

The Identification of Certain "Medicinal" Plant Families¹

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The search for new drugs from plants has occupied the interest of botanists, chemists and pharmaceutical scientists for many years. In recent decades, particularly since the discovery of the antibiotics and of a number of important drug compounds of value in vascular disease, hypertension, arthritis, cancer and mental disease, botanical field explorations and laboratory analyses and studies of thousands of species have been intensified (1-19).

Among the methods employed in the search for clues to the potential value of plants in medicine and pharmacy and their identification has been the study of plant life in the customs, institutions and culture of people the world over, with concentration on the ethnobotany of more primitive areas. As a result, a greater stream of specimens than ever before has become available to laboratory scientists, and the problem of the proper identification of these looms larger each year. It is generally recognized by pharmacognosists, plant chemists, and pharmacologists that the number of trained plant taxonomists and ethnobotanists who can keep up with the demand for this service is small. Therefore, a need exists for a simple method by which *preliminary* identification can be established in the field and/or the laboratory by the non-taxonomist so that specimens can be placed into proper families and genera or at least into some relationship with those known to have representatives with pharmacologically active principles.

The amateur collector is often familiar with the use of a key to plant identification, and a number of such keys are available (e.g. A. Gray's *Manual* and J. K. Small's

Manual). In order to facilitate their use, a scheme has been devised in these laboratories whereby certain plant families of outstanding medicinal importance have been selected and a simplified key for them established on the basis of abbreviated characteristics which may be generally recognized by the amateur collector.

The well recognized references of Youngken and Lawrence (20, 21) have been used to set up this key.

It is a dichotomous key, i.e. built up of sets or pairs of opposing statements. To illustrate how the key works, one may use as an example the common Morning Glory plant. This plant is presently being investigated in our laboratories, because the seeds of some varieties cause hallucinations when ingested. An elementary botanical description of the Morning Glory would be as follows: It is a vascular, dicotyledonous, seed-producing plant, with a climbing habit, with alternate, cordate to sagittate leaves, and showy bell-shaped flowers with united petals, five stamens, and superior ovary. Thus, reference to (1) would result in the choice of "Vascular plants" (13). This would lead to "Plants producing seeds" (15). Number (15) would lead to the choice of "Plants bearing covered ovules, no prothallus" (17). Number (17) would lead to the choice of "Two cotyledons, netted-veined leaves, flowers pentamerous, roots usually with secondary growth" (26). Number (26) would lead to "Petals more or less united (Sympetalae)" (86). Number (86) would lead to "Leaves alternate" (96). Number (96) would lead to "Ovary superior" (100). Number (100) would lead to "Stamens five or more" (102). Number (102) would lead to "Stamens five" (104). Number (104) would lead to "Climbing habit" (105), and finally (105) would lead to "Leaf shape cordate to sagittate to varied on plant. . . . Convolvulaceae." Thus, it is seen that the Morning Glory is a member of the Convolvulaceae.

