S.G.V.C. Vidya Prasarak Trust's

MGVC Arts, Commerce And Science College Muddebihal

DEPARTMENT OF BOTANY

PROJECT WORK

ON

GYMNOSPERM:

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DEPARTMENT OF BOTANY

CERTIFICATE

EXAMINATION SEAT NO:S1928133 CLASS:BSC 3RD SEM

This is to Certify that Mr/Mrs .SUDEEP TIGANIBIDARI.
Has satisfactorily completed Project work on "GYMNOSPERMS".

"Under my supervision in M.G.V.C Arts, Commerce and Science College Muddebihal year 2020-2021

STAFF MEMBER IN CHARGE

Gymnosperm

Gymnosperm: These are vascular plant that reproduces by means of an exposed seed, or ovule—unlike angiosperms, or flowering plants, whose seeds are enclosed by mature ovaries, or fruits. The seeds of many gymnosperms (literally, "naked seeds") are borne in cones and are not visible until maturity. Taxonomists recognize four distinct divisions of extant (nonextinct) gymnospermous plants. Pinophyta, Cycadophyta, Ginkgophyta, and Gnetophyta—with 88 genera and more than 1,000 species distributed throughout the world.

Gymnosperms were dominant in the Mesozoic Era (about 252.2 million to 66 million years ago), during which time some of the modern families originated (Pinaceae, Araucariaceae, Cupressaceae). Although since the Cretaceous Period (about 145 million to 66 million years ago) gymnosperms have been gradually displaced by the more recently evolved angiosperms, they are still successful in many parts of the world and occupy large areas of Earth's surface. Conifer forests, for example, cover vast regions of northern temperate lands, and gymnosperms frequently grow in more northerly latitudes than do angiosperms.

General features:

In all living gymnosperm groups, the visible part of the plant body (i.e., the growing stem and branches) represents the sporophyte, or asexual, generation, rather than the gametophyte, or sexual, generation. Typically, a sporophyte has a stem with roots and leaves and bears the reproductive structures. As vascular plants, gymnosperms contain two conducting tissues, the xylem and phloem. The xylem conducts water and minerals from the roots to the rest of the plant and also provides structural support. The phloem distributes the sugars, amino acids, and organic nutrients manufactured in the leaves to the nonphotosynthetic tissues of the plant.

In most gymnosperms the male pollen cones, called microstrobili, contain reduced leaves called microsporophylls. Microsporangia, or pollen sacs, are borne on the lower surfaces of the microsporophylls. The number of microsporangia may vary from two in many conifers to hundreds in some cycads. Within the microsporangia are cells which undergo meiotic division to produce haploid microspores.

The gametophyte phase begins when the microspore, while still within the microsporangium, begins to germinate to form the male gametophyte. A single microspore nucleus divides by mitosis to produce a few cells. At this stage the male gametophyte (called a pollen grain) is shed and transported by wind or insects.

