Epidermal Studies in Identification of Jatropha Species

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Abstract: The detailed cuticular study of jatropha plant species has been carried out to help in their identification. Jatropha species are traditional plants of Euphorbiaceae family. Tropically distributed Jatropha curcas and Jatropha gossypifolia have medicinal and toxic properties due to the presence of their chemical constituents. In Jatropha curcas anomocytic, anomotetacytic, actinocytic, paratetacytic stomata, biccelled glandular hair, uniseriate glandular hair, unicelled cylindrical glandular hair, two armed cylindrical glandular hair were reported. While in this Jatropha gossypifolia has been investigation found brachycarparyctic, anomotetacytic, anomocytic stomata, uniseriate aseptate flagellate glandular hair, and multisierate capitade glandular hair. Stomata number, stomata density, stomata frequency, stomata index, epidermal number, epidermal density, epidermal frequency, trichome number, trichome density, trichome frequency, trichome index are found in my research. The various parameters which are used in my study are helpful in identifying species plays a vital role in my research. The study indicates the taxonomic utility of the different parameter of plant species.

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

I. Introduction

Jatropha is a tropical genus of approximately 175 succulent plants, shrubs, trees from the family Euphorbiaceae. Generally, Jatropha has been used as abortifacient and remedies for dropsy, gout, tumors, syphilis, parasitic skin infestation (Iwu, 1993). Jatropha plants contain several toxins including lectin, saponin, carcinogenic phorbol and a trypsin inhibitor. Jatropha gossypifolia is known as invasive and highly toxic to people and animals. Jatropha curcas is used as purgative oil that is toxic in large quantities (smith1923). The present paper deals to use microscopic examinations of epidermal cells, stomata and trichomes with the aim of providing useful taxonomic data that would give further insight into proper classification, delineation and identification of the studied taxa.

Abdulrahman and et.al. (2009, 2010) has been discovered stomata complex in Dioscorea, Jatropha species. Patel and et.al. (1971) has been noticed anisocytic, anomocytic, diacytic, paracytic stomata and stomata with a single subsidiary cell in some polemoniales. Anomocytic stomata are found in Boerhavia species except in B. diffusa where a mixture of both anomocytic and anisocytic types occur. Trichomes are uniseriate and unbranched but are variable in size, distribution and abundance (Fadeyi and et.al.1989). According to Camargo and et.al.(2011) in 35 rainforest tree species in Central Amazonia, the most common stomatal type was anomocytic(37%), followed by paracytic (26%) and anisocytic (11%). Stomatal studies have been done by Hameed and et.al. (2008) on some plants of Polygonaceae, Abid and et.al.(2007) on monocots within flora of Karachi, Pakistan, Ahmad and et.al.(2009) on dicot flora of a district tank in Pakistan.

Trichomes have been discovered by Sahu (1982, 83, 84, 85), Tiwari (1982), Faust and Jones (1973) and Inamdar and Gangadhara (1975).They have indicated the taxonomic utility of the morphological characters of trichomes. Therefore the present work has been undertaken, which deals with a view to their elucidating diagnostic significance.

II. Materials and methods

In the central India, hills of Sagar district are made from Vindhya and Basalt rocks and tropical dry deciduous forest (Champian and seth 1968). Jatropha curcas and jatropha gossypifolia are taken for the microscopic study. Epidermal structures are studied by the methods of Bobous and Beakbane (1971) under microscope and camera lucida diagrams are prepared.

There are expressed various parameter of each complex type by following formula methods:

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

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

Area of grid = 1.25 * 1.25 = 1.56 square micron (where objective lens is 40x and eye lens is 15x).]
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(2) Stomata density = \[
\frac{\text{stomata frequency}}{10 \times \text{area of grid square micron}}
\]

(3) Stomata frequency = number of stomata per unit area

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

Where, \[\text{Area of grid} = 5 \times 5 = 25 \text{ square micron (where objective lens is 10x and eye lens is 15x)}\]
Area of grid = 1.25 * 1.25 = 1.56 square micron (where objective lens is 40x and eye lens is 15x).

