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NAAC ACCREDITED 'A' GRADE



Topic: PALEOBOTANY AND PALYNOLOGY  
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Name of the Department: Botany (Morning)

# NPC classification

G. Erdtman (1969) proposed NPC-System pollen/spore classification based on the apertures',

1. **Number** (N-whether single or two or many),
2. **Position** (P- polar: distal or proximal; global; meridional)
3. **Characters** (C – circular or elongated) with regard to microspore tetrad .










Under this system the term '**treme**' (**aperture**) has been used for preparing keys for the classification of the pollen grains/spores.

## **NUMBER:**

The pollen number (N) groups are of nine types. The grain without aperture is named "Atreme".

- Depending upon the number of apertures, the types of pollen are
- Monotreme (N<sub>1</sub>) with one aperture,
- Ditreme (N<sub>2</sub>) with two apertures;
- Tritreme (N<sub>3</sub>) with three apertures,
- Tetratrema (N<sub>4</sub>) with four apertures,
- Pentatrema (N<sub>5</sub>) with five apertures,
- Hexatrema (N<sub>6</sub>) with six apertures and

- Polytreme (N<sub>7</sub>) having more than six apertures.
- Irregularly arranged spiral apertures over the surface of the pollen irrespective of their number are designated as 'Anomotreme' (N<sub>8</sub>).

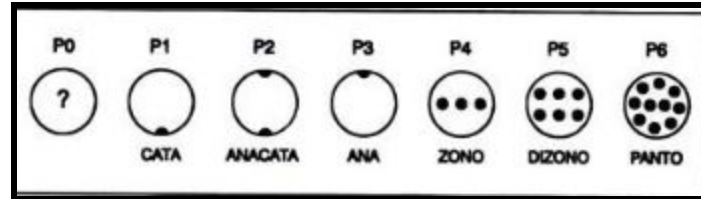
ATREME	NOMOTREME							ANOMOTREME
No	N1	N2	N3	N4	N5	N6	N7	N8
	 MONO	 DI	 TRI	 TETRA	 PENTA	 HEXA	 POLY	

### **POSITION:**

On the basis of the position (P) of apertures, pollen is categorized into seven groups (P<sub>0</sub> to P<sub>6</sub>).

- In 'Catatrema' (P<sub>1</sub>) pollen aperture is in proximal face,
- while in 'Anatrema' (P<sub>3</sub>) it is in distal face.
- The pollen is designated as 'Anacatatrema' (P<sub>2</sub>) where apertures are both in proximal and distal faces.
- The pollen grains are referred to as 'Zonotreme' (P<sub>4</sub>), when the apertures are located in the equatorial zone.
- 'Dizonotreme' (P<sub>5</sub>) are like zonotreme, but with two rows of apertures on the equatorial region.

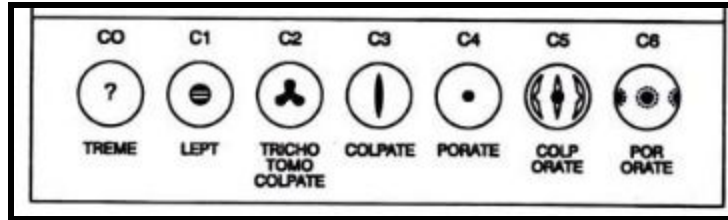
- In 'Pantotreme' (P6), apertures are globally distributed all over the pollen surface.



### **CHARACTERS:**

Like position groups the character (C) groups are of seven types (C<sub>0</sub> to C<sub>6</sub>). If the character of the aperture is not known, it is designated as C<sub>0</sub>.

- Pollen having an aperture like thin area or Leptoma is designated as C<sub>1</sub>. Pollen with one leptoma is called Monolept, it may be called Catalept if present in the proximal face, or Analept if in the distal face.
- Pollen with three- slits like colpus are called Trichotomocolpate which belongs to the C<sub>2</sub> category.
- The remaining character classes i.e., C<sub>3</sub>, C<sub>4</sub>, C<sub>5</sub> and C<sub>6</sub> include Colpate (with colpa i.e. furrow), Porate (with pore i.e. circular aperture), Colporate (both with colpa and pore/ora apertures), Pororate (aperture with pore and ora) respectively.



## Apertural types:

Apertures are of two basic types namely, Simple aperture i.e. with one type of aperture and Compound aperture i.e., with two different types of apertures.

- *Simple aperture:*

Simple opening or thinning overlaying a thick intine.

## **Lete:**

Slit like aperture situated at the proximal end viz. pteridophytes spores. Spore with one slit is called **monolete**, (Fig A) e.g., *Psilotum*, *Polypodium*, etc., and spore with triradiate slit is called **trilete**, ( Fig B, C ) e.g., *Lycopodium*, *Dryopteris*, etc.

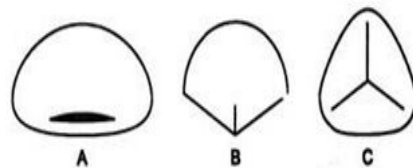


Fig: monolete(A), trilete (B,C)

## **Porus:**

Equatorial simple circular aperture with length/breadth ratio  $< 2$ . The pollen grains with porus apertures are referred to Porate e.g., Urticaceae, Ulmaceae, etc.



fig porus

## **Periporus:**

Global simple circular aperture with length/breadth ratio  $< 2$ . The pollen grains of this apertural type are called Pantoporate or Periporate, e.g., Amaranthaceae, Chenopodiaceae, Malvaceae etc.



fig periporus

**Ulcus:** Distal simple circular aperture with length/breadth ratio  $< 2$  and restricted to less than half the distal surface. The pollen grains with this aperture are referred to Ulcerate, e.g., Poaceae.

