

Hops

Revised 2018

Storage Conditions

Temperature	24 to 28°F (-4.4 to -2.2°C)
Relative Humidity	70 to 85%
Storage Period	12 months

It is recommended that processed and baled hops be stored in separate rooms from other products. The optimum storage temperature is 24 to 28°F (-4.4 to -2.2°C) at a relative humidity (RH) of 70 to 85%, with little air movement to prevent excessive drying. Sufficient space should be allowed around the bales for ventilation, so that any heat generated in the bale may be dissipated. This is particularly important immediately after baling. Cold storage of hops protects the desirable soft alpha and beta resins against deterioration and minimizes the formation of undesirable hard resins, such as gamma resin.

Normal-compressed and double-compressed hop bales of 11 and 22 lbs. per cubic foot (178 to 357 kg per cubic meter), respectively, retain their quality remarkably well in cold storage for fairly long periods. Throughout storage there is, of course, a gradual decline in brewing value. Some varieties keep much better than others, but cold storage is desirable regardless of variety.

Hops in refrigerated storage should be routinely inspected for 1) molds, which may develop if the hops have not been sufficiently dried prior to baling or if the storage room humidity is too high, and 2) development of unpleasant aroma and off-color. The dry-down ratio for hops is about 4 to 1, but seedless hops, which are being used in increasing amounts, tend to lose more weight in drying than the seeded types.

Freezing Baled Hops

Baled hops are not damaged by freezing and freezing actually improves storage stability. The only deterrent for this type of storage is the cost.

Storage of Hop Extracts

There are two basic types of hop extracts; isomerized and non-isomerized.

Isomerized: Some of the isomerized extracts are water solutions, which freeze at about 30°F (-1.1°C). There are other isomerized extracts that contain propylene glycol, and some other stabilizers against precipitation of soluble components, and these could be stored at a lower temperature. However, as a generalization, it is recommended to store at above freezing temperatures. These extracts should be stored in a cool room, approximately 35 to 40°F (1.7 to 4.4°C). At this temperature, a layer often settles

to the bottom of the container. This layer must be brought into solution before use, by warming the extract and agitating. These products are true liquids because they are usually a 30% solution of the isomerized alpha acids of hops as the potassium salt. Isomerized hop extract should not be exposed to light; therefore, the containers are generally enclosed in cardboard.

Reduced Isomerized Hop Extracts: Three types of reduced isomerized hop extracts have become popular products in the past several years; tetrahydro, rho, and hexahydro isomerized hop extracts.

Tetrahydro isomerized hop extract, commonly called "tetra", is a chemically stable product, meaning that the tetrahydro-iso-a-acids do not degrade very easily. However, the solubility characteristics of this extract decrease with time, with the pH dropping over time in storage. It is important to note that the cooler the temperature, the slower the pH drop, although some phase separation is likely to occur during storage. Re-dissolution is achieved by warming the product to 140°F (60°C) and mixing for a short period. The lower the pH, the more difficult it is for the precipitate to go back into solution. "Tetra" that is less than 1 year old should go back into solution fairly easily with warming and mixing; however, as the product approaches 2 years of age, the precipitate becomes more difficult to dissolve. Long term storage of "tetra" should be between 59 to 71.6°F (15 to 22°C). Exposure to light is not an issue.

Rho isomerized hop extract, commonly called "rho", is similar to "tetra" in that it is chemically stable. Rho can be stored between 59 to 77°F (15 to 25°C), although some phase separation is likely to occur during storage. Re-dissolution is achieved by warming the product to 122°F (50°C) and mixing for a short period. Exposure to light is not an issue with rho.

Hexahydro isomerized hop extract, commonly called "hexa" has the same storage conditions as "rho."

Non-Isomerized: Non-isomerized extracts are viscous resinous pastes at room temperature and should not be termed liquids. This type of hop extract is fairly stable for extended periods if stored in a cool room, 50 to 60°F (10 to 15.6°C). They are not damaged by freezing, and stability would be marginally better if frozen. Frozen extracts would have to be removed to a warmer area before use because otherwise the container, can or pail, would be difficult to empty.

Odor Transfer

There are two types of odors given off from hops during storage. The first odor is a byproduct of the collection and baling process, whereby a certain amount of crushing of the hops during baling releases essential oils into the bale. These odors are released during storage, and although not unpleasant they are persistent. The second type of odor is from the deterioration of the hops during storage. This odor is "cheesy" in nature, and disagreeable due to the release of short-chain fatty acids.

Among the volatiles released are some odors that are quite distinctive, and these could affect other commodities, especially if they are not in sealed packages. Oils, fats, and products high in oils, such as nuts, are particularly susceptible to this odor transfer problem. Furthermore, hops absorb other odors readily. In addition, the odor may contaminate corridors or other rooms and permeate walls and insulation, making the room unusable for a considerable period of time for other products. For these reasons, it is advisable to store hops in a separate room.

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