

## INVESTIGATION OF THE PHYSICOCHEMICAL AND BIOACTIVITY PROPERTIES OF *Dolichandrone spathacea* (Tha khut)

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### Abstract

This research work deals with the investigation of physicochemical properties and antimicrobial activity of the dried powdered sample of flower named *Dolichandrone spathacea* (Tha khut). The sample was collected from Amarapura Township, Mandalay Region. Preliminary phytochemical tests indicated the presence of glycoside, alkaloid,  $\alpha$ -amino acid, carbohydrate, flavonoid, phenolic compound, saponin, steroid, tannin and terpenoids. The elemental analysis of dried powdered sample was also performed by EDXRF and AAS techniques. The high contents of K (3.672%) and Ca (0.808%) were observed. The determination of nutritional values from the dried powdered sample of Tha khut was carried out by AOAC method. The highest amount of carbohydrate (73.30%) and low fat (2.67%) were observed. On antimicrobial screening of Tha khut sample, pet ether, EtOAc, CHCl<sub>3</sub> and EtOH extracts were examined with six microorganisms such as *Bacillus cereus*, *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Shigella boydii*, *Salmonella typhi* and *E. coli* species. The screening of antioxidant activity of ethanolic extract from Tha khut was carried out by DPPH method using UV spectrophotometer.

Keywords : *Dolichandrone spathacea*, Antimicrobial screening, EDXRF, AAS,

### Introduction

Most of the medicinal plants were being used in Indian traditional medicine to cure various diseases. In Myanmar, most of the people use the stem bark, flower and fruits of *Dolichandrone spathacea* (Tha khut), the indigenous medicinal plant, its bark is applied on antipyretic, asthma, vomiting, inflammation and diarrhoea. The flower and fruit were used as chlorosis, cholera, diuresis and haematemesis. The *Dolichandrone spathacea* flower is white. The flowers are cooked and eaten as a vegetable and the leaves are used in the treatment of thrush. The pale wood is durable, light in weight and easily worked. It is used for small household goods, toys, floods and wooden shoes.

### Scientific Classification

Family :	Bignoniaceae
Genus :	<i>Dolichandrone</i>
Species :	<i>spathacea</i>
Botanical name :	<i>Dolichandrone spathacea</i>
English name :	Mangrove trumpet tree
Myanmar name :	Tha khut ma, Hnin gut, Tha khut
Part of used :	Flower

### Description of *Dolichandrone spathacea* (Tha khut)

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A shrub or tree can grow up to 25 m tall. The trunk has grey, smooth bark. The plant produces bisexual flower that develop on flowering shoots. Each shoot contains 2-10 flowers. Its large, scented, white flowers are nocturnal, drooping off at about sunrise, trumpet-shaped, 12-20 cm long, and 3- 13 cm wide at the mouth.



Figure (1) Plant of *Dolichandrone spathacea* (Tha khut)



Figure (2) Flower of *Dolichandrone* (*Tha khut*)

### **Distribution of *Dolichandrone spathacea* (Tha khut)**

Tha khut is distributed only in South and South East Asia, India, Java, Solomons, Bismarch Arch, Thailand, New Guinea, Sri Lanka, Peninsular Malaysia, Singapore, Andomans, Nicobars, Myanmar (widespread) and Laos.

### **Medicinal Uses of *Dolichandrone spathacea* (Tha khut)**

A tea prepared from the leaves is thought to cure mouth related diseases. Its leaves and fruits can be substituted of betel leaves. Its seeds are taken with ginger in the case of convulsive affections. The timber is light and good for carving. In Indonesia, the leaves of *Dolichandrone spathacea* are used to treat thrush. In the Phillipines, *Dolichandrone spathacea* is used to treat nervous diseases and flatulence. The pharmacological potentials of this interesting plant remain unexplored. The flower can cure antitoxic and liver disease. The flower is edible and it is part of Thailand cuisine. Vitamin C can reduce the risk for cardiovascular disease by protecting LDL-cholesterol from oxidation. Additionally, vitamin C exhibits significant antioxidant function in the lungs, protection the rest of the body from exogenous sources of free radicals. Furthermore, when vitamin E is oxidized vitamin C regenerates vitamin E back to its active form (Aye Theingi, 2016).

## **Materials and Methods**

### **Sample Collection of *Dolichandrone spathacea* (Tha khut)**

The flowers of *Dolichandrone spathacea* (Tha khut) were collected from Amarapura Township, Mandalay Region. The collected samples were cleaned, washed and then cut into small pieces. The collected samples were dried at room temperature and powdered.



