

## Phytochemical and Physico-chemical Properties of the Leaves of *Tadehagi triquetrum* (L.) H. Ohashi

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### Abstract

*Tadehagi triquetrum* (L.) H. Ohashi is a perennial shrub belonging to the family Fabaceae under the order Fabales. The specimens were collected from Patheingyi University Campus, Ayeyarwaddy Region. Morphological characters of these plants were studied to get correct identification by using literatures and internet information. In morphological study, the plants are perennial shrubs. Leaves are alternate, 1-foliolate, wing petiolate. Inflorescences terminal and axillary racemes. Flowers small, papilionaceous, purple. Stamens diadelphous. Ovary oblong. Pods laterally compressed 2 to 8 jointed. The sensory characters of powdered leaves are pale green in colour, pungent, astringent taste, granular and fibrous texture. In preliminary phytochemical screening of crude leaves extract showed the presence of phenolic compounds, flavonoids, starch, reducing sugars, glycosides, saponins, tannins,  $\alpha$ -amino acids and carbohydrates. In physico-chemical study, the result pointed out the most significantly soluble matter contents of powdered leaves was in ethanol and methanol and the least soluble was in petroleum ether than other solvent. In this paper, morphological characters, phytochemical, physicochemical, sensory character of powder leaves of *Tadehagi triquetrum* were performed.

**Keywords:** *Tadehagi triquetrum*, phytochemical, physico-chemical characters

### Introduction

Herbal medicines have appropriate values in treating many diseases. That they can save lives of many, particularly in the developing countries, is undisputable (Ignacimuthu *et al.*, 2006).

All modern medicine is derived originally from ancient herbal traditions. These have evolved to produce the conventional medicine known in the west, which uses both synthetic drugs and isolated natural compound (Heinrich, 2004).

One of the medicinal plants, *Tadehagi triquetrum* (L.) H. Ohashi is a shrub belonging to the family Fabaceae. The genus *Tadehagi* comprises (5) species and is native to South and South-East-Asia. It is found from India eastward to southern China, Taiwan and the Ryukyu Islands and southward throughout Malesia eastward to the Pacific Islands and northern Australia. Synonyms of this species are *Desmodium triquetrum*, *Hedysarum triquetrum* and *Pteroloma triquetrum*. The plant grows wild in the lower parts of Myanmar. The rhizomes and leaves are the parts most commonly used. It is well known for its medicinal value in treating various kinds of cough and skin diseases.

The fresh leaves are applied to wounds and abscesses that do not heal well. They are used internally as a galactagogue. A paste of the bruised leaves with kamala is applied to inflamed sores and itchi. The fresh juice of the plant is given to children for cough. Externally the leaves are applied to treat lumbago. Both leaves and pods are ingredients of diuretic remedies against gravel in the kidneys and bladder.

Chemical constituents of *Tadehagi triquetrum* (L.) H. Ohashi are Bufotenine-O-methyl-N, N-dimethyl-tryptamine-oxide, bufotenine; nigerin; N, N-dimethyl tryptamine oxide; 5-methoxy-N-methyltryptamine; gramine. Active ingredients are flavonoids, alkaloids, triterpenoids, steroids and tannins.

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Aim and objectives of this study are to identify the morphological characters of this plant, to study diagnostic characters of powdered leaves and to investigate the preliminary phytochemical and physicochemical studies of crude leaves extract of *Tadehagi triquetrum* (L.) H. Ohashi.

## Materials and Methods

### Botanical Studies

#### Collection and Identification of Plants Specimens

In this study, the plant specimens of vegetative and reproductive parts were gathering from Patheingyi University Campus, Ayeyarwaddy Region, during the flowering and fruiting period from October to March (2017-2018). The fresh parts of this plant were used for morphology study. The mounted herbarium sheets were kept in the Botany Department, Patheingyi University. The natural habit, leaves, flower as seen and part of the plants were presented with photographic record and measurement. Study of L.S of flowers and T.S of ovary were done by using dissecting microscope. This specimen was identified by available literatures such as Hooker (1879), Backer (1963), Cronquist (1981), Dassanayake (1996), Nyo Maung (2003), Hu Qi-ming and *et al*, (2008) and Internet informations.

