



CHAPTER II

Strychnos nux-blanda A.W. Hill

Introduction to *Strychnos nux-blanda* A.W Hill

Strychnos nux-blanda A.W.Hill

(*S. nux-blanda* var. *hirsuta* A.W.Hill

S.nux-vomica L. var.*grandifolia* Dop

S. ramonensis Pierre ex Sauvan

S. ranconensis Pierre ex A.W. Hill.)

Distribution : India (Manipur) , Myanmar, Thailand, Laos,
Cambodia, and South Vietnam.

The plant is a shrub or small tree up to 15 m and occasionally more in height and with a trunk 1/2 - 1 m in circumference. The bark is whitish grey and lenticellate. When ripe, the fruits are orange with a shiny surface and they are globular, 5-8 cm in diameter, with a hard pericarp 2 - 2 1/2 mm thick, and contain up to 15 seeds resembling those of *S. nux-vomica* L. but tending to be more irregular in shape, slightly larger in size, and pale yellowish rather than greyish. In Myanmar and Thailand *S. nux-blanda* A.W. Hill occurs in the plains and in the lower hill (deciduous and half deciduous) forests up to about 1300 m altitude, while in Indo-China it is not too common tree growing isolatedly in clear forest, often on sandy-soil. (8)

The species is very similar to *Strychnos nux-vomica* L., but may be distinguished by its habitat and habit and by the greater dimensions of the flower calyx and fruit and the seed (8). It is remarkable for its large abruptly acute or acuminate leaves with their prominent strong nerves and inconspicuous vein, characters which enable it to be easily distinguished from *S. nux-vomica* L. With these characters and the fairly thick sharp-edged seeds, irregular in shape and furnished with a felt-like covering (Fig. 10) quite unlike the satiny coat of the round, flattened, button-like seeds of *S. nux-vomica* L.

In the flowers the most striking difference between *S. nux-blanda* A.W.Hill and *S. nux-vomica* L. is to be found in the calyx segments. The former species possess long and narrowly lanceolate, whereas in *S. nux-vomica* L. they are shortly and broadly ovate. The anthers of the *S. nux-blanda* A.W. Hill are apiculate and inserted below the sinuses; in both these respects they differ from those of *S. nux-vomica*, where the insertion is in the sinuses and there is no apiculus. (Fig. 11,12)

The fruits of *S. nux-vomica* L. are 2 1/2-4 cm in diameter containing 1-4 discoid seeds whereas fruits of *S. nux-blanda* A.W. Hill are 5-8 cm in diameter with 4-15 irregularly ellipsoid to ovoid seeds. (7)

