12 WEDNESDAY August '09 WK 33 224 - 141

Family

1. Brassicaceae
2. Asteraceae
3. Solanaceae
4. Lamiaceae
5. Euphorbiaceae
6. Malvaceae
7. Polygonaceae
8. Acanthaceae
9. Scrophulariaceae
10. Rubiaceae

3.13 Family CRUCIFERAE (BRASSICACEAE)

Genera about 380 with over 3000 species, distributed all over the world.

A. Diagnostic characters : Annual, biennial or perennial herbs with watery sap. Leaves exstipulate, simple, entire, lyrate. Flowers bisexual and actinomorphic in racemes. Sepals 4 (2+2), petals 4, placed diagonally in the form of a cross (cruciform corolla). Stamens 6 (2+4), tetradynamous. Carpels 2, united in a superior one-chambered ovary. Placentation parietal. Fruit usually a siliqua.

B. General characters—Plants are annual, biennial or perennial herbs, rarely undershrubs with watery sap and unicellular hairy coverings. *Leaves* radical or cauline, alternate, simple, exstipulate, entire, or with variously incised margins (lyrate), rarely pinnate compound (e.g. *Cardamine*). *Inflorescence* racemose (raceme type). *Flowers* ebracteate, bisexual, actinomorphic i.e. regular (zygomorphic *i.e.* irregular in *Iberis*), hypogynous, and tetramerous. *Sepals* 4 in two whorls (2+2), the outer 2 median and inner 2 lateral, free, caducous. *Petals* 4, usually clawed, placed diagonally in the form of a cross (cruciform corolla) in one whorl, imbricate or sometimes twisted. *Stamens* 6 in two whorls, tetradynamous (2+4), the outer 2 shorter and the inner 4 longer—the former whorl in a transverse plane alternating with the latter whorl in the median plane ; sometimes honey glands (1 to 4) are present near the base of the stamens ; anthers 2-celled. *Carpels* 2, transversely placed, united ; ovary superior, 1-chambered but later on ovary becomes two-chambered due to the formation of a replum *i.e.* a false partition wall ; ovules campylotropous, usually few to many, placentation parietal ; style 1 or obsolete, stigmas 2. *Fruit* a siliqua or pod-like. *Seeds* numerous, round, exendospermous ; embryo large with oily cotyledons.

C. General Floral formula—$\oplus\ \delta\ K_{2+2}, C_4, A_{2+4}, \underline{G_{(2)}}$.

D. Floral range—There is some deviation in the floral structure in this family. In *Lepidium*, the flower is perigynous. Zygomorphic flowers are present in *Iberis* and *Teesdalia*. In some species of *Rorippa* petals are absent, in *Megacarpaea* stamens are numerous (16).

E. Affinity and systematic position—The family Cruciferae is allied to Capparidaceae. The family has been placed by most taxonomists under the

order Rhoeadales next to Polygonales. Engler has placed it after Ranales in the order Rhoeadales, sub-class Archichlamydeae and the class Dicotyledoneae. Bentham and Hooker placed it under 2nd cohort (=order) Parietales, Series Thalamiflorae, subclass Polypetalae and the class Dicotyledones. Hutchinson

