

## Taxonomic Studies of Two Common Poisonous Plants

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**Abstract:** Plants which are harmful to human to human or animal body are known poisonous. The plants are poisonously effective on contact, ingestion or by absorption or inhalation. These plants are used in the form of potential killers. Tropical dry deciduous forests are the home of many of these plants. The present study includes the taxonomy, toxic and medicinal properties of some poisonous plants of this region. The poisonous plants have toxic properties because they contain many alkaloids, ricins, atropines, scopolamine, brucin, lactins, etc. poisonous plants have many properties like narcotics, delirients, irritants, depressants, astenics, purgatives etc. many of these contents are used for the preparation of medicines as well. Some common poisonous plants are Oleander (*Nerium oledander*), Bacain (*Melia azadirach*), Arund (*Ricinus communis*), Dhatura (*Datura metel*, *D.alba*, *D. Stramonium*) Lantana Camera, Madar (*Calotropis procera*), Abrus precatorius etc.

**Keywords:** Second = nd, edition = eds , figure = fig, Length = l , breadth = b

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### I. Introduction

In the form of vital source, plants are essential part of our life. Many plants contain a large number of biologically active chemicals which are extremely useful for treating various human and animal diseases. While some plants, trees, herbs are deadly poisons and cause serious illness of men and animals. Plant toxicity is caused by toxic constituents i.e. Alkaloids, glycosides, saponins, tannins, organic acids. Which effect by contact, eaten, absorption or inhalation; they cause painful skin irritations, internal poisoning and undesirable affects upon men and animals. The taxonomic, morphological and phytochemical characters of poisonous plants have been described by Smith (1923), and Caius (2003). Faust and Jones (1973) found that trichomes can be diagnostic characteristics in Vernonia for their identification. General structures of trichomes have been discussed by Ramayya et.al. (1962), Sahu (1982, 83, 84, 85), Tiwari (1982). They indicated that the morphological characters of trichomes provide data for identification of plants at generic, specific or intraspecific level. Stomata in some Cucurbitaceae have reported by Inamdar etal. (1976). On the basis of arrangement of the epidermal cell neighboring the guard cell, more than 25 main types of stomata in dicots have been recognized (Metcalf & Chalk, 1979). Therefore the present work has been undertaken which deals with the structure, organographic distribution and phylogenic considerations of stomata and trichomes of poisonous plants.

### II. Materials and methods

In the central India, hills of Sagar district are made from Vindhya and Basalt rocks. Forests types of Sagar district are tropical dry deciduous forest (Champion and Seth 1968).

The following materials of the poisonous plants were taken for study:-

*Thevetia nerifolia*

*Thevetia peruviana*

The taxonomic, morphological, and phytochemical study of poisonous plants has been done. Trichomes and stomata structure had studied by the methods of Bobous and Beakbane (1971) under microscope and camera lucida diagrams were prepared.

The Stomata index was calculated according to the following formula:

$$(1) \text{ Stomata index\% (SI) = } \frac{\text{stomata density} * 100}{(\text{Stomata density} + \text{epidermal cell density})} \quad (\text{Salisbury, 1927}).$$

Where: [Area of grid= 5\*5=25square micron (where objective lens is 10x and eye lens is 15x)

Area of grid= 1.25\*1.25=1.56square micron (where objective lens is 40x and eye lens is 15x).]

$$(2) \text{ Stomata density = } \frac{\text{stomata frequency}}{10 * \text{area of grid square micron}}$$

$$(3) \text{ Stomata frequency = number of stomata per unit area}$$

From the epidermal cell count data, the trichome index was calculated according to the following formula:

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$$(4) \text{ Trichome index\% (TI)} = \frac{\text{trichome density} \times 100}{(\text{Trichome density} + \text{epidermal cell density})}$$

Where:-[Area of grid= 5\*5=25square micron (where objective lens is 10x and eye lens is 15x)

Area of grid= 1.25\*1.25=1.56square micron (where objective lens is 40x and eye lens is 15x).]

$$(5) \text{ Trichome density} = \frac{\text{trichome frequency}}{10 \times \text{area of grid square micron}}$$

$$(6) \text{ Trichome frequency} = \text{number of trichome per unit area}$$

## 2.1. Trichome

### 2.1.1. Foot

The proximal foot is lying in the epidermis. It is recognized into two kinds viz.