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KEY FOR THE IDENTIFICATION OF MEDICINAL PLANTS

- (1) Non vascular plants (2)
- (1) Vascular plants (13)
 - (2) Photosynthetic (3)
 - (2) Non-photosynthetic (10)
 - (3) Macroscopic (4)
 - (3) Microscopic, cell wall valved, siliceous..... *Bacillariaceae*
 - (4) Uniform body structure (5)
 - (4) Symbiotic body of algae and fungi..... *Lichens*
 - (5) Embryo not retained within sporophyte (6)
 - (5) Embryo retained within sporophyte..... *Bryophytes*
 - (6) Thallus brown to translucent (7)
 - (6) Thallus red, purple or violet..... *Gigartinaceae*
 - (7) Thallus brown, fleshy (8)
 - (7) Thallus yellowish, translucent, cartilaginous..... *Gelidiaceae*
 - (8) Spherical air bladders lacking (9)
 - (8) Spherical air bladders present..... *Fucaceae*
 - (9) Single leaf-like frond..... *Laminariaceae*
 - (9) Few to numerous laminae..... *Lessionaceae*
 - (10) Fruiting body various (11)
 - (10) Fruiting body a black sclerotium..... *Hypocreaceae*
 - (11) Fruiting body umbrella shaped to shelf-like (12)
 - (11) A unicellular mass of cells..... *Saccharomyceteae*
 - (12) Under surface of pores..... *Polyporaceae*
 - (12) Under surface of gills..... *Agaricaceae*
- (13) Plants producing spores (14)
- (13) Plants producing seeds (15)
 - (14) Sporangia borne in axis of small one veined leaves..... *Lycopodiaceae*
 - (14) Sporangia borne on underside of large many veined leaves..... *Polypodiaceae*
 - (15) Plants bear naked ovules, possess prothallus (16)
 - (15) Plants bear covered ovules, no prothallus (17)
 - (16) Shrubs with upright climbing stems, devoid of resin, branches opposite or in bundles, compound male cone..... *Ephedraceae*
 - (16) Trees or shrubs with resinous juice, leaf entire, awl or needle shaped, evergreen, simple male cone..... *Pinaceae*
 - (17) One cotyledon, leaves parallel-veined, flowers trimerous, roots without secondary growth (18)
 - (17) Two cotyledons, netted-veined leaves, flowers pentamerous, roots usually with secondary growth (26)
 - (18) Ovary inferior (19)
 - (18) Ovary superior (23)
 - (19) Herbs or shrubs without twining herbaceous stems (20)
 - (19) Herbs or shrubs with twining herbaceous stems..... *Dioscoreaceae*
 - (20) Flowers with fewer than three stamens (21)
 - (20) Flowers with three stamens..... *Iridaceae*
 - (21) Habit other than climbing and epiphytic with aerial rootlets (22)
 - (21) Habit climbing and epiphytic with aerial rootlets..... *Orchidaceae*
 - (22) Petiole with peculiar pulviniform ligule..... *Marantaceae*
 - (22) Petiole lacking peculiar pulviniform ligule..... *Zingiberaceae*
 - (23) Stem herbaceous (24)
 - (23) Stem unbranched trunk terminated by crown of pinnate or palmate leaves..... *Palmae*
 - (24) Stems not cylindrical, hollow; swollen nodes, alternate leaves (25)

- (24) Stems cylindrical, hollow; swollen
nodes, alternate leaves.....*Gramineae*
- (25) Flowers with six stamens.....*Liliaceae*
- (25) Flowers with two, four, eight
stamens*Araceae*
- (26) Petals wanting or distinct (*Archichlamydeae*) (27)
- (26) Petals more or less united (*Sympetalae*) (86)
- (27) Flowers with only one floral envelope or none (28)
- (27) Flowers with two floral envelopes (44)
- (28) Leaves alternate (29)
- (28) Leaves opposite or whorled (36)
- (29) Herbs or shrubs (30)
- (29) Trees (33)
- (30) Leaf margin entire (31)
- (30) Leaf margin not entire (32)
- (31) Inflorescence in axillary
clusters*Aristolochiaceae*
- (31) Inflorescence in cymes
or cymules*Polygonaceae*
- (32) Corolla absent.....*Chenopodiaceae*
- (32) Corolla present*Moraceae*
- (33) Leaves stipulate (34)
- (33) Leaves exstipulate*Juglandaceae*
- (34) Perianth present (35)
- (34) Perianth absent*Salicaceae*
- (35) Inflorescence in
catkins*Fagaceae*
- (35) Inflorescence obscurely
spirally arranged *Ulmaceae*
- (36) Ovary inferior (37)
- (36) Ovary superior (38)
- (37) Inflorescence a panicle,
raceme, or spike.....*Loranthaceae*
- (37) Inflorescence a cyme of
actinomorphic flowers.....*Santalaceae*
- (38) Leaf simple (39)
- (38) Leaf compound,
palmate*Ranunculaceae*
- (39) Leaves lanceolate (40)
- (39) Leaves other than lanceolate (41)
- (40) Pistil monocarpellary*Thymeliaceae*
- (40) Pistil two to six-carpellary.....*Lythraceae*
- (41) Ovary one-loculed (42)
- (41) Ovary two to three-loculed (43)
- (42) Leaves palmately lobed and veined.....
.....*Menispermaceae*
- (42) Leaves not palmately lobed and
are penninerved*Lauraceae*
- (43) Inflorescence determinate*Euphorbiaceae*
- (43) Inflorescence indeterminate*Aceraceae*
- (44) Mostly herbaceous (45)
- (44) Woody shrubs or trees (59)
- (45) Ovary inferior (46)
- (45) Ovary superior (48)
- (46) Flowers in umbellate to racemose inflorescences (47)
- (46) Flowers solitary to clustered.....*Cactaceae*
- (47) Stems grooved and ridged.....*Umbelliferae*
- (47) Stems often prickly, hollow at internodes.....*Araliaceae*