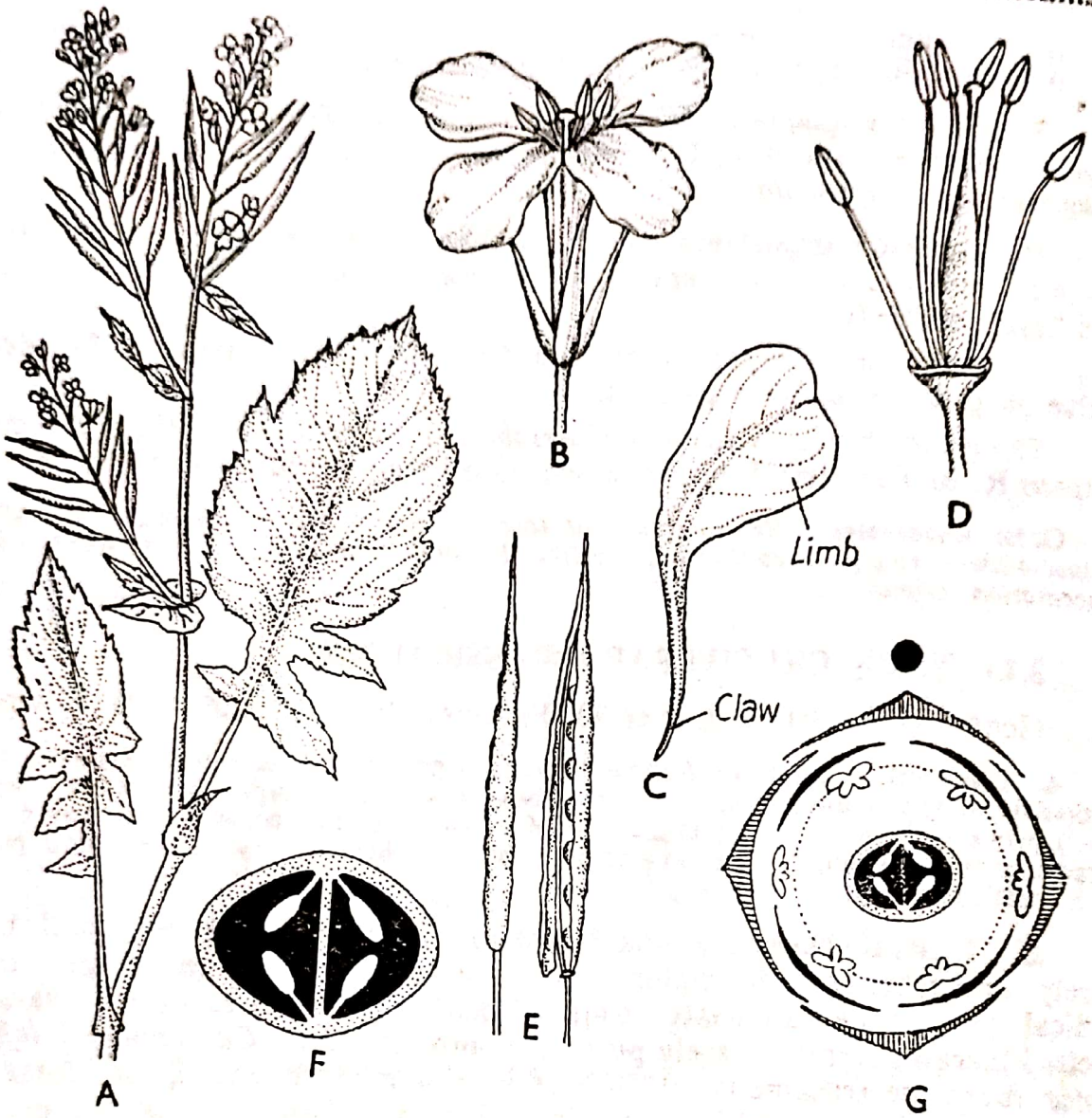

Fig. 3.16—*Brassica nigra* Koch (Cruciferae). A—Portion of a flowering twig. B—Flower. C—Single petal. D—Flower showing tetradynamous stamens and pistil (after removal of sepals and petals). E—Fruit and also fruit showing dehiscence. F—T.s. of ovary. G—Floral diagram.

placed the family Cruciferae i.e. Brassicaceae under the order Cruciales, division Archichlamydeae (or sub-group Herbaceae) and the sub-phylum Dicotyledonae.

F. Common plants—*Brassica juncea* (L.) Czern and Coss. ; *B. campestris* var. *dichotoma* Watt (Kalisarson) ; *B. campestris* var. *toria* Duth. (Indian rape or Toria) ; *B. nigra* Koch (Kali rai) ; *Raphanus sativus* L. ; *Eruca sativa* Lamk. : *Iberis amara* L. ; *Rorippa indica* (L.) Hochr. (Syn. *Nastartium indicum* (L.) DC.) etc.

G. Economic importance—This family is important from economic aspects. Leaves of *Brassica oleracea* var. *capitata* (the cabbage), swollen stem of *Brassica oleracea* (Knolkhol), inflorescence of *B. oleracea* var. *botrytis* (cauliflower), fleshy roots of *Raphanus sativus* (the raddish) etc. are used as vegetables.

Seeds of various varieties of *Brassica campestris* yield mustard oil for cooking and massage.

Euphorbiaceae

A. Diagnostic characters : Plants with milky or watery latex. Flowers unisexual, perianth of single whorl, rarely diplochlamydous. Inflorescences various—raceme, cyme or *cyathium*. Gynoecium of three carpels. Ovary superior, 3-chambered, each containing 1 or 2 pendulous ovules with ventral raphe. Fruit schizocarpic capsule, sometimes drupe or berry. Seeds albuminous, carunculate.

