

Ethnobotany. Lectures 38 and 39

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Outline

Harmful plants

Stinging plants

Technical plants

Incense plants

Ornamental plants

The most important cultivated plants and their centers of origins



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Harmful plants

Stinging plants



Stinging plants

- ▶ Covered with “glassy”, silica-tipped hairs (like nettles, *Urtica* spp., *Laportea* spp. and others from nettle family, Urticaceae) containing acetylcholine, histamine, serotonin, formic acid or even stronger toxins (like moroidin from stinging trees, *Dendrocnide excelsa*, and *D. moroides*, same family, from Australia)
- ▶ Plants from other families like Loasaceae (*Eucnide*, desert rock nettle), Euphorbiaceae (*Cnidoscolus*, spurge nettle) and even Leguminosae (*Mucuna*, velvet beans) are similar to nettles.



Nettle stinging hairs



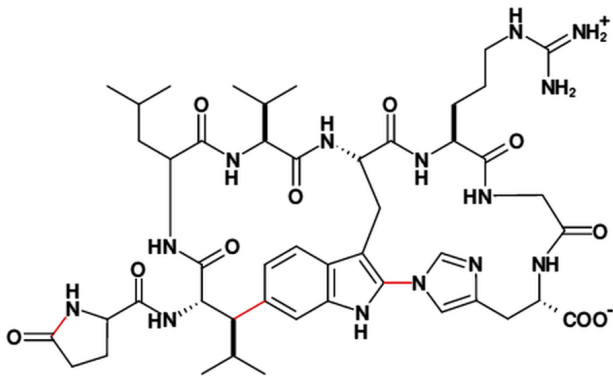
Giant stinging tree



Giant stinging tree leaves



Moroidin



Moroidin



Desert rock nettle



Spurge nettle



Velvet beans



Poisonous plants

- ▶ Allergic like poison ivy (*Toxicodendron radicans* from Anacardiaceae, rich of urushiol)
- ▶ Phototoxic like giant hogweed (*Heracleum* spp. from Umbelliferae)
- ▶ Digestively poisonous like *Strychnos* from Loganiaceae (source of curare), rosary pea *Abrus precatorius* (Leguminosae, contain abrin protein toxin) and castor beans (*Ricinus communis*, Euphorbiaceae) which both deactivate eukaryotic ribosomes, and most poisonous U.S. plant water hemlock (*Cicuta* spp., Umbelliferae, contains terpene cicutoxin which blocks GABA receptors)
- ▶ Almost all Solanaceae and Ranunculaceae are poisonous



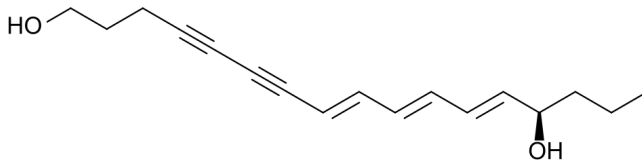
Rosary pea



Water hemlock



Cicutoxin



Parasitic plants

- ▶ Half-parasites (like root half-parasite *Comandra*, bastard toad-flax or stem half-parasite mistletoe) have chlorophyll, mycoparasites (like *Pterospora*) interact with fungi
- ▶ Full parasites: root (like *Pholisma*), or internal (only flowers will appear on surface, like *Pilosyles*)
- ▶ Full stem parasites dodder (*Cuscuta* spp., Convolvulaceae) and *Cassytha* (Lauraceae) are harmful for many cultivated plants, especially from legume and aster families



Bastard toadflax



Pterospora



Pholisma



Pilostyles



Dodder



Cassytha



Weeds

- ▶ Plants which interfere in agro-ecosystems
- ▶ In North Dakota, most noxious **native** weeds are common ragweed (*Ambrosia artemisiifolia* from Compositae) and different milkweeds (*Asclepias* spp. from Apocynaceae); first is also highly allergic, seconds are poisonous.



