Ethnobotany. Lecture 30

Alexey Shipunov

Minot State University

April 8th, 2011

Outline

Minot State UNIVERSITY

Outline

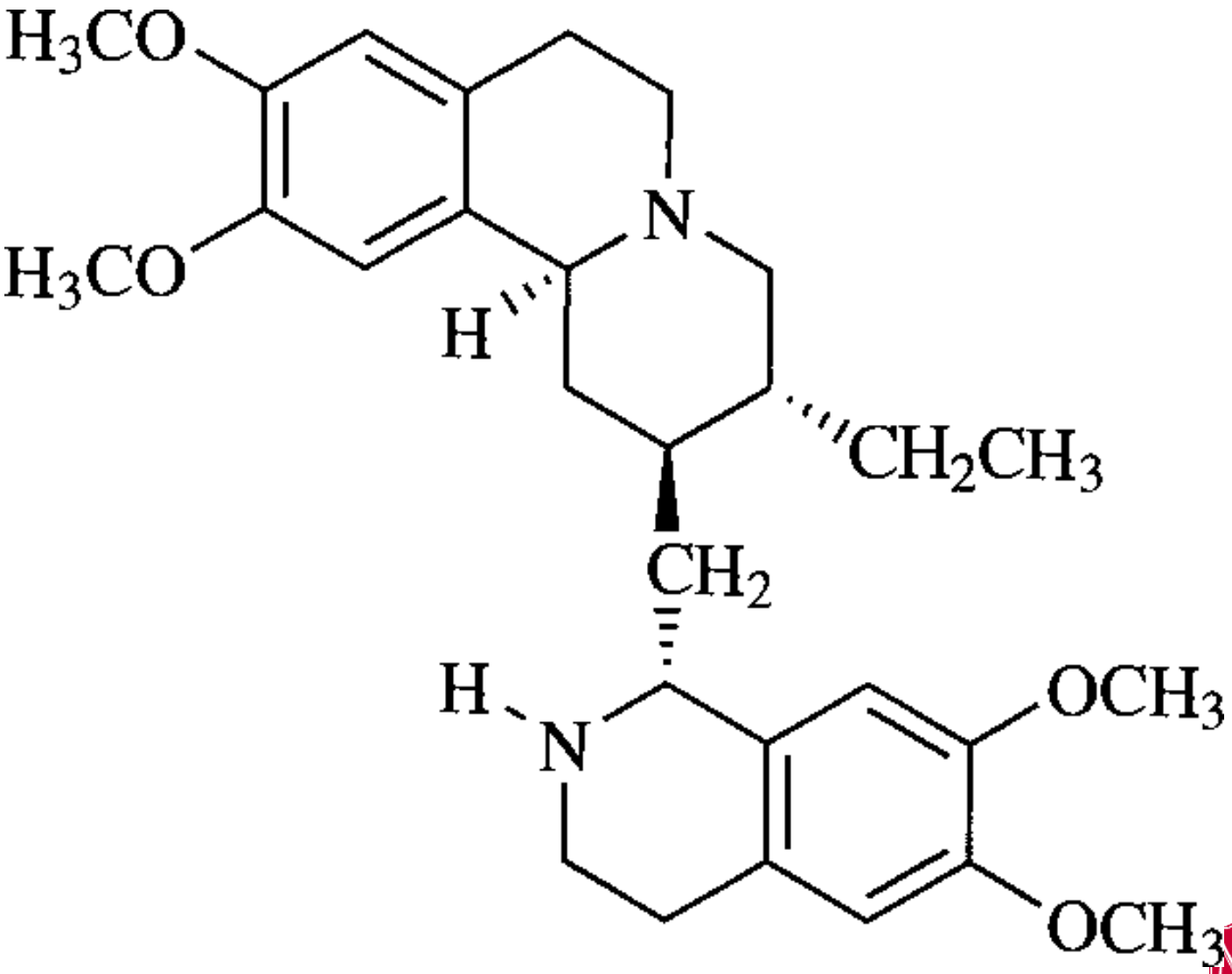
Minot State UNIVERSITY

Ipecac, *Cephaelis* (Psychotria) spp., Rubiaceae, Central America

- *Ipecacuanhae radix*
- Ioquinoline alkaloids as emetine
- Has both mucolytic and emetic effects (frequently used as anti-toxic)

