



CHAPTER I  
INTRODUCTION

The Niang tree (English name = djenkol tree, scientific name = Pithecellobium Jiringa or Pithecolobium lobatum) is a tree belongs to the family of Leguminosae. It is cultivated in the southern part of Thailand. It is also a native of the Malay Peninsula, south from Tenasserim in Burma, Malaysia, Borneo, Sumatra and Indonesia. Niang beans are favouritely eaten among the local inhabitants. The beans are rippen in the rainy season, i.e., during June to October.

The Niang tree is called by different names according to the places where it is grown.

Botanical name: Pithecellobium Jiringa Prain.

Synonym: Pithecolobium lobatum Benth Hook.

Native name: Ma-niang, Cha-niang, Maniang-Yong (Thai, central)

Phak-laton (Thai, Mae-Hongsorn), Ya-ring, Yi-ring Yong, Kha-Niang, Niang, Niang-Yai (Thai, southern) Yi-ni-ling (Malaysia), Djenkol, Jengkol, Genkol (Java), Jiring (Sumatra), Danyin-thee (Burma)

Descriptions:

The Niang tree is a tree of fair size even up to 80 feet in height with large rounded crown. The stem is 15 to 20

inches. Bark is light pinkish brown through grey in colour and smooth. Young leaves are in rich purple hanging limply. The timber is soft and reddish or white shining with no heart wood. (See Fig. 1).

Leaves have a stalk  $\frac{1}{2}$  - 3 inches long with one pair of side-stalks, glabrous. Leaflets are  $2\frac{1}{2}$  - 11 x  $1\frac{1}{4}$  - 4 inches with 2-3 pairs on each side-stalk. There is a dull green or yellowish gland on the lower part of the leaf-stalk,  $\frac{1}{4}$  -  $\frac{1}{2}$  inches from the base. They are very conspicuous in the young purple leaves, and there is a smaller gland between each of the last 1 - 2 pairs of leaflets.

Flowers are greenish white to cream-white. They are in small heads of 3-6 flowers and are arranged in panicles 4-9 inches long in the older leaf-axils or on the twigs behind the leaves. Flower-heads are  $\frac{3}{4}$  inches wide, very fluffy from the stamens ( $\frac{1}{3}$  inches long) with the corolla 15 inches long.

Pods are very massive 2 inches wide, 9-10 inches long, 1 inches thick, horseshoe-shaped, strongly lobed, leathery, dull-drab purplish brown. They are coiled in 2 circles in opposite directions and constricted between the large seeds. Each pod contains 3-9 seeds. (Fig. 2)

The seeds are orbicular, flat 2 inches across, orange-yellow to reddish brown epidermis, when removed exposing the pale yellow contents with fetid sulfurous odour (Corner 1952) (Fig. 3).



Pithecellobium jiringa Prain.

A = Flower

B = Fruit

Fig.1 Pithecolobium Lobatum Benth Hook.  
Niang tree showing flowers and Pods.