- (48) Leaves opposite (49)
- (48) Leaves alternate (50)
 - (49) Inflorescence solitary, paired or cymes.....*Zygophyllaceae*
 - (49) Inflorescence umbellate spikes.....*Piperaceae*
 - (50) Leaves compound (51)
 - (50) Leaves simple (54)
 - (51) Carpels three to five (52)
 - (51) Carpels one to two (53)
 - (52) Inflorescence dichasial or scorpioid
cyme*Geraniaceae*
 - (52) Inflorescence raceme or panicle *Sapindaceae*
 - (53) Flowers irregular, zygomorphic *Fumariaceae*
 - (53) Flowers regular, pentamerous.....*Leguminosae*
 - (54) Inflorescence solitary (55)
 - (54) Inflorescence variable (57)
 - (55) Non-climbing herb (56)
 - (55) Climbing vine with tendrils.....*Passifloraceae*
 - (56) Sepals two, caducous*Papaveraceae*
 - (56) Sepals four-six, persistent.....*Berberidaceae*
 - (57) Calyx of five to seven
distinct sepals (58)
 - (57) Calyx of four distinct
sepals*Cruciferae*
 - (58) Inflorescence a raceme,
or head*Polygonaceae*
 - (58) Inflorescence a dichasial
cyme*Linaceae*
- (59) Pistil many (60)
- (59) Pistil one (67)
 - (60) Inflorescence solitary, terminal (61)
 - (60) Inflorescence variable (63)
 - (61) Leaves alternate (62)
 - (61) Leaves opposite*Monimiaceae*
 - (62) Differentiated perianth*Magnoliaceae*
 - (62) Undifferentiated perianth*Illiciaceae*
- (63) Leaves pinnately compound (64)
- (63) Leaves simple (65)
 - (64) Stipules present*Rosaceae*
 - (64) Stipules absent*Simarubaceae*
 - (65) Petals usually five (66)
 - (65) Petals absent*Phytolaccaceae*
 - (66) Stipules present*Sterculiaceae*
 - (66) Stipules absent*Theaceae*
- (67) Stipules absent (68)
- (67) Stipules present (78)
 - (68) Leaves opposite (69)
 - (68) Leaves alternate (71)
 - (69) Ovary inferior (70)
 - (69) Ovary superior*Guttiferæ*
 - (70) Locule one*Myrtaceae*
 - (70) Locules many (eight to twelve).....*Punicaceae*
 - (71) Sepals absent or gamosepalous (72)
 - (71) Sepals three to five (74)
 - (72) Sepals absent*Myricaceae*
 - (72) Sepals gamosepalous (73)
 - (73) Gamosepalous, three-lobed calyx.....*Myristicaceae*
 - (73) Gamosepalous, five-lobed calyx.....*Caricaceae*