Ipecac

Emetine



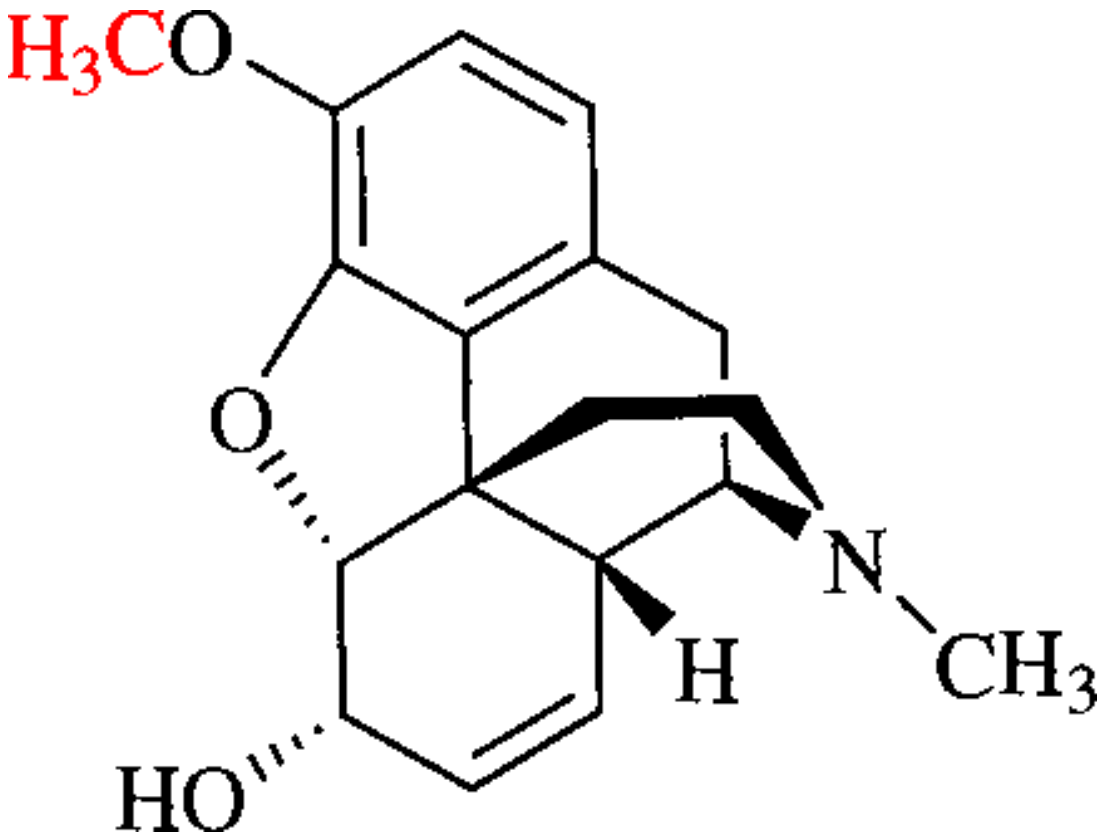
Cough

- Normally a symptom of other diseases
- Suppression of brain nervous centers will reduce the cough

Opium poppy, *Papaver somniferum*, Papaveraceae, Asia

- Contain alkaloids codeine and morphine
- Codeine is toxic in large doses because of respiratory depression effect
- Morphine causes strong addiction and painful withdrawal syndrome
- Opioids mimic endogenous opioids: endorphins, enkephalins, dynorphins neurotransmitters

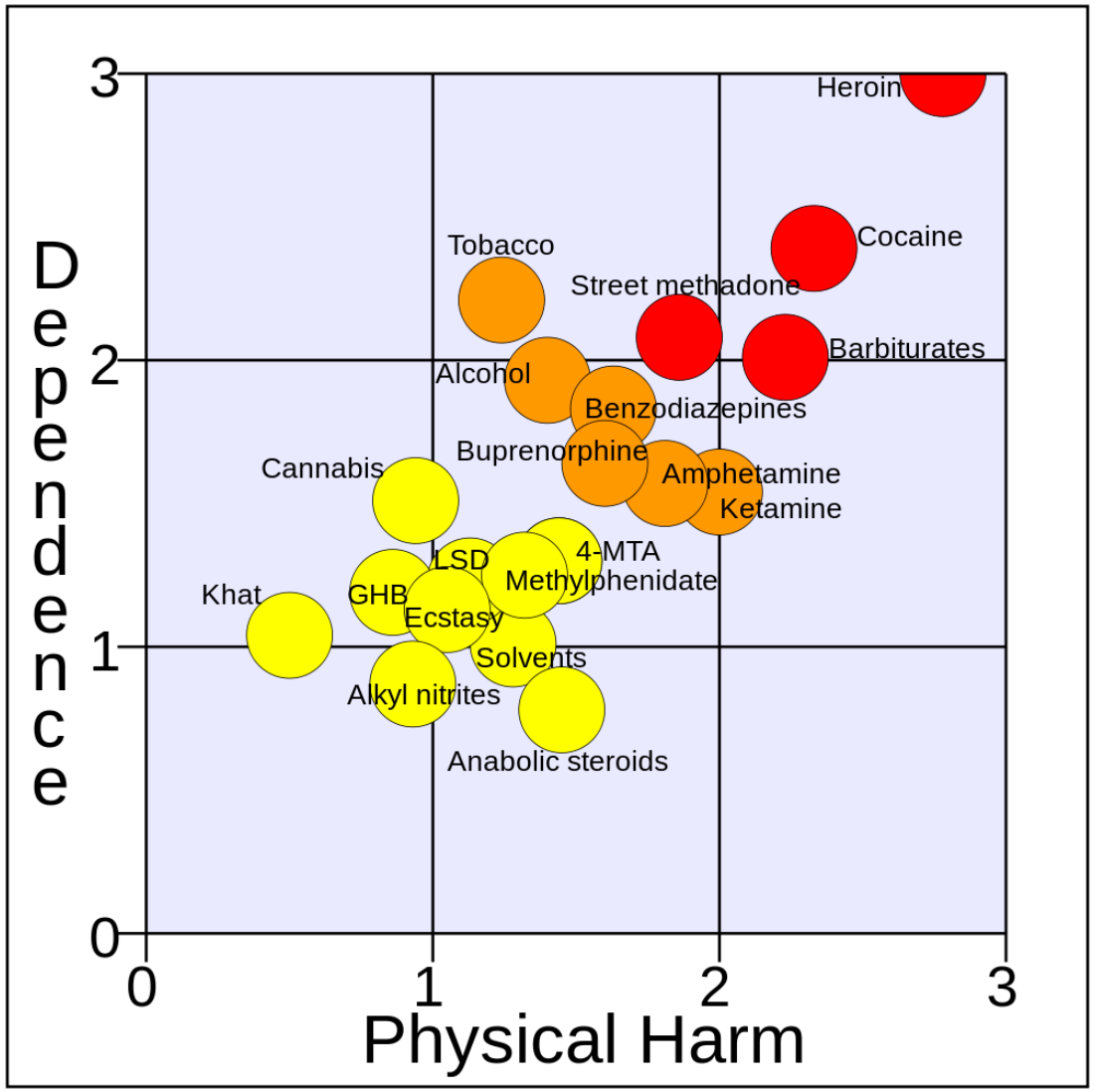
Codeine and morphine



Stimulants and narcotics

- Most of them substitute natural synaptic neurotransmitters
- Withdrawal syndrome is due to flexibility of our biosynthesis

From Nutt et al. (2007) in ”Lancet”