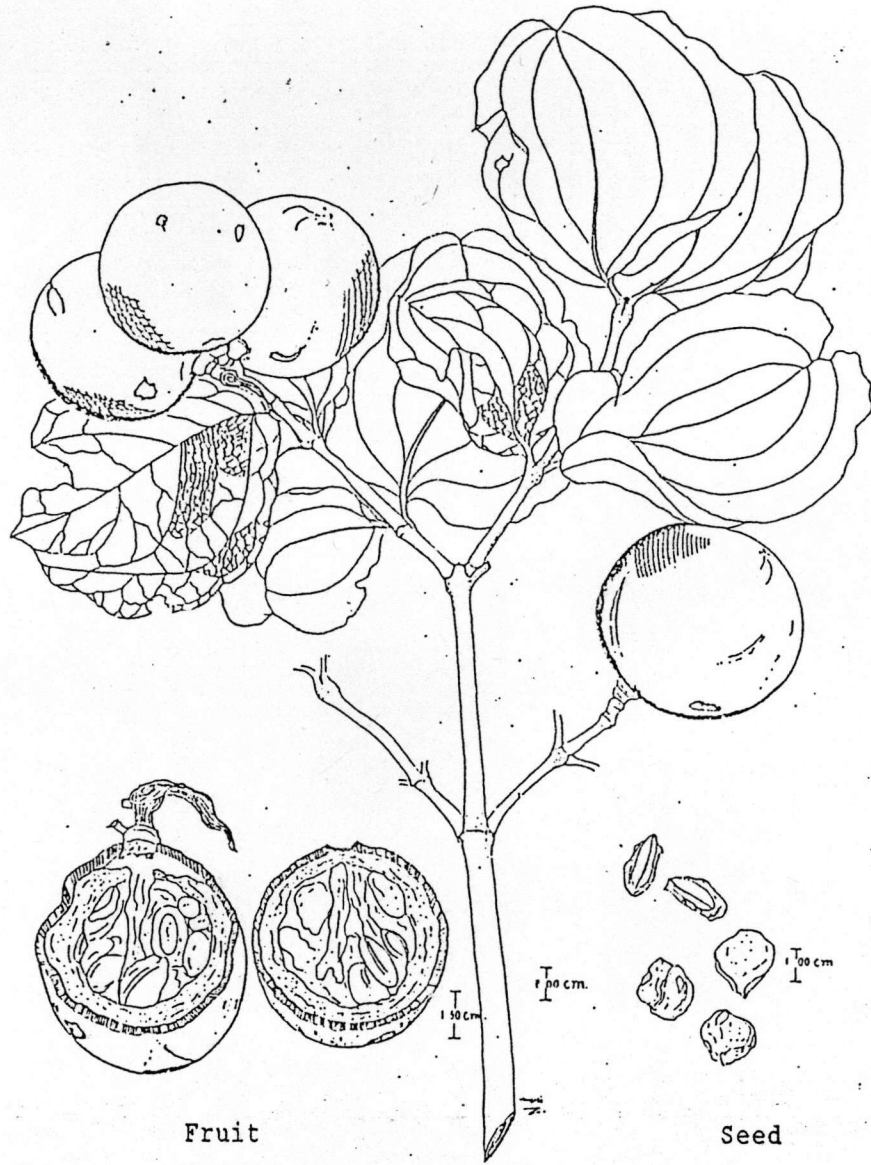


Figure 10 *Strychnos nux-blanda* A.W. Hill

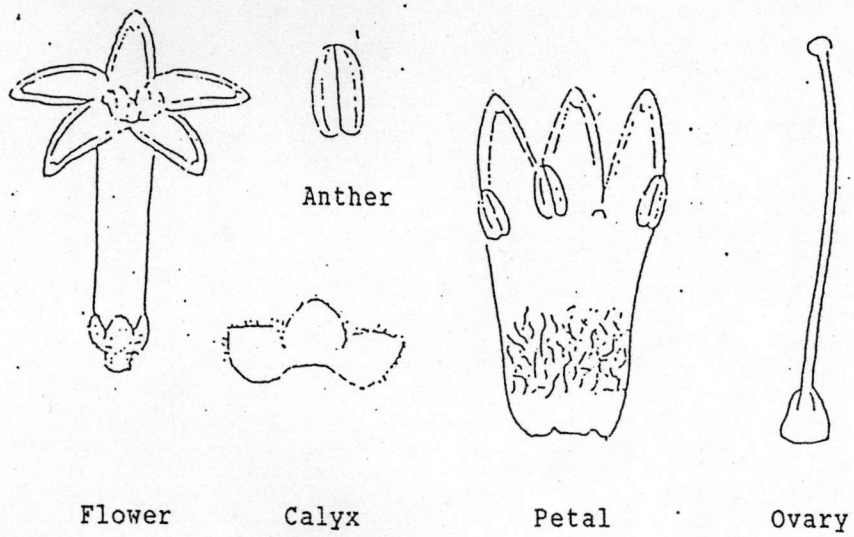


Figure 12 Details of flower of *Strychnos nux-vomica* L.

