CHAPTER II

MORPHOLOGICAL STUDY

2.1 General characters of subtribes Ischaeminae and Rottboelliinae in Thailand

2.1.1 Vegetative Morphology

2.1.1.1 Habits

It was found that grasses in subtribes Ischaeminae and Rottboelliinae are having different life cycle. The annual grasses have a rooting system which is simple and produce each ascending culm which terminates with an inflorescence. While perennials having an enduring root system which may consist of a woody root-stock or being rhizomatous or stoloniferous (e.g. *Ischaemum indicum*, *I. muticum*, *I. timorense*, *Kerriochloa siamensis*, *Thelepogon elegans*, *Eremochloa bimaculata*, *E. ciliaris*, *E. maxwellii*, *E. muricata*, *E.* sp.1, *Hemarthria altissima*, *H. compressa* and *H. stolonifera*). In addition to the flowering culm there will be other shoots in various stages of development, some of which may not flower till the following year. Plants in both subtribes are mostly perennial grass and rarely found in annual tufted as in *Ischaemum hirtum*, *I. rugosum*, *I. timorense*, *I.* sp.1, *Thelepogon elegans*, *Eremochloa ciliatifolia*, *E. lanceolata*, *Hackelochloa granularis*, *H. porifera*, *Hemarthria debilis* and *Rottboellia cochinchinensis*.

2.1.1.2 Clum

Most of culms are terete, subterete (e.g. *Kerriochloa siamensis*, *Hackelochloa granularis* and *H. porifera*) or compressed (e.g. *Hemarthria altissima*, *H. compressa* and *H. longiflora*) with a glabrous internodes, usually erect which covered with a hairs on the nodes. Only some species have a glabrous node (e.g. *Ischaemum hubbardii*, *I. magnum*, *I. tenuifolium*, *I.* sp.1, *Eremochloa bimaculata*, *E. maxwellii*, *E. petelotii*, *E.* sp.2, *Hemarthria altissima*, *H. compressa*, *H. pratensis*, *H. stolonifera* and *Vossia cuspidata*).

2.1.1.3 Leaves

Leaves are alternate arranging in two-ranks, consisting of three distinct parts: a sheath, a blade and a ligule as follow:

Leaf-sheaths

The sheath forms a hollow cylinder around the culm. It is attached to the whole circumference of the node. The margins are usually free from one another. The surface of the sheath is usually ridged and often hairy or glabrous.

The ligule

A ligule is a small structure, situates at the junction of the sheath and the blade. It is usually an appendage arising from the inner surface of the leaves. The ligules may be a membrane, a membrane tipped with hairs or a rim of hairs.

Leaf-blades

The shape, size and texture of the leaves are variable. The shape can be found from narrowly linear, linear, linear-lanceolate and oblong-lanceolate to lanceolate. Leaf size ranges from small, 3–6 cm by 2–3 mm, e.g. *Eremochloa lanceolata* to large, *ca.* 150 by 1–1.5 cm, e.g. *Phacelurus zea*. Laminas with membranous textures have been observed in most species while coriaceous lamina are rarely found, e.g. *Ischaemum* sp.1, *Phacelurus cambogiensis* and *P. zea*. Leaf base is mostly rounded or cordate, whereas apices are commonly acute or acuminate. Leaves margins are usually entire, with an exception in *Thelepogon elegans*, having undulate margins.

2.1.2 Reproductive Morphology

2.1.2.1 Inflorescence (Figs. 2.1–2.2)

Inflorescences are always terminal in both subtribes. They may, however, be found at the end of axillary shorts shoots. The peduncle is normally tereted. In general, shapes of inflorescences are having taxonomic value for identification. The determinate inflorescences can be divided in to 3 types due to differences in their lateral branches, as below:

Single spike-likes racemes (Figs. 2.1A-B & 2.2A-D): The pairs of spikelets, one spikelet sessile, the other pedicelled, are attached to a joint and fall with the joint of the axis bearing it, the pedicelled spikelet falls with its pedicel. This type is

common in the all member of the genus *Sehima, Eremochloa, Hackelochloa, Hemarthria, Mnesithea, Ophiuros* and *Rottboellia*. In the genus *Kerriochloa* the racemes are embraced by a spatheole.

Paired or digitate of spike-likes racemes (Figs. 2.1C-E & 2.2E): As in the single spike-likes racemes, but the inflorescence compose of paired or sometimes digitate racemes which are separated or conjugated 1-sided and interlocked back to back in a single spike. This type is common in most members of the genus *Ischaemum*, *Thelepogon* and *Vossia.*

Panicle (Fig. 2.1F): The inflorescence with branches, each branch is raceme, borne at intervals along the rachis. This inflorescence type is found in 3 species, i.e. *Apluda mutica*, *Phacelurus zea* and *P. cambogiensis*.