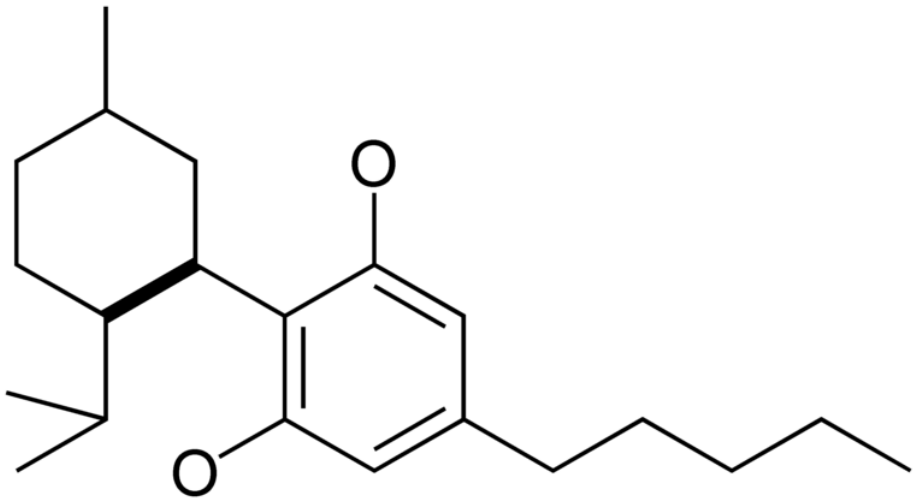


Cannabis, *Cannabis sativa*, Cannabaceae, South Asia

- Annual or perennial herb
- Leaves contain unique family of terpeno-phenolic compounds called cannabinoids (some psychoactive like THC, tetrahydrocannabinol; some are not like CBD, cannabidiols)
- THC is known to activate protein-coupled cannabinoid receptors I and 2 (CB_1, CB_2)
- Cannabinoids mimic endocannabinoids which acts as retro-neurotransmitters which go backward in synapse and terminate release of “normal” neurotransmitters

Cannabis

CBD, cannabidiol

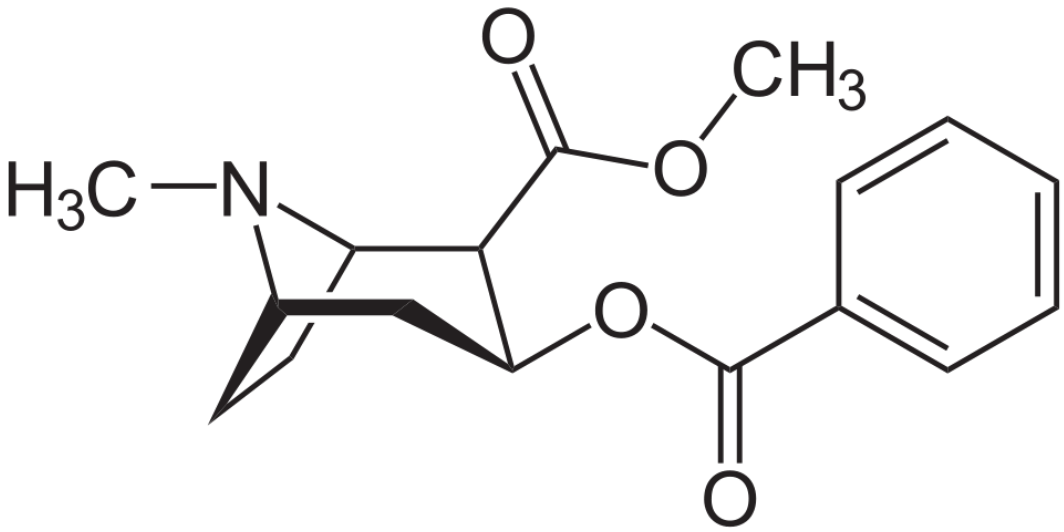


Coca, *Erythroxylon coca*, Erythroxylaceae, South America

- Andean evergreen shrub
- Contains cocaine, anesthetic and strong stimulant narcotic
- Cocaine blocks the dopamine transporter protein

Coca

Cocaine

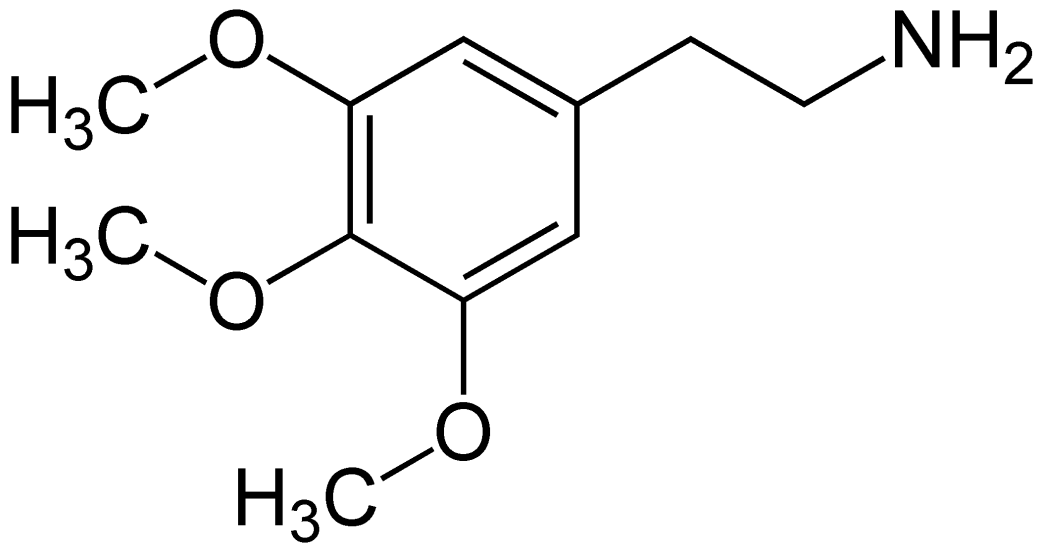


Peyote cactus, *Lophophora williamsii*, Cactaceae, Mexico

- Cactus plant containing mescaline, LSD/psilocybin group hallucinogen narcotic
- Agonist of serotonin 5-HT2A receptor