B. General characters—Plants are monoecious or occasionally dioecious herbs, shrubs or trees, rarely climber (e.g. *Tragia*, *Cnesmone*) often with milky or watery latex. *Leaves* mostly alternate, sometimes opposite or whorled, simple, entire or variously lobed, rarely compound (*Bischofia* sp.),

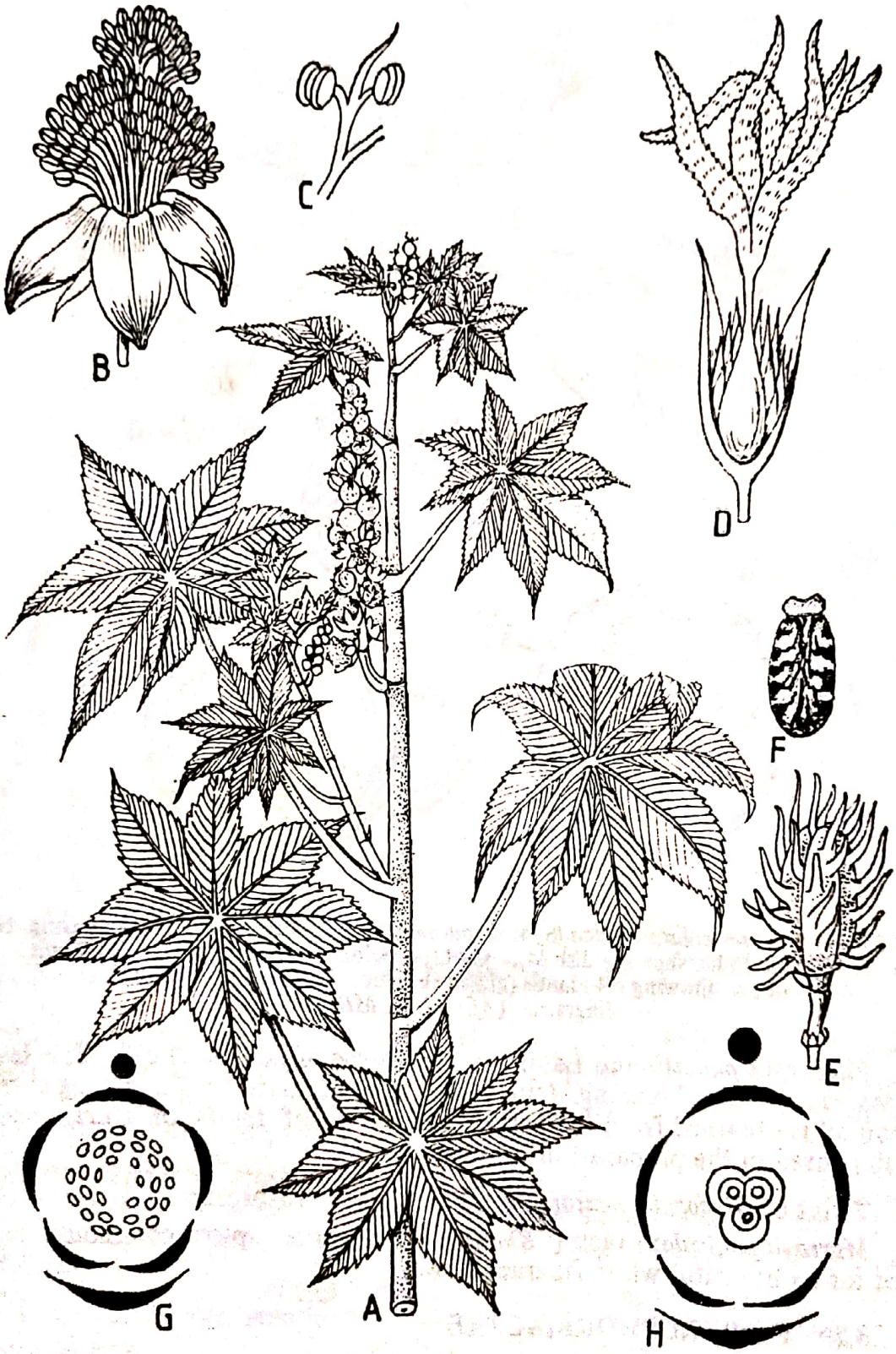

Fig. 3.32—*Ricinus communis* L. (Euphorbiaceae). A—Portion of a flowering shoot. B—Male (staminate) flower. C—Stamen. D—Female (Pistillate) flower. E—Fruit. F—Seed. G—Floral diagram of a male flower. H—Floral diagram of a female flower.