Simple foot: may be as many cells as the number of the immediately overlaying part of the trichome.

Compound foot: may be cells which are more in number than the cell rows of the immediately overlaying part of the trichome.

### 2.1.2. Body

Distal part of the trichome is lying above the foot. It is recognized into two kinds viz.

Undifferentiated body: It is entire body.

Differentiated body: It is differentiated into two or more parts. The proximal body is stalked and distal body is head.

## 2.2. Stomata

A stoma is a pore, found in the leaf and stem epidermis. The pore is formed by a pair of parenchyma cells called guard cells that are response to given environmental conditions.

Morphologically, four main types of stomata have been distinguished in the dicotyledons on the basis of the arrangement of the epidermal cells neighboring the guard cells (Metcalfe and Chalk 1950).

## III. Observation

### 3.1. *Thevetia peruviana*

#### 3.1.1 Scientific classification

Kingdom: Plantae

Division: Tracheophyta

Class: Magnoliopsida

Order: Gentianales

Family: Apocynaceae

Genus: *Thevetia*

Species: *Peruviana*

#### 3.1.2. Morphological characters

It is a large yellow flowered, evergreen shrub or small tree. The stem/trunk is green turning silver/gray as it ages. The leaves are willow: like, linear: lanceolate, acute or sub obtuse, sessile, dark green, glossy. The flowers are regular fragrant, bloom from summer to fall. The long funnel shaped, yellow flowers are in terminal cluster. The fruit is hard capsule and deep red black in color.

#### 3.1.3. Trichome characters

Trichome plate A, fig 1, 3, 4,9,10. Multicelled flagellate glandular hair. Description: foot compound, body multicelled, differentiated into stalk and head, flagellate; contents translucent; walls thin, smooth and straight. Distribution: on style, carpel, pedicel, corolla, fruitwall, and petal. Trichome plate A, fig 5, 8, 6. Unicelled flagellate glandular hair.

Description: foot compound, body unicelled, undifferentiated, flagellate, pointed apex; contents translucent; walls thin, smooth and straight.

Distribution: on stigma, anther, and fruitwall.

Trichome plate A, fig 2, 7. Papillate glandular hair.

Description: foot compound, body papillose, oblique, entire, spatulate apex; contents translucent; walls thin, smooth and straight.

Distribution: on stigma, anther, carpel and sepal.

#### 3.1.4. Stomata characters

There are following stomata that distributed on different parts of *thevetia pereviana*.

Anomocytic, anomotetracytic stomata.

Distribution: leaf

anomocytic stomata.

Distribution: stem, pedicel, calyx.

Brachyparacytic stomata.

Distribution: corolla.

anomotetracytic stomata.

Distribution: fruit wall

### 3.1.5. Constituents

It contains cardiac glycosides, therein a and b, thevetoxin, peruvoside, ruvoside and nerifolin.

### 3.1.6. Medicinal properties

It is applied medicinally for treatment of cardiac insufficiency.

### 3.1.7. Toxic effects

It may develop digitalis poisoning with gastrointestinal and cardiac symptoms, drowsiness, mydriasis, coma and convulsions.

## 3.2. *Thevetia neriifolia*

### 3.2.1. Scientific classification

Kingdom: Plantae

Division: Tracheophyta

Class: Magnoliopsida

Order: Gentianales

Family: Apocynaceae

Genus: *Thevetia*

Species: *Neriifolia*

### 3.2.2. Morphological characters

It is a bush, shrub or small tree. The leaves are glossy dark green, linear lanceolate. The flowers are long funnel shaped, fragrant, and orange in color.