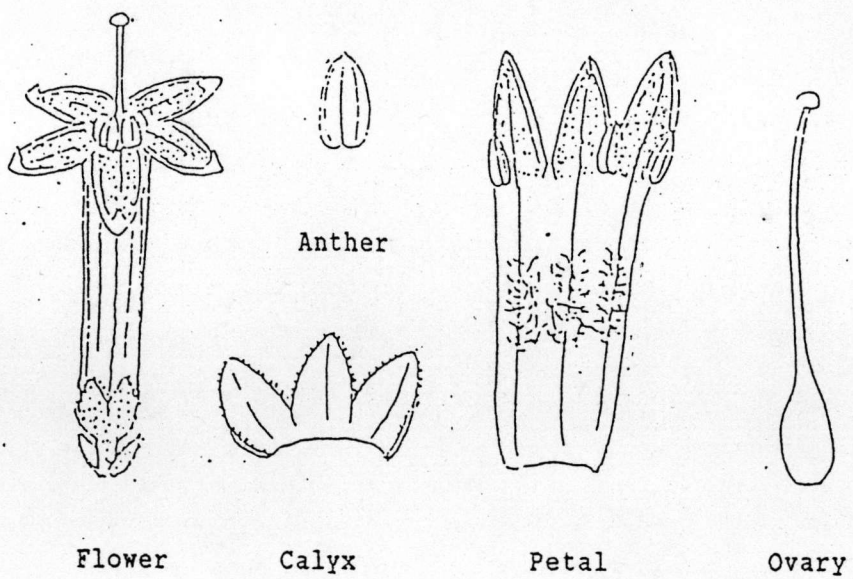


Figure 13 Details of flower of *Strychnos nux-blanda* A.W. Hill

S. nux-blanda A.W. Hill seeds have been in place of those of *S. nux-vomica* L., they are distinguished by a very low alkaloid content.(8)

When Hill, for his 1917 revision of Asian *Strychnos*, came to examine the material from Myanmar which had been identified up to that time as *S. nux-blanda* L. it became clear that the specimens available all belonged to his new species *S. nux-blanda* A.W. Hill, which he named thus because of the very low alkaloid content of the seeds. It follows that the *S. nux-vomica* L. from Myanmar discussed in older publications is in fact *S. nux-blanda* A.W. Hill.(8)

The Medicinal Used of *Strychnos nux-blanda* A.W. Hill

In Myanmar, the fruit is used for fish poison ; a decoction of the root is applied in rheumatism, ulcers, elephantiasis, fever, and epilepsy; the bark is used in fever; the ripe seeds are used as a spinal stimulant and bitter tonic in severe illness and sexual impotence; the tree is a good substitute for *Strychnos nux-vomica* L.(8)

In Thailand, the root is used in folk medicine as a febrifuge (70); the wood is used as antipyretic, bitter tonic and nerve tonic (71);the dried ripe seeds are used as a therapeutic agent for stomachic and tonic, cathartic and analeptic. (72) The stem bark is used as an antidote for snake venom by rubbing the bark on a stone with liquor and covering the bite with cotton

wool soaked with the liquid obtained.(74) Fresh bark , rubbed on a stone with water, taken orally was said to be a fairly good antidote for snake bite.(74) Powdered stem bark mixed with rice bran is used as taeniicide in the horse.(74)

Previous investigations

The following is a short account of more recent research work done by some workers on various parts of *S. nux-blanda* A.W. Hill(12)

As can be seen from Table 5, small amounts of alkaloids are present in most of the samples investigated. The leaves of Vidal 4324 gave an extract containing small amounts of strychnine 54 and brucine 55 and their various derivatives (Table 6).

The three seed samples (Table 6) had only a few components and brucine 55 and/or strychnine 54 were the major alkaloids. Small amounts of the brucine N-oxide, 64 , strychnine N-oxide 62 and pseudobrucine 66 were likewise present.

The GLC complicated the picture, for the extracts gave several peaks with short retention times, including one with the same R_t value as diaboline 47 . In Bisset and Phillipson (5) it was stated that *S.nux-blanda* A.W. Hill contains diaboline 47. Further examination of the TLC and use of the Ferric chloride perchloric acid ($FeCl_3-HClO_4$) spray have not confirmed this and the MS have not provided any evidence either for its occurrence

in extracts from this species.

It is clear from the study now reported that the leaves and seeds of *S.nux-blanda* A.W. Hill do definitely contain small amounts of alkaloids and also that these alkaloids are in general similar to those of the closely related *S. nux-vomica* L.. The one important difference between the two species is that the seeds of the former, in addition to having a much lower alkaloid content, have a component with a R_f value similar to that of diaboline 47 ; such a component is not known to occur in *S. nux-vomica* L.