usually stipulete (often reduced to hairs, glands or spines). *Inflorescence* various types such as simple raceme or spike, cymose panicle or head-like clusters or cyathium. *Flowers* unisexual, incomplete, actinomorphic (regular), or rarely slightly zygomorphic (irregular). Perianth 5-merous, i.e. 5 in number, sepaloid, much reduced, sometimes absent (then flowers are naked), sometimes perianth is differentiated into outer calyx and inner corolla (the number of which varies from 3 to 5 usually), free or partially connate, imbricate or valvate. *Stamens* in male flowers vary from one (e.g. *Euphorbia*) to numerous,

Fig, 3.33—*Croton bonplandianum* Baill. (Syn. *C. sperciflorum* Morr.—Euphorbiaceae).
A—Portion of a plant bearing flowers. B—Male flower. C—Whorl of stamens
D—Single stamen. E—Surface view of male flower. F—Female flower.
G—T.s. of ovary. H—Fruit. I—Floral diagram of a female flower.
J—Floral diagram of a male flower.

they are disposed variously, either free or united by filaments into one bundle (monadelphous) or into several bundles (polyadelphous) as in *Ricinus*, *Lassiococca* and *Homonoia*; anthers 2-celled; intrastaminal disc usually present, pistillode often present. *Carpels* in female flowers usually 3, rarely 2 or more, united; ovary superior, usually 3-chambered or sometimes more chambered, placentation axile, the number of ovules in each chamber of ovary is either

2 or 1, ovules are pendulous with ventral raphe ; styles 3, distinct or basally connate, each often 2-lobed ; stigmas 3 or 6 and linear or broadened, often papillate or dissected into filiform segments. *Fruit* is usually capsule or 2 to 3-valved cocci, rarely berry or drupe as in *Emblica*. *Seeds* with copious fleshy to soft-fleshy endosperm, usually carunculate ; embryo straight or curved.

C. General Floral formula—

(1) Male flower— $\oplus \delta\ P_{3-5 \text{ or } (5)+(5)}\ A_{1-\infty}$.

(2) Female flower— $\oplus \varphi\ P_{3-5 \text{ or } (5)+(5)}\ \underline{G_{(3) \text{ or more}}}$

D. Floral range—This family has very wide floral range ; the variations occur in each floral appendage. Only constant character is unisexuality and usual 3-carpellary gynoecium in pistillate i.e. female flowers, but occasional