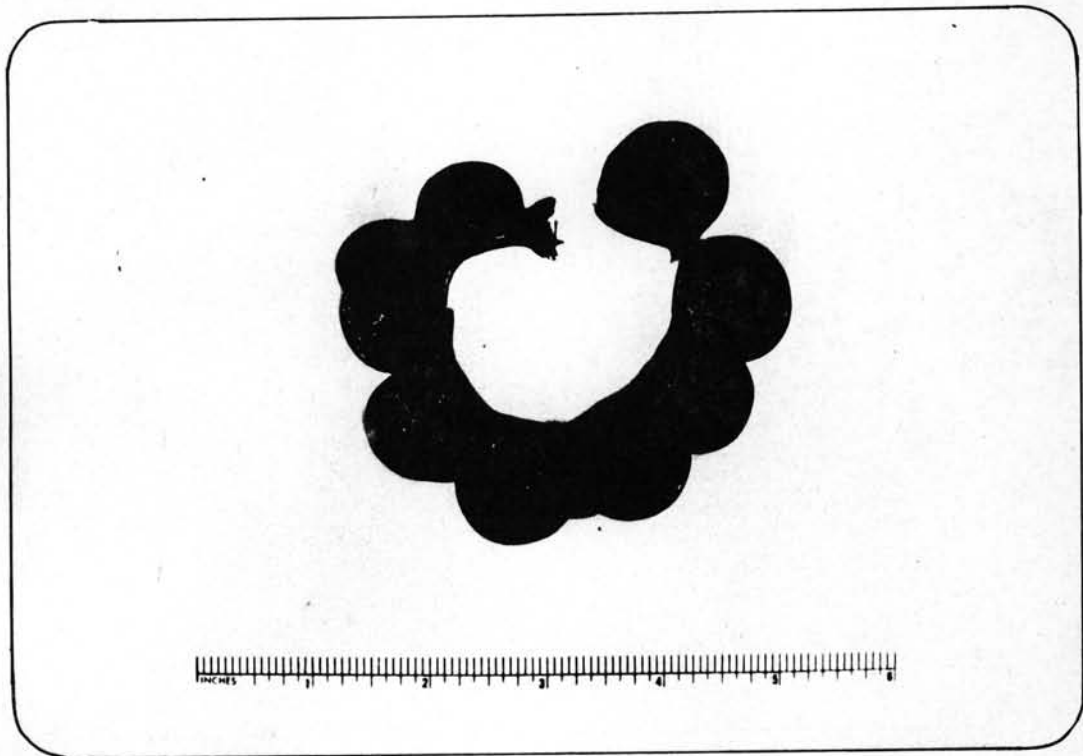


Fig.2 Pods of the Niang.

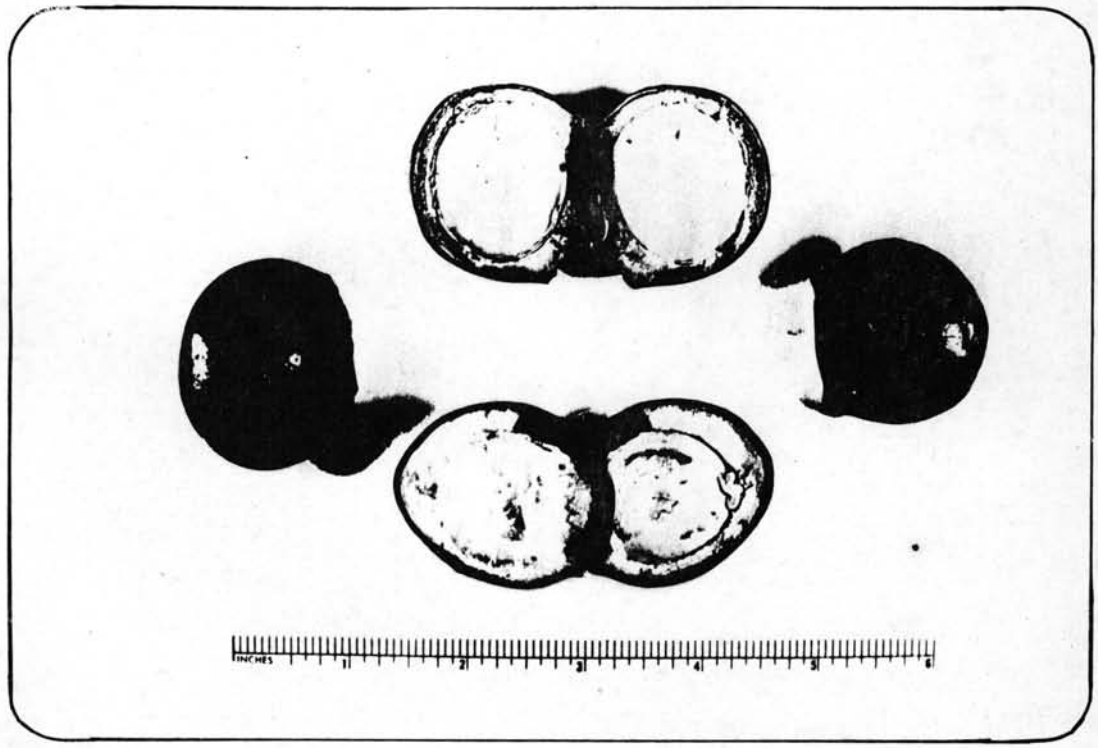


Fig.3 Niang beans. One of the centre bean has the outer layer of the testa removed to expose the inner layer of the testa .



