
MEDICINAL PLANTS: EDIBLE GARDENS FOR IMPROVED HEALTH
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OBJECTIVES
What are medicinal plants?
History of use and ethnobotany
Are they safe?
How and why plants produce medicinally active compounds; regulations for natural products
What are some plants I can grow?
Review of medicinal plants cultivated by UF/IFAS faculty, staff, and students that can be successfully cultivated in Florida landscapes

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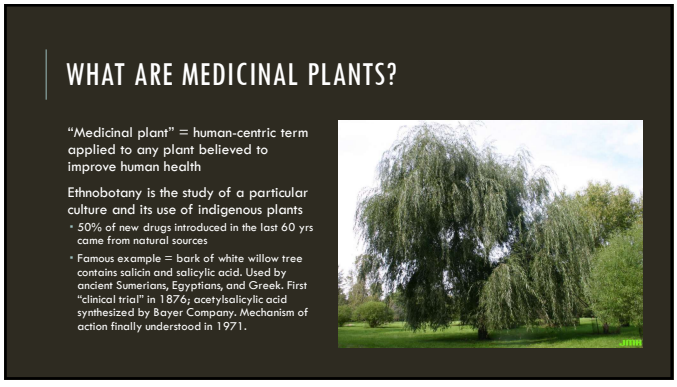
WHAT ARE MEDICINAL PLANTS?
"Medicinal plant" = human-centric term applied to any plant believed to improve human health
Ethnobotany is the study of a particular culture and its use of indigenous plants
50% of new drugs introduced in the last 60 yrs came from natural sources
Famous example = bark of white willow tree contains salicin and salicylic acid. Used by ancient Sumerians, Egyptians, and Greek. First "clinical trial" in 1876; acetylsalicylic acid synthesized by Bayer Company. Mechanism of action finally understood in 1971.

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WHAT TYPES OF PLANTS AND APPLICATIONS ARE ETHNOBOTANICAL?

Ethnobotany focuses on the use of plants and their products for a diverse range of applications to include:

- Plants used in rituals
- Coloring agents
- Fiber
- Poisons
- Fertilizers
- Building materials
- Oil
- Ornamentals
- Food

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ARE FOOD CROPS MEDICINAL PLANTS?

What if a plant improves health through nutrition?

- Nutraceuticals – "food as medicine"
- Phytotherapy – use of phytomedicines to prevent or treat disease

Significant growth in the use of phytomedicines in Europe, North America, Australia, and New Zealand

From 1977 to 2007, research publications focused on the chemistry, pharmacology, toxicology, and clinical applications of medicinal plants increased 700%

Source: healthvision.in

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NUTRACEUTICALS OR 'FUNCTIONAL FOODS'

Many foods are known to have beneficial health effects

- Garlic, ginger, turmeric, and many other herbs and spices
  - Gingerols (6-, 8-, and 10-gingerol) and curcuminoids (curcumin, demethoxy curcumin, and bisdemethosy curcumin)
- Carotenoid-containing plans such as tomatoes, carrots and many other vegetables

Natural plant products, or "herbal medicines", include phytomedicines and nutraceuticals.

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WHY DO PLANTS MAKE THESE COMPOUNDS?

Plants have main outputs (primary metabolites) that often include carbohydrates, proteins, fats, and oils.

And they also produce secondary compounds (secondary or specialized metabolites) that often protect, repel, and communicate. These compounds are generally produced in relatively small amounts.

- Four main categories: alkaloids, terpenoids, phenolics, and sulfated amino acids.

Secondary compound synthesis is often similar among plants within the same family (*Cannabaceae* or *Rubiaceae*)

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WHAT TYPES OF DRUGS ARE DERIVED FROM PLANTS?

Herbal Drugs Derived from Specific Parts of Medicinal Plants

Shoots or aerial parts of St. John's wort (*Hypericum perforatum*) used to treat mild to moderate depression

Leaves of *Ginkgo bilboa*, used to treat cognitive deficiencies

Flower heads of chamomile (*Chamomilla recutita*) used as mild sedative

Natural Products or Compounds Isolated from Nature

Morphine from opium poppy (*Papaver somniferum*) used as analgesic

Taxol from Pacific yew (*Taxus brevifolia*) used to treat cancer

Galantamine from *Galanthus* and *Leucojum* species, used in the management of cognitive disorders