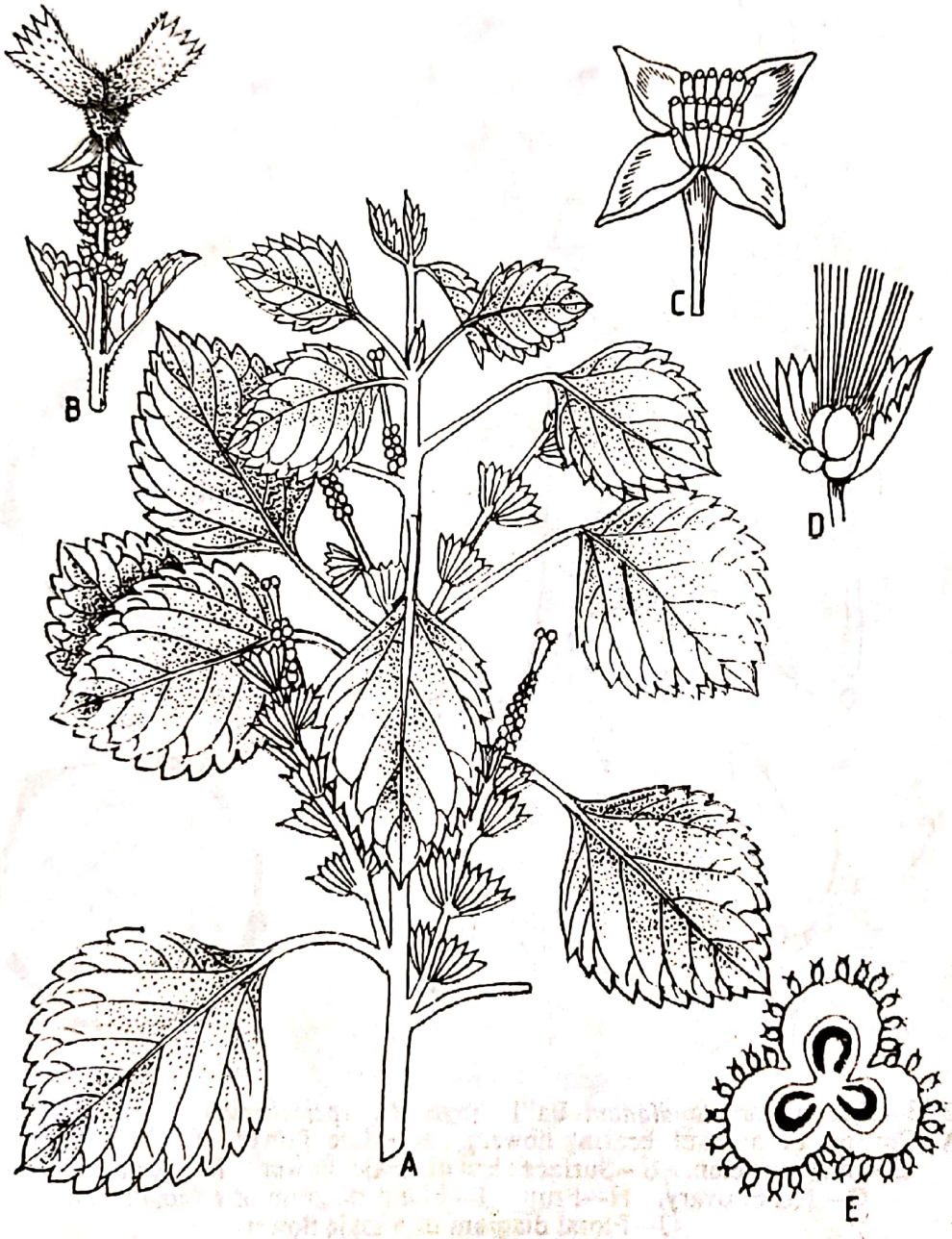

Fig. 3.34—*Acalypha indica* L. (Euphorbiaceae). A—Portion of a flowering twig. B—Inflorescence. C—Male flower. D—Female flower. E—T.s. of ovary

occurrence of bisexual flowers in *Jatropha gossypifolia* was reported by Sarup and Maheshwari (1951) ; the number of carpels also varies e.g. in *Glochidion* carpels may be upto 15, some species of *Phyllanthus* have more than 3 carpels. The variation in number of stamens ranges from 1 to several hundred, e.g.

In *Euphorbia* male flower has only 1 stamen ; in *Trewia* the male flower has about over 200 stamens. Perianth is wanting in *Euphorbia* and *Pedilanthus* ; in *Wielandia*, *Jatropha* etc. the perianth is double, differentiated into pentamerous calyx and corolla ; in the former the flower is typically pentamerous.

E. Affinity and systematic position—Euphorbiaceae is closely allied to the members of the order Malvales. This family is also related to the members of the orders Geraniales and Sapindales. Euphorbiaceae has been

