# Making Mead: the Art and the Science

*Making mead is a centuries-old practice that can be enjoyed by the home brewer. As with the preparation of most foods and beverages, the making of a good mead is a blend of science and art. This kit is designed to help you understand the basic principles of mead making and guide you through the process. It is intended as a primer for the beginner and as a resource for the more experienced home brewer.*

## The History of Mead Brewing

Mead is one of the world's oldest fermented beverages. Ancient myths and writings throughout the world contain references to alcoholic beverages that were drunk by both people and gods alike.

Mead was a part of the rituals of the Celts, Anglo-Saxons and Vikings. It was believed to have magical, healing powers even capable of increasing fertility. The word *honey-moon* is derived from the practice of the newlyweds drinking mead for one month (a moon) after the wedding. If the mead was "proper," a son would be born nine months later.

As civilizations and agricultural resources grew, beverages such as wine made from grapes or other fruits, and ale made from barely and wheat replaced mead in many areas of the world. In Northern Europe, where grapes were difficult to grow, mead remained popular until grape wine was imported from southern regions.

The roots of the variations of mead we have today can be found in the cultures and agriculture of old. The practice of adding bitter herbs (gruit) to mead began in the Middle Ages. Mixing grape and other fruit wines with mead can be traced to Roman times.

Eventually, agricultural crops such as grapes, grains and hops, became the preferred ingredients for alcoholic beverages such as wine, beer and ales.

## Varieties of Mead

Mead is an alcoholic beverage made by fermenting a mixture of honey and water. Traditional mead is simply that — honey and water. Variations have existed through the ages and range from the traditional to complex mixes of fruit juices and spices. (See Table 1.)

Mead can be either still or sparkling. Sparkling mead results from a second fermentation that retains dissolved carbon dioxide in the bottled product.

Other alcoholic beverages made from honey include braggot and mead brandy. *Braggot,* made with malted grain and honey, is part beer. *Mead brandy* is mead that has been distilled. A honey liqueur is made by adding extra honey to mead brandy.

# Table 1. Varieties of Mead

| | |
|---|---|
| Traditional Mead | A fermented honey beverage made from approximately two and one-half pounds of honey diluted with one gallon of water only. |
| Hydromel | Weak, or watered mead |
| Sack Mead | Mead that is made sweeter by the addition of twenty to twenty-five percent more honey; a sauterne-like beverage. |
| Metheglin | Spiced mead; originally spiced with a combination of herbs (gruit) but later hops became more popular. |
| Sack Metheglin | Sweet spiced mead; traditionally similar to vermouth. |
| Melomel, or Mulsum | Mead made with fruit juice. |
| Cyser | A melomel made with apple juice or cider; similar to a sherry wine. |
| Pyment, or Clarre | A melomel made with grape juice; sometimes referred to as honey-sweetened grape wine. |
| Hyppocras | Spiced pyment. |

# Basics for Brewing Mead

## Getting Started: Ingredients

**HONEY**

Honey is the first ingredient to consider when making mead. The flavor and color of the final product are dependent on the variety of honey used. In general, a light honey yields lighter colored and flavored mead and a dark honey, darker colored and more robust flavored mead.

The floral source of the honey determines its flavor profile and other sensory attributes. Honey bees gather nectar and convert it to honey. There is some variation in the amount of sugar, minerals and vitamins in the nectars that the bees gather. An enzyme (invertase) secreted by the bees converts the sucrose in the nectar to fructose and glucose and another enzyme (glucose oxidase) changes the glucose to gluconic acid and hydrogen peroxide. The water content in the nectar is also reduced in the process. The result is honey: a fermentable sugar with pH of approximately 3.9, on average, and an 17.1 percent water content.

Choosing which honey to use is a matter of taste and the type of mead desired. Stronger honeys go well with sweeter, heavy or spiced meads and milder honeys with delicate flavors work well for traditional or fruit meads.

The National Honey Board has additional information available on the floral sources of honey. A list of honey suppliers is available on the National Honey Board's Web site, www.nhb.org. A paper describing the sensory attributes of U.S. honey varieties is available both online and as a hard copy.

The United States Department of Agriculture Technical Bulletin number 1261 gives detailed information on the chemical composition, color and granulation of various honey varieties. These resources will be helpful in selecting a honey variety.

**YEAST**

Yeast is the next ingredient to consider and once again, there are several choices. Yeast is living organism that metabolizes sugars in honey to carbon dioxide and ethyl alcohol. Cultured wine yeast is commonly used to make mead. In general, those that are used for white wines, especially sauterne-yeast work well. The yeast used for wine and mead fermentation is *Saccharomyces cerviseae*.

Matching the appropriate yeast culture to the honey variety is key to developing the desired taste and mouthfeel of mead. Formulation guideline for various types of yeasts and honeys can be found in *Zymurgy: For the Homebrewer and Beer Lover*, May-June 2000 issue.

In addition to sugar, yeast needs nitrogen, phosphorus and potassium for growth. Ingredients such as urea, peptone and potassium phosphate are used to supply these nutrients. It is also possible to buy packaged nutrients specially designed for mead.