#### Preparation of Powdered Samples

For chemical studies, the collected samples were washed with water to remove impurities and then dried in room temperature for several days. Then the specimens was weighed and air dried under the shade, when constant weight was obtained the specimen was ground to get powder and stored in air tight containers to prevent moisture and contamination for further studies.

#### Preliminary Phytochemical Screening

In this qualitative analysis, the air dried powdered leaves were carried out for alkaloids, phenolic compounds, flavonoids, starch, reducing sugars, glycosides, saponins, tannins,  $\alpha$ -amino acids and carbohydrates by using the extracts obtained from various solvents with proper reagents. These experiments were carried out according to British Pharmacopoeia, 1968; Harborne, 1973, Marini Bettolo *et al.*, 1981; Central Council for Research in Unani Medicine, 1987; and Trease and Evans, 2002. The detailed procedures were mentioned in the following. The chemical studies had been carried out at Botany Department, Patheingyi University.

#### Physico-chemical Properties of Powdered Leaves of *Tadehagi triquetrum* (L.) H. Ohashi.

The physico-chemical characters such as moisture content, extractive values for the various solvents were determined at Botany Department, Patheingyi University according to British Pharmacopoeia, 1968.

## Results

### Botanical Studies

Botanical Name - *Tadehagi triquetrum* (L.) H. Ohashi

Myanmar Name - Lauk-thay

English Name - Trefle gross

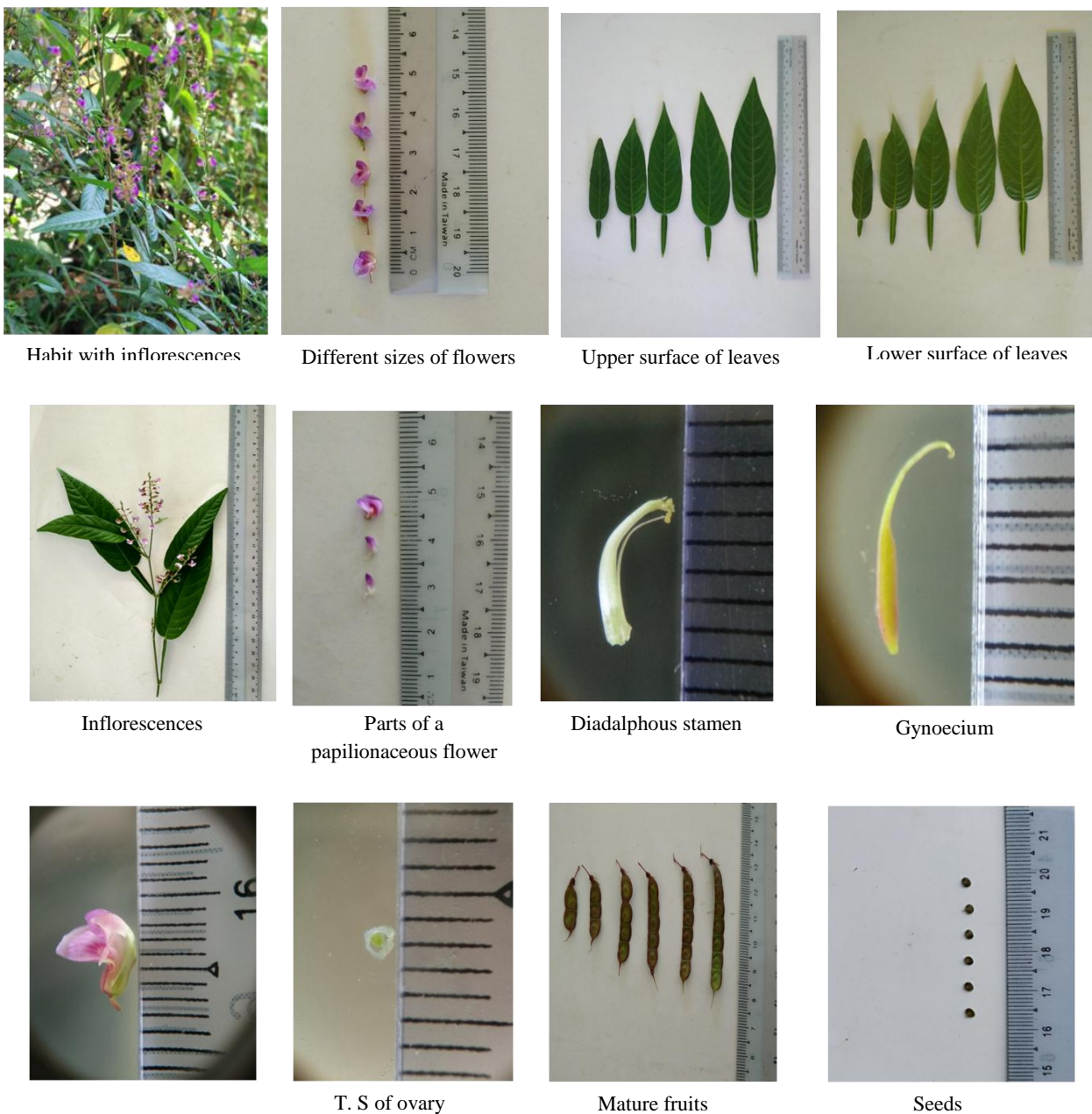
Family - Fabaceae

Location - Patheingyi University Campus