### 3.2.3. Trichome characters

Trichome plate B, fig 1, 3; trichome plate c, fig 5,8,10. Unicelled flagellate glandular hair.

Description: foot compound, body flagellate, oblique, entire, rounded tip; contents translucent; walls thin, smooth and straight.

Distribution: on stem sepal, leaf, fruitwall, filament, and pedicel.

Trichome plate B, fig 2. Two celled flagellate glandular hair.

Description: foot compound, body entire, two celled, flagellate; contents translucent; walls thin, smooth and straight.

Distribution: on petal, leaf.

Trichome plate C, fig1. Multicelled branched glandular hair.

Description: foot compound, body uniseriate, differentiated into stalk and head, obliquely or vertically subdivided in many cells, truncated apex; contents translucent; walls thin, smooth and straight.

Distribution: on anther lobe.

Trichome plate C, fig2. Two celled cylindrical glandular hair:-

Description: foot compound, body uniseriate, differentiated into stalk and head, head club shaped rounded apex; contents translucent; walls thin, smooth and straight.

Distribution: on pedicel.

Trichome plate C, fig3, 4, 6, 7. Unicelled papillate glandular hair:-

Description: foot compound, body unicelled, papillose, rounded tip; contents translucent; walls thin, smooth and straight.

Distribution: on stigma, style, and petal.

Trichome plate C, fig9. Uniseriate flagellate glandular hair.

Description: foot compound, body uniseriate, entire; contents translucent; walls thin, smooth and straight.

Distribution: on carpel.

### 3.2.4. Stomata characters

There are following stomata that distributed on different parts of *thevetia neriifolia*.

Anomocytic, anomotetracytic, brachyparacytic, anisocytic stomata:

Distribution: leaf

Anomocytic stomata.

Distribution: stem, pedicel

Anomocytic, brachyparacytic stomata

Distribution: calyx

Anomocytic stomata.

Distribution: corolla

Anomotetracytic, anomocytic, anisocytic, brachyparacytic stomata

Distribution: fruit wall

### 3.2.5. Constituents

It contains glycosides of oleic acid, therein, thevetoxin.

## 3.2.6. Medicinal properties

It is used as insecticides, arachnidicides. It is used as in medicines for febrifuges menstrual cycle. Tincture of the bark is also emetic and purgative.

## 3.2.7. Toxic properties

It is cardio toxic acting like digitalis.

## IV. Table and graph

## 4.1. There are presented number of stomata of studied plants in table 1

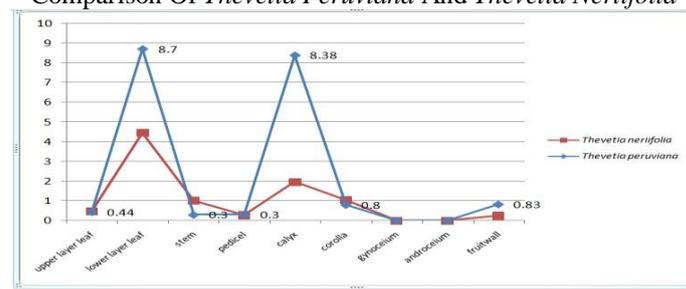
Name of plant	Name of plant parts	type of stomata	Number of stomata	Stomatal frequency	Stomatal density	Type of epidermal cell	Number of epidermal cell	Frequency of epidermal cell	Density of epidermal cell	Stomatal index
<i>Thevetia peruviana</i>	Upper layer of leaf	Anomocytic, anomotetracytic	1 or rare	.32	.02	Rectangular, pentagonal, hexagonal	110	70.51	4.52	0.44
<i>Thevetia peruviana</i>	Lower layer of leaf	Anomocytic, anomotetracytic	11 or 12	7.37	.47	“	120	76.92	4.93	8.70
<i>Thevetia peruviana</i>	Stem	Anomocytic	1 or rare	.32	.02	rectangular	160	102.56	6.57	0.30
<i>Thevetia peruviana</i>	Pedice	Anomocytic	1 or rare	.32	.02	“	160	102.56	6.57	0.30
<i>Thevetia peruviana</i>	Calyx	anomocytic	11 or 12	7.37	.47	Rectangular, pentagonal, hexagonal, polygonal	125	80.13	5.14	8.38
<i>Thevetia peruviana</i>	Corolla	Brachyparacytic	1	0.64	0.04	Rectangular, hexagonal	120	76.92	4.93	0.80
<i>Thevetia peruviana</i>	Gynoecium					oval	325	208.33	13.35	
<i>Thevetia peruviana</i>	Androecium					Oval and rectangular	200	128.21	8.22	
<i>Thevetia peruviana</i>	fruit wall	Anomotetracytic	1 or 2	0.96	0.06	rectangular	175	112.18	7.19	0.83
<i>Thevetia nerifolia</i>	Upper layer of leaf	Anomocytic, brachyparacytic, anisocytic, anomotetracytic	1 or rare	.32	.02	Polygonal, hexagonal	100	64.10	4.11	0.48
<i>Thevetia</i>	Low	Anomoc	5	3.2	.21	Polygonal	110	70.	4.52	4.44