Common ragweed



Milkweed



Invasive plants

- ▶ Invasive plants are normally not harmful in their native range, but in exotic range they start to spread uncontrollably
- ▶ Nice reciprocal examples are spotted knapweed (*Centaurea stoebe*) and boxelder (*Acer negundo*) in Eurasia and North America
- ▶ Leafy spurge (*Euphorbia esula*) is the most problematic invasive plant in North Dakota
- ▶ Despite of numerous hypotheses formulated (e.g., presence of symbionts, epigenetic evolution), the reason of invasiveness is still not known



Invasive vs. native knapweed



Invasive weed: leafy spurge, *Euphorbia esula*, Euphorbiaceae, East Europe



Forage plants

- ▶ Need to contain balanced diet: not only carbohydrates, but also proteins, fats and vitamins
- ▶ Most important are different Gramineae (like oats, corn and sorghum) and Leguminosae (like clovers, vetches and alfalfa)
- ▶ Green parts of grasses are most often used as silage—fermented (with *Lactobacillus plantarum*) cellulose



Silage

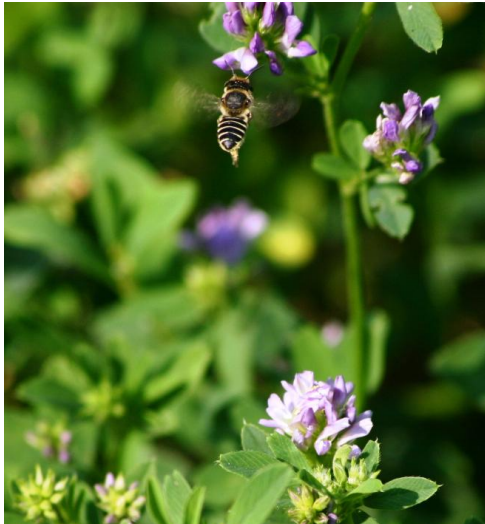


Alfalfa, *Medicago sativa*, Leguminosae, Eurasia

- ▶ Root nodules contain nitrogen-fixing bacteria, providing plant with nitrogen
- ▶ Up to 12 harvests a year
- ▶ High in proteins, vitamins C, K, E and some B



Alfalfa pollination

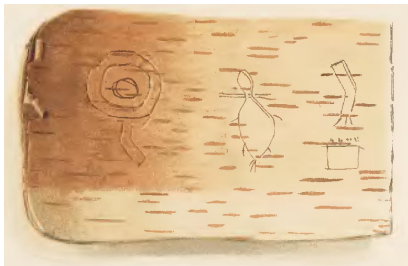


Lumber, paper and basket plants

- ▶ Mostly trees which give hardwood (rosids/asterids) and softwood (conifers)
- ▶ For the paper, birch (*Betula* spp.) bark was used by ancient Russians and Ojibwe people (“Wiigwaasabak”), papyrus sedge (*Cyperus papyrus*, Cyperaceae) was used in ancient Egypt, and pulpwood is used now
- ▶ For baskets and similar things (like bast shoes), gourd (*Lagenaria* spp.) fruits, birch and linden (*Tilia* spp.) bark and willow (*Salix* spp.) twigs were used most frequently in our latitudes



Russian and Ojibwe bark documents



Bast shoes



Baskets



Hybrid poplar, *Populus deltoides* hybrids, Salicaceae, North America

- ▶ Sometimes referred as *Populus* × *euroamericana*
- ▶ One of the fastest growing trees
- ▶ Accept wide range of soils, but require moist habitats, with high water level in soil
- ▶ Used for making pulpwood



Hybrid poplar plantation



Cork oak, *Quercus suber*, Fagaceae, Mediterranean

- ▶ Evergreen oak with extremely thick cork
- ▶ Used mostly for stoppers in wine bottles and in chemical labs
- ▶ Main producer is Portugal



Cork oak



Bamboos, Gramineae, East Asia (mostly)

- ▶ Subfamily of grasses, Bambusoideae
- ▶ Woody but temporary stems, plants often monocarpic
- ▶ Resistant to fungi and termites



Bamboo house



Fiber plants

- ▶ Normally, bast (phloem) is used for fibers
- ▶ Most important stem fibers are flax (*Linum usitatissimum*), jute (*Corchorus* spp., Malvaceae, South Asia) and hemp (*Cannabis sativa*); fruit fibers are cotton, coir (outer part of coconut, *Cocos nucifera*) and kapok (*Ceiba pentandra*, Malvaceae, Central America); leaf fibers are abaka (*Musa textilis*, Musaceae, Philippines), sisal (*Agave sisalana*, Asparagaceae, Mexico), snake plant (*Sansevieria* spp., Asparagaceae, Africa) and New Zealand flax (*Phormium tenax*, Xnanthorrhoeaceae)
- ▶ Native Americans used “Indian hemp” (*Apocynum cannabinum*) stems



Kapok



Indian “hemp”



Cotton, *Gossypium* spp., Malvaceae, West Asia

- ▶ Several species which were domesticated independently in Old and New Worlds, now the most cultivated species is American *Gossypium hirsutum*
- ▶ Requires high temperatures, humidity and (for best result) manual harvesting
- ▶ Biggest producers are China, India and U.S.



