Ethnobotany. Lecture 4

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Outline

1. Lesser C_3 grasses
   - Indian rice, Zizania
   - Digitaria exilis, fonio
   - Eragrostis tef, tef
2. C_4 grasses
   - Zea mays, corn
   - Sorghum
   - Pearl millet, Pennisetum
   - Finger millet, dagusa, Eleusine
   - Common, or proso millet, Panicum

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Indian rice, *Zizania*

- Small (3 species) genus of water grasses distributed in East Asia and North America
- Big (up to 1.5 m), partly submerged grasses with unisexual flowers
- Inflorescences are panicles
- Has a long grains

Zizania aquatica, or manoomin

- Only one species was used by Native Americans
- Odjibwe name “manoomin”, Dakota name “psi”
- Half-cultivated (supported but not planted)
- Stems tied (precaution against birds), then harvested from canoe

Ricing 1

Ricing 2

Ricing 3

Ricing 4

Ricing 5

Ricing 6

Digitaria exilis, fonio

- Main crop of West Africa
- The only cultivated species of big ($\approx$ 300 species) genus *Digitaria*
- Low, heavily branched grasses
- Grains are extremely small (2–3 mm); however, the yield is comparable with primitive wheats

Fonio agriculture

- Well adapted to short days, hight temperatures and low precipitation
- Need only surface development of soil, planted by scattering
- Manual harvesting and threshing

Fonio

Fonio threshing

Eragrostis tef, tef

- One of the main cultures of East Africa
- Used for making bread
- Small, branching plants with small spikelets and grains
- Grains are rich of iron (used also for medical purposed, for treating anemia)
- Well adapted to high altitudes

Tef

Tef grains

Zea mays, corn

- The most important world grain (after wheat and rice)
- Mostly tropical, subtropical and warm temperate culture
- U.S. is a main corn producer (almost 50% of world production)
- Has a high yield: up to 8 tons/hectare
- Grains are rich of proteins (up to 20%) and oil (4–8%)
- Using for bread-like products, for making starch, sugar, as a forage plant, for making different secondary production (coal, ethanol, paper)

Zea mays morphology and taxonomy

- Unique grass, the sole member of genus *Zea*
- High (up to 6 m) annual with relatively small root system
- Has a highly modified inflorescences: terminal male are panicles whereas axillare female inflorescences have inflated axis and densely packed flowers
- Female flowers have extremely long styles (sometimes $\approx$ 1 m)
- Cross-pollinated
- Caryopsis big, round-shaped, with soft or glossy endosperm

Zea mays diversity

- Four most common varietes:
- var. *microsperma*: small grains and corns, endosperm has two layers and used for popcorn
- var. *amylacea*: grains a rich of starch
- var. *dentiformis*: 70% of cultivated corn
- var. *saccharata*: rich of sugars, used for canned corn