Lophophora

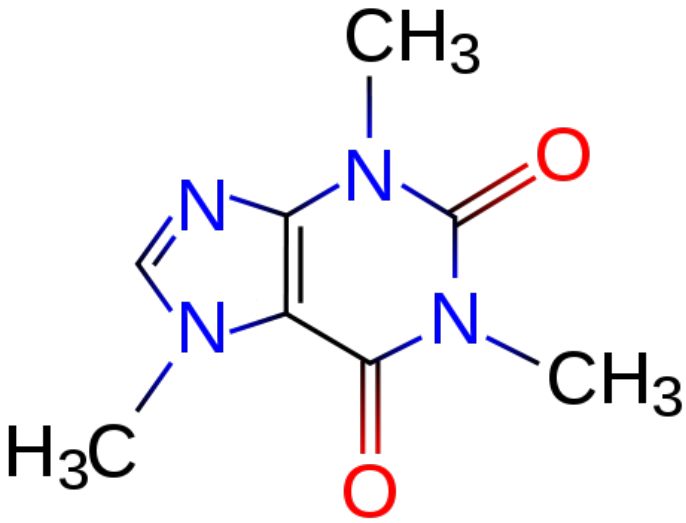
Mescaline



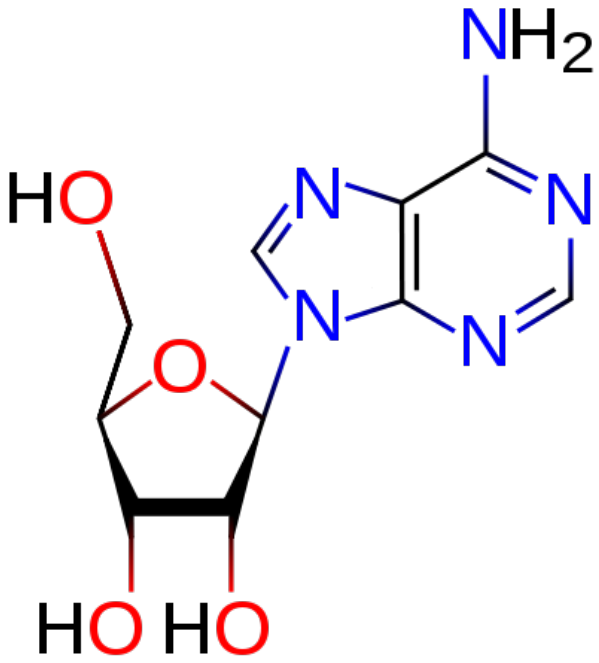
Cola, *Cola* spp., Malvaceae, West Africa

- *Colae semen*
- Tropical tree, seeds contain caffeine and kolanins
- Caffeine is antagonist of adenosine inhibitory receptors and natural insecticide

Cola



Caffeine



Adenosine

Caffeinated spiders make wrong webs

Tea, *Camellia sinensis*, Theaceae, East Asia

- Small evergreen shrub
- Native to China, cultivated there from 2500 BC

Tea

Tea facts

- Young leaves and buds are mostly used
- There are fermented (black, pu-ehr, up to 3% of caffeine!) and non-fermented (green) teas
- All contain caffeine and small amounts of theobromine and theophylline

Coffee, *Coffea arabica*, Rubiaceae, East Africa

- Small evergreen tree with regular growth
- Native to Ethiopia, was a local Yemen culture until XVIII century

Coffee

Coffee facts

- Seeds contain up to 2.5% of caffeine
- Most of aromatic compounds (caffeol) are activated when frying

Cocoa, *Theobroma cacao*, Malvaceae, South America

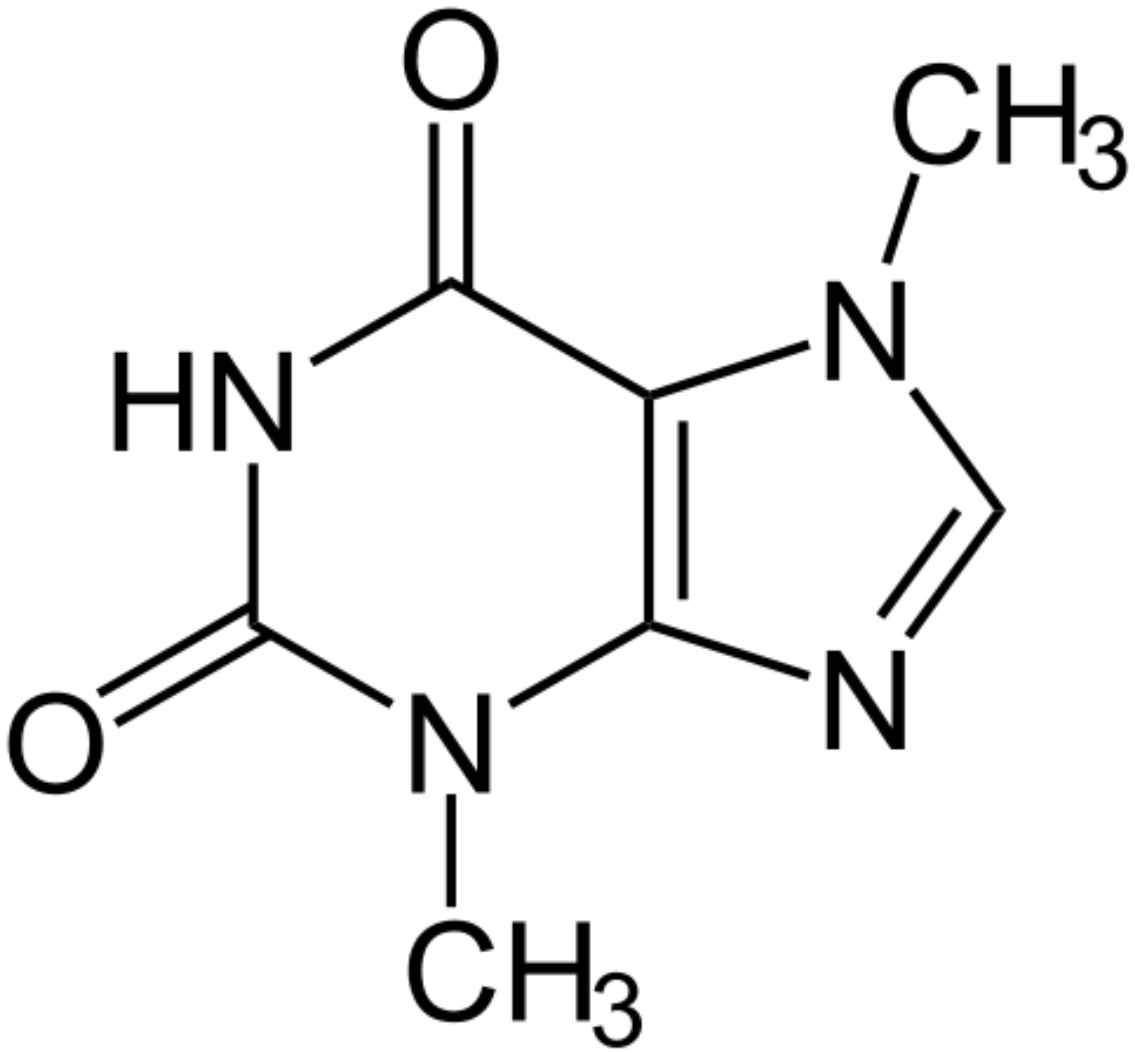
- Evergreen small tree with cauliflory
- Cocoa beans are large fruits which go to cocoa, chocolate and oil production