Vegetable lamb of Tartary



Cotton



Dye plants

- ▶ Most of these cultures are declined after invention of artificial dyes in 1920s
- ▶ Examples are: “bloodwood” *Haematoxylum campechianum* (Leguminosae, Central America, red haematoxylin); achiote *Bixa orellana* (Bixaceae, South America, yellow annatto), true indigo *Indigofera tinctoria* (Leguminosae, blue indigotin), safflower and others.



Achiote fruits



True indigo



Cochineal, *Dactylopius coccus*/Homoptera + *Opuntia* spp./Cactaceae, North America

- ▶ Almost unique combinational culture of scale insect and opuntia (similar to mulberry/silkworm): cultivated ecosystem
- ▶ For several centuries, have been Mexican most valued export
- ▶ Insect produces carminic acid
- ▶ Another similar “combination” is kermes scale insect (*Kermes* spp., Homoptera) and Kermes oak (*Quercus coccifera*) in Mediterranean which used to produce crimson dye.



Cochineal



Latex plants

- ▶ Latex is a stable dispersion (emulsion) of polymer (mostly terpenes) microparticles
- ▶ Occur in many plants, but frequently used only several species, e.g., guayule *Parthenium argentatum* (Compositae, Mexico), Panama rubber tree *Castilla elastica* (Moraceae, Central America), little elastic and bio-inert Gutta-percha *Palaquium* spp. (Sapotaceae, South Asia), chewing gum tree *Manilkara chicle* (Sapotaceae, Central America)



Rubber tree, *Hevea brasiliensis*, Euphorbiaceae

- ▶ Large tropical tree originated in Amazonian but cultivated mainly in Southeastern Asia
- ▶ Natural rubber is extremely elastic but fragile at low temperatures
- ▶ In 1839, Charles Goodyear invented vulcanization (hyper-polymerization with sulfur)



Para rubber tree



Technical plants

Incense plants



Incense plants (ceremonial odors)

- ▶ Used in many religions, most often in Eastern Christian churches, Hindu and Buddhism
- ▶ Multiple plants with essential oils, plus some specific species like myrrh *Commiphora myrrha* (Burseraceae, West Asia), styrax *Styrax benzoin* (Styracaceae, West Asia) and sandalwood *Santalum* spp. (Santalaceae, Old World tropics)



Incense stick in Buddhist temple



Sandalwood cultivation



Frankincense, *Boswellia sacra*, Burseraceae, Africa

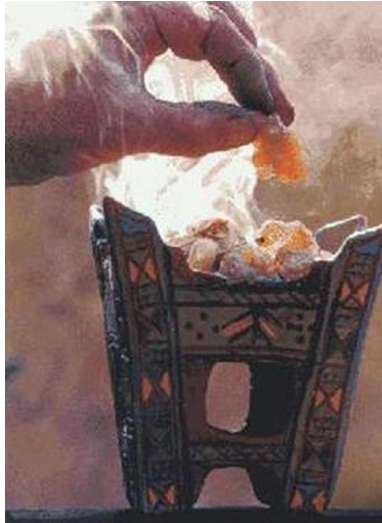
- ▶ Aromatic resin from *Boswellia* trees
- ▶ Burning of frankincense came from ancient Egypt to Hebrew church and then to Christian churches
- ▶ Contains a complicated set of terpenes which have also medicinal effects



Frankincense tree



Frankincense in church



Indoor plants

- ▶ Should be adapted for dry and relatively dark conditions
- ▶ We already covered cacti and other succulents in February excursion



