

Hordeum vulgare, barley

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Taxonomy

cellular organisms - Eukaryota - Viridiplantae - Streptophyta - Streptophytina - Embryophyta - Tracheophyta - Euphyllophyta - Spermatophyta - Magnoliophyta - Liliopsida - commelinids - Poales - Poaceae - BEP clade - Pooideae - Triticeae - Hordeum - Hordeum vulgare

Brief facts

- Barley is annual cereal plant grown for livestock fodder and brewing industry. It is the fourth most important cereal in the United States.
- Barley is probably native to Middle East. The first signs of barley cultivation has been recorded from the Middle East

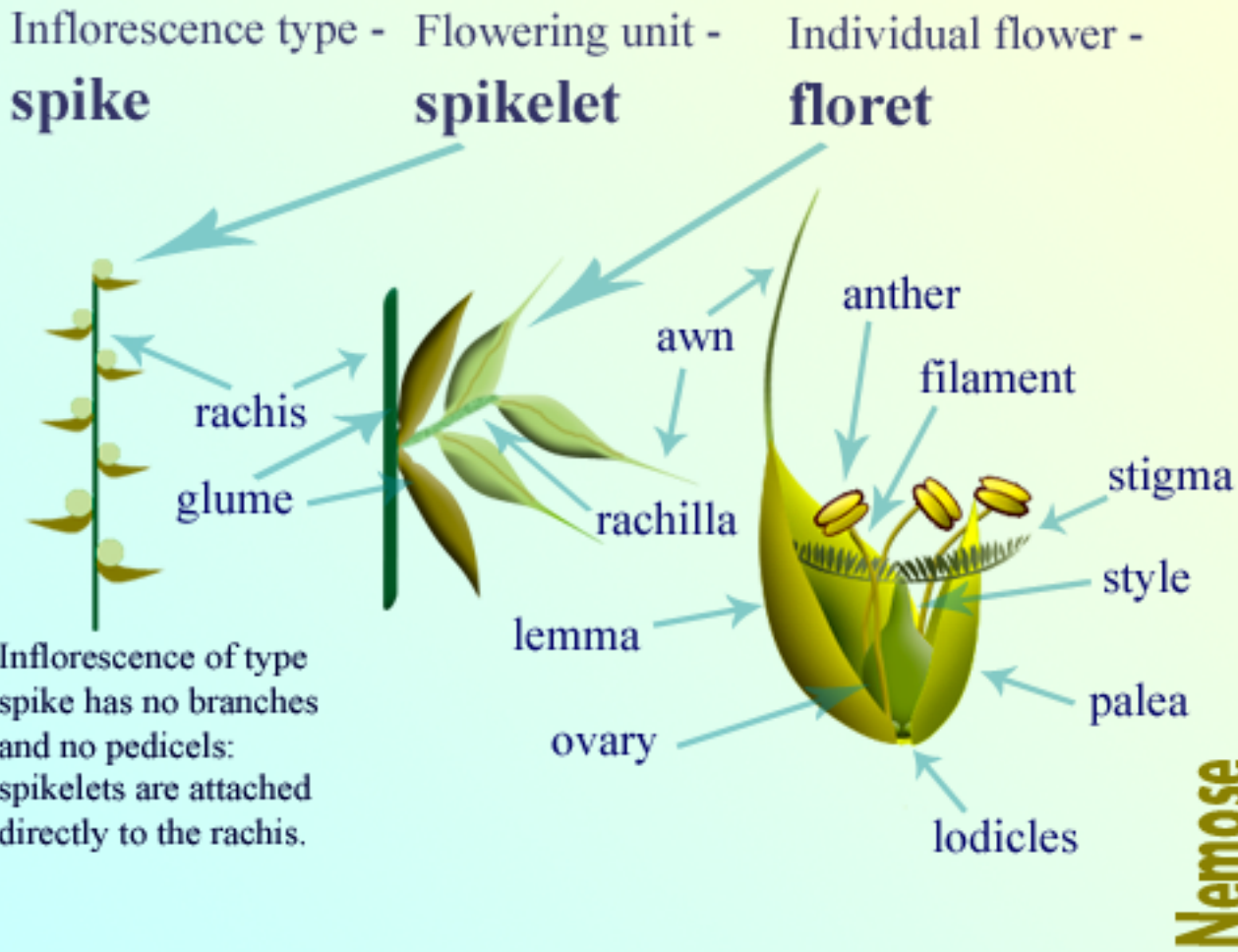
more than 10,000 years ago. Now it is widely cultivated in all temperate regions from Arctic Circle to high mountains in the tropics.

