CHAPTER - III

GENERAL MORPHOLOGY OF GRASSES
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Grasses are mostly herbs, while few are shrubs, or even trees (Babusa), but they all have certain common characteristics. The grass plant consists of a root system and a shoot system. The root system is fairly uniform, while the shoot system consisting of stem, leaves and flowers is much diversified.

Root System

The primary root dies in a short time and is replaced by adventitious fibrous roots from the nodes of the stem. The root system may be small, holding the soil but lightly, or extensive, holding the soil firmly. Sometimes adventitious roots form on the nodes, on erect culms, or on nodes only near the base, to act as stilt roots. Adventitious roots frequently arise at the nodes of creeping or prostrate stems as in Cynodon dactylon.

Shoot System

Stem or Culm. The aerial stems or culms are more or less cylindrical and consist of nodes which are solid and internodes which are mostly hollow at maturity excepting a few grasses where they are solid. The base of the internode remains capable of growth for some time and is enclosed in the swollen base of the sheath, often mistaken for the stem node. At the base of the culm of perennial grasses in a very short sympodial rhizome formed by the basal parts of the successive culms. The stem sends out
Explanations to figure No. 6

A Plant

Sp = Spikelet
P = Panicle
B = Blade
L = Leaf
Sh = Sheath
L1 = Ligule
I = Internode
S = Stem
R = Root

Types of Inflorescence

A = Panicle
B = Raceme
C = Spike
D = Spikelike raceme (digitately arranged)
E = Scattered spikelike raceme
F = Spike like panicle

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FIG. 6

Eragrostis pilosa (Linn) P. Beauv.

DIFFERENT TYPES OF INFLORESCENCE
(AFTER C.E HUBBARD)
branches from the axils of the basal leaves. In annual grasses the branches are all alike and all form inflorescences. In the perennial species some of the culms form inflorescences while the others remain leafy. These branches may either grow up inside the leaf-sheaths (intra-vaginal) forming tufts or the young shoots bursts through the leaf-sheaths (extra vaginal) and often spread horizontally above the ground as stolens or below the surface of the ground as rhizomes, giving rise to erect shoots at intervals.

Leaf - The leaves are alternate and borne in two ranks along the stem. The leaf consists of two parts, a sheath enveloping the stem, and typically a flat blade. Grasses of dry climates frequently possess narrow, inrolled blades, while most shade grasses have shoot wide blades. In some grasses (Bambos) the blades are stalked and jointed on the sheaths. At the junction with the blade, the sheath is produced on its inner side into a membranous or ciliate structure, the ligule, while on the outside of the junction is the region known as the collar. In some grasses the base of the blade is produced on either side into ear-shaped appendage, the auricle. When a branch originates (in the axil of a sheath) the side next to the parent shoot and is called the prophyll.

Inflorescence - While generally in other flowering plants the flower is taken as the unit of inflorescence, in grasses spikelet is considered as the unit. The spikelet consists of one to a few flowers enclosed in a series of two-ranked, chaffy bracts.

The spikelets are grouped together in various ways on the inflorescence axis (rachis). When the axis is unbranched
Explanation to Figure No. 7

P = Palea
L = Lemma
Lg = Lower glume
Ug = Upper glume
R = Rachilla
Ped = Pedicel
Lod = Lodicules
O = Ovary
S = Stamen
FIG. 7

AFTER AGNES CHASE

AFTER C.E. HUBBARD

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and bears spikelets along it, the inflorescence is a spike (Fig. C), if the spikelets are sessile a raceme (Fig. B), if the spikelets are pedicelled, or a spike-like raceme, if the spikelets are so short-pedicelled as to give the inflorescence the appearance of a spike. When a branched axis bears pedicelled spikelets, the inflorescence is a panicle (Fig. A) which is the commonest type in grasses. The panicle may be lax or open, or it may be so contracted that the pedicels and branches are hidden by the spikelets, when it is called a spike-like panicle (Fig. F).

**Spikelet** — The typical spikelet consists of an axis (rachilla) bearing a series of overlapping, scaly bracts. The two lowest bracts are empty and are called the glumes. Each bract above the glumes bears a flower and is called a lemma (valve or flowering glumes). At the base of the flower is a scale-like organ, the palea corresponding to the prophyll or vegetative branches. Above the palea are two minute, fleshy scales, the lodicules, probably representing the perianth, three stamens and a pistil. The lemma, palea and included flower together are called a floret. Various modifications of the spikelets by reduction or suppression occur usually associated with change in sexual characters. The spikelet may be male or female, the separate sexes occurring in the same inflorescence or in different inflorescence of the same plant (Maize). The spikelets may be solitary and reduced to a single bisexual floret. They may be paired, one spikelet being sessile and bisexual while the other is pedicelled and male or neuter (Andropogoneae). Sometimes the spikelets are in threes, a sessile bisexual spikelet
with two pedicelled sterile spikelet (Love grass). In some grasses the spikelets are in groups of sterile spikelet with one or more fertile spikelets (Themeda). The spikelets may consist of a perfect terminal floret and below this a sterile floret with a lemma like the glumes and empty or with a palea or with a male flower (Paniceae) (Fig. 7).

Rachilla - The axis (rachilla) the florets is articulated either below the glumes (Panicum) or above the glumes and between the florets (Bragrostis). It may be continuous or jointed between the lemmas, and it may be produced beyond the uppermost floret.

Glumes - The two glumes are called lower glume and the upper glume. They are usually similar in shape and texture, each with a median nerve, the lower glume being usually smaller, with fewer nerves, or entirely wanting (Paspalum). Rarely both glumes are wanting (Oryzaceae).

Lemmas - The lemmas may be similar to the glumes or variously modified. They may be thin and enclosed in the hardened glumes, or they may be hardened. They often bears awns as continuations of the nerves.

Palea - The palea is mostly two-nerved, the nerves forming keels with the back between them often concave. The nerves lie so close together as to appear as one. The keels may be ciliate, bearded or winged. The paleas are much reduced or wanting in some species. The paleas are rarely awned.

Lodicules - Lodicules are small, fleshy, usually two, rarely three which become turgid to force the lemma and palea apart at anthesis.
Stamens - The stamens are usually three, rarely one to six or more consists a slender filament bearing two-celled anthers attached to the base though appearance of attachment at the middle. These stamens arise opposite the lemma and each edge of palea.

Pistil - Consists one celled ovary, ovule single, rarely two or three styles each ending in a feathery stigma.

Grain - The fruit (Caryopsis) or grain is the ripened ovary containing the ripened ovule. These grains consists mostly reserve food (endosperm) with the embryo at the base on the side next to the lemma. The grains free or tightly enclosed by the lemma and palea and distributed by wind or domestic animals with the help of an awn or some modified organs.

Pollination - Typically grasses are adopted for cross-pollination but in many species part of the inflorescence is enclosed in the sheath so the pollination take place self called self-pollination. The agencies for pollination is wind and in some cases water those are aquatic habitat.