Figure (3) Flowers of *Dolichandrone spathacea* (Tha khut)

Preliminary phytochemical tests indicated the presence of glycoside, alkaloid,  $\alpha$ -amino acid, carbohydrate, flavonoid, phenolic compound, saponin, steroid, tannin and terpenoids. The elemental analysis of dried powdered sample was also performed by EDXRF and AAS techniques. The determination of nutritional values from the dried powdered sample of Tha Khut was carried out by AOAC method. On antimicrobial screening of Tha khut sample, pet ether, EtOAc,  $\text{CHCl}_3$  and EtOH extracts were examined with six microorganisms such as *Bacillus cereus*, *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Shigella boydii*, *Salmonella typhi* and *E. coli* species. The screening of antioxidant activity of ethanolic extract from Tha khut was carried out by DPPH method using UV spectrophotometer.

## Results and Discussion

### Phytochemical Constituents of Flower of *Dolichandrone spathacea* (Tha khut)

The phytochemical tests revealed that alkaloids,  $\alpha$ -amino acids, carbohydrates, flavonoids, glycosides, phenolic compounds, saponins, steroids, tannins and terpenoids were presented in the sample. The results were shown in Table (1). The observed phytochemical constituents are essential compounds for the metabolism and nutrition of human body.

Table 1: Results of Phytochemical Investigation of Flower of *Dolichandrone spathacea* (Tha khut)

No.	Type of compounds	Extract	Test reagent	Observations	Remark
1	Alkaloid	1% HCl	Wagner's reagent	Brown ppt	+
2	$\alpha$ -amino acids	$\text{H}_2\text{O}$	Ninhydrin	Purple color	+
3	Carbohydrates	$\text{H}_2\text{O}$	10% $\alpha$ -naphthol, conc: $\text{H}_2\text{SO}_4$	Purple color solution	+
4	Flavonoids	EtOH	Mg truning, conc: HCl	Pink color solution	+
5	Glycosides	$\text{H}_2\text{O}$	10% lead acetate solution	White ppt	+
6	Phenolic compounds	$\text{H}_2\text{O}$	5% $\text{FeCl}_3$ solution	Greenish color solution	+
7	Saponins	$\text{H}_2\text{O}$	Distilled water	Frothing	+
8	Steroids	PE	Acetic anhydride, conc: $\text{H}_2\text{SO}_4$	Green color solution	+
9	Tannins	$\text{H}_2\text{O}$	2% gelatin solution	White ppt	+
10	Terpenoids	$\text{CHCl}_3$	Acetic anhydride conc: $\text{H}_2\text{SO}_4$	Red ring color solution	+

(+) = Present, (-) = Absent

### Elemental Compositions in Flower of *Dolichandrone spathacea* (Tha khut) by EDXRF and AAS

Potassium regulates acidic and alkaline level of body fluid. It is also called alkalizer. Calcium is important to bone growth and formation, blood clotting nerve and muscle functioning. Iron is an essential mineral for human body. Its major function is to combine with protein and copper in making hemoglobin, the component of the blood that carries oxygen from the lungs to the tissues throughout the body. Phosphorus helps build strong bones and teeth. It also helps convert food into energy and helps with metabolism. Chlorine is required for reproduction of hydrochloric acid in the stomach. Sulphur is healing normal. Silicon gives

strength and support to all the tissues of the body. Phosphorus supports the immune system, blood sugar balances and it is involved in the production of cellular energy, reproduction and bone growth. It is also called brain mineral. Table (2) and Table (3) indicate that Tha khut contains essential nutrients for our body.

Table 2: Relative Percent Abundance of Element in Flower of *Dolichandrone spathacea* (Tha khut) by EDXRF

No.	Element	Symbol	Relative abundance (%)
1	Potassium	K	3.672
2	Calcium	Ca	0.808
3	Chlorine	Cl	0.396
4	Sulphur	S	0.247
5	Phosphorus	P	0.226
6	Iron	Fe	0.179
7	Silicon	Si	0.0914
8	Strontium	Sr	0.0368
9	Rubidium	Rb	0.0286
10	Zinc	Zn	0.0266
11	Copper	Cu	0.0215
12	Aluminium	Al	0.016