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<i>a neriifolia</i>	er layer of leaf	ytic, brachyparacytic, anisocytic, anomotet racytic	1	1	.32	.02	l, hexagonal	51			
<i>Thevetia neriifolia</i>	Stem	Anomocytic	1 or rare	.32	.02	rectangular	48	30.77	1.97	1.01	
<i>Thevetia neriifolia</i>	Pedice	Anomocytic	1	.64	.04	rectangular	348	223.08	14.30	0.28	
<i>Thevetia neriifolia</i>	Calyx	Brachyparacytic, anomocytic	5	3.21	.21	rectangular	256	164.10	10.52	1.96	
<i>Thevetia neriifolia</i>	Corolla	anomocytic	1	0.64	0.04	Hexagonal, pentagonal	93	59.62	3.82	1.04	
<i>Thevetia neriifolia</i>	Gynoceium					oval	228	146.15	9.37		
<i>Thevetia neriifolia</i>	Androceium					oval	169	108.33	6.94		
<i>Thevetia neriifolia</i>	fruit wall	Anomocytic, brachyparacytic, anisocytic, anomotet racytic	1 or rare	.32	.02	polygonal	198	126.92	8.14	0.25	

4.2. Chart Of Stomata Index

Comparison Of *Thevetia Peruviana* And *Thevetia Neriifolia*



4.3. There are presented number of trichomes of studied plants in table 1

Name of plant	Name of plant parts	type of trichome	Number of trichome	frequency of trichome	density of trichome	Type of epidermal cell	Number of epidermal cell	Frequency of epidermal cell	Density of epidermal cell	Index of trichome
<i>Thevetia peruviana</i>	Upper layer of leaf					Rectangular, pentagonal, hexagonal	110	70.51	4.52	