Cocoa

Cocoa facts

- Fermented and fried seeds contain 2% of theobromine
- Phosphodiesterase inhibitor which raises intracellular cAMP
- 43% of world cocoa come from Côte d'Ivoire

Theobromine



Yerba mate, *Ilex paraguariensis*, Aquifoliaceae, South America

- Evergreen shrub from semi-deserts of South America
- Leaves contain up to 2% of caffeine
- Anti-cancer and cancer effects were both stated

Mate

Yerba mate

Guarana, *Paulinia* spp., Sapindaceae, South America

- Tropical shrub with pinnate leaves; seed powder is used as a drink
- Extremely high in caffeine (up to 6%), actually caffeine old name was “guaranine”

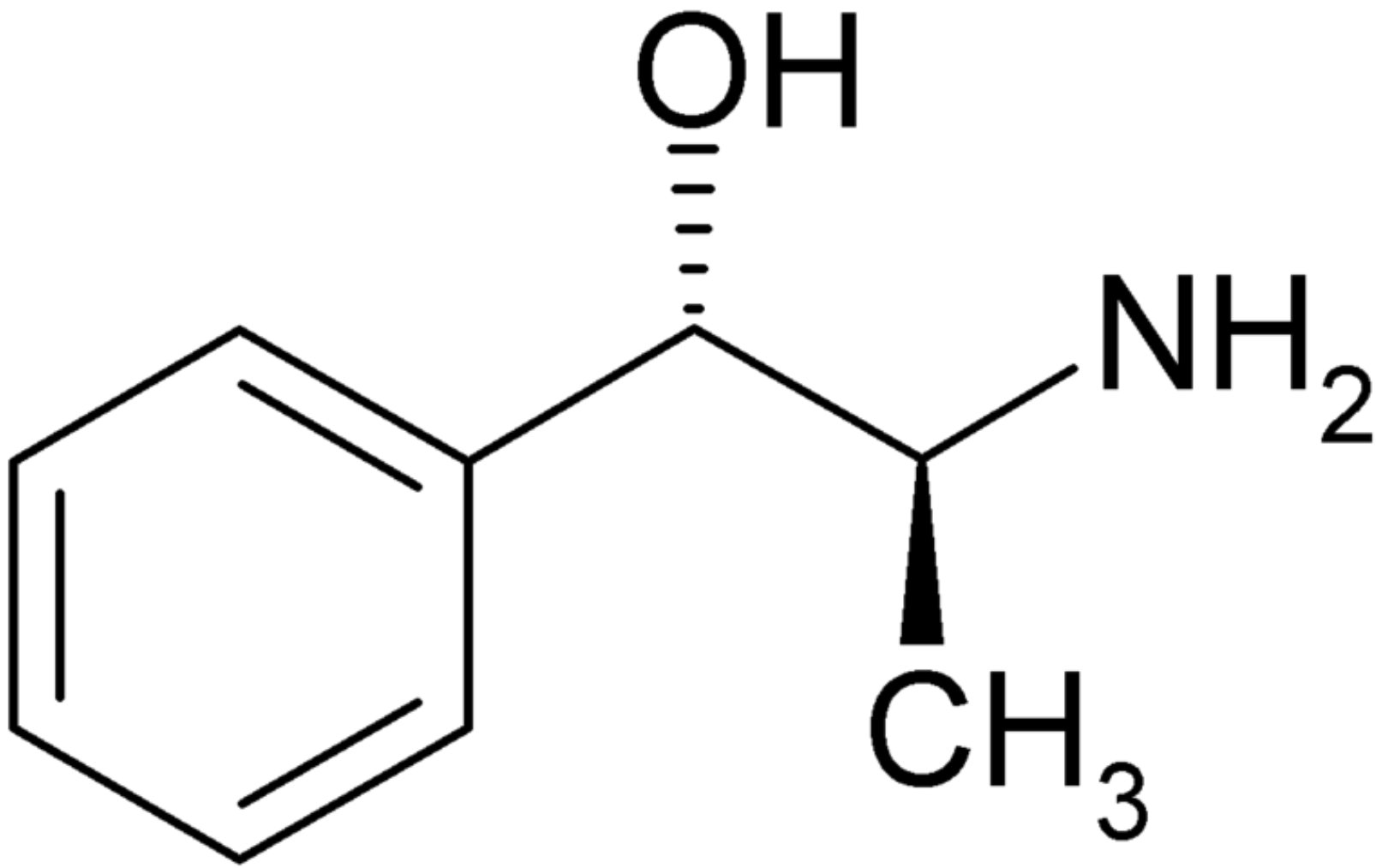
Guarana

Khat, *Catha edulis*, Celastraceae, East Africa

- Evergreen shrub ecologically similar to coffee
- Leaves contain cathine (pseudonorephedrine), agonist of noardrenaline receptors, which mild psychoactive effects

