

Ethnobotany

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Lecture 14

Outline

- 1 Centers of cultivated plants origin
- 2 Legumes
 - Soya beans, soybeans, *Glycine max*
 - Beans (*Phaseolus vulgaris*)
 - Pea (*Pisum sativum*)

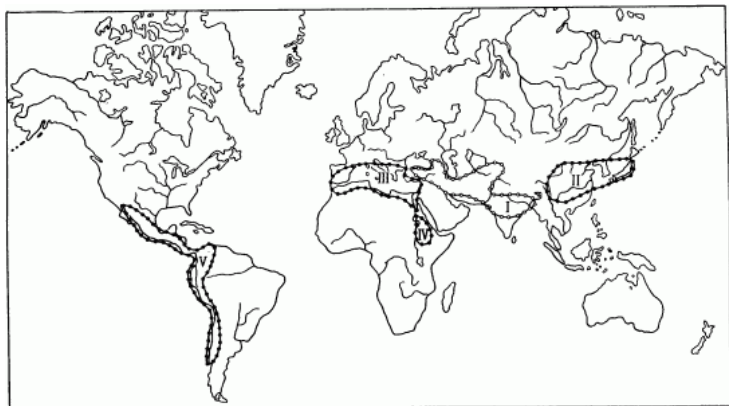
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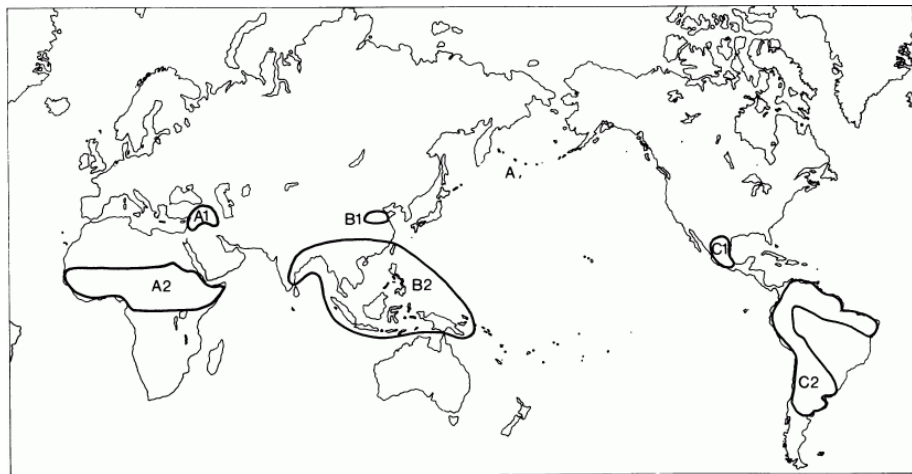
Why knowing centers of origin is important

- Allows to trace history of civilizations alongside with history of plant cultivation
- Allows for historical discoveries
- Helps to find new landraces and wild relatives useful for selection

Five Vavilov's centers



Harlan's (1971) centers of agricultural beginnings



West Asian center (A1)

- Xerophytes, plants relatively small, stiff stems and leaves, drought-tolerant
- Some wheats, two-rowed barley, oats, lentils
- Ancient Egypt and Mesopotamia

Indian center (B2)

- Xerophytes, small leaves, rapid development and filling-out of seeds, small seeds, extremely susceptible to European fungal and bacterial diseases
- Some wheats, six-rowed barley, finger millet, chickpea
- Ancient Indus Valley Civilization

African/Ethiopian center (A2)

- Adapted to poor soils, starting to grow in the beginning or in the end of rain season
- Fonio, tef, sorghum, pearl millet
- Ancient African civilizations: Aksum, Yoruba, Benin

China center (B1)

- Mesophytes and even hydrophytes, short development, small and medium-sized seeds, relatively big leaves
- Rice, soybeans
- Ancient Chinese kingdoms

Central American center (C1)

- Xerophytes and mesophytes, slow growing, big seeds, drought- and hot-tolerant
- Corn, common bean, sweet potatoes
- Ancient Aztec and Mayan empires

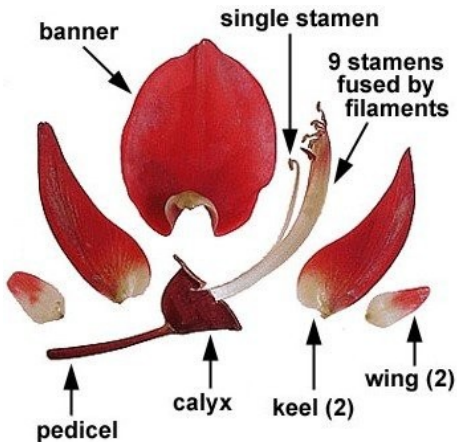
South American center (C2)