*Taxonomic Studies Of Two Common Poisonous Plants*

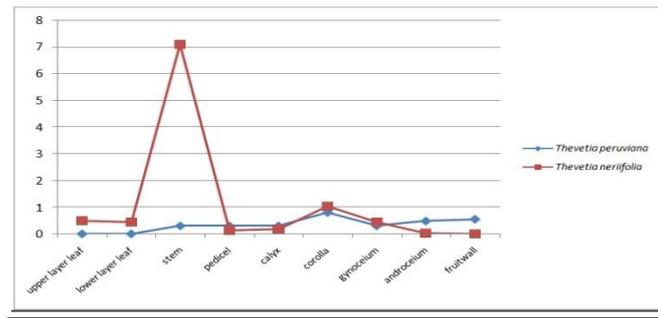
<i>Thevetia peruviana</i>	Lower of leaf					“	120	76.92	4.93	
<i>Thevetia peruviana</i>	Stem	Multicelled flagellate glandular hair	1 or rare	0.32	0.02	rectangular	160	102.56	6.57	0.30
<i>Thevetia peruviana</i>	Pedicel	Multicelled flagellate glandular hair	1 or rare	0.32	0.02	“	160	102.56	6.57	0.30
<i>Thevetia peruviana</i>	Calyx	Papillate glandular hair	1 or rare	0.32	0.02	Rectangular, pentagonal, hexagonal, polygonal	125	80.13	5.14	0.30
<i>Thevetia peruviana</i>	Corolla	Multicelled flagellate glandular hair	1	0.64	0.04	Rectangular, hexagonal	120	76.92	4.93	0.80
<i>Thevetia peruviana</i>	Gynoecium	Multicelled flagellate glandular hair, Papillate glandular hair, unicelled flagellate glandular hair	1	0.64	0.04	oval	325	208.33	13.35	0.30
<i>Thevetia peruviana</i>	Androecium	Papillate glandular hair, unicelled flagellate glandular hair	1	0.64	0.04	Oval and rectangular	200	128.21	8.22	0.48
<i>Thevetia peruviana</i>	fruit wall	Multicelled flagellate glandular hair, Papillate glandular hair	1	0.64	0.04	rectangular	175	112.18	7.19	0.55
<i>Thevetia nerifolia</i>	Upper layer of leaf	Two celled flagellate glandular hair	1 or rare	.32	.02	Polygonal, hexagonal	100	64.10	4.11	0.48
<i>Thevetia nerifolia</i>	Lower of leaf	Two celled flagellate glandular	1 or rare	.32	.02	Polygonal, hexagonal	110	70.51	4.52	0.44

*Taxonomic Studies Of Two Common Poisonous Plants*

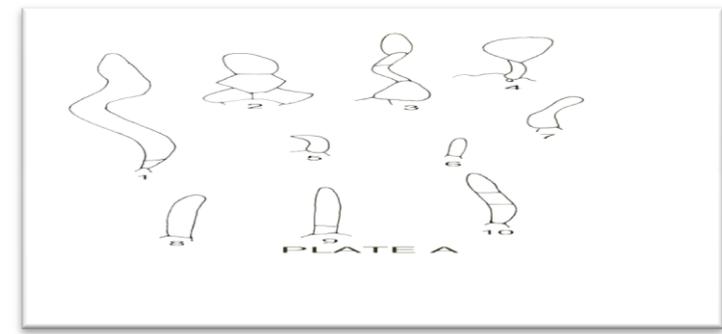
		r hair								
<i>Thevetia nerifolia</i>	Stem	Two celled flagellate glandular hair, unicelled flagellate glandular hair	10,1 or rare	2.37	0.15	rectangular	48	30.77	1.97	7.08
<i>Thevetia nerifolia</i>	Pedicel	Two celled flagellate glandular hair unicelled flagellate glandular hair	1 or rare	.32	.02	rectangular	348	223.08	14.30	0.14
<i>Thevetia nerifolia</i>	Calyx	unicelled flagellate glandular hair	1 or rare	.32	.02	rectangular	256	164.10	10.52	0.19
<i>Thevetia nerifolia</i>	Corolla	Two celled flagellate glandular hair	1	.64	.04	Hexagonal, pentagonal	93	59.62	3.82	1.04
<i>Thevetia nerifolia</i>	Gynoecium	Uniseriate flagellate glandular hair, unicelled papillate glandular hair	1	.64	.04	oval	228	146.15	9.37	0.43
<i>Thevetia nerifolia</i>	Androecium	Multicelled branched glandular hair, unicelled flagellate glandular hair	2,6	2.56	0.16	oval	169	108.33	6.94	0.02
<i>Thevetia nerifolia</i>	fruit wall	Two celled flagellate glandular hair, Two celled flagellate glandular hair	1 or rare	0.32	0.02	polygonal	198	126.92	8.14	0.00