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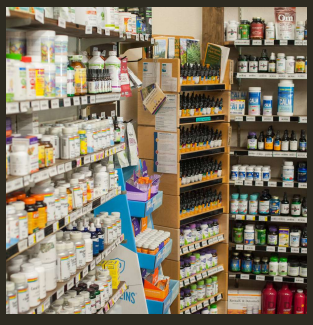
USE OF HERBAL MEDICINES

Herbal medicine use varies significantly by country

- 20-33% of individuals living in the United Kingdom (UK) regularly use complimentary and alternative medicine (CAM)
- In the US, 38% of adults and 12% of children use some form of CAM
  - Only $^1/_3$ of 38 millions adults surveyed revealed CAM use to their physician (Kennedy et al. 2008)
- Usage data for other regions of the world are more limited; however, high usage is believed to occur in India, China, Indonesia, and Australia



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WHAT IS THE VALUE OF HERBAL MEDICINES?

In 2009, estimated total market value of herbal medicines was $83 billion

- In the US, consumers estimated to have spent $5 billion
- In Europe, consumers estimated to have spent $7.4 billion
  - Germany: 27%
  - France: 24%
  - Italy: 12%
  - UK: 9%
- In India, herbal medicine sales estimated at $2.2 billion
- In China, herbal medicine sales estimated at $8 billion

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USE OF HERBAL MEDICINES

Why has there been an increase in usage of herbal medicines?

- Appeal to being 'natural'
- Considered by users to be 'safer' than conventional medicines often derogatorily referred to as 'drugs'
- Philosophical beliefs
- Religious beliefs

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ISN'T MEDICINAL PLANT CHEMISTRY COMPLEX?

Modern medicinal chemists often prefer single-chemical entity (SCE) drugs, whether natural or synthetic, due to lower cost and simplicity

- Compared to chemically complex materials likes roots, leaves, bark, flowers, seeds, etc.

With greater diversity of phytomedicines and supplements available, concern over quality of botanical raw ingredients, extracts, and essential oils exist

Two main areas of concern:

- Identity/authenticity
- Purity

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IS IT SAFE?

Most individuals do not seek professional advice before purchasing or using herbal medicines (Barnes et al. 1998, Gulian et al. 2002)

- Limited usefulness of advice
- Limited information about herbal medicines or healthcare professionals are not adequately informed

Drug-herb interactions are a concern when patients are currently taking prescription medicines

- St. John's wort interactions with alprazolam (Xanax), antidepressants, barbiturates, chemotherapy medications, specific statins, and contraceptive medications

St. John's (*Hypericum perforatum*) wort flower

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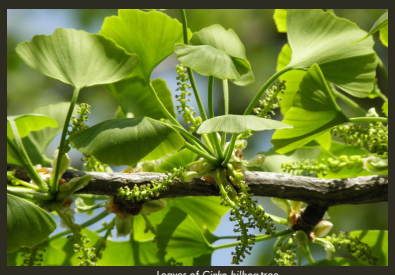
ARE THEY REGULATED?

Regulation of herbal medicines vary greatly by country

- *Ginko bilboa* is an herbal medical product in Germany but a food supplement in US

Regulations are also subject to change over time

- *Ginko bilboa* was a food in UK but is now regulated as an herbal medicine



Leaves of *Ginko bilboa* tree

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UNITED STATES OF AMERICA

Herbal medicines are generally regulated as 'dietary supplements'

- Primary to marketing, dietary supplements do not have to be assessed for safety and effectiveness
- Limited therapeutic claims can be made (i.e., can help address nutrient deficiency, support health, etc.) but requires supportive prior research and must be followed by "This statement has not been evaluated by the U.S. Food and Drug Administration (FDA). This product is not intended to diagnose, treat, cure, or prevent any illness."

Since 2008, GMPs are expected

Once a supplement is on the market, FDA monitors claims

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UNITED KINGDOM & EUROPE

Traditional Herbal Medicinal Products Directive 2004/24/EC

- Allows manufactures of good-quality herbal medicines an opportunity to register products as medicinal products with restricted claims to patients to include:
  - Evidence of herbal product (or related product) to be used traditionally for at least 30yrs (15 yrs in non-EU and 15 yrs in EU, or >30yrs in the EU)
  - Bibliographic data on safety with an expert report
  - Documentation of how company complies with quality guidance and regulatory standards
  - Proper packaging, naming, and labeling of product
- Can only be used for minor, self-limiting conditions

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WHAT ARE SOME PLANTS I CAN GROW?

