

Ethnobotany. Lecture 7

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Outline

- 1 Questions and answers
 - Lab 2
- 2 Main food source plants: grains
 - Rice, *Oryza sativa*
- 3 Lesser C₃ grasses
 - Indian rice, *Zizania*
 - *Digitaria exilis*, fonio
 - *Eragrostis tef*, tef
- 4 C₄ grains
 - *Zea mays*, corn



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Questions and answers

Lab 2



Lab 2: most important notes

- Compound leaves vs. stem with simple leaves
- Roots vs. underground stems (rhizomes *etc.*)



Main food source plants: grains

Rice, *Oryza sativa*



Rice features

- High calories (360 cal / 100 g), up to 10% of proteins, including lysine amino acid (!)
- White (polished) rice does not contain embryo and therefore deficient of many vitamins; beriberi disease is a deficiency of vitamin B₁ (thiamine) originated in richer families of Indonesia (because they were wealthy enough to buy a “better” rice)
- Rice is not used for bread, if cooked it become extremely brittle
- Yield is higher than wheat, ≈ 6 ton/hectare
- Rice is a coastal plant, requiring water, especially when young; seedlings are often manually planted in the soil covered with water
- Ancestrally, rice requires monsoon climate: first season is wet (rice germinates), second is dry (rice matures)



Rice taxonomy

- 28 species, only one is widely cultivated: *Oryza sativa*, common rice
- Several main varieties, including Japanese (short-grain) and Indian (long-grain) rice. Japanese variety has sticking (high proteins) and non-sticking forms.



Rice origin and history

- First remains (Thailand) are 7,000 BC; mass cultivation started in East Asia 4–5,000 BC
- Most probably, perennial *Oryza perennis* is a wild relative of cultivated rice
- Came to Europe with Arabs in first millennium
- From 1865, is cultivated in U.S. (first plantations in North Carolina)
- After the “Green Revolution” in 1960s, genetically modified rice cultivars allow to finish hunger in India and China



Rice agriculture

- Seeds are germinated in nurseries
- After several weeks, seedling are transplanted (often manually) to flooded fields
- Water should be removed after 1–2 month from transplanting
- There are also “mountain” rice which does not require flooding (but its yield is less)



Common rice, *Oryza sativa*



Rice flower



Ancestor of rice, *Oryza perennis*



Lesser C₃ grasses

Indian rice, *Zizania*



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
- 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, step 1



Ricing, step 2



Ricing, step 3



Ricing, step 4



Ricing, step 5: threshing



Ricing, step 6



Lesser C₃ grasses

Digitaria exilis, fonio



Digitaria exilis, fonio

- Main crop of West Africa
- The only cultivated species of big (≈ 300 species) genus *Digitaria*
- Low, heavily branched grasses
- Grains are extremely small (2–3 mm); however, the yield is comparable with primitive wheats (0.6–1 ton/ha)



Fonio agriculture

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



Fonio



Fonio threshing



Fonio grains



Lesser C₃ grasses

Eragrostis tef, tef



Eragrostis tef, or 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
- Yield is comparable with rye (≈ 1 ton/ha)



Tef



Tef grains



C₄ grains

Zea mays, corn



Zea mays, corn, maize

- 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 axillary female inflorescences have inflated axis and densely packed flowers
- Female flowers have extremely long styles (sometimes ≈ 1 m)
- Cross-pollinated
- Caryopsis big, round-shaped, with soft or glossy endosperm



Zea mays diversity

- Four most common varieties:
- var. *microsperma*: small grains and cobs, endosperm has two layers and used for popcorn
- var. *amylacea*: grains are rich in starch
- var. *dentiformis*: 70% of cultivated corn
- var. *saccharata*: rich in 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



Summary

- **Rice** is the old culture with extremely complicated agriculture but high yield
- Wild, or Indian rice was the only grain used widely in northern tribes
- Both fonio and tef are old African cultures with the relatively low yields



For Further Reading



P. Stamp.

Virtual cereal cultivar garden [Electronic resource].

2008.

Mode of access:

<http://www.sortengarten.ethz.ch/?content=start>



A. Shipunov.

Ethnobotany [Electronic resource].

2011—onwards.

Mode of access:

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