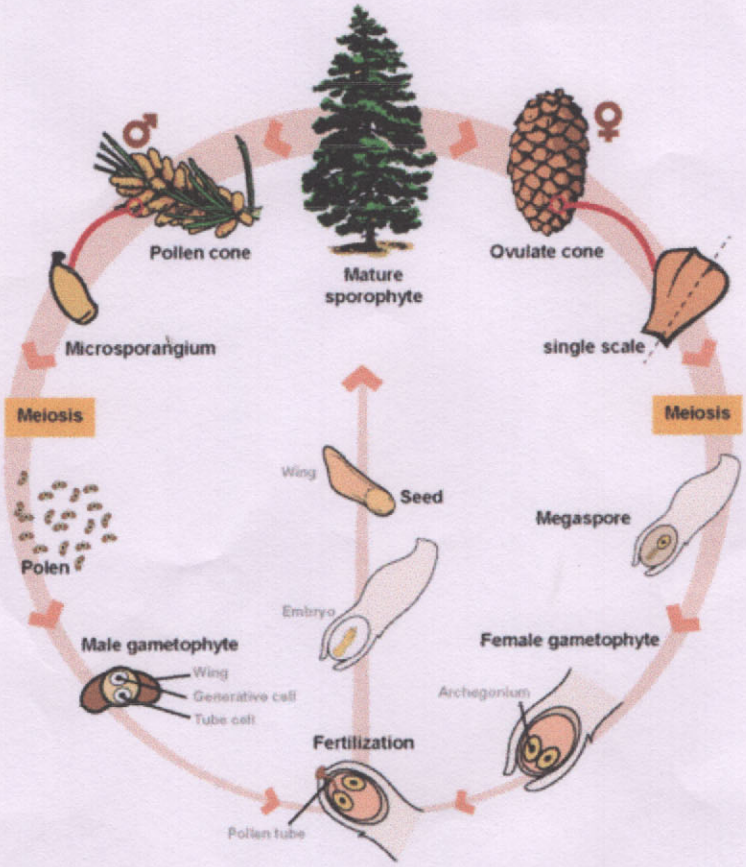
Female ovulate cones, called megastrobili, may be borne on the same plant that bears microstrobili (as in conifers) or on separate plants (as in cycads and *Ginkgo*). A megastrobilus contains many scales, called megasporophylls, that contain megasporangia. Within each megasporangium, a single cell undergoes meiotic division to produce four haploid megaspores, three of which typically degenerate. The remaining megaspore undergoes mitosis to form the female gametophyte. As the number of free nuclei multiplies, the megasporangium and megaspore wall expand. At this stage the ovule is ready to be fertilized.

Before fertilization can take place, however, the mature male gametophyte (the pollen grain) must be transported to the female gametophyte—the process of pollination. In many gymnosperms, a sticky "pollination droplet" oozes from a tiny hole in the female megasporangium to catch pollen grains. The droplet is then resorbed into the megasporangium for fertilization. In other species, the pollen grain settles on the surface of the megasporangium, where the male gametophyte develops further. A pollen tube emerges from the grain and grows through the megasporangium toward the multicellular egg-containing structure called the archegonium. The egg and sperm continue to mature, the nucleus of the latter undergoing additional divisions resulting in two male gametes, or sperm. Interestingly, cycads and *Ginkgo* are the only seed plants with flagellated sperm. By the time the pollen tube reaches the archegonium, both the egg and sperm are fully mature, and the egg is ready to be fertilized.

In gymnosperms, when the nuclei of the two sperm meet the egg cell, one nucleus dies and the other unites with the egg nucleus to form a diploid zygote. The fertilized egg undergoes mitosis to begin the development of a new sporophyte generation—the multicellular embryo of the seed. Food for the developing embryo is provided by the massive starch-filled female gametophyte that surrounds it.

Life Cycle of Gymnosperms

Gymnosperms are vascular plants that produce seeds in cones. Examples include conifers such as pine and spruce trees. The gymnosperm life cycle has a dominant sporophyte generation. Both gametophytes and the next generation's new sporophytes develop on the sporophyte parent plant. Figure below is a diagram of a gymnosperm life cycle.



Cones form on a mature sporophyte plant. Inside male cones, male spores develop into male gametophytes. Each male gametophyte consists of several cells enclosed within a grain of **pollen**. Inside female cones, female spores develop into female gametophytes. Each female gametophyte produces an egg inside an ovule.

Pollination occurs when pollen is transferred from a male to female cone. If sperm then travel from the pollen to an egg so fertilization can occur, a diploid zygote results. The zygote develops into an embryo within a seed, which forms from the ovule inside the female cone. If the seed germinates, it may grow into a mature sporophyte tree, which repeats the cycle.

Conclusion:

- Gymnosperms are seed plants that generate naked seeds and are heterosporous.
- The sporophyte generation is most prominent in the gymnosperm life cycle.
- The life cycle of a gymnosperm begins on a mature sporophyte plant.
- Male spores grow into male gametophytes inside male cones. Each male gametophyte is encased in a grain of pollen.
- Female spores mature into female gametophytes inside female cones. Each female gametophyte is encased in an egg within an ovule.
- During pollination, pollen is transported from the male to the female gametophyte where fertilization occurs, creating a zygote.
- The zygote matures into an embryo within a seed. If the seed germinates, it will develop into a full sphorophyte plant, and the cycle repeats.