- Wild barley (*Hordeum spontaneum*) is interfertile with domesticated barley (*Hordeum vulgare*) and the two forms are often treated as one species, divided into *Hordeum vulgare subsp. spontaneum* and *Hordeum vulgare subsp. vulgare*. The main difference between the two forms is the brittle rachis of the former, which enables seed dispersal in the wild.

Important traits of barley domestication

- **Non-brittle rachis.** Spikes of non-brittle mutant remain longer on the plant and do not fall off during harvesting. As a result, more seeds are harvested. The loss of natural seed shedding and dispersal mechanisms was essential for agriculture. Earliest non-brittle rachis variety of barley is dated around 9,500 years ago.
- **Six-rowed spike.** The six-rowed spike is one of most conspicuous traits that appeared sporadically and was selected gradually as a result of domestication about 8,800 years ago. Six-rowed barley produces three times as many seeds per spike as wild type two-rowed barley. Barley is unique among the *Triticeae* because its spike bears three spikelets at each rachis node. In wild type and in some strains of cultivated barley only the central spikelet is fertile and develops into grain while two lateral spikelets remain empty during the crop maturation and later facilitate seed dispersal. In six-rowed cultivated barley all three spikelets are fertile and produce grain. The increased seed production comes at expense of several important dispersal and self-planting mechanisms and six-rowed spontaneous mutants are not preferred for survival in the wild.
- **Naked caryopsis.** The hulled barley' husk is cemented to the caryopsis (grain), while naked barley has husks that are easily separated from the grain upon threshing. It is important agronomic trait because it is linked to dietary use of the barley.

Monocot reproductive anatomy



Developmental stages (life cycle)

Life Cycle Stages

The development and growth of cereal grains have been translated into several numeric scales to quantify development for scientific and management purposes. The most commonly used scales are the Feekes, Zadoks and Haun. Completion of development from germination to maturity takes 280-359 days for winter barley and 3-3.5 months for spring barley.

- seed stage **MeSH**

- dormant seed

Zadok stage 00; dry kernel

- germinating seed MeSH

also called **malt**; Zadok stages 00-09; decimal code stages GS10-GS19; this stage includes imbibition, emergence of radicle and emergence of coleoptile; winter barley is sown in October

- vegetative

- seedling MeSH

Zadok stages 10-19; decimal code stages GS10-GS19; up to 9 or more leaves unfolded on the main shoot; leaves appear about every 3 to 5 days depending on variety and conditions; this stage lasts approximately until mid-March

- tillering

growth of shoots (tillers) that sprout from the base of a grass; Zadok stages 20-29; decimal code stages GS20-GS29; active tillering occurs from mid-March until mid-April

- stem elongation

most tillers have been formed by this stage; Zadok stages 30-39; decimal code stages GS30-GS39; by end of this stage pseudostem becomes erect; floral primordia are initiated; blades of flag leaves become visible; this stage ends in early May

- reproductive

- booting

at this stage, the head is fully developed and can be easily seen in the swollen section of the leaf sheath below the flag leaf; Zadok stages 40-49; decimal code stages GS41-GS49

- heading

emergence of inflorescence; Zadok stages 51-59; decimal code stages GS51-GS59; this stage completes in late May

- flowering

also called anthesis; Zadok stages 61-69; decimal code stages GS61-GS69

- ripening

Zadok stages 71-99

- milk development

Zadok stages 71-79; decimal code stages GS61-GS69

- dough development

Zadok stages 81-89; decimal code stages GS81-GS89

- ripe

plant reached physiological maturity and is harvest ready

References

PubMed articles

- Pourkheirandish M, Komatsuda T. The importance of barley genetics and domestication in a global perspective. *Ann Bot (Lond)*. 2007 Nov; 100 (5):999-1008 **PMID: 17761690**
- **Major topic: *Hordeum* (free full text articles in PubMed)**

Websites

- **Growth Stages of Weat, Barley, and Wild Oats**
- **Wikipedia: Barley**
- **Growth and Development Guide for Spring Barley**
- **Managing barley growth (.pdf)**



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