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

(6) Trichome frequency = number of trichome per unit area

Trichomes are epidermal outgrowths or appendages on plants. Trichomes are differentiated mainly in two parts,
1. Proximal foot that is lying in the epidermis.
2. Distal part body that is lying above the foot.

Nomenclature and terminology of trichome are based on Ramayya (1962) and Payne (1978).
In the stomata, terminology and nomenclature are mainly based on Metcalfie and Chalk (1950). According to
Clive Anthony stace (1989) Thirty-one types of arrangement of subsidiary cells in the mature stomatal complex
of vascular plants, adapted from Dilcher (1974).
According to David Frederick cutler etal (2008) five other types sunken stomata, tetracytic stomata, stomata
with a single subsidiary cell, traditional between diacytic and paracytic, hemidiacytic stomata are also found in
plants.

A stoma is a small aperture on the surface of land plants. It is surrounded by a pair of specialized
epidermal cells called guard cells, which act as a turgor-driven valve that open and close the pores in response
to given environmental conditions.

III. Observation

Geographically, Jatropha curcas is widely distributed in almost all countries in the tropical regions of
Africa, Asia and Latin America and has several local names, showing that it has become almost indigenized in
most of countries and can withstand conditions of severe drought and low soil fertility. Jatropha gossypifolia is
native to Brazil and tropical America from Mexico to Paraguay and the Caribbean region. It was imported into
Australia in the late 1800’s, probably as a garden, ornamental and had naturalized in Queensland by 1912. It is
major weed in Australia grown as live fence, and also found in waste places. It occurs throughout tropical
Africa, except the dry regions in southern Africa, but including South Africa. It is widely distributed in India.
3.1. Jatropha curcas
3.1.1. Scientific classification
Order - Malpighiales
Family - Euphorbiaceous
Genus - Jatropha
Species - curcas
3.1.2. Morphology
It is a poisonous, drought-resistant perennial with smooth gray bark which exudes a whitish colored,
watery, latex when cut. The leaves are green to pale green, deciduous, and alternate to sub opposite and three to
two lobed with a spiral phyllotaxis. The stem is erect; 1.80-7.0m branched at the top. Flowers have several too
many in greenish cymes, yellowish, bell-shaped, sepals 5, broadly deltoid. Male and female flowers are
produced on the same inflorescence, averaging 20 male flowers to each female flower or 10 male flowers to
each female flower. The fruit is a broadly ellipsoid capsule, smooth-skinned containing three ellipsoid seeds.

3.1.3. Trichome characters
Trichomes plate A, Fig 1. Uniseriate capitates glandular hair: Foot compound, body differentiated into stalk and
head, entire, uniseriate, head capitates, contents translucent, walls thin, smooth and straight.
Distribution: on pedicel, gynoecium.
Trichomes plate A, Fig 2, 5, 7. Unicelled flagellate glandular hair: Foot compound, body unicelled, undifferentiated, oblique, pointed apex, contents translucent, and walls thin, smooth and straight.
Distribution: on pedicel, petal, stem, androecium.
Trichomes plate A, Fig 3. Developing uniseriate flagellate glandular hair: Foot compound, body multicelled, flagellate, differentiated in stalk and head, contents transparent, walls thin, smooth and straight.
Distribution: on stem.
Trichomes plate A, Fig 9, 8. Uniseriate flagellate glandular hair: Foot compound, body multicelled, flagellate, differentiated into stalk and head, contents translucent, walls thin, smooth and straight.
Distribution: on calyx, corolla.
Trichomes plate A, Fig 10. 6. Unicelled branched glandular hair: Foot compound, body unicelled branched entire, contents translucent, walls thin, smooth and straight.
Distribution: on calyx, corolla, stem, gynoeicum.
Trichomes plate A, Fig 4. Papillate glandular hair: Foot compound, body papilllose, contents translucent, walls thin, smooth and straight.
Distribution: on stem.

3.1.4. Stomata characters
There are following stomata that distributed on different parts of *Jatropha curcas*:
Anomocytic, anomotetracytic stomata:
Distribution: on leaf, stem, and pedicel.
Actinocytic stomata:
Distribution: On calyx, corolla
Paratetracytic stomata:
Distribution: on fruit wall

3.1.5. Toxic constituents
Curcin A and B, phorbolesters, phytic acid, curcinoleic acid, lectin, ricin and abrin.

3.1.6. Economic importance
The plant is useful in treatment of skin diseases and other ailments. It is wound disinfectant, purgative, rheumatism. The latex of Jatropha contains an alkaloid known as “Jatrophine” which is believed to have anti-cancerous properties.