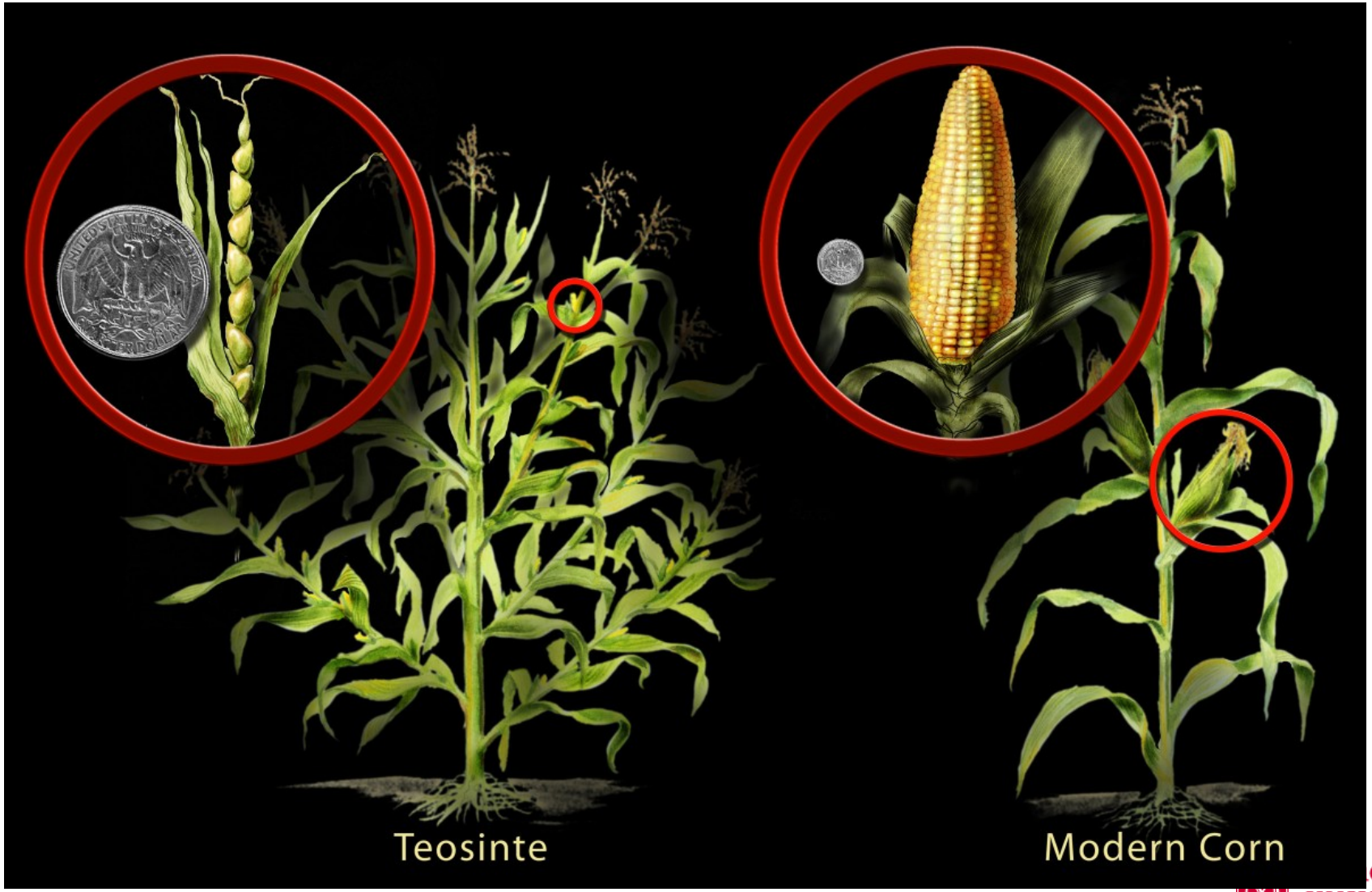
Zea mays agriculture

- Optimal temperatures are 25–30° C
- Needs a constant water supply and rich (especially with nitrogen and phosphorous) soil
- Most effective with crop rotation
- Likes short days, vegetation period up to 200 days

Zea mays origin

- No close relatives exist (!)
- Two related genera are *Teosinte* (teosinte) and *Tripsacum* (gama grass) which could cross with corn
- Most probably, wild ancestor became extinct $\approx$ 5,000 years ago

Corn and teosinte



Teosinte

Tripsacum

Zea mays history

- First remains from Mexico dated 3,400 years BC
- Most probably domestication started in Mexico and Central America independently
- All varietes already exist in pre-Colombian era, corn became widely cultivated from Canada to southern South America
- In 1492, Columbus wrote first notes about corn cultivation
- From XVI century, cultivation started in Africa, than in Europe and finally in Asia

Sorghum, sorghum

- More than 30 species, many of them are cultivated
- Ancient culture (3,000 BC), started in Africa
- Now cultivated mostly in Asia and Africa, preferably in most dry and hot places
- Yield is around 3 tons/hectare

Sorghum morphology and agriculture

- Tall (up to 1.5 m) grasses
- Inflorescences are dense panicles
- Small grains
- Requires high temperatures and short days
- Drought-tolerant, allows most kinds of soils
- Long growth period: 200 or more days
- Came to Asia $\approx$ 2,000 years ago, but cultivated in Europe and U.S. only for last 100 years

Sorghum diversity

- *Sorghum bicolor*—grain sorghum, Africa
- *Sorghum durra*—white sorghum, India
- *Sorghum chinensis*—red sorghum, or gao liang, China

Sorghum

Gao liang

Pearl millet, *Pennisetum*

- One cultivated African species, *Pennisetum glaucum*
- Forage and cereal culture, mostly in Africa and Asia
- Tall plant with compact cylindric panicle
- Undemanding culture, requires only warm temperatures and short days

Pearl millet

Finger millet, dagusa, *Eleusine coracana*

- Indian ancient crop (now cultivated also in Africa), sole species of genus
- Used as cereal
- Yield is comparable with wheat (2 ton/hectare)
- Requires aerated, humid soils and short days
- Resistant to fungal and bacterial diseases

Finger millet

Common, or proso millet, *Panicum miliaceum*

- Initially, ancient Chinese culture (2,500 BC)
- Grains are rich of proteins (14%)
- Requires short days but also has short cultivation time therefore cultivated up to 56° latitude
- Now cultivated mostly in East Europe, in U.S. only as a birdseed

Proso millet

Summary

- Wild, or Indian rice was the only grain used widely in northern tribes
- C_4 grasses are mostly ancient American (corn) or African (sorghum) cultures

For Further Reading

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

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