Figure 2.1 Inflorescence types of Ischaeminae: A-B. single spike-likes racemes; A. *Sehima nervosum*; B. single raceme enclosed by a spatheole; C. conjugating of pairs racemes; D. separating of pairs racemes; E. digitated racemes and F. panicle inflorescence (drawn by P. Traiperm).

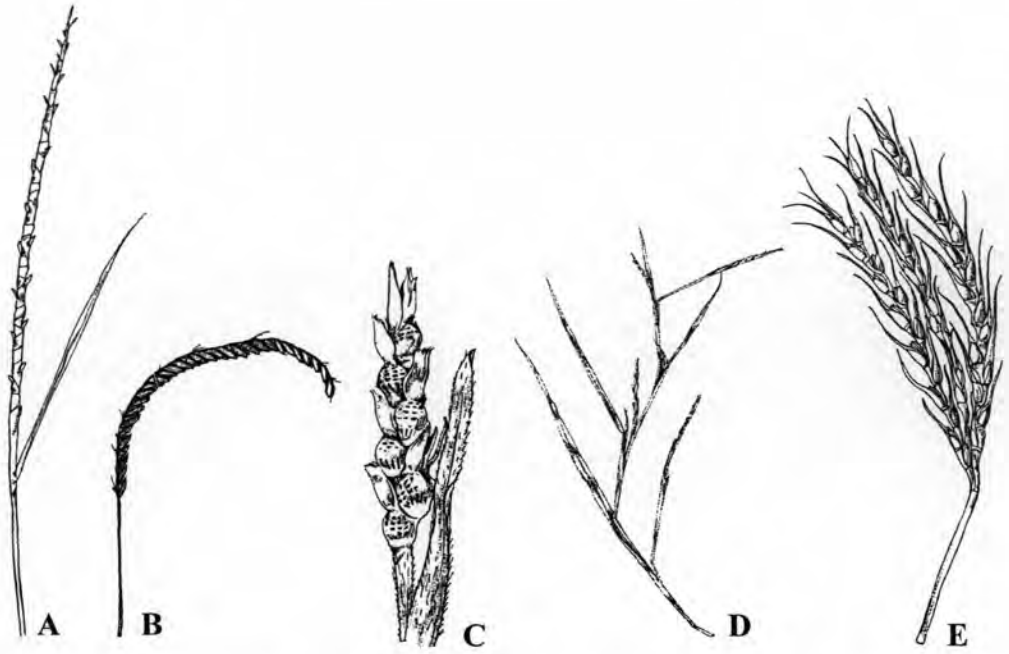

Figure 2.2 Inflorescence types of Rottboellinae: A-D. single spike-likes racemes and E. digitated racemes (drawn by P. Traiperm).

2.1.2.2 Spikelet (Figs. 2.3–2.4)

The spikelets of both subtribes are of two types, one is sessile and the other is pedicelled. Shape, size and a number of spikelet are taxonomic significant in identification. Three spikelets can be found in the genus *Apluda* or sometimes in the genus *Mnesithea*. Sessile spikelet of most genera is usually equal or larger than pedicel, except in the genus *Sehima*. The spikelets are globose in the genus *Hackelochloa*, while columnar or cylindrical forms are found in *Hemarthria*, *Mnesithea*, *Ophiuros*, *Rottboellia* and *Vossia*. The presence of pedicelled spikelet can be found in most genera, with an exception in *Thelepogon*, *Eremochloa*, *Ophiuros* and *Mnesithea laevis*.

2.1.2.3 Rachis node

The grasses in the subtribe Ischaeminae are having a slender rachis node, which is linear or oblong in shape, while thickened or swollen rachis node is found in the subtribe Rottboelliinae.