3.1.7. Toxicology
The plant can be show mild symptoms and toxic symptoms. The important symptoms of poisoning included diarrhoea, inability to keep normal posture, depression and lateral recumbence.

3.2. Jatropha gossypifolia
3.2.1. Scientific classification
Order - Malpighiales
Family - Euphorbiaceous
Genus - Jatropha
Species - gossypifolia

3.2.2. Morphology
It is a busy, gregarious shrub up to 1.8m, 3-5 lobed, approximately 20 cm long and wide with leaves having a long petiole, covered with glandular hairs from the euphorbiaceous family. The stem is hairy and non-woody. Flowers are red-crimson of purple in corymbs, with greenish seed in smooth, glabrous, oblong capsule.

3.2.3. Trichome characters
Trichome plate A, Fig 1. Uniseriate flagellate glandular hair: Foot compound; body uniseriate, differentiated in stalk and head; contents translucent; walls thick, smooth and straight.
Distribution: all the parts of this plant except gynoeicum.
Trichomes plate A, Fig 2. Multiseriate capitates glandular hair: Foot compound; body multiseriate, differentiated in stalk and head, stalk multicelled, head capitate; contents translucent; walls thin, smooth, entire.
Distribution: all the parts of this plant except gynoeicum.

3.2.4. Stomata characters
Brachyparacytic, anomotetracytic stomata:
Distribution: on leaf, calyx.
Anomocytic stomata:
Distribution: on stem, pedicel.
Anomotetracytic stomata:
Distribution: on fruit wall

3.2.5. Toxic constituents
Ricinine, alkaloid, jatrophin.
3.2.6. Economic importance

The plant is antibiotic, insecticidal and used for toothache and as blood purifier. In the Philippines, cytoplasm of fresh leaves is applied to swollen breasts. In Venezuela, roots are used in leprosy, decoction of leaves used as purgative and stomachic. The latex used on ulcers. The leaves are used as febrifuge for intermittent fevers. In Ayurveda the oil from the seeds is used for treatment of eczema and skin itches, though the main use is as renewable source of energy as biodiesel. The roots are employed against leprosy, as an antidote for snakebite and in urinary complaints. A decoction of the bark is used as an emmenagogue and leaves for stomachache, venereal disease and as blood purifier.

3.2.7. Toxicology

The seeds and seed oil rapidly produce abdominal pain followed by vomiting and diarrhoea when consumed in excess. The important signs of toxicity include ptosis, reduction of body weight, darkening of cuticle, abnormal puation and hind limb paralysis.

4.1. Graphs And Tables

The macro morphological characters are assessed on different parts of studied plants.