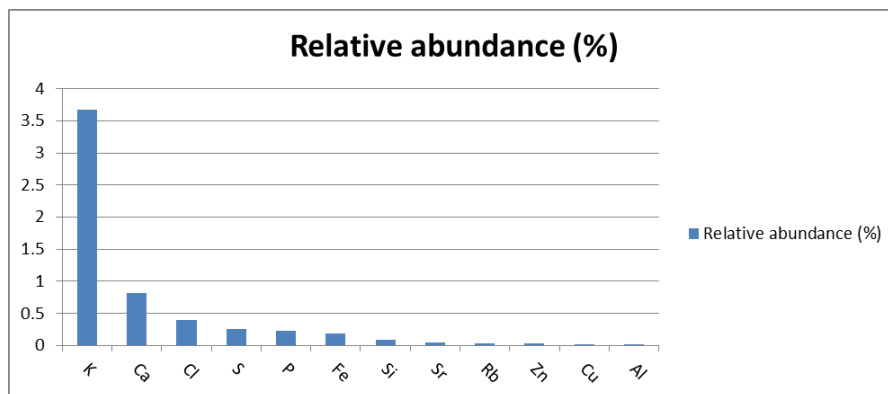


Figure (4) Relative Percent Abundance of Element in Flower of *Dolichandrone spathacea* (Tha khut) by EDXRF

Table 3: Results of Some Elements Present in Flower of *Dolichandrone spathacea* (Tha khut) by AAS

No.	Element	Heavy metal content (ppm)
1	Fe	4.127
2	Zn	0.702
3	Cu	0.278
4	Pb	-

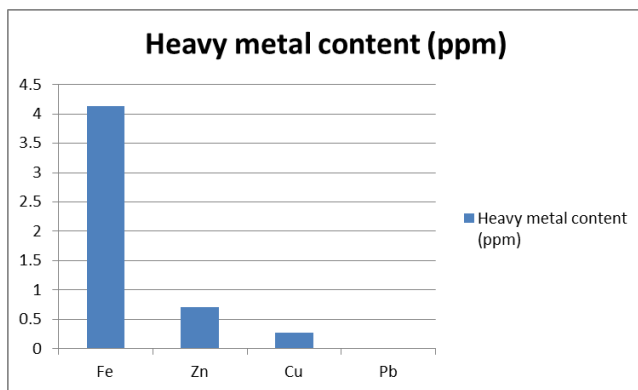


Figure (5) Results of Some Elements Present in Flower of *Dolichandrone spathacea* (Tha khut) by AAS

### Nutritional Values of the Dried Powdered Sample of Flower of *Dolichandrone spathacea* (Tha khut)

Table (4) and Figure (6) represent nutritional values of the dried powdered sample of flower of *Dolichandrone spathacea* (Tha khut) moisture, ash, fat, protein and carbohydrate contents in sample were determined by using appropriate reagents. The carbohydrate content was found to be 73.30 %. Carbohydrates supply the major portion of the daily energy requirements of the normal individual on an ordinary diet more than half of the total daily calories usually come from the source.

Table (4) : Nutritional Values (%) in Flower of *Dolichandrone spathacea* (Tha khut)

No.	Nutrients	Contents (%)
1	Moisture	14.19
2	Protein	5.53
3	Ash	4.01
4	Fat	2.97
5	Carbohydrate	73.30

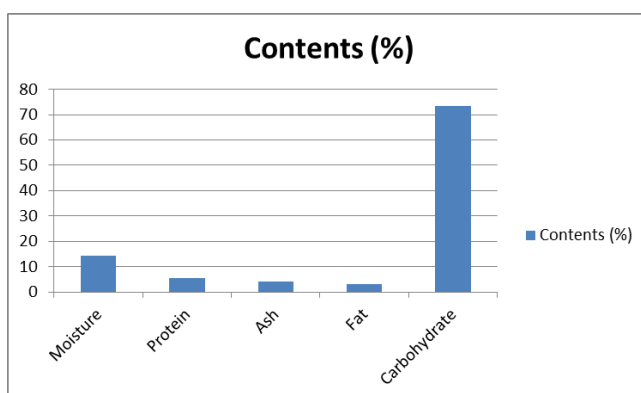


Figure (6) Nutritional Values in Flower of *Dolichandrone spathacea* (Tha khut)

### Antimicrobial Screening of the Ethanol Extracts from *Dolichandrone spathacea* (Tha khut)

Antimicrobial activities of pet ether,  $\text{CHCl}_3$ , EtOAc and EtOH extracts were screened by agar well diffusion method. According to Table (5),  $\text{CHCl}_3$  extracts give high activity on *Bacillus cereus* and *Salmonella typhi* and no activity on *Staphylococcus aureus*

and *Pseudomonas aeruginosa*. Pet ether extract also gives high activity on *Salmonella typhii*. The activities of  $CHCl_3$  and pet ether extract on the organisms are considerably high. The sensitivity of  $CHCl_3$  and pet ether extract are suitable for medicinal formulation of antimicrobial drugs. EtOAc extract is inactive on *Staphylococcus aureus* and EtOH extract also is inactive on *Pseudomonas aeruginosa*, *Shigella boydii* and *Salmonella typhii*.