4.4. Chart of trichome index

Comparison Of *Thevetia Peruviana* And *Thevetia Nerifolia*



4.5.1. Trichome Plate A



4.5.1.1. In *thevetia peruviana* trichome plate A

Fig1, 3, 4, 9, 10: multicelled flagellate glandular hair

Fig.1: 40x62.50

Fig.3: 40x 38.75

Fig.4: 40x31.25

Fig.9: 40x31.25

Fig.10: 40x26.25

Fig5, 8, 6: unicelled flagellate glandular hair

Fig.5: 40x8.75

Fig.8: 40x25

Fig.6:40x8.75

Fig.2, 7: papillate glandular hair

Fig.2: 40x10

Fig.7: 40x25

4.5.2. Trichome plate B



4.5.2.1. In *thevetia neriifolia* trichome plate B

Fig.1, 3: unicelled flagellate glandular hair

Fig.1: 40x500

Fig.3: 40x100

Fig.2: two celled flagellate glandular hair 40x18.75

4.5.3. Trichome plate C

4.5.3.1. In *thevetia neriifolia* trichome plate C

Fig.1: multicelled branched glandular hair 40x31.25

Fig.2: two celled cylindrical glandular hair 40x47.50

Fig.3, 4, 6, 7: unicelled papillate glandular hair

Fig.3: 40x27.50

Fig.4: 40x13.75

Fig.6: 40x22.50

Fig.7: 40x12.50

Fig.5, 8, 10: unicelled flagellate glandular hair

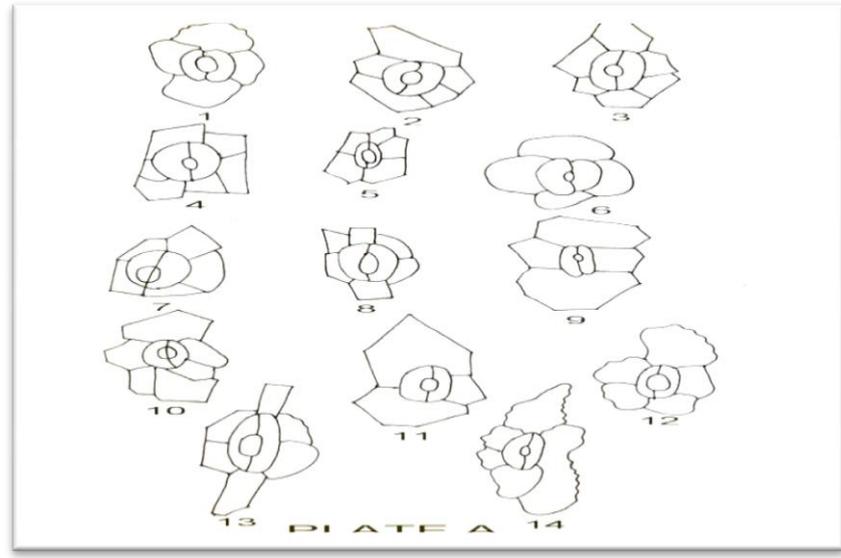
Fig.5: 40x62.50

Fig.8: 40x40

Fig.10: 40x250

Fig.9: uniseriate flagellate glandular hair 40x43.75

4.5.4. Stomata Plate A



4.5.4.1. In *Thevetia Peruviana* Stomata Plate A

Fig.1: Anomotetracytic stomata, in leaf

Size: in 40X

Stomata: l=11.25, b=7.50

Stomata with subsidiary cell: - l=23.75, b=16.25

Fig.2, 5: Brachyparacytic stomata

Fig.2: in leaf, fruitwall

Size: in 40X

Stomata: l=11.25, b=7.50

Stomata with cell: - l=21.25, b=18.75

Fig.5: in petal

Size: in 40X

Stomata: l=7.50, b=5

Stomata with subsidiary cell: l=18.75, b=12.50

Fig.3, 4: Anomocytic stomata

Fig.3: in sepal

Size: in 40X

Stomata: l=13.75, b=8.75

Stomata with cell: l=31.25, b=16.25

Fig.4: in stem

Size: in 40X

Stomata: l=13.75, b=10

Stomata with cell: l=25, b=16.