- (74) Ovary unilocular (75)
- (74) Ovary two to five-loculed (76)
 - (75) Leaves simple trifoliate or pinnate *Anacardiaceae*
 - (75) Leaves entire, coriaceous, glandular punctate or dotted *Canellaceae*
 - (76) Stamens not at base of disc (77)
 - (76) Stamens at base of disc *Rutaceae*
 - (77) Filaments of stamen connate *Meliaceae*
 - (77) Filaments of stamen distinct *Burseraceae*
- (78) Ovary inferior (79)
- (78) Ovary superior (80)
 - (79) Inflorescence pendulous catkin-like *Betulaceae*
 - (79) Inflorescence axillary, capitate, or spicate *Hamamelidaceae*
 - (80) Ovary unilocular (81)
 - (80) Ovary two to five-loculed (82)
 - (81) Roots not tubercled *Flacourtiaceae*
 - (81) Roots tubercled *Leguminosae*
 - (82) Inflorescence a thyrse or a raceme of panicle (83)
 - (82) Inflorescence cymose (84)
 - (83) Inflorescence a thyrse *Erythroxylaceae*
 - (83) Inflorescence a raceme or panicle *Sapindaceae*
 - (84) Stamens four to five (85)
 - (84) Stamens numerous (over five) in two whorls *Malvaceae*
 - (85) Stamens 5, *opposite* petals *Rhamnaceae*
 - (85) Stamens four to five, alternate with petals *Celastraceae*
- (86) Leaves opposite (87)
- (86) Leaves alternate (96)
 - (87) Ovary inferior (88)
 - (87) Ovary superior (90)
 - (88) Inflorescence determinate (89)
 - (88) Inflorescence indeterminate, a capitulum *Compositae*
 - (89) Inflorescence axillary usually cymose *Cucurbitaceae*
 - (89) Inflorescence mono-or dichasial cyme *Campanulaceae*
 - (90) Ovary unilocular (91)
 - (90) Ovary two to four locules (92)
 - (91) Leaves stipulate *Gentianaceae*
 - (91) Leaves stipulate (minute) *Asclepiadaceae*
 - (92) Stems quadrangular (94)
 - (92) Stems cylindrical (94)
 - (93) Leaf margin nearly always serrate, or crenate, commonly scented *Labiatae*
 - (93) Leaf margin entire, rarely scented *Verbenaceae*
 - (94) Stems without enlarged nodes (95)
 - (94) Stems with enlarged nodes *Oleaceae*
 - (95) Inflorescence racemose or cymose *Loganiaceae*
 - (95) Inflorescence in axillary dichasia *Pedaliaceae*
 - (96) Ovary inferior (97)
 - (96) Ovary superior (100)
 - (97) Leaves stipulate (98)
 - (97) Leaves stipulate *Rubiaceae*
 - (98) Ovary one to five-loculed (99)
 - (98) Ovary unilocular *Compositae*
 - (99) Leaves simple, rarely pinnately compound *Caprifoliaceae*
 - (99) Leaves pinnately much divided *Valerianaceae*
 - (100) Stamens two to four (101)
 - (100) Stamens five or more (102)

- (101) Inflorescence bracteate, seapose, capitate.....*Plantaginaceae*
- (101) Inflorescence condensed fascicles or solitary in
axils of leaves.....*Styracaceae*
- (102) Stamens more than five (103)
- (102) Stamens five (104)
- (103) Stamens epipetalous, distinct, usually two to
three whorls of four to five each.....*Sapotaceae*
- (103) Stamens arise from base of disc, commonly
two times petal number.....*Ericaceae*
- (104) Climbing habit (105)
- (104) Non-climbing habit (106)
- (105) Leaf shape consistent.....*Apocynaceae*
- (105) Leaf-shape cordate to sagittal
to varied on plant.....*Convolvulaceae*
- (106) Without gynobasic style and scorpioid cyme (107)
- (106) With gynobasic style and scorpioid cyme.....*Boraginaceae*
- (107) Petals irregular (108)
- (107) Petals regular (five).....*Hydrophyllaceae*
- (108) Corolla deeply synpetalous.....*Scrophulariaceae*
- (108) Corolla rotate to tubular
to funnel shaped.....*Solanaceae*

The key is not intended to be definitive—rather a simplified guide which will work most of the time and especially in the field. Understandably, some plants not of medicinal value may fit in the key, but careful checking later will reveal this. At least, those belonging to the so-called "medicinal families" will not be missed in collections.

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