Some groups of indoor plants

- ▶ Orchidaceae: tropical orchids; *Phalaenopsis* is one of the most frequently cultivated
- ▶ Bromeliaceae: South American bromeliads; *Cryptanthus*, *Neoregelia* and *Guzmania* are frequently cultivated
- ▶ *Begonia* from Begoniaceae, all tropics, is extremely shade-tolerant (and also ferns)
- ▶ Many ornamentals (indoor or outdoor) are variegated plants: induced variegation or naturally pigmented leaves



Begonia



Neoregelia, naturally variegated



Rubber ficus (*Ficus elastica*, Moraceae, Old World tropics), variegated mutant



Bonsai

- ▶ Specific way of cultivation resulted in dwarf plants
- ▶ Variety of temperate tree species used, cultivation is in-house but outdoor (in patio)
- ▶ Specific techniques are: leaf trimming, stem pruning and wiring, use stony substrate and small pots



Bonsai pine



Cut plants

- ▶ Cultivated throughout the year in greenhouses and/or open grounds, then cut
- ▶ Forcing of flowering is needed for most cases (hormones, temperature, day length, selection)



Most frequent cut plants

- ▶ Rose: *Rosa* spp., Rosaceae, China
- ▶ Carnation: *Dianthus caryophyllus*, Caryophyllaceae, Mediterranean
- ▶ Lily: *Lilium* spp., North Hemisphere
- ▶ Chrysanthemum: *Chrysanthemum* \times *koreanum*, Compositae, East Asia
- ▶ Gerbera hybrids: *Gerbera*, Compositae, South Africa



Carnation



Gerbera



Outdoor annuals and perennials

- ▶ Plants from diverse families
- ▶ Annuals should (like petunia, *Petunia hybrida*, Solanaceae, South America) be fast-growing
- ▶ Biennials like pansy (*Viola x wittrockiana*, Violaceae, Europe) produce vegetative part in the first year
- ▶ Perennials normally have underground rhizomes (like peony, *Paeonia* spp., Paeoniaceae, East Asia) or bulbs (like daffonlids, *Narcissus* spp., Mediterranean), often wintering indoor (like geraniums, *Pelargonium* spp., Geraniaceae, South Africa)
- ▶ Traditionally, flowering shrubs like roses, lilacs (*Syringa* spp., Oleaceae) are also referred here

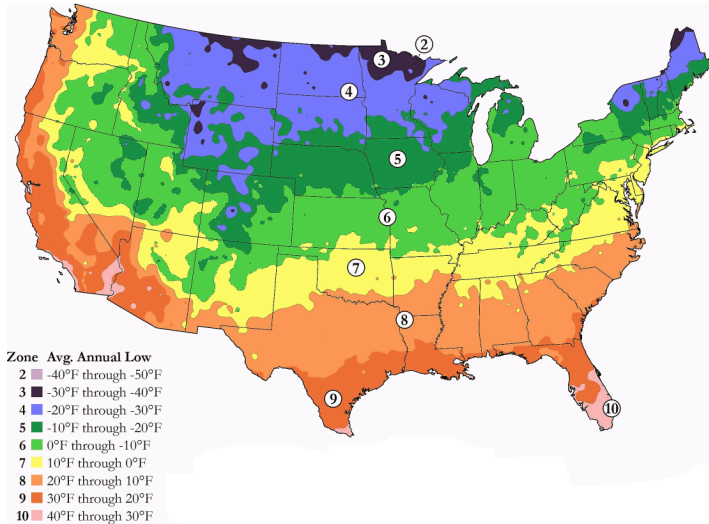


Hardiness zones

- ▶ Determined from average lowest temperature
- ▶ North Dakota belongs to 3/4 zones



Hardiness zones in U.S.



Petunia



Pansy



Peony



Bulb plants

- ▶ Liliaceae: lily *Lilium*, tulip *Tulipa*, fritillary *Fritillaria*
- ▶ Amaryllidaceae: daffodil *Narcissus*, snowdrop *Galanthus*
- ▶ Asparagaceae: grape hyacinth *Muscari*, hyacinth *Hyacinthus*, squill *Scilla*, common bluebell *Hyacinthoides*



Common bluebell



Landscape woody plants

- ▶ Trees, shrubs, rarely vines
- ▶ Evergreen and deciduous



Conifers

- ▶ Pinaceae: *Picea* (especially blue spruce, *Picea pungens*, North America), *Pinus*, *Larix*
- ▶ Cupressaceae: *Cupressus*, *Juniperus*