<table>
<thead>
<tr>
<th>Name of plant</th>
<th>Name of plant parts</th>
<th>Type of stomata</th>
<th>Number of stomata</th>
<th>Stomatal frequency</th>
<th>Stomatal density</th>
<th>Type of epidermal cell</th>
<th>Number of epidermal cell</th>
<th>Frequency of epidermal cell</th>
<th>Density of epidermal cell</th>
<th>Stomatal index</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jatropha gossypifolia</td>
<td>Upper Layer Of Leaf</td>
<td>Brachyparacytic, Anomotetracytic</td>
<td>1 Or Rare</td>
<td>0.32</td>
<td>0.02</td>
<td>Irregular</td>
<td>90</td>
<td>57.69</td>
<td>3.67</td>
<td>0.54</td>
</tr>
<tr>
<td>Jatropha gossypifolia</td>
<td>Lower layer of leaf</td>
<td>Brachyparacytic, anomotetraacytic</td>
<td>24 or 40</td>
<td>2.51</td>
<td>0.17</td>
<td>Irregular</td>
<td>180</td>
<td>115.38</td>
<td>7.40</td>
<td>2.25</td>
</tr>
<tr>
<td>Jatropha gossypifolia</td>
<td>Stem</td>
<td>Anomocytic</td>
<td>2</td>
<td>1.28</td>
<td>0.08</td>
<td>Rectangular</td>
<td>200</td>
<td>128.25</td>
<td>8.22</td>
<td>0.89</td>
</tr>
<tr>
<td>Jatropha gossypifolia</td>
<td>Pedicel</td>
<td>Anomocytic</td>
<td>2</td>
<td>1.28</td>
<td>0.08</td>
<td>Rectangular</td>
<td>200</td>
<td>128.25</td>
<td>8.22</td>
<td>0.89</td>
</tr>
<tr>
<td>Jatropha gossypifolia</td>
<td>Calyx</td>
<td>Brachyparacytic, Anomotetraacytic</td>
<td>24 Or 40</td>
<td>2.51</td>
<td>0.17</td>
<td>Irregular To Rectangular</td>
<td>180</td>
<td>115.38</td>
<td>7.40</td>
<td>2.25</td>
</tr>
<tr>
<td>Jatropha gossypifolia</td>
<td>Corolla</td>
<td>Not Found</td>
<td>Oval</td>
<td>120</td>
<td>76.93</td>
<td>4.93</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jatropha gossypifolia</td>
<td>Gynoecium</td>
<td>Not Found</td>
<td>Irregular</td>
<td>1165</td>
<td>746.80</td>
<td>47.87</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jatropha gossypifolia</td>
<td>Androecium</td>
<td>Not Found</td>
<td>Oval</td>
<td>1600</td>
<td>1025.64</td>
<td>65.75</td>
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</tr>
<tr>
<td>Jatropha gossypifolia</td>
<td>Fruit Wall</td>
<td>Anomotetracytic</td>
<td>3</td>
<td>1.92</td>
<td>0.12</td>
<td>Irregular To Rectangular</td>
<td>144</td>
<td>92.96</td>
<td>5.96</td>
<td>1.97</td>
</tr>
</tbody>
</table>
### Epidermal Studies in Identification of Jatropha Species

<table>
<thead>
<tr>
<th>Jatropha Curcas</th>
<th>Upper Layer Of Leaf</th>
<th>Anomocytic, Anomotetracytic</th>
<th>1 Or Rare</th>
<th>0.32</th>
<th>0.02</th>
<th>Irregular To Polygonal</th>
<th>Oval</th>
<th>4.87</th>
<th>2.88</th>
<th>0.69</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jatropha Curcas</td>
<td>Lower Layer Of Leaf</td>
<td>Anomocytic, Anomotetracytic</td>
<td>7</td>
<td>4.49</td>
<td>0.29</td>
<td>Irregular To Polygonal</td>
<td>Oval</td>
<td>96.64</td>
<td>6.19</td>
<td>4.48</td>
</tr>
<tr>
<td>Jatropha Curcas</td>
<td>Stem</td>
<td>Anomocytic, Anomotetracytic</td>
<td>1</td>
<td>0.64</td>
<td>0.04</td>
<td>Irregular To Polygonal</td>
<td>Oval</td>
<td>26</td>
<td>1.07</td>
<td>3.60</td>
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<tr>
<td>Jatropha Curcas</td>
<td>Pedicel</td>
<td>Anomocytic, Anomotetracytic</td>
<td>1</td>
<td>0.64</td>
<td>0.04</td>
<td>Regular To Pentagonal</td>
<td>Oval</td>
<td>150</td>
<td>12.37</td>
<td>0.32</td>
</tr>
<tr>
<td>Jatropha Curcas</td>
<td>Calyx</td>
<td>Actinocytic</td>
<td>1 Or 2</td>
<td>0.96</td>
<td>0.06</td>
<td>Sepal</td>
<td>Oval</td>
<td>500</td>
<td>20.55</td>
<td>0.29</td>
</tr>
<tr>
<td>Jatropha Curcas</td>
<td>Corolla</td>
<td>Actinocytic</td>
<td>6</td>
<td>3.85</td>
<td>0.25</td>
<td>Irregular To Rectangular</td>
<td>Oval</td>
<td>360</td>
<td>14.79</td>
<td>1.66</td>
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<td>Gynoecium</td>
<td>Not Found</td>
<td>Ellipsoid</td>
<td>400</td>
<td>250.64</td>
<td>16.07</td>
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<td>Irregular</td>
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<td>250.64</td>
<td>16.07</td>
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<tr>
<td>Jatropha Curcas</td>
<td>Fruit Wall</td>
<td>Paratetracytic</td>
<td>1</td>
<td>0.64</td>
<td>0.04</td>
<td>Oval</td>
<td>Oval</td>
<td>150</td>
<td>96.15</td>
<td>6.16</td>
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</tbody>
</table>