- Hops (*Humulus lupulus*) – bittering agent, preservative, sleep aid; alpha acids
- Butterfly pea (*Clitoria ternatea*) – food and drink colorant, antioxidant; anthocyanin
- Ginger (*Zingiber officinale*) – food spice, nausea relief, antioxidant, suspected to be anti-inflammatory; gingerols. *should not be taken if prescribed warfarin
- Turmeric (*Curcuma longa*) – food spice, anti-inflammatory, anti-anxiety; curcuminoids. *should not taken if prescribed warfarin
- Kratom (*Mitragyna speciosa*) – tea, pain relief, mild stimulant; alkaloids.
- Kava (*Piper methysticum*) – tea, anti-anxiety, sleep aid; kavalactones
- Hemp (*Cannabis sativa*) – edible, anti-anxiety, sleep aid, anti-inflammatory; cannabinoids *must have commercial permit to cultivate in Florida
- Skullcap (*Scutellaria lateriflora*) – tea, anti-anxiety, anti-inflammatory; baicalin

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HOPS (*HUMULUS LUPULUS*)

Diecious, short-day perennial; full-sun, plant in spring on south-facing side of home

Relatively high fertility needs (150 lbs acre yr^{-1}); use 'high' rate as recommended by CRF manufacturer; susceptible to boron deficiency

Needs trellis or support structure

Harvest cones when yellow resin is visible, and cones are papery

Dry with no or low heat then store in freezer until use

UF/IFAS Electronic Data Information System (EDIS): ENH1227, ENH1297, ENH1304, & ENH1314

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BUTTERFLY PEA (*CLITORIA TERNATEA*)

Start from seed with a nick and soaking for 24 hr in water

Transplant in spring in full sun and provide trellis or support structure

Harvest and dry flowers. Then, add them to beverage or food to extract anthocyanins

Color dependent upon pH:
- Low – pink/purple
- Medium – blue
- High – green

EDIS ENH1309

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GINGER (*ZINGIBER OFFICINALE*) & TURMERIC (*CURCUMA LONGA*)

Plant rhizomes in spring when average soil temperature is above 70 °F (March in S. Florida/May in N. Florida)

Partial shade (25-40% of full sun) is ideal

Apply fertilizer at medium or high rate as per manufacturer's recommendation (CRF) or water-soluble at 100 ppm N with each irrigation event

Avoid excessively wet soil to limit disease pressure

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HARVEST

5 months after planting = "baby ginger" having low fiber and pungency

Full season (senesce) = higher concentration of gingerols and curcumins

Wash rhizomes, allow to cure for 3 to 5 days, then place in refrigerated storage (54 to *57* °F and 85% RH to minimize excessive drying

EDIS ENH1374

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SKULLCAP (*SCUTELLARIA* SPP.)

> 350 species, 11 native to Florida

S. baicalensis or Baikal skullcap has long history of use in traditional Chinese medicine; roots are used as source of medicine

S. integrifolia is the most common species in Florida

Easiest to start from seed

Full sun to partial shade, fairly drought tolerant, low to medium rates of CRF maximized flowering and baicalin production

EDIS ENH1300

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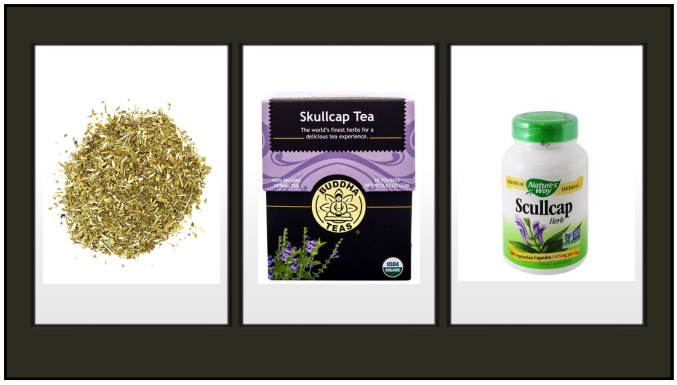

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KRATOM (*MITRAGYNA SPECIOSA*)

- Leaves used for pain management and opioid withdrawal; mild simulant
- Illegal in 6 states and Sarasota
- Variability in commercial products, especially concentrated extracts, challenge accurate dosing
- Limited outdoor cultivation in Florida as its not cold tolerant; shade is ideal
- Relatively high fertility requirement needed to sustain high growth rate