#### Morphological Characters of *Tadehagi triquetrum* (L.) H. Ohashi

Perennial subshrubs; up to 3m tall, young stem trigonous, branchlets sharply angular. Leaves alternate, 1- foliolate, (6.38 cm-18.9 cm) long and (1.9cm – 5.83cm) wide; petiolate, prominently winged (1.1cm – 4.9 cm) long and (0.2 cm – 1.4 cm) wide; narrow lanceolate to

ovate lanceolate. Inflorescences terminal and axillary raceme, usually 2-3 flowers at a node (13.5 cm -36.0 cm) long. Flowers bracteates (0.5 cm - 0.2 cm) long, dimorphic, bracteolate, pedicellate, complete, irregular, zygomorphic, purple, (0.8 cm) long, papilionaceous, hypogynous, persistent. Calyx (5), campanulate, upper 2 lobed minutely 2 toothed persistent. Corolla (5), the standard orbicular, (0.5 cm - 0.7 cm) wide, wing elliptical oblong as long as the keel, wing (0.5 cm - 0.2 cm)wide, keel (0.6 cm – 0.2 cm) wide, keel petals acute on obuse at apex, keel petal slightly wider and shorter than wing. Androecium stamen (9+1), diadelphous, ditheous, inserted, yellow, basifixed, filament white, introrse. Gynoecium ovary oblong, unilocular, one ovule in the locule in T.S, sessile, pubescent without, marginal placentation, style short, curved, glabrous, stigma capitate, superior. Pods laterally compressed, 2 to 8 jointed. Seeds broadly, elliptic.



**Fig. 1. Morphological characters of *Tadelhagi triquetrum* (L.) H. Ohashi**

### Sensory Characters of the Powdered Leaves of *Tadehagi triquetrum* (L.) H. Ohashi

The sensory characters of powdered leaves are pale green in colour, pungent, astringent taste, granular and fibrous texture. These characters were shown in Figure 2 and Table 1.