Blue (Colorado) spruce



Special groups

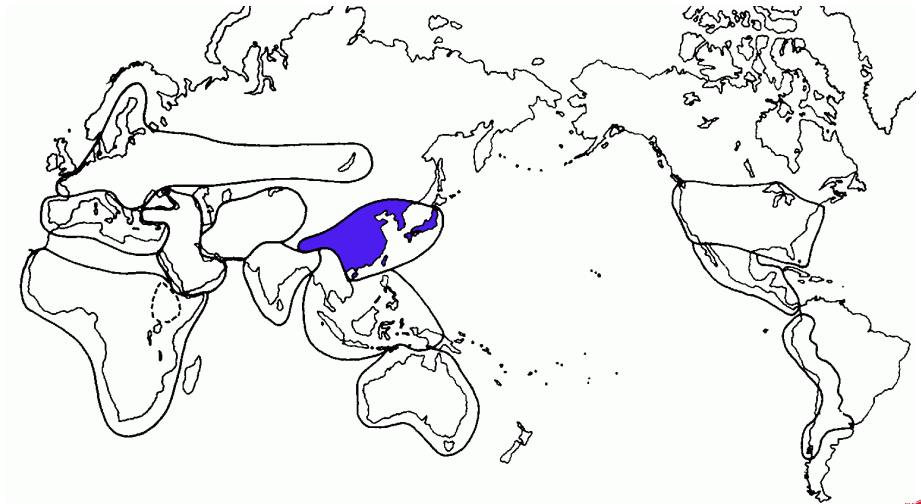
- ▶ Plants for alpine (rocky) gardens like stonecrops, *Sedum* spp., Crassulaceae
- ▶ Aquatic ornamentals: ponds (like waterlily, *Nymphaea* spp.) and fishtanks (like *Pistia*, *Elodea* etc.)
- ▶ Lawn plants: *Lolium perenne*, ryegrass and species of bluegrass (*Poa*) and bentgrass (*Agrostis*)



Water lily



East Asian center



East Asian center: main food

- ▶ Rice
- ▶ Soybeans



East Asian center: fruits and vegetables

- ▶ Peach
- ▶ Orange
- ▶ Radish



East Asian center: sugar and oil

► Tung



East Asian center: spices and drinks

- ▶ Tea
- ▶ Camphor tree



East Asian center: medicinal

- ▶ Ginseng
- ▶ Ginkgo



East Asian center: technical

- ▶ Bamboos
- ▶ Gutta percha

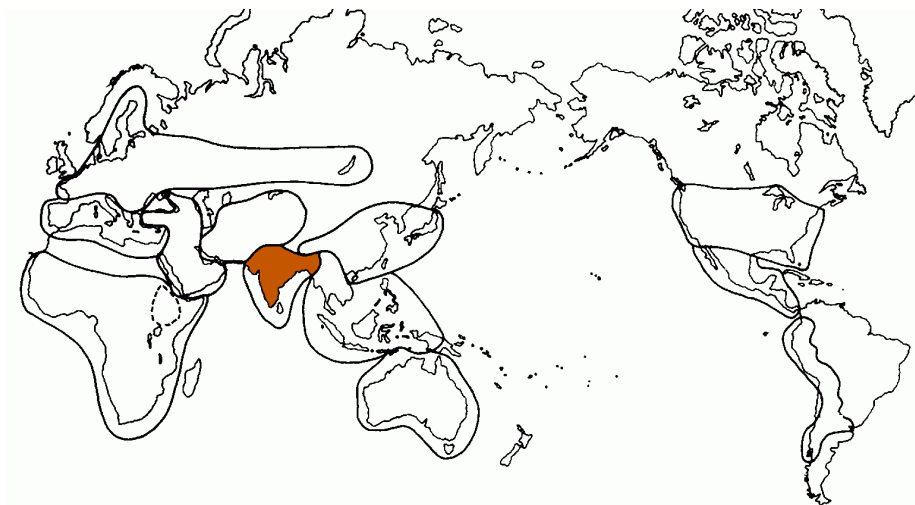


East Asian center: ornamental

- ▶ Chrysanthemum
- ▶ Ornamental maples



South Asian (Indian) center



South Asian (Indian) center: main food

- ▶ Buckwheat
- ▶ Chickpea



South Asian (Indian) center: fruits and vegetables

- ▶ Mango
- ▶ Cucumber



South Asian (Indian) center: sugars and oils

- ▶ Sugarcane
- ▶ Sesame



South Asian (Indian) center: spices and drinks

- ▶ Black pepper
- ▶ Cinnamon



South Asian (Indian) center: technical

- ▶ Jute
- ▶ Cotton (partly)