### 4.1.2. Chart of stomata index

Comparison of *jatropha gossypifolia* and *jatropha curcas*
### Epidermal Studies in Identification of Jatropha Species

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

<table>
<thead>
<tr>
<th>Name of plant</th>
<th>Name of plant parts</th>
<th>Type of trichome</th>
<th>Number of trichome</th>
<th>Frequency of trichome</th>
<th>Density of trichome</th>
<th>Type of epidermal cell</th>
<th>Number of epidermal cell</th>
<th>Frequency of epidermal cell</th>
<th>Density of epidermal cell</th>
<th>Index of trichome</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Jatropha gossypifolia</em></td>
<td>Upper layer of leaf</td>
<td>Uniseriate flagellate glandular hair and multisieriate capitate glandular hair</td>
<td>1 or rare</td>
<td>.32</td>
<td>0.02</td>
<td>Irregular</td>
<td>90</td>
<td>57.69</td>
<td>3.67</td>
<td>0.54</td>
</tr>
<tr>
<td><em>Jatropha gossypifolia</em></td>
<td>Lower of leaf</td>
<td>Uniseriate flagellate glandular hair and multisieriate capitate glandular hair</td>
<td>12 or rare</td>
<td>3.85</td>
<td>0.25</td>
<td>Irregular</td>
<td>180</td>
<td>115.38</td>
<td>7.40</td>
<td>3.27</td>
</tr>
<tr>
<td><em>Jatropha gossypifolia</em></td>
<td>Stem</td>
<td>Uniseriate flagellate glandular hair and multisieriate capitate glandular hair</td>
<td>5</td>
<td>3.21</td>
<td>0.21</td>
<td>Rectangular</td>
<td>200</td>
<td>128.25</td>
<td>8.22</td>
<td>2.49</td>
</tr>
<tr>
<td><em>Jatropha gossypifolia</em></td>
<td>Pedicel</td>
<td>Uniseriate flagellate glandular hair and multisieriate capitate glandular hair</td>
<td>5</td>
<td>3.21</td>
<td>0.21</td>
<td>Rectangular</td>
<td>200</td>
<td>128.25</td>
<td>8.22</td>
<td>2.49</td>
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<tr>
<td><em>Jatropha gossypifolia</em></td>
<td>Calyx</td>
<td>Uniseriate flagellate glandular hair and multisieriate capitate glandular hair</td>
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<td>7.71</td>
<td>0.49</td>
<td>Irregular to rectangular</td>
<td>180</td>
<td>115.38</td>
<td>7.40</td>
<td>6.21</td>
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<tr>
<td><em>Jatropha gossypifolia</em></td>
<td>Corolla</td>
<td>Uniseriate flagellate glandular hair and multisieriate capitate glandular hair</td>
<td>3 or 5</td>
<td>2.56</td>
<td>0.16</td>
<td>Oval</td>
<td>120</td>
<td>76.93</td>
<td>4.93</td>
<td>3.14</td>
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<td><em>Jatropha gossypifolia</em></td>
<td>Gynoecium</td>
<td>Not found</td>
<td></td>
<td></td>
<td></td>
<td>Irregular</td>
<td>1165</td>
<td>746.80</td>
<td>47.87</td>
<td></td>
</tr>
<tr>
<td><em>Jatropha gossypifolia</em></td>
<td>Androecium</td>
<td>Uniseriate flagellate glandular hair and multisieriate capitate glandular hair</td>
<td>1</td>
<td>.64</td>
<td>0.04</td>
<td>Oval</td>
<td>1600</td>
<td>1025.64</td>
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<td>0.06</td>
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<tr>
<td><em>Jatropha gossypifolia</em></td>
<td>Fruit wall</td>
<td>Uniseriate flagellate glandular hair and multisieriate capitate glandular hair</td>
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<td>0.16</td>
<td>Irregular to rectangular</td>
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<td>92.96</td>
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<td>2.61</td>
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<td>0.02</td>
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<td>70</td>
<td>44.87</td>
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### Epidermal Studies in Identification of Jatropha Species