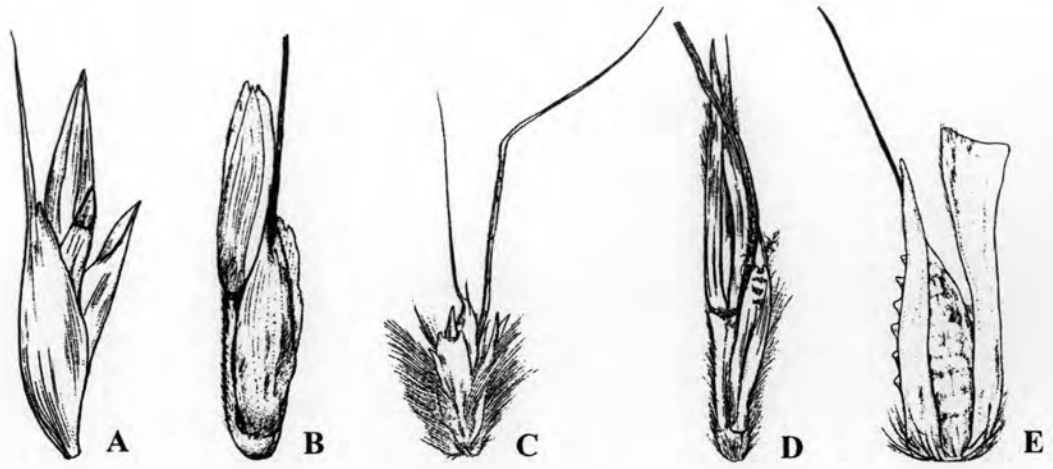

Figure 2.3 Variation of spikelet in Ischaeminae: A. *Apluda mutica*; B. *Ischaemum hubbardii*; C. *Kerriochloa siamensis*; D. *Sehima nervosum* and E. *Thelepogon elegans* (drawn by P. Traiperm).

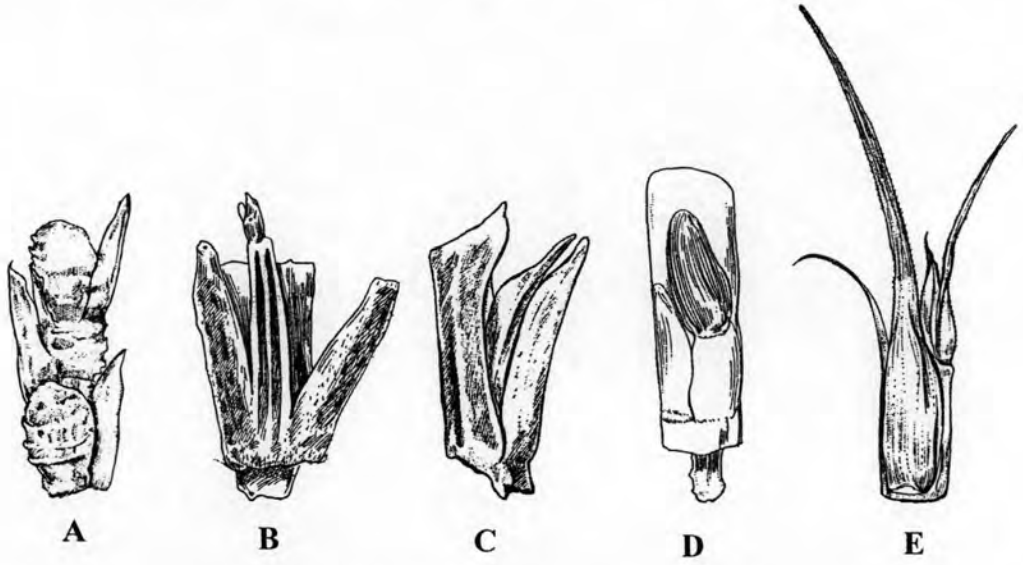

Figure 2.4 Variation of spikelet in Rottboelliinae: A. *Hackelochloa porifera*; B. *Mnesithea mollicoma*; C. *Mnesithea laevis*; D. *Rottboellia cochinchinensis* and E. *Vossia cuspidata* (drawn by P. Traiperm).

2.1.2.4 Glume (Figs. 2.5–2.6)

Glume is a scale-like bract. There are two bracts at the base of grasses in these two subtribes. The first one is inserted on the rachilla just above the other and designated the lower and the upper glume. There are variously modified in size,

shape, texture, nerve number, hairiness and colour. This character is very useful diagnostic feature for identification into species level of all taxa.

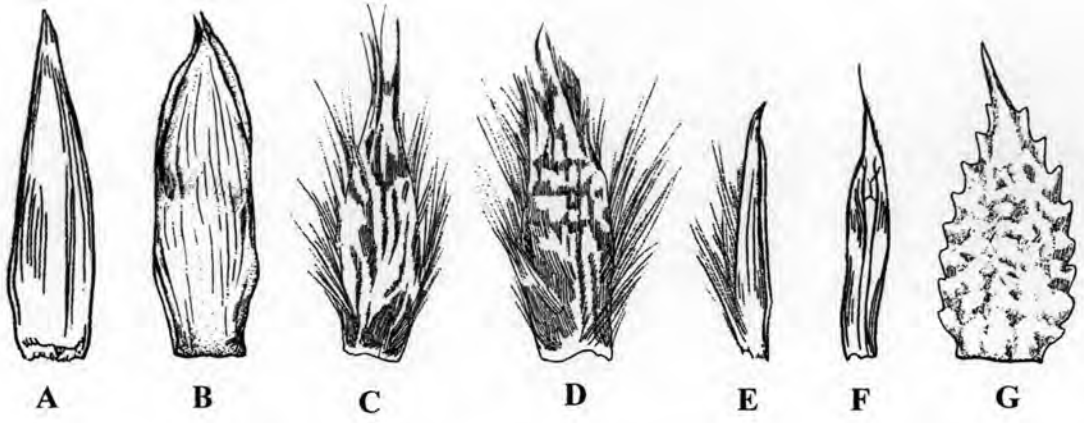

Figure 2.5 Variation of lower glume in subtribe Ischaeminae: A. *Apluda mutica*; B. *Ischaemum hubbardii*; C-D. *I.* sp.2; E. *Kerriochloa siamensis*; F. *Sehima nervosum* and G. *Thelepogon elegans* (drawn by P. Traiperm).