South Asian (Indian) center: medicinal

- ▶ Turmeric
- ▶ Gotu kola



South Asian (Indian) center: ornamental

- ▶ Rhododendron
- ▶ Ficus



West Asian center



West Asian center: main food

- ▶ Wheat (partly)
- ▶ Lentils
- ▶ Barley
- ▶ Oats



West Asian center: sugars and oils

- ▶ Sugar beet
- ▶ Olive



West Asian center: fruits and vegetables

- ▶ Grapes
- ▶ Pomegranate
- ▶ Walnut
- ▶ Cabbage
- ▶ Pear



West Asian center: spices and drinks

- ▶ Coriander
- ▶ Cumin
- ▶ Dill
- ▶ Bay leaf



West Asian center: technical

- ▶ Alfalfa
- ▶ Flax
- ▶ Clover



West Asian center: medicinal

- ▶ Chamomile
- ▶ Senna
- ▶ Deadly nightshade
- ▶ Autumn crocus



West Asian center: ornamental

- ▶ Rose
- ▶ Tulip
- ▶ Carnation
- ▶ Lilac
- ▶ Primrose



African (Ethiopian) center



African (Ethiopian) center: main food

- ▶ Sorghum



African (Ethiopian) center: fruits and vegetables

- ▶ Watermelon
- ▶ Date palm



African (Ethiopian) center: sugars and oils

- ▶ Castor
- ▶ Oil palm



African (Ethiopian) center: spices and drinks

- ▶ Coffee



African (Ethiopian) center: technical

- ▶ Gourd



African (Ethiopian) center: medicinal

- ▶ Aloe
- ▶ Madagascar periwinkle



African (Ethiopian) center: ornamental

- ▶ Geranium
- ▶ Gerbera



Central American (Mexican) center



Central American (Mexican) center: main food

- ▶ Corn
- ▶ Beans



Central American (Mexican) center: fruits and vegetables

- ▶ Avocado
- ▶ Squash



Central American (Mexican) center: sugars and oils

- ▶ Sunflower



Central American (Mexican) center: spices and drinks

- ▶ Red pepper



Central American (Mexican) center: technical

- ▶ Cochineal



Central American (Mexican) center: medicinal

- ▶ Quassia



Central American (Mexican) center: ornamental

- ▶ Marigold
- ▶ Cacti



South American (Andean) center



South American (Andean) center: main food

- ▶ Potato
- ▶ Sweet potato



South American (Andean) center: fruits and vegetables

- ▶ Pineapple
- ▶ Tomato



South American (Andean) center: sugars and oils

- ▶ Peanut



South American (Andean) center: spices and drinks

- ▶ Cocoa
- ▶ Vanilla



South American (Andean) center: technical

- ▶ Para rubber tree



South American (Andean) center: medicinal

- ▶ Quina
- ▶ Ipecac



South American (Andean) center: ornamental

- ▶ Canna
- ▶ Bromeliads



Really short anonymous voluntary survey

1. What do you **like** most in ethnobotany course?
2. What do you **dislike** most in ethnobotany course?
3. **Which lab** do you remember most of all?
4. Please grade (1—bad, 5—excellent):
 - 1 Lectures
 - 2 Labs
 - 3 Exams



Summary

- ▶ Main groups of harmful plants: prickly, stinging, poisonous, parasitic, weed/invasive
- ▶ Main groups of technical plants: forage, wood, fiber, dye, latex, incense
- ▶ Main groups of ornamental plants: indoor, cut, outdoor annuals and perennials, landscape woody



For Further Reading



A. Shipunov.

Ethnobotany [Electronic resource].

2011—onwards.

Mode of access:

http://ashipunov.info/shipunov/school/biol_310



Heinrich et al. 2012.

Fundamentals of Pharmacognosy and Phytotherapy.

Churchill Livingstone, Edinburgh.

