Tridax: An Alternative Option for Studying Plant Anatomy in Practical Classes

Abstract: Introduction of specimen like Tridax in the anatomy practical syllabi of Botany in the school and college level may be more logical and better option than the existing specimen like Helianthus.

Keywords: Helianthus, Tridax, Dicotyledonous, Asteraceae, Stem Anatomy.

Practical knowledge has huge significance in the teaching-learning process of sciences. Practical classes engage students, helping them to develop important skills, understand the process of scientific investigation and develop a broad understanding of scientific concept through abductive reasoning. Like other sciences, practical study is an inseparable part of plant sciences. For instance, Plant Anatomy, an important branch of Botany, is largely avoided by students due to obscurity. But plant anatomy may be a very attractive subject for the students, if they can observe the internal structures of a plant practically in the laboratory which they have gone through in their text books and theoretical notes. From high school to undergraduate level, the anatomical study of various plant parts such as stem, root, leaf, and others are included in the syllabi of central and state school boards and all the Indian universities under UGC. The students usually receive their fundamental knowledge of anatomy of typical dicotyledonous, monocotyledonous and gymnospermous stem as per the syllabi of school and colleges all over India.

However, the Common Sunflower (Helianthus annuus L.) plant of Asteraceae is unanimously used in all our laboratories to study the anatomy of stem, for about last five decades or more. With this single specimen all the students, from class nine standard to the students of part I classes of post-graduate level, are introduced with the normal cell and tissue patterns of dicotyledonous stem. This entire fact, on one hand is monotonous and, on the other, unscientific and impractical.

Though Helianthus is available everywhere and its stem is somewhat hardy; fine sections can be cut from the stem from which we can get a clear anatomical view of the specimen. But Helianthus is a seasonal plant mainly in winter, so that we cannot use fresh plant material throughout the year in laboratory to study the stem anatomy. The preserved specimens (preferably in FAA solution), become wet and soft, and as a result it is hard to cut fine sections and exact stem anatomy also may be missing sometimes. Besides, Helianthus is a well known oil-seed plant. It is mainly cultivated for making vegetable oils, for its medicinal properties and for the ornamental purposes also. So, if we use the plant randomly for our study in schools and colleges all over India, then we are going to face a great peril of economic loss.

In this section, we have tried to demonstrate Coat Buttons (Tridax procumbens L.) of Asteraceae as an alternative option of Helianthus annuus to study typical dicotyledonous stem anatomy.

Material and Method: Both the specimens, Helianthus annuus and Tridax procumbens were collected from the campus of Syamsundar College, Purba Bardhaman, West Bengal. Precise field notes were made as a record and habit photographs (Figure 1a and 1b) were taken in the field. Chopped portion of both the collected specimens were then preserved individually in 50 per cent ethyl alcohol over night for further anatomical study. Large number of thin transverse sections was prepared separately from those stem portions with the help of a new sharp razor. From these sections the finest sections (about 0.5-1.0mm in thickness) were collected on two individual glass slides and then the sections were stained with aqueous Safranin and Fast Green solutions and temporarily mounted in 10 per cent Glycerin solution. Then the prepared slides were studied under compound microscope,
compared with available literatures\textsuperscript{2,3}; the camera lucida drawings and the photographs of sections were taken (see also in Plate 1).