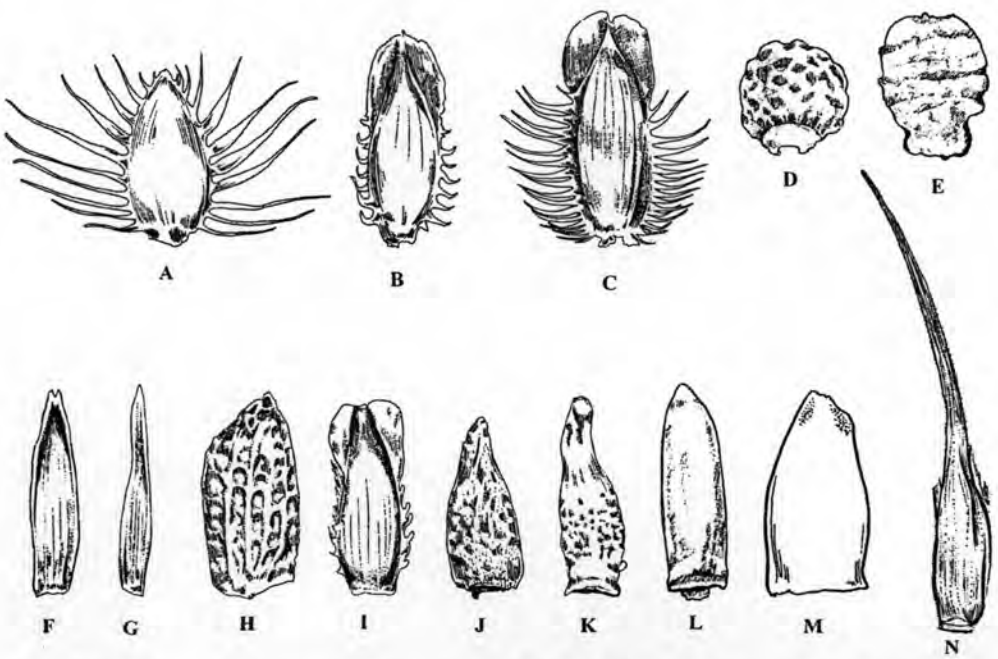

Figure 2.6 Variation of lower glume in subtribe Rottboelliinae: A. *Eremochloa eripoda*; B. *E. petelotii*; C. *E. muricata*; D. *Hackelochloa granularis*; E. *H. porifera*; F. *Hemarthria altissima*; G. *H. stolonifera*; H. *Mnesithea cancellata*; I. *M. glandulosa*; J. *M. mollicoma*; K. *M. striata* var. *pubescens*; L. *Ophiuros exaltatus*; M. *Rottboellia cochinchinensis* and N. *Vossia cuspidata* (drawn by P. Traiperm).

2.1.2.5 Lemma

Lemma is a small bract, subtending the floret. It encircles the palea and also protects the reproductive organs. The characters of the lemma are very useful in classification of both subtribes.

2.1.2.6 Palea

Palea is a scale borne on the floral axis directly facing the lemma. It is usually with 2 keels, the adaxial is concave and the two flap embrace the flower.

2.1.2.7 Lodicules

The lodicules are situated at the base of palea. There are two and small to fairly large scales. Their shapes are conical.

2.1.2.8 The Androecium

. The androeceum consists of the stamens which is three in number. Each stamen composes of a long slender filament carrying a two-celled anther. The colour of the anther is bright yellow.

2.1.2.9 The Gynoeceum

The gynoceum comprises of the ovary, ovule, style and stigmas. The shape of the ovary is normally elliptic and glabrous on surface, composed of 3 carpels fused together. The base of style is connected into a beak which is persistent and attached to the pericarp. The style ends in stigma, which is papillose or plumose on the surface. The colour is usually purple, except in *Ischaemum muticum* and *I. barbatum*, which is white to yellow.

2.1.2.10 Fruit

The fruit is a caryopsis; one-seeded fruit in which the seed coat is closely fused to the fruit wall. The caryopsis is popularly called a grain and is the typical fruit of the family Poaceae.

2.2 Conclusion

The characters of inflorescence and spikelet are the most two important in identification, especially in the genera level. Some additional characters, e.g., culms, leaves and habit can be of taxonomical importance and can be useful for species identification, especially in closely related collected group.