Niang beans are relished as a flavouring for food. Immature seeds are eaten as well as ripe ones. Seeds from wild tree are preferable than those from a cultivated tree. They are eaten raw, fried or roasted. Raw seeds are sometimes taken with Thai food such as hot curry. They are also served as a kind of dessert in the form of the sliced boiled seed with coconut milk and sugar. Occasionally they are burried and allowed to germinate or after pounding the seed and making them into sun-dried cake.

Niang pods give a purple dye on silk. It was used by the dyers of Pekan. In Borneo the bark is used for dyeing matting black with the aid of mud into which the mat is pressed after it has been boiled with juice from the bark. In another method of dyeing, the leaves are used instead of the bark. The black colour is said to be very fast.

The leaves are used for poulticing for skin complaints and for pains in the chest.

The bark is also used for pains in the chest and to make a gargle for tooth-ache.

Ash of old leaves are applied for itch in Java. Powder of scorched young leaves may be applied to cut and chiefly to the wound of circumcision. After ingestion, the seeds act as a diuretic. The allyl compound is excreted by the body through the kidneys.

The timber is soft, reddish or white shining with little or no heart wood. It is a soft, almost valueless wood, only used for coffins and firewood.

#### Nutritive values of Niang beans.

The bean contains starch together with protein and small quantities of fat. The rest portion is consisting of a sulfur compound, vitamins and minerals.

#### Toxicity

Most person eat Niang beans without ill effect, but at times severe sickness follows. Some persons who previously had eaten them without ill effect may be severely affected, but later may eat them again without untoward manifestations. Poisoning varies with the number of beans eaten, the method of preparation of bean for consumption, the time of year that the bean has been harvested and depending on their source and age. The hazard is well known but it is generally ignored by local people.

Mild djenkolism is characterized by spasmodic pain in the loin and bladder and by urine containing albumin, leukocytes, epithelial cells, erythrocytes and needle-shaped crystals. Severity is alarming within 2 to 12 hours after eating the beans. They are intense colic, flatulence, meteorism, and painful micturation. Vomiting, diarrhea or constipation sometimes occurred. The urine at first is "milky" but soon becomes bloody and reduced in amount. Transient

anuria, hypertension and azotemia may follow. There may be low fever and leukocytosis. The majority of otherwise healthy victims recover within a few days. Death is rare. The history of eating Niang beans, the characteristic odour of breath and urine and crystalluria make diagnosis easy. (Reiman and Sukaton 1956).

The symptoms are associated with the appearance of djenkolic acid crystals in the urine. The disease may take two forms depending on the level of blockage in the urinary system. Blockage of the renal tubules and ureters stop the production of urine. In severe case the flow of urine ceases and death occasionally follows.

A mild form of the disease occurs if the crystals obstruct the urethra. The patient experiences painful distension of the bladder and crystals can be seen at the outlet of the urethra. If the patient survives the attack, the urethra may develop strictures, abscesses and fistulae. It is conceivable that obstruction of both upper and lower urinary tracts may be seen in the same patient (West et al. 1973).

The crystals had been demonstrated in the urine of a patient who was suffering from cystitis after eating Niang beans.



Van-Veen and Hyman: (1933) isolated the crystals from the urine of a patient who suffered from djenkolism and also succeeded in isolating the same crystals from Niang beans. They called djenkolic acid. It is an amino acid which is rich in sulfur with a suggested formula of  $C_{11}H_{23}S_3O_6N_2$ . It is presumably the cause of djenkolism.