Khat

Cathine

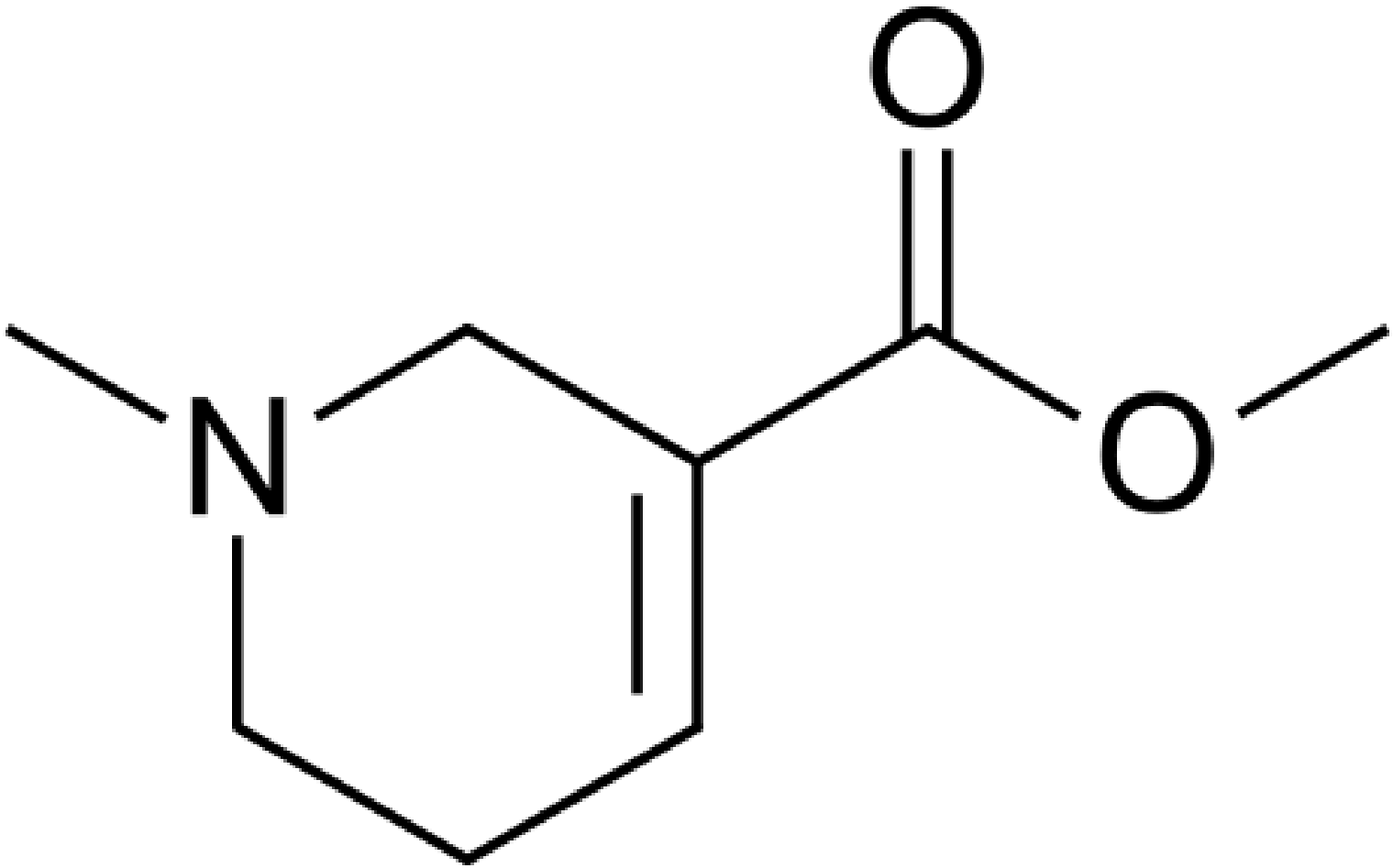


Areca nut, *Areca catechu*, Palmae, Southeast Asia

- Nuts are chewed with betle pepper (*Piper betle*, Piperaceae) leaves and slaked lime ($Ca(OH)_2$)
- Chemical reaction will free arecoline alkaloid (similar to nicotine), agonist of acetylcholine receptors

Areca nut vendor (Hainan, China)