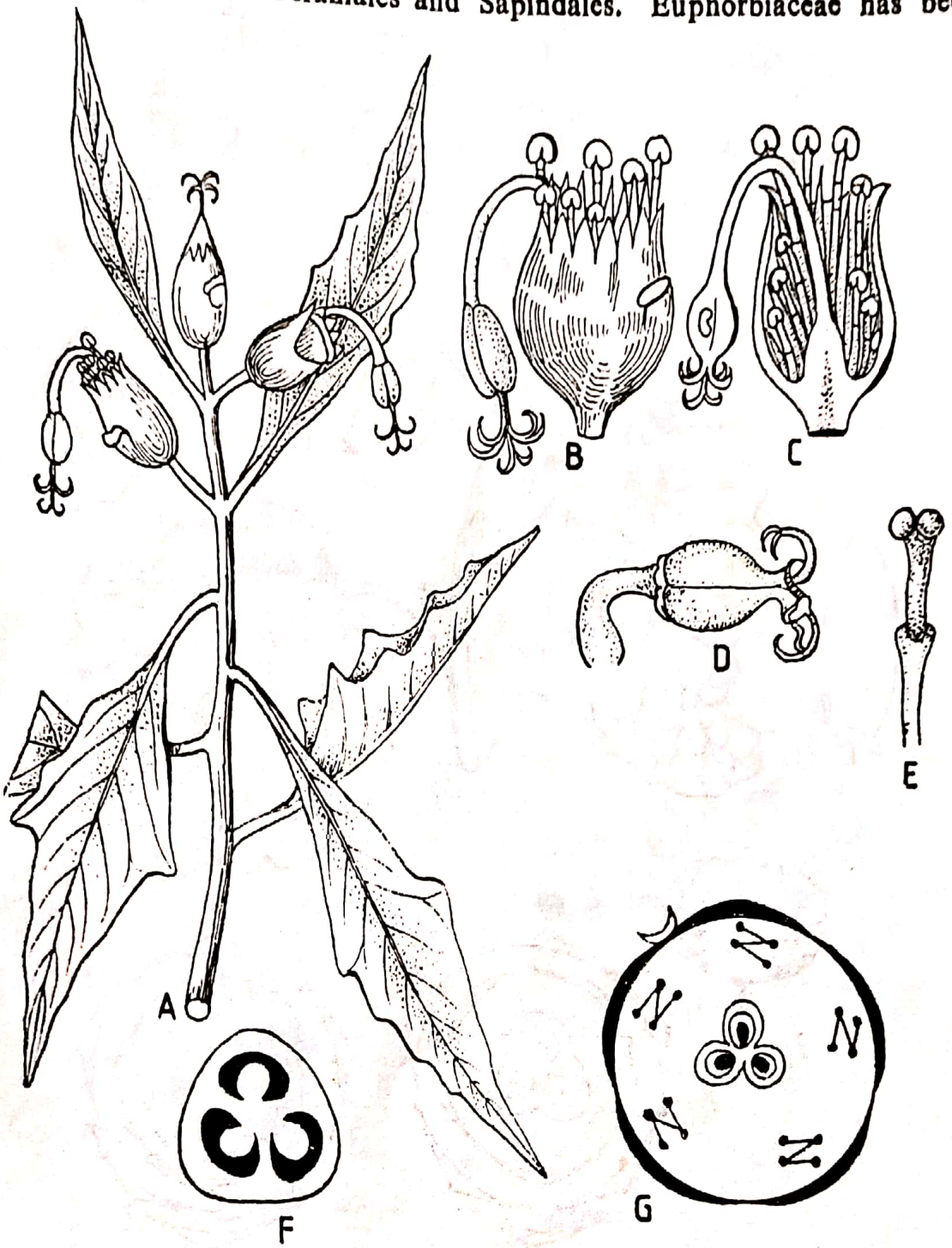

Fig. 3.35—*Euphorbia pulcherrima* Willd (Euphorbiaceae). A—Flowering twig. B—Entire inflorescence (cyathium). C—Cyathium in l.s. D—Female flower i.e. only carpel. E—Stamen i.e. only one male flower. F—Ovary in t.s. G—Diagram of Cyathium.

placed by Bentham and Hooker as a distinct Naturel Order in the series Unisexuales, sub-class Monochlamydeae and class Dicotyledones. Many authors have put it after Malvales in the Archichlamydeae (i.e. close to Sterculiaceae). Engler placed it under the order Geraniales (close to Malvales), sub-class Archichlamydeae and the class Dicotyledoneae. Hutchinson considered the family more or less advanced and placed it under the order

Euphorbiales (near Geraniales), division Archichlamydeae (or sub-group Lignosae) and sub-phylum Dicotyledonae.

F. **Common plants**—*Croton bonplandianum* Baill. (Syn. *C. sperciflorum* Morr.) ; *Acalypha indica* L. ; *A. hispida* Burm. f. ; *Chrozophora rottleri* Klotz.