Mreyen (1941) recognised that djenkolism is produced by precipitation of djenkolic acid in the renal-urinary system.

Reiman and Sukoton (1956) reported sixteen adult patients who gave the history of eating Niang beans having those manifestation as such. In many instances the needle-like crystals were found in the urine. The post mortem examination showed only minor changes in the kidneys of these patients. The kidneys may be oedematous and cortical necrosis has been reported in a child. The crystals are not found in the kidney as they seem to be removed by histological preparation (Van Veen and Hyman 1933). It is possible that these crystals may be visualised in slides prepared by frozen section. Vigneaud & Patterson (1936) and Armstrong & Vigneaud (1936) had synthesized the cysteine thioacetal of formaldehyde which has been shown to agree closely in physical properties and chemical behavior with djenkolic acid isolated by Van Veen and Hyman (1933) from natural sources.

Only a few inconclusive studies on animals have been done. The animals used in these experiments are monkeys, rats and dogs.

a. Experiment in monkeys

Van Veen and Hyman (1933) fed Niang beans to monkeys and could demonstrate the rosette needle-shape crystals in urine of these monkeys. Mreyen (1941) fed beans to one monkeys and also to a few rabbits. None became sick. Tissues of animals killed 6 to 24 hours after feeding were meagerly described. The lungs, kidneys, jejunum and liver were hyperemic. Occasionally there was a leukocytic infiltration of the peripelvic renal connective tissue and exfoliation and obliteration of some tubules. Rajatasilpin et al. (1961) fed 20 per cent Niang beans mixed diet to two monkeys. The monkeys did not show any obvious untoward signs or symptoms which might occur in man. Their urine turned turbidly and smelled like sulfur. The pH of the urine ranged from 6.5 to 7.5 during the control period and remained in this level throughout the period of the experiment. Microscopic examination revealed that amorphous particles and epithelial cells were increased during the Niang mixed diet period. Occasionally granular casts appeared in some urine samples, but there was no red blood cells in the urine. The 48 hour urine of the second monkey show abundant needle shaped crystals which appear in only one day. The crystals were easily dissolved in diluted acid

or alkali solutions. The excretion of crystals in the urine was not persisted. They found them in urine of the second monkey only on the 2nd day of the experiment. Since then no crystalluria appeared even in the second experiment of the Niang mixed diet. The result of autopsies revealed the cloudy swelling and hyperemia of the kidney tubules, but no sign of desquamation was seen. There were no changes in other organs of the monkeys.

b. Experiment in rats

Mreyen (1941) did an experiment on guinea pigs by feeding them with the beans. He found no changes in urine of these animals. Rajatasilpin et al (1961) fed six albino rats with the diet containing 20 per cent of Niang beans for 6 weeks as well as a control group of the equal number of rats. Their urine were collected freshly and directly from the rats and were examined microscopically everyday. Besides the increasing of amorphus particles, they did not find any significant changes. Autopsies did not reveal any pathological lesion in organs examined.

c. Experiment in dogs

Mokasmith (1961) did an experiment on four bitches by feeding them with fresh 8-9 Niang beans per day. No crystals were observed in the urine. The total volume of 24 hour urine specimen was slightly decreased. No significant effect of Niang beans on bitch's kidney have been observed.

As mentioned above, Niang beans could cause mild to severe degree of dysuria, haematuria and anuria in some patients. It has been proposed that these symptoms were due to the laceration of the renal tissue caused by the needle-like crystal in the urine. What condition the crystals may occur is still doubtful. It is more likely that the crystals might be formed in specific species of animal and in only a certain condition, such as the proper body pH, the capability of enzymes for the formation of the crystals and some other unknown factors. It is also of biochemical and physiological interest to investigate whether djenkolic acid occurs in free state or bound as part of the proteins.

The objectives of the present studies are therefore:

1. To estimate the amount of the djenkolic acid and its state in the Niang beans and to find various ways to extract this acid out of the fresh beans.
2. To study on the toxicity of Niang beans in experimental animals such as monkeys, mice, and rats.