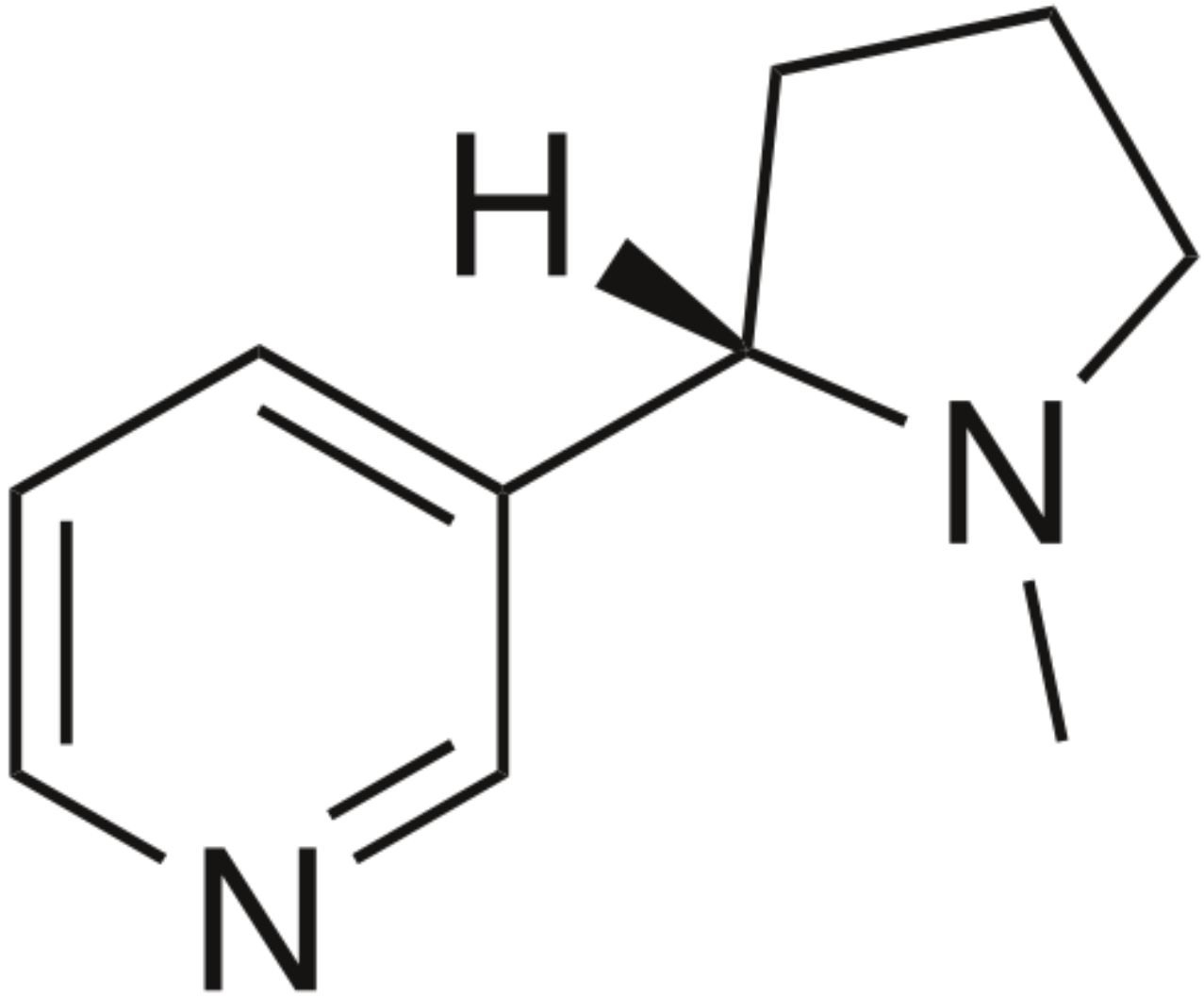
Arecoline



Tobacco, *Nicotiana tabacum*, Solanaceae, Central America

- Perennial herb with large glanduliferous leaves
- Contain alkaloid nicotine binding to acetylcholine receptors and (among other effects) increases the level of brain dopamine
- Nicotine is a also a well-known natural insecticide