**WATER**

The third basic ingredient used to make mead is water. The quality and chemical composition of the water used to make mead is critical.

For example, water that has a high chlorine content may produce off-flavors. Most mead makers recommend bottled or spring water but not distilled water since it lacks sufficient minerals for the yeast.

**OTHER INGREDIENTS**
ACIDS: Small amounts of acids, such as malic, tartaric and citric acid, are added to balance the flavor. Their tartness offsets the sweetness of the honey while combining with the alcohol to give a degree of stability against spoilage.

Some experts recommend an acid blend composed of twenty-five percent citric, thirty percent malic and forty-five percent tartaric acids.

SULFITES: Sodium bisulfite or potassium metabisulfite in tablet or powder form are commonly used for sanitation in wine making.

STABALIZERS: When making still mead, potassium sorbate, or wine stabilizer, can be added at the bottling stage to prevent a second fermentation by killing remaining yeast cells.

FRUIT: To create the fruit-containing mead, ten to twenty percent fruit juice or purees are added to the honey-water mixture. Whole, pitted fruit can also be used. Twelve to fifteen pounds of fruit with twelve to fifteen pound of honey in five gallons are recommended.

SPICES AND HERBS: Almost any spice or herb can be added to mead either as an extract or directly at almost any time during the mead making process. Blends of two or more spices and herbs are commonly used. If added directly, they should not remain in the mix for longer than twenty-four hours because bitter components may be extracted.

A strong extract of mixed herbs (gruit), can be added at bottling time. Or, a strong extract of each spice can be prepared and added at any time after fermentation but before fining. To make an extract, boil the spices in a small amount of water for 15 minutes.

HOPS: Adding hops to mead will add a distinctive flavor, but more importantly, its resins, oils, tannins and pectin can help to clarify the mead and preserve its freshness.

Tannin is sometimes used by itself to add astringency and aid in brewing and clarification.

## Getting Started: Equipment

Home brewers typically make five-gallon batches of mead. The equipment they need is similar to what is used to make wine and is readily available in home wine and brewing supply stores.

Basic equipment needed to produce five-gallon batch includes:

- 1 (four-gallon) enameled or stainless steel pot
- 2 (five-gallon) glass carboys*
- 1 fermentation lock with rubber cork to fit carboy
- 7 feet clear plastic siphoning hose, 5/16-inch diameter
- 3 feet plastic blow-out hose, 5/16-inch diameter
- Detergent and chlorine bleach
- Large funnel
- Corker or bottle capper
- Corks or bottle caps
- Bottles
- Wine hydrometer
- Thermometer
- Acid-testing kit

**Note: A carboy is a glass container with a narrow neck.*

## Processing Guidelines

There are seven basic steps to making mead. (See Table 2.)

**SANITIZING**
The single most important step in making a good mead is sanitation. Contamination with wild yeast, molds or bacteria will result in mead that is cloudy and off-flavored. Wash all equipment and containers with detergent and water. Scrub well and rinse repeatedly. After rinsing, sanitize all equipment and bottles by immersing them in a bleach solution of one-ounce chlorine bleach to 5 gallons water. Soak for at least 10 minutes; rinse well with water.

Equipment can also be sanitized in a rinseless solution called iodophor sanitizer (available at brewing supply stores).

**PREPARING THE MUST**
*Must* is the unfermented mix of honey, water and other ingredients. There are several methods for preparing the must. Several factors should be considered in choosing which method to use.

BOILING: Boiling the honey and water for 10 to 30 minutes will sterilize the must and cause a "cold break" which precipitates the protein and other colloidal materials in the honey. This will help clarify the final mead.

The disadvantage of boiling is that it drives off the delicate flavor components of the honey. Yeast nutrients and acid blends can be added before or after boiling.

PASTEURIZATION: Heating the honey and water to 190 °F for 10 to 20 minutes will destroy any wild yeast in the honey but will preserve more of the volatile flavor components.

When preparing large batches of mead (3 to 5 gallons), it may be impractical to heat the total volume of water. Instead, mix the honey with 1 or 2 gallons of water. Heat-sanitize this mixture (boil or pasteurize) and when cool, transfer to the carboy. Add enough additional water to the mixture in the carboy to equal the total volume needed.

SULFITING: An alternative method of sanitizing the must is "sulfiting." The advantage of this method is that there is no heating. Simply dissolve the honey in water along with the acid blend and yeast nutrients and add the sulfites. The major disadvantage is that some individuals are allergic to sulfites and would not be able to consume mead that is made with sulfiting agents. Also care must be taken not add too much sulfite as levels in the 60-70 ppm range can inhibit yeast growth. Since proper adjustment of levels requires an accurate scale and pH meter, sulfiting is not recommended for the amateur mead maker.

Sanitizing with sulfites is recommended when making Mulsum or Melomel. Since boiling fruit juices will "set" the fruit pectin and prevent the final mead from clarifying.