<table>
<thead>
<tr>
<th>Anatomical Zones</th>
<th>In the stem of $Helianthus$ $annuus$ $L.$</th>
<th>In the stem of $Tridax$ $procumbens$ $L.$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>More or less circular to wavy in outline.</td>
<td>More or less circular in outline.</td>
</tr>
<tr>
<td>Epidermis</td>
<td>Single layered, composed of compactly arranged tabular parenchyma cells, outer wall cuticularised, stomata may be present, multicellular epidermal hairs are found.</td>
<td>Single layered, composed of compactly arranged rectangular parenchyma cells, outer wall thin cuticularised, stomata present, multicellular epidermal hairs are found.</td>
</tr>
<tr>
<td>Hypodermis</td>
<td>2-5 layered, composed of collenchymatous cells with thickened corners.</td>
<td>Few layered, composed of collenchymatous cells with distinct intercellular spaces.</td>
</tr>
<tr>
<td>Cortex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>General Cortex</td>
<td>Many layered, composed of parenchyma cells with several intercellular spaces. It often encloses a number of glands.</td>
<td>Several layered, consists of thin walled parenchymatous cells. The outer layer contains chlorophyll within the cells.</td>
</tr>
<tr>
<td>Endodermis</td>
<td>Single layered, composed of barrel-shaped cells with casparian strips. These cells possess abundant starch and hence, it is called ‘starch sheath’.</td>
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</tr>
<tr>
<td>Pericycle</td>
<td>Several layered, composed of 2 types of cell layers – outer and inner sclerenchymatous caps and a parenchymatous layer in between them.</td>
<td>Several layered, composed only of sclerenchymatous cells and continuous in nature.</td>
</tr>
<tr>
<td>Vascular Bundles</td>
<td>Conjoint, collateral and open, phloem is outer and xylem is inner in position, few layers of cambium are present in between xylem and phloem, protoxylem is endarch.</td>
<td>Conjoint, collateral and open, arranged in one ring, phloem is outer and xylem is inner in position, few layers of cambium are present in between xylem and phloem, protoxylem is endarch.</td>
</tr>
<tr>
<td>Pith</td>
<td>Parenchymatous, well developed, broad with intercellular spaces.</td>
<td>Parenchymatous, well developed, broad with intercellular spaces.</td>
</tr>
</tbody>
</table>

**Discussion**: After gone through the comparative account, we can find that the stem of $Helianthus$ $annuus$ is more or less similar to that of $Tridax$ $procumbens$, anatomically. From dermal region to pith they are more or less identical. Even the vascular bundles of these two stems are totally alike. If we want to replace $Helianthus$ $annuus$ with $Tridax$ $procumbens$ to study the typical dicotyledonous stem anatomy, no omission will be created among the

\textbf{Result}: In our study, we have found such comparison between the stem anatomy of $Helianthus$ and $Tridax$ as follows:
a FAA is a plant fixative, made up of Formaldehyde (10 per cent), Alcohol (50 per cent), Acetic Acid (5 per cent), and water (35 per cent). Advantages include rapid and thorough penetration of tissue by formaldehyde, long term storage possibilities, and balancing of tissue contraction/expansion between the alcohol and acid.

b Safranin or Safranin O is a cationic dye which can easily be dissolved in water to make the staining solution. In presence of Safranin, thick-walled lignified cells of plants (like xylem) are stained with red or reddish orange colour.

c Fast Green FCF, an organic sodium salt, can easily be dissolved in water and is used to stain cellulose containing cells. In presence of Fast Green FCF, thin-walled cells of plants (like phloem, pith, epidermis, etc.) are stained with blue to blue-green colour.
students to understand the normal anatomy of dicotyledonous stem in the laboratory as per as the syllabus criteria is concerned.

On the other hand, *Tridax procumbens* grows abundantly in grassy waste lands and along roadside. We can use the fresh plant part in laboratory to anatomical study throughout the year as it is perennial herb. The stem is somewhat hard but not too much; as a result, we can cut fine sections from it to study its anatomy. Besides, *Tridax* is reported as weed, so if we use it in laboratory for random study then weed control will be also occurred to some extent.

So, we can think about the use of *Tridax procumbens* as an alternative option for studying typical dicotyledonous stem anatomy instead of *Helianthus annuus*.

**Acknowledgement**: The authors are thankful to Mr Amiya Kumar De, Lab Instructor, for providing technical support, and to Mr Subhankar Das and Ms Anasuya Dan for preparing the sections and camera lucida drawings consecutively.

*Chotonilpur Pirtala, PO Sripally
Dist. Purba Bardhaman 713 104
E-mail: dpanjanghosh@gmail.com

**Department of Botany, Syamsundar College,
Shyamsundar, Purba Bardhaman 713 424
E-mail: sayantan.jash98@gmail.com

Received : 13 August, 2019