Nicotine

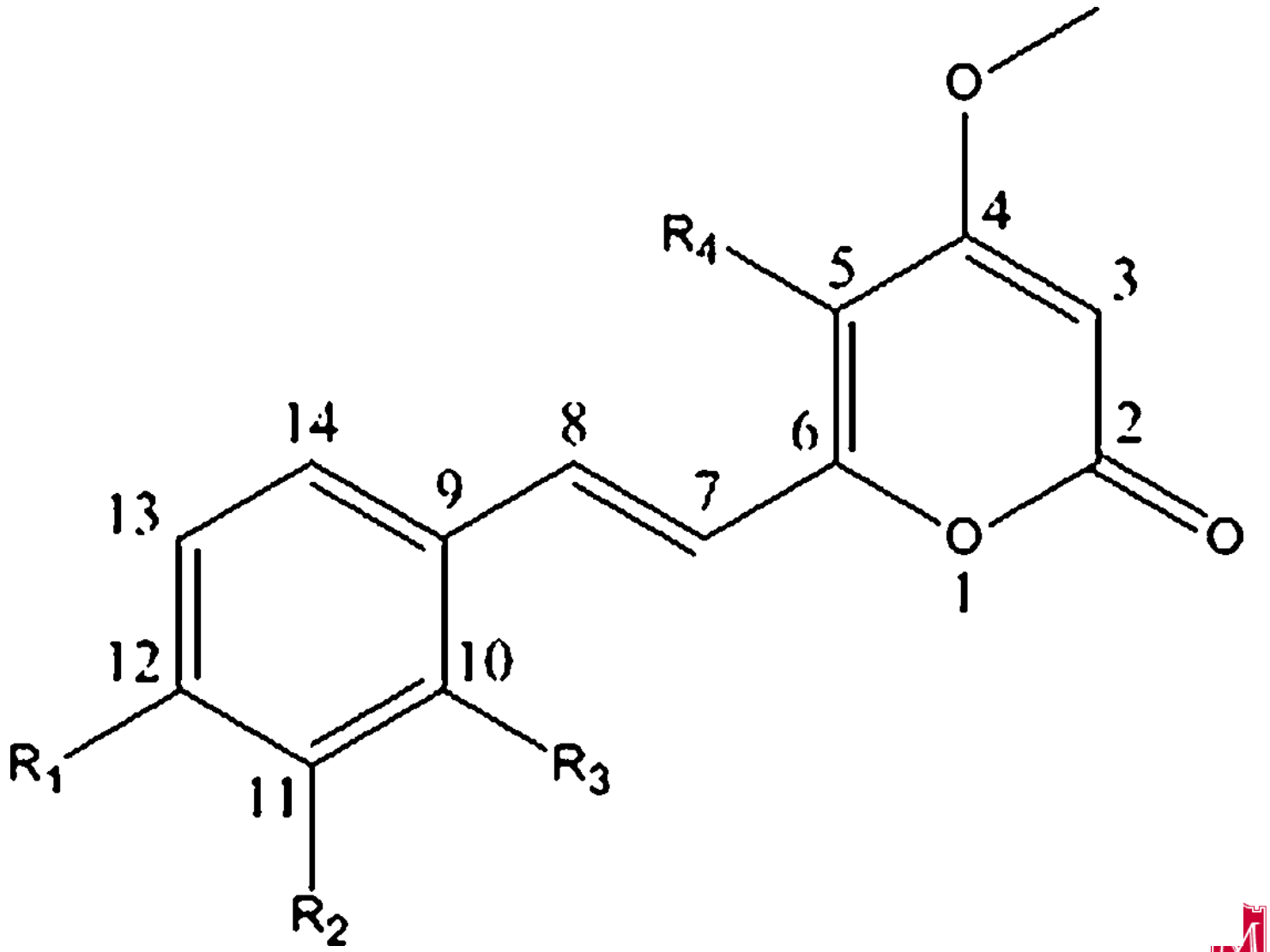


Kava, *Piper methysticum*, Piperaceae, Pacific

- Small shrub, roots are used to prepare sedative drink
- Active components are kavactones, stimulate inhibitory γ-aminobutyric GABA receptors

Kava

Kavactone

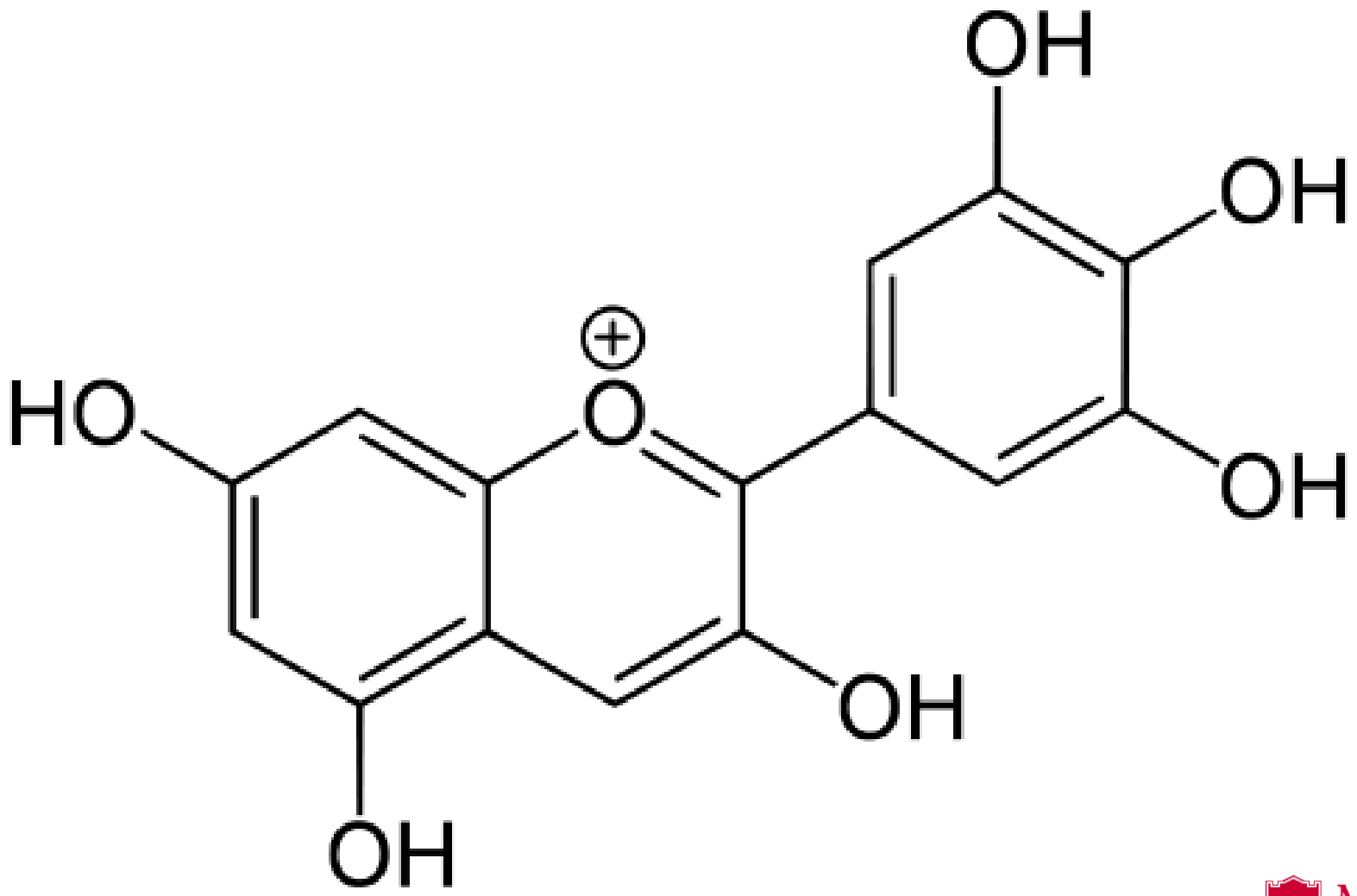


Hibiscus tea, *Hibiscus sabdariffa*, Malvaceae, Mediterranean

- Flower calyces (sepals) are dried and boiled
- Contain flavonoids (e.g., anthocyanin deplhinidin) and organic acids with multiple medicinal effects, e.g., lowering blood pressure

Hibiscus tea plant

Delphinidin anthocyanide



Rooibos tea, *Aspalathus linearis*, Leguminosae, South Africa

- Small shrub of Cape province
- Leaves contain high level of antioxidants such as aspalathin and nothofagin, fermented similarly to tea or yerba mate

Rooibos

Summary

- Most of stimulant narcotics are analogs of neurotransmitters

For Further Reading

A. Shipunov.
Ethnobotany [Electronic resource]. 2011—onwards.
Mode of access:
http://ashipunov.info/shipunov/school/biol_310

M. Heinrich and others.
Fundamentals of pharmacognosy amd phytotherapy (selected chapters). [Electronic resource].
Churchhill Livingstone, 2004.
Mode of access: http://ashipunov.info/shipunov/school/biol_310/heinrich2004_fund_pharm_part.djvu
Chapter 16.

Minot State UNIVERSITY