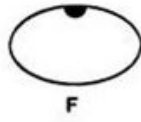


fig ulcus

## Sulcus:

Distal simple elongated boat-shaped aperture, generally with tapering ends showing length/breadth ratio  $> 2$ . The aperture is parallel with the equatorial breadth. Pollen grains with sulcus aperture are called Sulcate e.g., *Arecaceae*, *Magnoliaceae* etc.

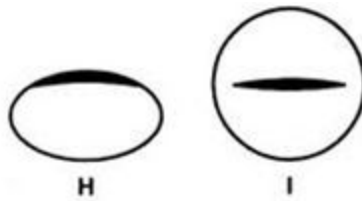


fig: sulcus

## Sulculi:

Sulculi are sulcoid apertures, parallel to equator and usually situated between the equator and the distal pole. If united apically, the sulculi form a zone, or ring parallel to the equator, e.g., *Eupomatia*, *Cephalostemon*, *Atherosperma* etc.

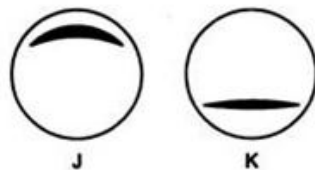
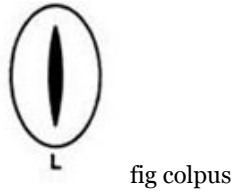


fig sulculus

## Colpus:

Meridional simple long furrow-like aperture with length/breadth ratio  $>2$ . Aperture is facing pole to pole direction. The pollen grains of this apertural type are referred to Colpate, e.g., Lamiaceae, Brassicaceae.



## Pericolpus:

Global simple, long furrow-like aperture with length/breadth ratio  $>2$ . The pollen grains with pericolpus apertures are aperture and the branches are more than twice referred to Pantocolpate/Pericolpate, e.g., Portulacaceae, Martyniaceae.

- *Compound or Composite Apertures:*

Composite aperture is an opening or thinning in the outer exine (Ecto Aperture, Colpi or Pore) which is not congruent with that in the inner exine, that is, endexine (endo aperture, Ora).

Composite apertures are of two types: **Colporate** (Ora in Colpi) and **Pororate** (Ora in Pore). Ora are located centrally in the endexine

region. Ora may be Circular (Fig. 4.9) or lalongate (elongated laterally at right angles to the colpus) [Fig.4.9] or lolongate (elongated meridionally or longitudinally) [Fig. 4.9].

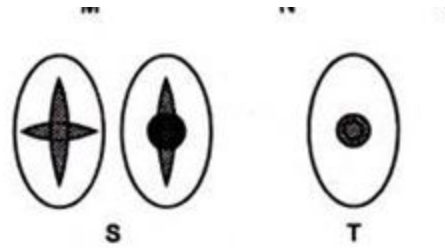


fig:colporus(S) and pororate(T)

### *Views of grains with reference to apertures:*

#### **Polar view:**

In this view the pollen/ spores are viewed with one of the poles exactly uppermost i.e. with the polar axis directed straight towards the observer (Fig. 4.11). In polar view the lete/sulcus/ulcus type of apertures will be observed centrally as they are situated in the polar region. The polar axis will not be viewed here. The zonal apertures like colpi, pore, etc. will be viewed in the circumference of the pollen grains.

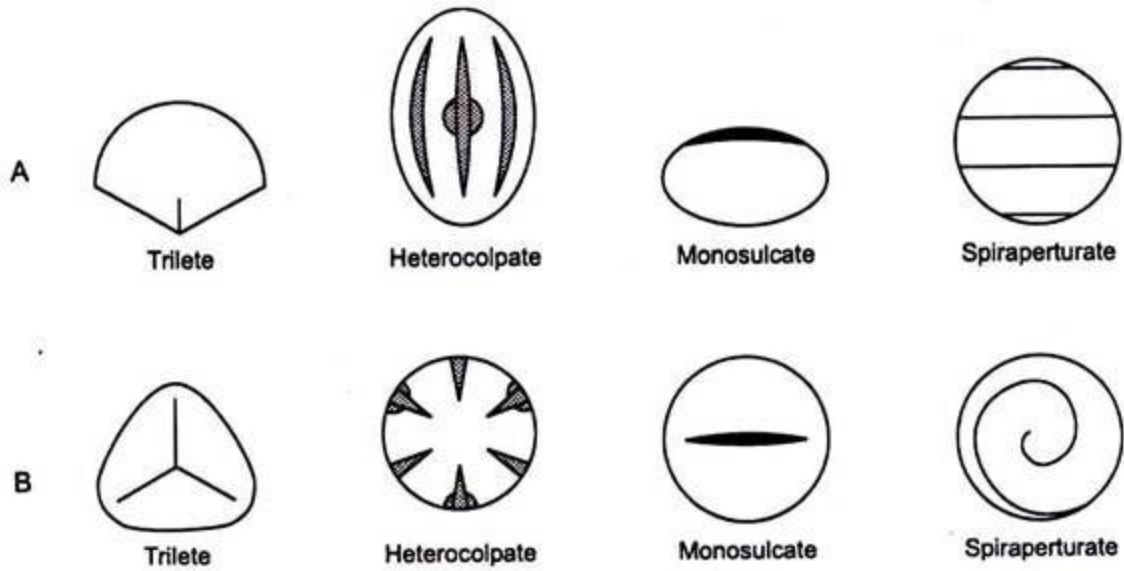


Fig. 4.11 : Views of grains (A=Equatorial view, B=Polar view)

### Equatorial view:

In this view the apertures are arranged meridionally-pole to pole at right angles to the equator (Fig. 4.11). Both polar axis and equatorial diameter will be viewed and they can be measured in this view.