Fig. 2. Powdered leaves of *Tadehagi triquetrum* (L.) H. Ohashi

Table 1. The Sensory Characters of Pleaves of *Tadehagi triquetrum* (L.) H. Ohashi

Sr. No	Sensory characters	Powdered leaves
1	Colour	Pale green
2	Odour	Pungent
3	Taste	Astringent
4	Texture	Granular and Fibrous

### Chemical Studies

#### Preliminary Phytochemical Examination on Leaves Powder of *Tadehagi triquetrum* (L.) H. Ohashi

Preliminary phtochemical tests indicated that phenolic compounds, flavonoids, starch, reducing sugars, glycosides, saponins, tannins,  $\alpha$ -amino acids and carbohydrates were present in the leaves of *Tadehagi triquetrum* (L.) H. Ohashi. Alkaloids were present test with Wagner's reagent. The experimented results were shown in Table 2 and Figures (3-8).

Table 2. Preliminary Phytochemical Test from the Powdered Leaves of *Tadehagi triquetrum* (L.) H. Ohashi

No.	Tests	Solvent used for extraction	Test reagents	Observation	Results
1	Alkaloids	1% HCl	Dragendroff's reagent Mayer's reagent Wagner's reagent	no ppt no ppt white ppt	- - +
2	Phenolic compounds	1% HCl	3% FeCl <sub>3</sub> solution	Light yellow	+
3	Flavonoids	Ethanol	HCl	Pinkish green	+
4	Starch	H <sub>2</sub> O Extract	Iodine solution	Bluish black	+
5	Reducing sugars	H <sub>2</sub> O Extract	Benedicts solution	Brick red	+
6	Glycosides	H <sub>2</sub> O Extract	10% lead acetate solution	Yellow ppt	+
7	Saponins	H <sub>2</sub> O Extract	Distilled water	Frothing	+
8	Tannins	H <sub>2</sub> O Extract	3% FeCl <sub>3</sub> solution	Greenish brown	+
9	$\alpha$ -amino acids	H <sub>2</sub> O Extract	Ninhydrin reagent	Purple	+
10	Carbohydrates	H <sub>2</sub> O Extract	10% $\alpha$ -naphthol and conc: H <sub>2</sub> SO <sub>4</sub>	Red ring	+

Present = (+)

Absent = (-)



**Fig. 3. Preliminary phytochemical tests of phenolic compounds, flavonoids, starch, reducing sugars, glycosides, saponins, tannins,  $\alpha$ -amino acids and carbohydrates of *Tadehagi triquetrum* (L.) H. Ohashi**



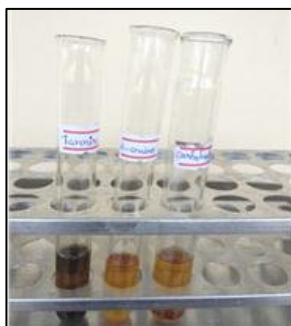
**Fig. 4. Test for alkaloids**



**Fig. 5. Test for reducing sugars, glycosides, saponins**



**Fig. 6. Test for phenolic compounds, flavonoids,**



**Fig. 7. Test for tannins,  $\alpha$ -amino acids, carbohydrates**



**Fig. 8. Test for  $\alpha$ -amino acids**

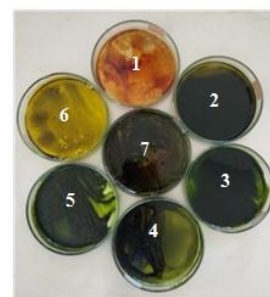
### **Physico-chemical Properties of Leaves Powder of *Tadehagi triquetrum* (L.) H. Ohashi**

According to the results of physico-chemical properties, the moisture content was usually determined and recorded by drying to constant weight and taking the loss in weight as moisture. The solubilities of powdered leaves in distilled water, acetone, chloroform, ethanol, ethyl acetate, methanol and petroleum ether were carried out to determine the amount of total solids soluble in an individual solvents. It deals with the determination of quantity or amount of the individual element or compound present in the powdered sample.

The result pointed out the most significantly soluble matter contents of powdered leaves was in ethanol and methanol and the least soluble was in petroleum ether than other solvents. The experimental results were shown in Figures (9) and Table 3.