<table>
<thead>
<tr>
<th>Organ</th>
<th>Description</th>
<th>Occurrence</th>
<th>Shape</th>
<th>Length (µm)</th>
<th>Width (µm)</th>
<th>Diameter (µm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jatropha curcas</td>
<td>Lower of leaf</td>
<td>Not found</td>
<td>Irregular to polygonal</td>
<td>150</td>
<td>96.64</td>
<td>6.19</td>
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<td>Jatropha curcas</td>
<td>Stem</td>
<td>1,4,3</td>
<td>Irregular to polygonal</td>
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<td>16.67</td>
<td>1.07</td>
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<td>Pedicel</td>
<td>1 or rare</td>
<td>Rectangular to polygonal</td>
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<td>192.96</td>
<td>12.37</td>
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<tr>
<td>Jatropha curcas</td>
<td>Calyx</td>
<td>1 or rare</td>
<td>irregular to rectangular</td>
<td>360</td>
<td>230.76</td>
<td>14.79</td>
</tr>
<tr>
<td>Jatropha curcas</td>
<td>Corolla</td>
<td>Not found</td>
<td>Irregular to rectangular</td>
<td>360</td>
<td>230.76</td>
<td>14.79</td>
</tr>
<tr>
<td>Jatropha curcas</td>
<td>Gynoecium</td>
<td>1</td>
<td>Ellipsoid</td>
<td>400</td>
<td>250.64</td>
<td>16.07</td>
</tr>
<tr>
<td>Jatropha curcas</td>
<td>Androecium</td>
<td>2.6</td>
<td>Irregular</td>
<td>240-560</td>
<td>250.64</td>
<td>16.07</td>
</tr>
<tr>
<td>Jatropha curcas</td>
<td>Fruit wall</td>
<td>1</td>
<td>Oval</td>
<td>150</td>
<td>96.15</td>
<td>6.16</td>
</tr>
</tbody>
</table>

**Hair Types:**
- Uniseriate flagellate glandular hair
- Uniseriate capitate glandular hair,
- Unicelled flagellate glandular hair,
- Unicelled branched glandular hair,
- Papillate glandular hair.
4.1.4. Chart of trichome index

Comparison of *jatropha gossypifolia* and *jatropha curcas*

4.1.5. Trichome Plate A

4.1.6. In *jatropha curcas* trichome plate A

- Fig. 1, 5, and 6: Unicelled flagellate glandular hair
  - Fig. 1: 40X87.50
  - Fig. 5: 40X38.75
  - Fig. 6: 40X12.50
- Fig. 2: Uniseriate capitates glandular hair 40X31.25
- Fig. 7: Developing uniseriate flagellate glandular hair 10x30
- Fig. 4, 10: Uniseriate flagellate glandular hair
  - Fig. 4: 40X25
  - Fig. 10: 10X100
- Fig. 3, 8: Unicelled branched glandular hair
  - Fig. 3: 10X250
  - Fig. 8: 10X85
- Fig. 9: Papillate glandular hair 10X25

4.1.7. Trichome plate B
4.1.8. In *jatropha gossypifolia* trichome plate B
Fig. 1: Uniseriate flagellate glandular hair 40X75
Fig. 2: Multiseriate capitates glandular hair 10X350

