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## **STOMATA AND ITS CLASSIFICATION**

Stomata arise from the protoderm cells. Normally a protoderm cell undergoes anticlinal division, one of them serves as the stoma mother cell. It eventually divides into two cells leaving a small slit between them. The two cells develop into two kidney-shaped guard cells and the slit into the stomatal aperture. In many families the protoderm undergoes several divisions before the stoma mother cell differentiates. Commonly subsidiary cells arise from protoderm cells lying adjacent to the stoma mother cell. They may be sister cells of the mother cell or may arise by division of the cells lying adjacent to the mother cells. A number of types of stomata have been recognised on the basis of their modes of development, relation with neighbouring cells and occurrence and number of subsidiary cells. In *Allium*, *Iris*, etc., the protoderm cell divides anticlinally into two unequal cells; the smaller one serves as the stoma mother cell which gives rise to the stoma. The subsidiary cells are absent. It is a very common type of stoma. In *Zea*, bamboos and other members of grass and sedge families the guard cells are peculiarly dumb-bell-shaped in appearance. Two subsidiary cells arise by division of the protoderm cells lying adjacent to stoma mother cell and they occur on two sides of the guard cells. This is referred to as *Zea* type. In *Tradescantia* four subsidiary cells are formed which originate from four protoderm cells surrounding the stoma mother cell. In *Bryophyllum* the protoderm cells have been found to produce a series of spirally arranged subsidiary cells, and finally they give rise to the guard cells.



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**A. Anomocytic or irregular-celled type:**

Stoma remains surrounded by a limited number of cells which cannot be distinguished from other epidermal cells. Thus the subsidiary cells are absent. This is also called ranunculose type, common in the families Ranunculaceae, Capparidaceae and others.

**B. Anisocytic or unequal-celled type:**

Here the stoma remains surrounded by three subsidiary cells of which one is distinctly smaller than the other two. It is otherwise known as cruciferous type common in Cruciferae.

**C. Diacytic or cross-celled type:**

Here the stoma remain enclosed by a pair of subsidiary cells whose common wall is at right angles to the guard cells. This is also called caryophyllaceous type, common in Caryophyllaceae, Acanthaceae and others.

**D. Paracytic or parallel-celled type:**

The stoma is accompanied on either side by one or more subsidiary cells which lie parallel to the long axis of the pore of guard cells. This is also referred to as rubiaceous type common in Rubiaceae, Magnoliaceae and others. In view of the fact that diversities occur as regards the nature of the stomata the terms ranunculose, etc., are rather confusing, and anomocytic, etc., suggested by Metcalffe and Chalk appear to be more appropriate.



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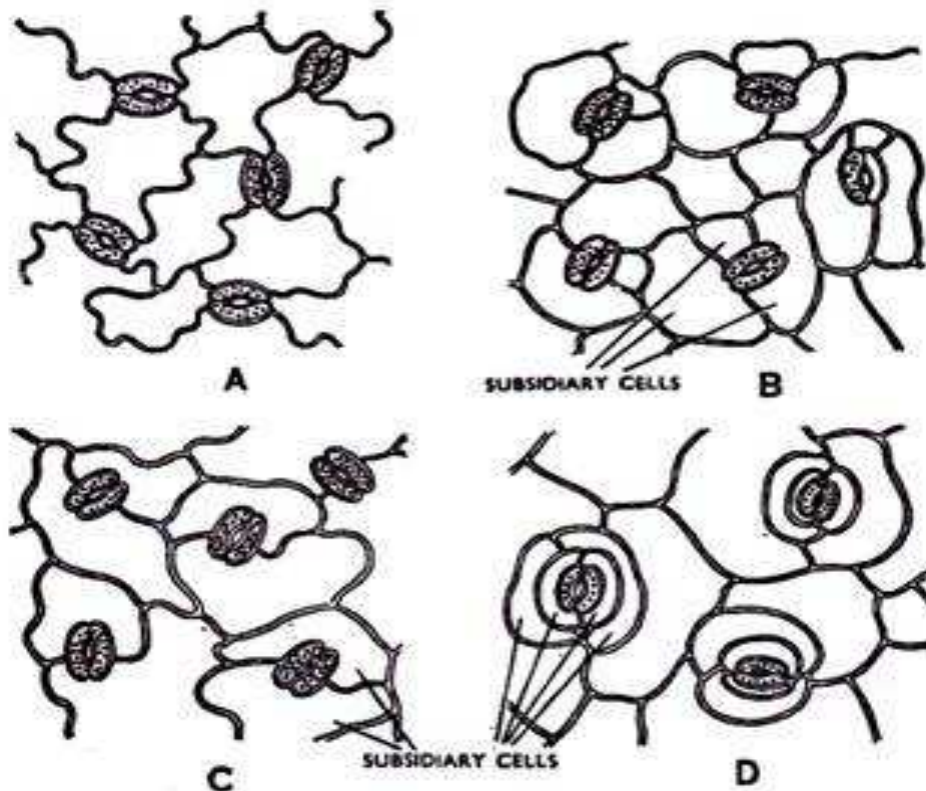


FIG. 563. Stomata—types. A. *Anomocytic* or irregular-celled type in *Clematis*. B. *Anisocytic* or unequal-celled type in *Iberis*. C. *Diacytic* or cross-celled type in *Dianthus*. D. *Paracytic* or parallel-celled type in *Gardenia*.

Classification on the basis of development was devised, and stomata have been put in three categories:

(1) **Mesogenous type** – guard cells and subsidiary cells derived by consecutive division of a mother cell, e.g., Rubiaceae, Cruciferae.

(2) **Mesoperigenous type** – where the surrounding cells are of dual origin, some from the mother cell and some from the neighbouring cell, e.g, Ranunculaceae, Caryophyllaceae.



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(3) **Perigenous type** – all neighbouring and subsidiary cells having independent origin, e.g., Cucurbitaceae, Nymphaeaceae.

In the monocotyledons the most common one is the graminaceous or grass type. Here the two guard cells are dumb-bell-shaped having a narrow middle portion and bulbous ends. Two distinct subsidiary cells lie parallel to the long axis of the pore.

It has been suggested that stomata with many subsidiary cells are primitive, and those with few or no subsidiary cells have been derived by reduction. The stomata are very important from physiological point of view. It is through them that interchange of gases takes place between the intercellular space system of the internal tissues and the outer atmosphere and thus important physiological functions like photosynthesis, respiration and transpiration become possible.

Water-stomata or hydathodes are also epidermal openings through which liquids often with dissolved salts, are exuded from the plants. They have been discussed in the preceding chapter.

**PROBABLE QUESTIONS :**

- 1. Mention the types of Stomata with example**
- 2. What do you mean by anomocytic stomata?**
- 3. What do you mean by Hydathode ?**
- 4. What is Monoceous and dioceous stomata ?**



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