

Ethnobotany. Lecture 6

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Outline

- 1 Main food source plants: grains
 - Barley
 - Oat
 - “European” grains: summary
 - Rice



Herbarium collection movie



Main food source plants: grains Barley



Barley, *Hordeum*

- Belongs to the same tribe Triticeae
- Plant of multiple use: as bread (rarely), as a cereal, for making beer, as a forage plant
- Old West Asian culture, now cultivated mostly in temperate regions of North Hemisphere



Barley features

- Grains are not fully appropriate for bread, they have too high amount of proteins ($> 7\%$), resulted in bread which is crumbling too much
- Hardy plant, survives easily in winter (there are many winter cultivars), has extremely fast life cycle and therefore cultivated on high altitudes in mountain areas (as Tibet)



Barley taxonomy

- Almost 40 species, only two are widely cultivated
- *Hordeum distichon*, two-rowed barley, is cultivated mostly for beer production; spike has two rows of spikelets
- *Hordeum vulgare*, six-rowed barley, cultivated for multiple purposes; six rows of spikelets
- These species are sometimes treated as one



Hordeum distichon, two-rowed barley

- Old culture (7,000 BC) from West Asia and Egypt, originated from wild *Hordeum spontaneum*
- Annual, with flat spikes
- Only spring forms
- Now cultivated mostly in West and Middle Asia and Europe



Hordeum vulgare, six-rowed barley

- Newer culture, 4–5,000 BC, originated from East Asia
- China and Japan are still centers of diversity (and probably, centers of origin)
- Goes very high on mountains, up to 6,000 m above sea level
- Widely cultivated, the yield is comparable to the contemporary wheats (≈ 2 ton/ha)
- Unfortunately, sensitive to drowning and to fungal diseases, especially to powdery mildew (*Erysiphe* spp.)



Role in brewing

- For brewing, barley grains are malted: germinated by soaking in water and then sharply drying by hot air
- Consequently, enzymes started to modify starch into mono- and disaccharides, such as fructose, glucose, sucrose and maltose
- These saccharides are used for making wort (mixture of malted barley with water); wort is then fermented with brewer yeasts (*Saccharomyces cerevisiae* fungus)



Two-rowed barley, *Hordeum distichon*



Six-rowed barley, *Hordeum vulgare*



Ancestor of barley, *Hordeum spontaneum*



Main food source plants: grains Oat



Oat (*Avena*)

- Belongs to different tribe, Aveneae
- Morphology is also different: oats have branched inflorescence, panicle
- Several species in cultivation, as a forage plants (especially for horses) and as cereals



Oat features

- Hardy culture, cultivated mostly in temperate regions, yield relatively low, is ≈ 1 ton/hectare
- Grains contain high amounts of proteins and lipids
- Mostly spring forms (winter cultivars also exist); life cycle longer than in barley (should be planted earlier in a spring)
- Not sensitive to many fungal diseases



Oat taxonomy

- Several dozens species, only two are widely cultivated
- *Avena byzantina*, red oat, is more hardy and also better adapted to dry climates, has long grains
- *Avena sativa*, common oat, main cultivated oat, has shorter grains



Origin of oats

- Red oat is a domesticated form of wild oat, *Avena sterilis*. Cultivation started with invention of big cavalry armies (\approx 400 BC) of Alexander the Great
- Common oat was the weed of emmer wheat (*Triticum dicoccum*), and became pure culture when crops went northward (similar to rye)



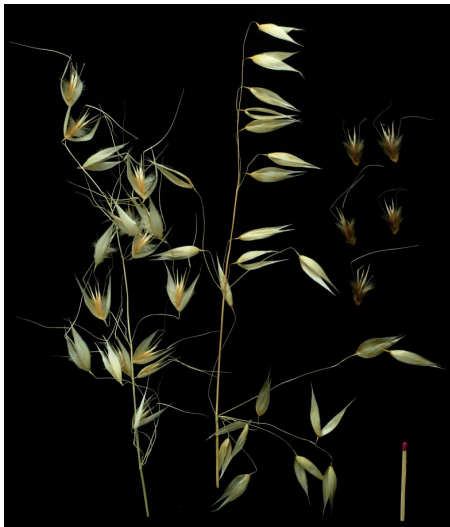
Red oat, *Avena byzantina*



Common oat, *Avena sativa*



Oat ancestor, *Avena sterilis*



Main food source plants: grains

“European” grains: summary



Summary: "European" grains

- Wheats (*Triticum*) are ancient cultivated plants, originated in West Asia
- Tetraploid and hexaploid wheats are intergeneric hybrids
- **Barley** is an ancient culture well adapted to agriculture in mountain regions
- **Rye** and **common oat** were originated from weeds



Main food source plants: grains Rice



Rice (*Oryza sativa*)

- Belong to the tribe Oryzeae
- Has panicle as an inflorescence, flowers with 6 stamens (uncommon in grasses)
- More than half of human population use rice as a main food source
- Cultivated mostly in tropics and subtropics, below 42° latitudes



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 much higher than wheat, \approx 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)



Summary

- **Rice** is the old culture with extremely complicated agriculture but extremely high yield



Summary

- **Barley** is an ancient culture well adapted to agriculture in mountain regions
- **Rye** and **common oat** were originated from weeds



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