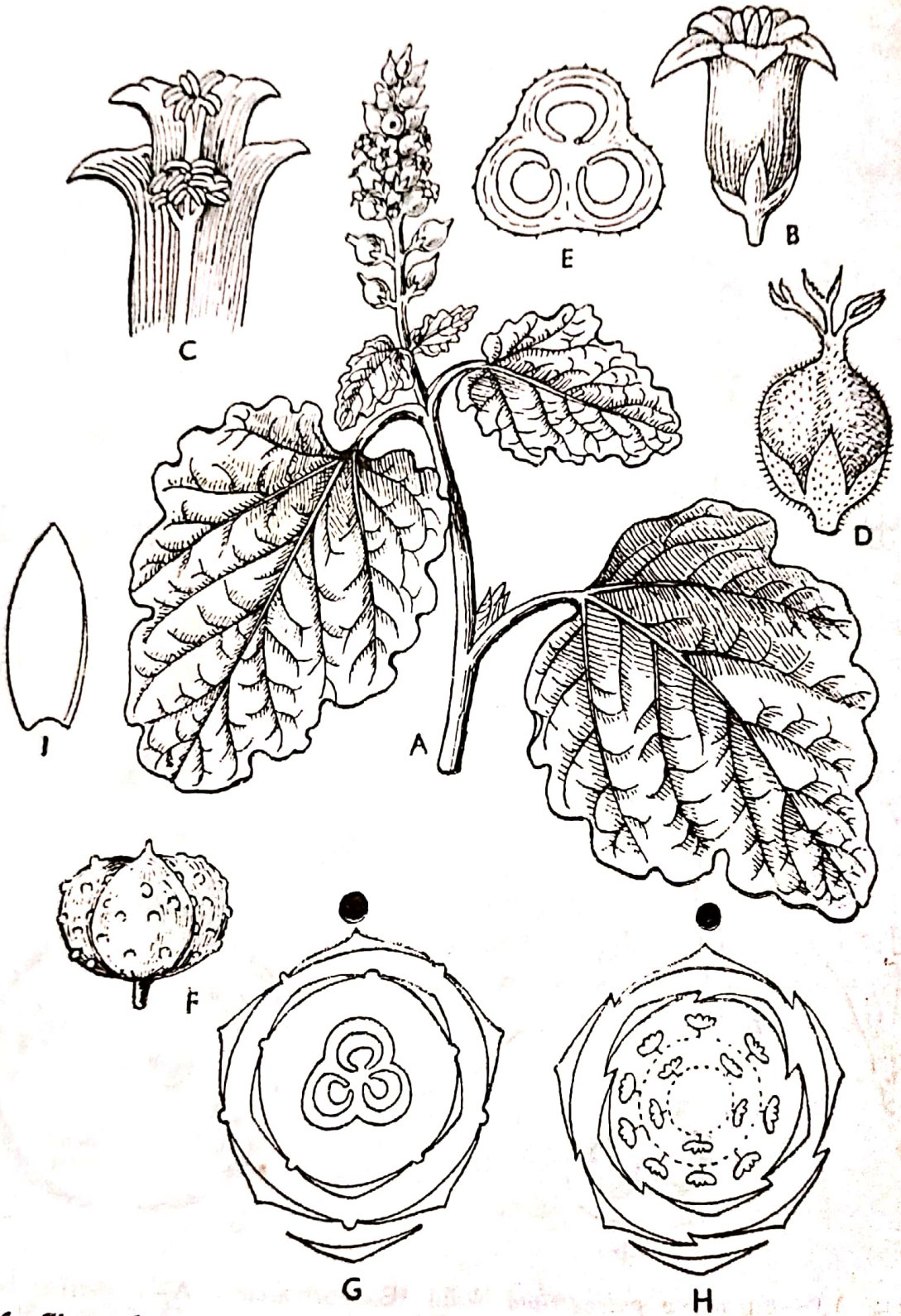

Fig. 3.36—*Chrozophora rottleri* Klotz. (Euphorbiaceae). A—Portion of a flowering twig. B—Male flower. C—Male flower split open. D—Female flower. E—Ovary in t.s. F—Fruit. G—Floral diagram of female flower. H—Floral diagram of male flower. I—Single petal of a male flower.

(Syn. *C. plicata* A. Juss.) ; *Phyllanthus simplex* Retz. ; *Phyllanthus fraternus* Webster ; *Euphorbia hirta* L. ; *E. bombaiensis* Santapau (Syn. *E. microphylla* Heyne ex Roth) ; *E. pulcherrima* Willd (Syn. *Poinsettia pulcherrima* R. Grah.) ; *E. nerifolia* L. ; *Kirganelia reticulata* Bail. (Syn. *Phyllanthus reticulatus* Poir.) ;

Emblica officinalis Gaertn. (Syn. *Phyllanthus emblica* L.) ; *Jatropha gossypifolia* L. ; *Pedilanthus tithymaloides* L. ; *Mallotus philippinensis* Muell.-Arg. ; *Gelonium multiflorum* A. Juss. ; *Saplum sebiferum* Roxb. ; *Bischofia javanica* Bl. ; *Putranjiva roxburghii* Wall. ; *Trewia nudiflora* L. ; *Ricinus communis* L. etc.