- Mesophytes, many are tolerant to low temperatures, big leaves, developed underground parts
- Cassava, potatoes, oca etc.
- Ancient Andean civilization

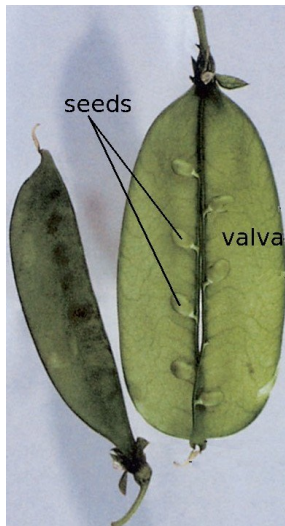
Main characteristics of legumes

- One of the biggest plant families, more than 15,000 species
- Two most important characters: monosymmetric flowers with banner and keel; and monomerous legume fruit
- Nitrogen-fixing bacteria form root nodules (for cultivation, there are special *nitragines*)
- Consequently, all parts of legumes are rich of proteins, 2–4 times more than in cereals

Monosymmetric flower of legumes



Legume: the fruit of Leguminosae



Root nodules



Legumes

Soya beans, soybeans, Glycine max

Soya beans, *Glycine max*

- The most cultivated legume
- Seeds contain 42% of proteins including essential amino acids lysine, methionine and tryptophan; plus 20% of non-saturated oils
- Nearly universal culture: used as food, as technical culture, as oil culture and for the forage

Soya flowers



Soya features

- Cultivated mostly to the south from 50° latitude
- Nitrogen assimilation is slow at the beginning of season and reach the pike when plants start to flower
- Yield is \approx 2 ton/hectare
- Main producer is United States, than Brazil

Soya agriculture

- Requires warm, wet and shiny climates; tolerates small frosts
- Easily grow on different soils but needs crop rotation
- Relatively fast growing: 120–150 days
- The biggest problem is harvesting: early harvesting leads to decaying of seeds whereas late harvesting results in legume cracking

Soya beans



Soya history

- Prehistoric crop in East Asia (B1)
- Introduced in Europe and North America about the end of XVIII century
- In U.S., considered as technical and did not used for food until late 1920s

Legumes

Beans (*Phaseolus vulgaris*)

Beans (*Phaseolus vulgaris*)

- The second most cultivated legume
- “Beans” is the name of multiple cultivated legumes (more than 10 genera), but in strict sense, there are common beans, *Phaseolus vulgaris* and similar species
- Seeds are rich of carbohydrates and proteins
- Green legumes are also used as vegetables

Beans features

- Herbaceous annual vines with deep roots
- High diversity of cultivars
- Beans should be cooked for at least 10 min at 100° C to destroy weakly poisonous *phytohaemagglutinins*

Beans



Diversity of common beans



- Navy beans (*Phaseolus vulgaris*, multiple cultivars)
- Lima beans (*Phaseolus lunatus*)
- kidney beans (*Phaseolus vulgaris* cv. 'Red Kidney')
- Pinto beans (*Phaseolus vulgaris* cv. 'Pinto')
and many others...

Beans agriculture

- Extremely heat tolerant, requires average watering
- Does not grow well in colder climates
- Require short days; soil type is not critical
- Often cultivated inside mixed crops (with corn, rice, safflower)

Beans history

- Native culture of Central America and Mexico (C1); important plant for Aztec civilization
- Spread around the world in XIX century
- Top producers now are Brazil and India

Legumes

Pea (*Pisum sativum*)

Pea (*Pisum sativum*)

- Old culture of Old World, one of most hardy legumes
- Food and forage plant
- Seeds are high of carbohydrates (14%, and 1/3 of them are sugars) and proteins (5%)

Pea flowers



Pea features

- Annual herb which is able to climb up to 2 m with tendrils
- Comparing with other legumes, has an extremely short vegetation period, from 65 days (!)
- The northern line of cultivation is 68° latitude
- Long-day culture, also requires wet soils

Pea history

- Domesticated prehistorically in West Asia (A1); wild landraces of same species are still exist
- Spread to both Western Europe and Eastern Asia (common culture in Japan)
- Self-pollinated, and became a famous model plant of first genetic experiments made by Gregor Mendel

Summary

- Legumes are rich of proteins including essential amino-acids
- They mostly require humid climates and do not need specific soils

For Further Reading



A. Shipunov.

Ethnobotany [Electronic resource].

2011—onwards.

Mode of access:

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



P. M. Zhukovskij.

Cultivated plants and their wild relatives [Electronic resource].

Commonwealth Agricultural Bureaux, 1962. Abridged translation from Russian.

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http://ashipunov.info/shipunov/school/biol_310/zhukovskij1962_cultivated_plants.pdf.