4.1.9. Stomata plate A

4.1.10. In *jatropha curcas* stomata plate A
Fig. 1: Paratetracytic stomata, in fruit wall,
Size: in 40X
Stomata: l=12.50, b=8.75
Stomata with subsidery cell: l=25, b=18.75
Fig. 2, 4, 6: Anomocytic stomata
Fig. 4: in leaf
Size: in 40X
Stomata: l=15, b=12.50
Stomata with subsidery cell: l=38.75, b=26.25
Fig. 2 in stem
Size: in 40X
Stomata: l=18.75, b=11.25
Stomata with subsidery cell: l=47.50, b=18.75
Fig. 6 in pedicel
Size: in 40X
Stomata: l=18.75, b=7.50
Stomata with subsidery cell: l=25, b=15
Fig. 3, 5: Anomotetracytic stomata
Fig. 5: in leaf
Size: in 40X
Stomata: l=18.75, b=12.50
Stomata with subsidery cell: l=56.25, b=25
Fig. 3: in stem
Size: in 40X
Stomata: l=22.50, b=10
Stomata with subsidery cell: l=50, b=21.25
Fig. 7, 8: Actinocytic stomata
Fig. 7: in sepal
Size: in 40X
Stomata: l=12.50, b=10
Stomata with subsidery cell: l=18.75, b=15
Fig. 8: in petal
Epidermal Studies in Identification of Jatropha Species

IV. Results and discussion

Jatropha curcas and Jatropha gossypifolia belongs to Euphorbiaceous family. They are found in tropical regions. Jatropha curcas is perennial plant. It has pale green leaves, erect stem, male and female flowers and ellipsoid capsule. It has many toxic contents curcin A and B, phorbolesters. It is useful in treatment of many diseases. Its toxicity can be showed in form of diarrhea, posture, depression. Jatropha gossypifolia is busy shrub. It has lobed, wide leaves, hairy, non-woody stem, red crimson flowers in corymb inflorescence and oblong capsule. It has toxic content ricinine and jatrophi. It is used for toothache, laropsy, ulcers, skin itches etc. When it consumed in excess then it produce abdominal pain, ptosis, and hind-limb paralysis.

There has been found brachyparacytic, anomotetracytic stomata in Jatropha gossypifolia and anomocytic, anomotetracytic, actinocytic, paratetracytic stomata in Jatropha curcas. The largest stomata 24 or 40 have been found in calyx and lower layer of leaf of Jatropha gossypifolia. The largest stomatal frequency 4.49 has been found in lower layer of leaf of Jatropha curcas. The largest stomatal density 0.29 has been found in lower layer of leaf of Jatropha curcas. The largest epidermal number 1600 has been found in androceium of Jatropha curcas. The largest stomatal frequency 1025.64 has been found in androceium of Jatropha gossypifolia. The largest density of epidermal cell 1025.64 has been found in androceium of Jatropha gossypifolia. The largest stomatal index 4.48 has been found in lower layer of leaf of Jatropha curcas. Stomata, stomatal frequency, stomatal density has been absent in corolla, gynoceium, androceium of Jatropha curcas. The lowest epidermal number 26 has been found in stem of Jatropha curcas. The lowest epidermal frequency 16.67 has been found in stem of Jatropha curcas. The lowest epidermal density 1.07 has been found in stem of Jatropha curcas. There has been found uniseriate aseptate flagellate glandular hair, multiseriate capitale glandular hair in Jatropha gossypifolia and bicelled uniseriate glandular hair, uniseriate glandular hair, uniseriate sekile shaped glandular hair, simple two armed cylindrical glandular hair, acinaciform non glandular hair, cylindrical non glandular hair in Jatropha curcas. The largest trichome number 12 has been found in calyx of Jatropha gossypifolia. The largest trichome frequency 7.71 has been found in calyx of Jatropha gossypifolia. The largest trichome density 0.49 has been found in calyx of Jatropha gossypifolia. The largest trichome index 9.32 has been found in stem of Jatropha curcas. There have been absent trichome, trichome index, trichome frequency, trichome density in gynoceium of Jatropha gossypifolia.

V. Conclusion

Economically Jatropha curcas and Jatropha gossypifolia are useful that included in Euphorbiaceous family. As well as they are showed also toxic properties. They can be identified by brachyparacytic, anomotetracytic, anomocytic, actinocytic, paratetracytic stomata, uniseriate flagellate glandular hair, multiseriate capitale glandular hair, uniseriate capitale glandular hair, unicelled flagellate eglandular hair, uniseriate flagellate glandular hair, unicelled branched glandular hair, papillate glandular hair and other data parameters in the taxonomy.

VI. Acknowledgement

“One touch of nature makes the whole work kin”

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