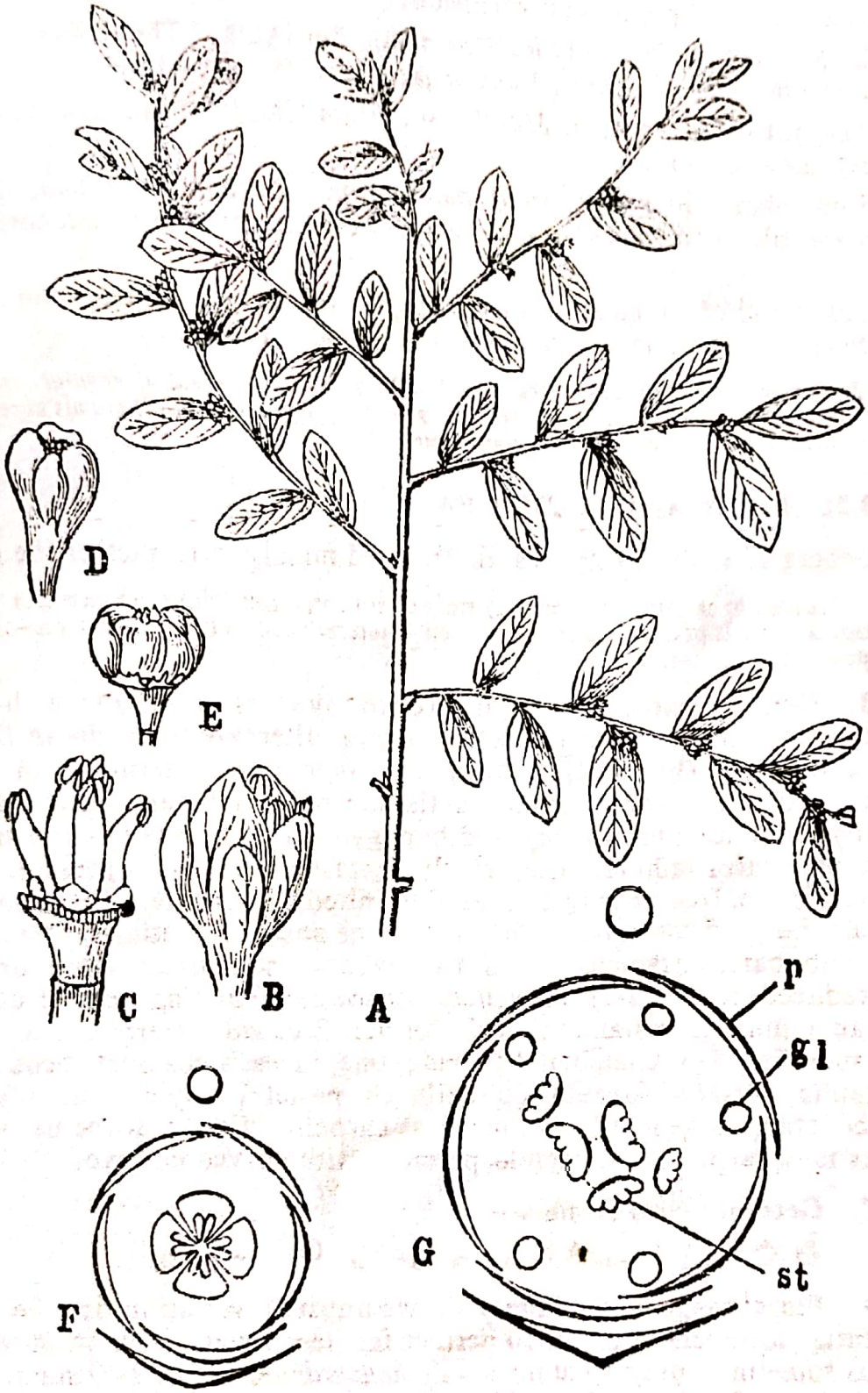

Fig. 3.37—*Phyllanthus reticulatus* Poir. (Euphorbiaceae). A—Flowering twig. B—Male flower. C—Male flower after removal of perianth leaves. D—Female flower in bud condition. E—Mature female flower. F—Floral diagram of female flower. G—Floral diagram of male flower ; p, perianth ; gl, glands ; st, stamens.

G. Economic importance—This family contains many economic plants.

The latex of *Hevea brasiliensis* Muell.-Arg. yields good quality rubber known as 'para-rubber', used for the manufacture of top grade rubber goods.