

Hops

Hops are an essential crop for beer production worldwide. They are mostly grown between latitudes 35° to 55° north which includes northern Arizona. The U.S. leads world hop production at 40% and is closely followed by Germany at 38%. In the U.S., Washington state is the highest producer with Idaho and Oregon in the second and third positions, respectively.

The hop plant (*Humulus lupulus* L.) is in the same family as the hemp plant (Cannabaceae) and is a native plant to Europe, western Asia, and North America. It is a herbaceous perennial plant that produces annual bines (long, slender climbing stems) which can grow up to 15 to 25 feet high. The rootstocks have both rhizomes (with buds) and real roots (without buds) and could grow to a depth of 15 feet or more in the soil. Hop rootstocks overwinter and grow rapidly from spring to early summer into bines. The bines grow fast with massive biomass and require substantial support such as poles on which they climb in a clockwise direction. In mid-summer, the plant stops vertical growth in response to shortening day length and produces side arms to bear the flowers.

Hops are a dioecious plant, which means seeds could germinate into a female or male plant and will produce a female or male flowers, respectively. The male flower is a pollinator while the female produces the cone-shape (hop) with the economic value. Though the male serves as a pollinator, the female can still produce the hop cones without the male.



Hop cones, *Humulus lupulus* (David Gent, USDA Agricultural Research Service, Bugwood.org).

Climatic factors such as day length, latitude, and temperature must be considered carefully for hop production. Hops need about 120 frost-free days with 15 hours of sunlight per day or more for flower initiation and cone maturity. In northern Arizona, they will require irrigation during periods when monsoon rains are not providing adequate soil moisture.

Hops prefer a well-drained sandy loam soil with a deep profile and pH of 6.0 to 7.0. Avoid soils such as poorly drained and strong alkaline and saline soils. Spring fertilizer applications of nitrogen, phosphorus, and potassium benefit hop growth and quality. Nitrogen is often the most limiting nutrient for hop growth and can be provided through periodic fertilization prior to and during the growing season.

Commercial hops are mostly propagated from bine cuttings or rhizomes. Advantages of using cuttings of known varieties are vigor, disease resistance, and cone quality (alpha acids, oils, aroma, yield, and quality). This also ensures female plants. Hops are added to beer during brewing (boiling) to contribute alpha acids adding to the beer's bitterness. Later additions of hops contribute to the beer's aroma. Craft brewers add aroma hops at the end of the boil and even during the fermentation process (called "dry hopping").

Hops are usually harvested between August and September, depending on the variety and season. Mature cones can be identified by opening several cones from top of plants. A cone which is ready to harvest should have a dry, papery feel with a golden-yellow colored "lupulin" inside of the cone and a pleasant "hoppy" aroma.

Local educational institutions and partners are exploring the potential for northern Arizona hop production potentially creating new economic opportunities for small scale growers. This is a great pairing because Sinagua Malt has been growing malting barley in Camp Verde since 2016 and has now constructed a malting facility. This locally-based partnership has been successful at producing local barley malt and conserving seasonal flows in the Verde River.

Hops can also be grown as ornamentals in landscapes, often to provide shade to a porch or outside gathering area. Rhizomes are available for purchase from multiple on-line vendors and can be ordered by mail for spring planting. Popular varieties are: Cascade, Centennial, Chinook, Mount Hood, Nugget, Fuggles, and many more.

Additional Resource:

Iowa State University Extension

[Hop Production 101: A Guide to Growing Healthy Hops](#)

[Sinagua Malt](#) located in Camp Verde, AZ

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