4.5.4.2. In *thevetia neriifolia* stomata plate A

Fig.7, 12: Brachyparacytic stomata

Fig.7: in sepal, fruitwall

Size: in 40X

Stomata: l=15, b=10

Stomata with cell: l=21.25, b=18.75

Fig.12: in leaf

Size: in 40X

Stomata: l=10, b=6.25

Stomata with cell: l=26.25, b=17.50

FIG.8, 10, 13, 14: Anomocytic stomata

Fig.8: in sepal

Size: in 40X

Stomata: l=15, b=10

Stomata with cell: l=21.25, b=18.75

Fig.10: in leaf

Size: in 40X

Stomata: - l=10, b=6.25

Stomata with cell: l=25, b=18.75

Fig.13: in pedicel

Size: in 40X

Stomata: l=18.75, b=10

Stomata with cell: l=46.25, b=18.75

Fig.14: in petal

Size: in 40X

Stomata: l=10, b=6.25

Stomata with cell: l=25, b=18.75

Fig.9: Anomotetracytic stomata, in leaf

Fig.9: in leaf

Size: in 40X

Stomata: l=10, b=5

Stomata with cell: l=31.25, b=21.25

Fig.11: Anisocytic stomata, in leaf

Fig.11: in leaf

Size: in 40X

Stomata: l=11.25, b=6.25

Stomata with cell: l=28.75, b=20

## V. Results and discussion

In apocynaceae family *Thevetia peruviana* and *Thevetia neriifolia* are distributed in tropical area. They are shrub and tree in habit. They have been found many constituents like therein A and B, thevetoxin, peruvoside, ruvoside, nerifolin. They are useful for treatment of many diseases like cardiac insufficiency and febrifuges menstrual cycle. They are toxic as digitalis poisoning.

There have been seen anomocytic, anomotetracytic, brachyparacytic and anisocytic stomata and unicelled flagellate glandular hair, two celled flagellate hair, multicelled branched glandular hair, two celled cylindrical glandular hair, unicelled papillate glandular hair, multicelled flagellate glandular hair, papillate glandular hair in *Thevetia peruviana* and *Thevetia neriifolia* with the help of microscope.

The largest stomata 11 or 12 have been found in calyx and lower layer of leaf of *Thevetia peruviana*. The largest stomata frequency 7.37 has been found in calyx and lower layer of leaf of *Thevetia peruviana*. The largest stomata density .47 has been found in calyx and lower layer of leaf of *Thevetia peruviana*. The largest stomata index 8.7 has been found in calyx and lower layer of leaf of *Thevetia peruviana*. Stomata, stomata frequency, stomata density, stomata index has been absent in gynoecium, androecium of *Thevetia peruviana* and *Thevetia neriifolia*. The largest trichome number 10 has been found in stem of *Thevetia neriifolia*. The largest trichome frequency 2.37 has been found in stem of *Thevetia neriifolia*. The largest trichome density 0.15 has been found in stem of *Thevetia neriifolia*. The largest trichome index 7.08 has been found in stem of *Thevetia*

*neriifolia*. There have been absent trichome, trichome index, and trichome frequency, trichome density in upper and lower layer of leaf of *Thevetia peruviana*.

## VI. Conclusion

*Thevetia peruviana* and *Thevetia nerifolia* have fragrant flowers which exist in the form of shrub or trees. Its fruits are hard capsules. It can be found in tropical region and shows digitalis poisoning. The present study therefore attempts to use microscopic examinations of epidermal cells and stomata with a view to their elucidating diagnostic significance and can be singled out as being the most significant in relation to the taxonomic separation of the taxa.

## VII. Acknowledgement

“One touch of nature makes the whole work kin”

Apart from our hard work, devotion and grace of our parents the completion of this research required a helping hand of number of person, here is acknowledge in the honor of those super persons.

First of all our sincere thanks to respected Dr. Ela Tiwari without whose kind permission the project would have not even started, also the lecturer of Botany department who guided us all the way through this research.

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