**Table 3. Physico-chemical Properties of Leaves of *Tadehagi triquetrum* (L.) H. Ohashi**

No.	Physico-chemical properties	Quantity determination (%)
1	Moisture content	43.64
2	Total ash	3.30
3	Acid insoluble ash	4.93
4	Water soluble ash	47.73
5	Distilled water soluble content	8.4
6	Acetone soluble content	7.8
7	Chloroform soluble content	3.4
8	Ethanol soluble content	14.2
9	Ethyl acetate soluble content	3.4
10	Methanol soluble content	15.6
11	Petroleum ether soluble content	1.4



1. Distilled water  
2. Chloroform  
3. Ethyl acetate  
4. Ethanol  
5. Acetone  
6. Pet ether  
7. Methanol

### Discussion and Conclusion

The selected plants, *Tadehagi triquetrum* (L.) H. Ohashi, is a member of the Fabaceae family. It is grow widely distributed in lower part of Myanmar. The specimen is locally known as Lauk-thay in Myanmar.

In this study, the morphological characters of both vegetative and reproductive parts of the plant, sensory characters of powder air dry leaves, preliminary phytochemical, physico-chemical investigation of powder leaves of *Tadehagi triquetrum* (L.) H. Ohashi, had been undertaken.

In the morphological study, the plant of *Tadehagi triquetrum* (L.) H. Ohashi is erect shrub, branches trigonous, glabrescent. Leaves are alternate, 1-foliolate, petiole distinctly winged, leaflet narrowly elliptical to obovate, papery, stipules persistent. Inflorescences terminal and axillary raceme, flowers small 3 - 5 at each node, calyx campanulate, lobes deltoid, corolla purplish or violet.

These characters are agreement with those stated by (Hooker 1879; Kirtikar and Basu, 1935; Dassanayake, 1996; Hu Qi-ming and WU De Lin, 2008)([https://en.m. wikipedia. org>wiki>Phyto](https://en.m.wikipedia.org/wiki/Phyto) ).

The flowers are small, fascicled in laxed racemes. The calyx is turbinate-campanulate, subtended by 2 bracteoles and 4 lobes. The wings are oblong, spurred or eared. The stamens are diadelphous. The anthers are uniform; ovary sessile; ovules several; style glabrous above and stigma capitate. These characters are agreement with those described by [https://202.71. 110.236>id-105797.tadehagi](https://202.71.110.236>id-105797.tadehagi).

Stipules free, entire; petioles winged; leaves 1 foliolate. This is a key characters of the genus *Tadehagi*.

Pods are 5-8 segments, distinctly stalked, densely clothes with yellowish or withish soft hair both on the sutures and the lateral surface. These characters are agreement with those mentioned by (Bunyapraphatsara and Valkenburg, 2002 and Hu Qi-ming and WU De Lin, 2008).

The sensory characters of powdered leaves of *Tadehagi triquetrum* (L.) H. Ohashi are pale green in colour, pungent, astringent taste, granular and fibrous texture.

In phytochemical screening the coarse powder leaves extract were subjected to various chemical tests to detect the presence of different phytoconstituents. The qualitative phytochemical analysis of this species exhibited the presence of phenolic compounds, flavonoids, starch, reducing sugar, glycosides, saponins, tannins,  $\alpha$ -amino acids and carbohydrates. Alkaloids are present in test with Wagner's reagent.

These characters are agreement with those stated by (Campbell and *et al.*, 2002 and Anti-TB herbs, 2007).

According to the physicochemical properties the crude extract of leaves of *Tadehagi triquetrum* (L.) H. Ohashi showed more soluble in polar solvent such as methanol (15.6%) and ethanol (14.2%) and least soluble in non polar solvent such as petroleum ether (1.4%).

In morphological, phytoconstituents, physico-chemical and sensory characters of coarse powder leaves reported in this research work can serve as valuable source of information.

According to this research work and various local uses of the plant part of *Tadehagi triquetrum* (L.) H. Ohashi are used as medicinal purposes. It possess many medicinal value bioactive compounds should be isolated from the plants. Therefore to promote myanmar traditional medicine, this plant should be further study.

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