, and that was reached within 20 days.

Although the plant reaches to its specific size the longevity of the life span was continued till the end of October and in some areas up to November it was observed.

Current Market Information

According to the information received from Muse, the price of Ta-bin-shwe-hti was 4580 US Dollars per metric ton in year 2000 and increased up to 4670 Dollars in 2001. If compared to the other non-wood forest products it was the highest of all. Trace on the marketing route reveals that Mandalay was the major collector, demanding 6000-8000 kyats per viss. According to the discussions with the local people and traders, it was learnt that wild plants collected from the natural forest was 500-1000-1500 viss annually. The materials on sale were dried leaves and the trade route was Mandalay via Muse to China.

In conclusion, this study was intended to provide information to those who wish to penetrate on trade significantly. It was also intended to upgrade the knowledge and to enhance the income of the local communities through plantation establishment of Ta-bin-shwe-hti. Finally, the aim of this survey was to determine the possibility of expanding trade in medicinal plants, which is hoped to be the second route of income for the Ministry of Forestry.

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