The collection Nai Noe 216 is a problem. The high alkaloid content of its leaves, 2.83%, clearly differentiated it from the other collections of *S. nux-blanda* A.W. Hill examined (Table 5) Moreover, the composition of the mixture of alkaloids (Table 6) bore a marked resemblance to that of *S. nux-vomica* L. and suggested that the sample did not belong to *S. nux-blanda* A.W. Hill. Indeed, on reexamination the herbarium material was thought to agree better with *S. nux-vomica* L. or *S. angustiflora* Benth. Certainly the former, but not the latter, identification is more in keeping with the quantitative and qualitative chemical findings, but nevertheless, opinion has veered back again to the initial identification as *S. nux-blanda* A.W.Hill(12). In accepting this, at least for the time being, it is with the realization that chemically the material is out of line with the other collections of the species investigated.

Table 5 Sample data and results of alkaloid screening procedure for *Strychnos nux-blanda* A.W. Hill (12)

| Collector's Number | Date collected | Locality | Plant part | Amount Extracted(mg) | Amount of Extract(mg) | % Extract | Alkaloids Test | Remarks |
|---------------------|----------------|-----------------------------|------------|----------------------|-----------------------|-----------|----------------|--|
| Gilbert Roger 810.. | 06/05/19 | Myitkva, Myanmar | l | 277 | 0.5 | 0.18 | -ve | |
| Fl. Thailand 71.... | 20/04/70 | Phitsanulok, Thailand | peri | 6064 | 1.1 | 0.02 | + | |
| Fl. Thailand 71.... | 20/04/70 | Phitsanulok, Thailand | s | 4342 | 3.8 | 0.09 | +++ | |
| Smitinand 10203.... | 21/02/67 | Khon Kaen, Thailand | l | 3522 | 2.7 | 0.08 | tr | Slightly bitter |
| Nai Noe 216..... | 23/05/29 | Nakorn Ratchasima, Thailand | l | 198 | 5.6 | 2.83 | +++ | Very bitter |
| Vidal 1115..... | 13/11/49 | Vientiane Prov., Laos | s | 3968 | 5.1 | 0.13 | + | CH ₂ CH ₂ extr. blue mauve |
| Vidal 4324..... | 08/11/65 | Borikhane Prov., Laos | l | 4568 | 8.9 | 0.19 | +++ | Slightly bitter |
| ST 10/26/K1..... | ---- | ----- | s | 1974 | 2.2 | 0.11 | +++ | |

Table 5 (continued)

| Collector's Number | Date collected | Locality | Plant part | Amount Extracted(mg) | Amount of Extract(mg) | % Extract | Alkaloid Test | Remarks |
|------------------------|-------------------|-----------------------------|---------------|-------------------------|--------------------------|-----------|------------------|--|
| A.K. Choudhury (cult.) | 15/09/68 | Chittagong, Bangladesh | s | 6633 | 15.7 | 0.24 | ++++ | |
| A.K. Choudhury (cult.) | 00/08/68 | Sylhet, Bangladesh | rb | 2425 | 55.5 | 2.29 | ++++ | 3-4 cm diameter |
| A.K. Choudhury (cult.) | 00/08/68 | Sylhet, Bangladesh | rw | 4343 | 13.1 | 0.30 | ++++ | 3-4 cm diameter |
| A.K. Choudhury (cult.) | 00/08/68 | Sylhet, Bangladesh | sb | 4603 | 43.1 | 0.94 | ++++ | 4-5 cm diameter; some loss in work up |
| A.K. Choudhury (cult.) | 00/08/68 | Sylhet, Bangladesh | sw | 1916 | 5.8 | 0.30 | ++++ | 4-5 cm diameter |
| A.K. Choudhury (cult.) | 00/08/68 | Sylhet, Bangladesh | sb | 1221 | 11.8 | 0.97 | ++++ | 1/2 - 1 cm diameter |
| A.K. Choudhury (cult.) | 00/08/68 | Sylhet, Bangladesh | sw | 1793 | 7.8 | 0.44 | ++++ | 1/2 - 1 cm diameter |
| A.K. Choudhury (cult.) | 00/08/68 | Sylhet, Bangladesh | l | 4551 | 9.5 | 0.21 | ++++ | |
| Phung Trung Ngan s.n. | 18/06/74 | Phuoc Tuy Prov., S.Viet-Nam | l | 1385 | 19.9 | 1.44 | ++++ | |
| Thorel 1026 | Ca. 1860 | Cochin-China, S. Viet-Nam | l | 179 | 2.3 | 1.28 | ++++ | Somewhat bitter |