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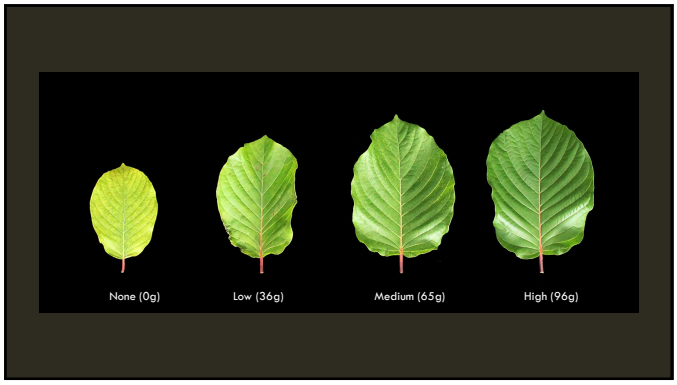
None (0g)
Low (36g)
Medium (65g)
High (96g)

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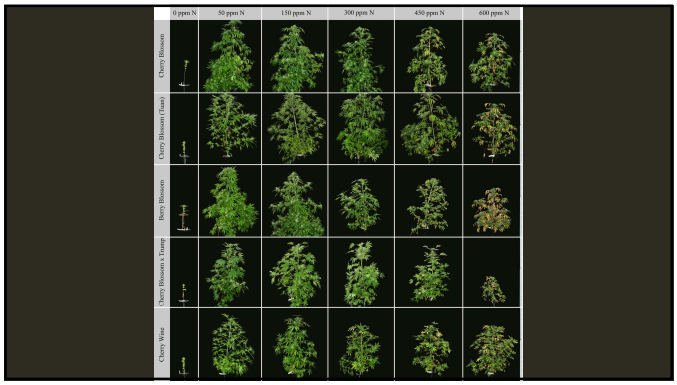
0 ppm N
50 ppm N
150 ppm N
300 ppm N
450 ppm N
600 ppm N
Cherry Blossom
Cherry Blossom (Tuan)
Berry Blossom
Cherry Blossom x Trump
Cherry Wine

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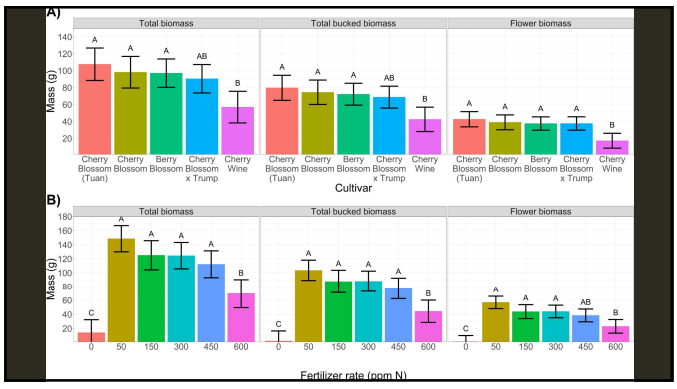
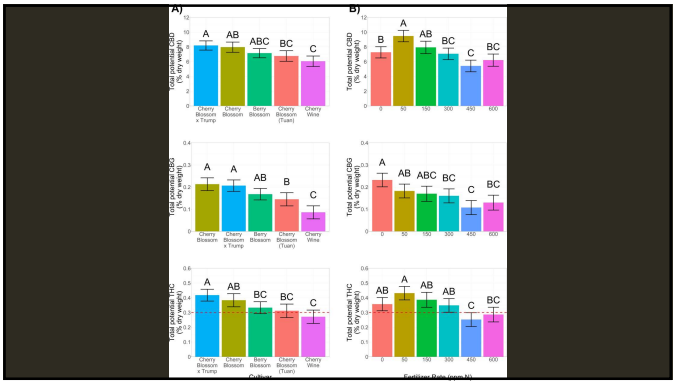

A)
Total biomass
Total bucked biomass
Flower biomass
Mass (g)
Cherry Blossom (Tuan)
Cherry Blossom
Berry Blossom
Cherry Blossom x Trump
Cherry Wine
Cultivar
B)
Fertilizer rate (ppm N)

30



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CONCLUSIONS

Defined and described medicinal plants
- Ethnobotany, nutraceuticals, and superfoods

Herbal medicine and natural plant product safety
- Regulations are relatively relaxed in the U.S., but consistency of products are hard to estimate

Medicinal plants that can be grown in Florida
- Hops, ginger, turmeric, skullcap, & butterfly pea can be dual-purpose plants (ornamental & medicinal)

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THANK YOU

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