Table (5) :Result of Antimicrobial Screening of the Ehanol Extracts from *Dolichandrone spathacea* (Tha khut)

Sample	Solvent	Inhibition zone					
		I	II	III	IV	V	VI
Dolichandrone <i>spathacea</i> (Tha khut)	Pet ether	14 mm (+)	14 mm (+)	12 mm (+)	17 mm (++)	14 mm (+)	28 mm (+++)
	$CHCl_3$	22 mm (+++)	-	-	11 mm (+)	10 mm (+)	35 mm (+++)
	EtOAc	16 mm (++)	-	15 mm (+)	10 mm (+)	12 mm (+)	18 mm (++)
	EtOH	14 mm (+)	15 mm (+)	-	12 mm (+)	-	-

Agar well - 10 mm ~ 15 mm (+), 15 mm ~ 19 mm (++) , 20 mm above (+++)  
Organisms

- I = *Bacillus cereus*
- II = *Staphylococcus aureus*
- III = *Pseudomonas aeruginosa*
- IV = *E. coli*
- V = *Shigella boydii*
- VI = *Salmonella typhii*

**Screening of Antioxidant Activity of Crude Extracts of Flower of *Dolichandrone spathacea* (Tha khut)**

The antioxidant activity was studied on the ethanol extracted by DPPH assay. The  $IC_{50}$  value was found to be 15.89  $\mu\text{g/mL}$  for ethanol extract of Tha khut. Table (6) and Figure (7) show the bar graph of  $IC_{50}$  values of ethanol crude extract and standard ascorbic acid.  $IC_{50}$  value of Tha khut is significant antioxidative effect.

Table (6):  $IC_{50}$  Values of Standard Ascorbic Acid and Tha khut

Test Samples	$IC_{50}$ Values ( $\mu\text{g/mL}$ )
Ascorbic Acid	9.47
Tha khut	15.89

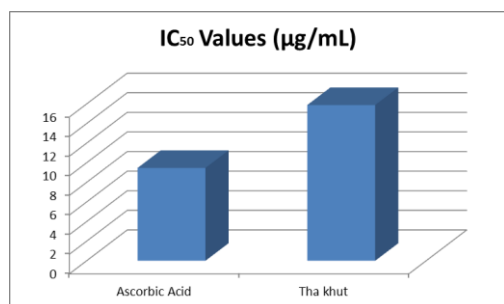


Figure (7)  $IC_{50}$  Values of Ascorbic Acid and Tha khut

## Conclusion

From the research study, on the investigation of the dried powdered sample of flower of *Dolichandrone spathacea* (Tha khut), the following inferences could be drawn. Phytoconstituents such as alkaloids,  $\alpha$ -amino acids, carbohydrates, flavonoids, glycosides, phenolic compounds, saponins, steroids, tannins and terpenoids were represented in the sample. The observed phytoconstituents are essential compounds for the metabolism and nutrition of human body. From the determination of nutritional values of flower of *Dolichandrone spathacea* (Tha khut), it was found that the amount of carbohydrate and moisture were the highest in the sample.  $\text{CHCl}_3$  extracts give high activity on *Bacillus cereus* and *Salmonella typhi* and no activity on *Staphylococcus aureus* and *Pseudomonas aeruginosa*. The sensitivity of  $\text{CHCl}_3$  and pet ether extract are suitable for medicinal formulation of antimicrobial drugs. Tha khut sample contains many elements, 4.127 ppm of Fe, 0.702 ppm of Zn and 0.278 ppm of Cu by using AAS method. Iron builds up the quality of blood and increases resistance to stress and disease. It can be found that Tha khut contains twelve principal elements K, Ca, Cl, S, P, Fe, Si, Sr, Rb, Zn, Cu and Al. Among them, the highest content of potassium is 3.672 %. Potassium is one of the most important electrolytes in the human body.  $\text{IC}_{50}$  values of ethanolic extract sample and standard ascorbic acid were 15.89  $\mu\text{g/mL}$  and 9.47  $\mu\text{g/mL}$ . According to the comparison between  $\text{IC}_{50}$  values of standard ascorbic acid and the extract sample, ethanolic extract of Tha khut possesses the rich antioxidant property. It can be concluded that Tha khut should be taken daily to get minerals which are beneficial for human health.

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