Table 5 (continued)

| Collector's Number | Date collected | Locality | Plant part | Amount Extracted(mg) | Amount of Extract(mg) | % Extract | Alkaloid Test | Remarks |
|---|-------------------|------------------------|---------------|-------------------------|--------------------------|-----------|------------------|-----------------|
| Herb. Rottler s.n.... | 01/04/1806 | Madras, India | l | 230 | 5.7 | 2.48 | +++ | Very bitter |
| ST 10/27/K5 (commercial) | Ca. 1950 | (Cochin), S.India | s | 4465 | 57.6 | 1.29 | +++ | |
| ST 10/27/K6 (commercial) | Ca. 1950 | (Cocanada), S.India | s | 3378 | 50.0 | 1.48 | +++ | |
| ST 10/27/K4 (commercial) | Ca. 1950 | (Madras), S.India | s | 4746 | 41.2 | 0.87 | +++ | |
| P. Hermann, Herb. vol.4, fol.33..... | Ca. 1675 | Nr.Colombo, Sri Lanka | l | 183 | 2.2 | 1.20 | +++ | |
| Fouche (commercial).. | Ca. 1967 | Sri Lanka | b | 5244 | 34.8 | 0.66 | +++ | |
| A.K.Choudhury (cult.) | 15/09/68 | Chittagong, Bangladesh | s | 6633 | 15.7 | 0.24 | +++ | |
| A.K.Choudhury (cult.) | 00/08/68 | Sylhet, Bangladesh | rb | 2425 | 55.5 | 2.29 | +++ | 3-4 cm diameter |

Table 5 (continued)

| Collector's Number | Date collected | Locality | Plant part | Amount Extracted(mg) | Amount of Extract(mg) | % Extract | Alkaloid Test | Remarks |
|-----------------------------------|------------------------|----------|---------------|-------------------------|--------------------------|-----------|------------------|------------------|
| ST 10/27/M1 | 19 th cent. | ----- | b | 4271 | 94.8 | 2.22 | +++ | "Angostura bark" |
| ST 10/27/M3 | 19 th cent. | ----- | b | 4354 | 26.2 | 0.60 | +++ | |
| Sloane Colln 412 (Cunninghame) | 1698-1699 | ----- | s | 3142 | 48.3 | 1.54 | +++ | |
| 1816-A155/1903 | ----- | ----- | s | 4244 | 87.6 | 2.07 | +++ | |

The abbreviations for the plant part are listed as follows:

b = bark, l = leaf,
 peri = pericarp, rb = root bark,
 rw = root wood, s = seed,
 sb = stem bark, sw = stem wood

Table 6 Alkaloids identified by thin-layer Chromatographic (T), gas-liquid chromatographic (G), and mass-spectrometric (M) techniques in various collections of *Strychnos nux-blanda* A.W. Hill (12)

| Collector's Number | Plant part | D | S | HS | C | HMS | B | SO | BO | ψ-S | ψ-B | I | V | N |
|--------------------|------------|---|-----|----|---|-----|-----|----|----|-----|-----|----|----|----|
| Fl. Thailand 71 | seed | | TGM | | | | TGM | | TM | | T | | | |
| Nai Noe 216 | leaves | | TG | | | | TG | | | | | TG | TG | TG |
| Vidal 1115 | seed | | TG | | | | T | | | | | | | |
| Vidal 4324 | leaves | | T | | | | T | T | T | T | T | T | T | T |
| ST 10/26/K1 | seed | | TGM | | | | TGM | TM | | | | TM | TM | TM |

The abbreviations for the various alkaloids identified are as follows :

B = brucine; BO = brucine N-oxide; C = α - and/or β - colubrine
D = diaboline; HMS = 4-hydroxy-3-methoxystrychnine; HS = 4-hydroxystrychine;
I = icajine; N = novacine; ψ-B = pseudobrucine; ψ-S = pseudostrychnine;
S = strychnine; SO = strychnine N-oxide; V = vomicine

Greenish (69) analysed seeds of *S. nux-blanda* A.W. Hill from Myanmar; they were not bitter and ether/chloroform-soluble bases, which include strychnine 54 and brucine 55, could not be detected in "7 1/2 g" of material. In a paper headed note on False Nux-vomica seed. Small (12) wrote that in the seeds investigated by him, which also came from Myanmar, he had been unable to detect any alkaloid. Similarly, Joyeux- Mollinedo (12) obtained on ether/chloroform or chloroform - soluble bases from seeds of Laotian and Cambodian origin; she did however, obtain a positive test for loganin 157 with a 10% tincture made with 80% ethanol. In the dog "1/2 ml/kg" of a 10% tincture injected intravenously had no effect on the arterial pressure and only caused a slight renal constriction; and in the guinea pig injection of "2 ml/kg" of a 10% aqueous macerate did not give rise to any symptoms of toxicity but caused a slight excitation. Evidently, *S. nux-blanda* A.W. Hill seeds contain little in the way of toxic constituents. Turner and Davies (12) noted that the taste of the seeds was "bland and mucoid".

The alkaloids previously found in *S. nux-blanda* A.W. Hill are already summarized in Table 7.

Table 7 The alkaloids previously found in *Strychnos nux-blanda*

A.W. Hill

| Plant part | Isolated alkaloid | Group | Reference |
|------------|---------------------------------|----------------|-----------|
| unknown | Diaboline <u>47</u> | S ₂ | 73 |
| | ---Brucine <u>55</u> | S ₄ | 12 |
| seeds | ---Pseudobrucine <u>66</u> | S ₄ | 12 |
| | ---Strychnine <u>54</u> | S ₄ | 12 |
| | ---Strychnine <u>N-oxide 62</u> | S ₄ | 12 |
| | ---Brucine <u>55</u> | S ₄ | 12 |
| | ---Brucine <u>N-oxide 64</u> | S ₄ | 12 |
| | ---Icajine <u>72</u> | S ₄ | 12 |
| | ---Novacine <u>73</u> | S ₄ | 12 |
| leaves | ---Pseudobrucine <u>66</u> | S ₄ | 12 |
| | ---Strychnine <u>54</u> | S ₄ | 12 |
| | ---Strychnine <u>N-oxide 62</u> | S ₄ | 12 |
| | ---Vomicine <u>74</u> | S ₄ | 12 |

Purpose of the Present Investigation

On the previous works, there was only few phytochemical studies on various parts of *Strychnos nux-blanda* A.W. Hill. Most of the research works were on its seeds because of the confusion between *S.nux-blanda* A.W. Hill and *S. nux-vomica* L.in the past, only one paper studied on the alkaloidal compositions in its leaves. Up to now, still no research work on the stem bark of this plant. Further work is desirable in order to put the identification of the bases present in *S. nux-blanda* A.W.Hill on a surer footing and also to establish more clearly the quantitative differences in the alkaloids occurring in the otherwise closely related *S. nux-blanda* A.W. Hill and *S. nux-vomica* L..

The present investigation has carried out mainly to isolated the alkaloid bases from the stem bark of *S. nux-blanda* A.W. Hill with the hope to gain more information about the plant alkaloidal compositions.

It is hoped that, this investigation would provide some informations concerning the alkaloid distributions, the chemotaxonomic and the biosynthetic relations among the indole alkaloids.

Moreover, some isolated alkaloids from the plant would lead to the establishment of the structure and pharmacological or toxicological activities relationships which, are one time is

still unexplained.