**ADDING THE YEAST**
If the must has been sanitized by heating, the yeast can not be added or "pitched" until the must is at room temperature (approximately 70-75 °F).

When using sulfites to sanitize, let the must stand for 24 hours before adding the yeast. If using dry yeast, activate it by stirring the packet of yeast into 4 ounces of warm water (80 °F). Allow the yeast to hydrate for 10 minutes before stirring into the must.

**Table 2. Basic Steps For Making Mead**

1. Clean and sanitize all equipment and containers.
2. Make the must (i.e., honey-water mixture).
3. Add the yeast or yeast starter.
4. Ferment until all visual signs of air bubbles disappear.
5. Rack (fine first, if desired) two or more times.
6. Age until clear and good flavor develops.
7. Bottle and cap with bottle caps or corks.

**FERMENTATION**

Fermentation takes from several weeks to several months. During this step, the sugar in honey is converted to alcohol and carbon dioxide gas. Once the must has been sterilized (by boiling, pasteurization or sulfite treatment), transfer it to the fermentation vessel (carboy) and add the activated yeast.

At the onset of fermentation, yeast need an ample supple of dissolved oxygen. Therefore, it is helpful to cascade the cold must into the carboy prior to adding the yeast. Air is excluded during the remainder of the fermentation process by installing an air lock on the neck of the carboy.

**RACKING**

Racking involves siphoning off the clear mead into a second sanitized fermenter, leaving the sediment behind in the first. This step is repeated as many times as is necessary to achieve the desired level of clarity, usually at three-month intervals.

Strict sanitation practices must be observed to prevent contamination. (If sulfiting agents are used as a disinfectant, they need to be added at each racking to ensure the desired level of 50 ppm sulfur dioxide.)

Care must also be taken to not incorporate oxygen during racking after the onset of fermentation. Excess exposure to oxygen once the process has begun, can cause spoilage. When filling the carboy, headspace should be limited to approximately one inch to minimize the available oxygen.

**FINING**

Fining is an optional step that clarifies mead, using agents such as bentonite, isinglass, egg white, gelatin, and casein. A commercial product called Sparkolloid is also available. Fining agents combine with charged particles in suspension, such as protein, and precipitate them. The result is clear mead that has a sparkle. The drawbacks to fining are the amount of mead left in the residue and the potential for decolorizing the mead.

Fining is usually done before racking or when mead fails to clear. After racking, attach the air lock. Fermentation will begin in several hours or may take several days. Mead is best fermented at temperatures between 70 °F and 80 °F. Fermenting at lower temperatures will not harm the mead flavor; it will just take longer to complete.

During fermentation, rack the mead into a new container as sediment develops. If the mead sits on the sediment too long, the yeast will begin to feed on the sediment (autolysis) and result in an unpleasant flavor. Fermentation is complete when air bubbles are no longer visible.

**AGING**

Aging requires the most patience. During this step, the mead clears and develops its flavor. Usually, it moves from a harsh, acidic, unpleasant taste to a smooth, mellow beverage with a nice bouquet and fragrance. As the dead yeast cells continue to settle, it is important to continue racking the mead. A steady temperature below 70 °F (preferably around 60 °F) is recommended through the aging process. The length of aging can take months or years,

depending on a number of factors. In general, lighter meads will be ready sooner while darker, sweet meads and those with higher alcohol content will need more time to fully develop. Ultimately, the taste preference of the mead maker will determine when it has aged enough.

**BOTTLING**

The last step is bottling and capping. As with all the steps, good sanitation practices are essential and aeration during the transfer should be avoided. Standard caps or corks can be used. Bottles with corks need to be stored on their sides or the corks need to be dipped in melted paraffin to keep them from drying out. Headspace should be approximately one-half to three-quarters of an inch to limit exposure to oxygen.

Making sparkling mead requires a second fermentation using a new yeast culture and priming sugar. The concentration of sugar to mead should be 60 grams or 2 ounces for each gallon of must or three-fourths to one cup per five gallons. The second fermentation occurs in capped bottles, thus trapping the carbon dioxide gas until the bottle is opened. Typically, sparkling mead has higher alcohol content. Additional sediment settles in the bottom of the bottle. The finished sparkling mead should be decanted off the sediment. Overall, careful handling of sparkling mead is required to prevent premature release of the carbon dioxide gas and exploding bottles.

Throughout the mead-making process, it is important to test various parameters. Sugar levels of the honey, fruit juices, and mead are measured in brix or specific gravity, using a hydrometer. Acid levels are determined by measuring pH using acid test kits that are readily available in brewing supply stores. A good thermometer is necessary to monitor room and brew temperatures throughout process.

## Common Problems

**OFF FLAVORS**

Most off flavors are the result of poor sanitation practices. All equipment must be sanitized to prevent contamination and the resulting off flavors. The must needs to be free of any wild yeast of bacterial contamination before fermentation starts (see **"Preparing the Must"**) and good practices must continue throughout the brewing process. Also, any residue of sanitizer (bleach, sulfites, soaps) remaining on the equipment will affect the flavor of the final mead.

**"STUCK" FERMENTATION**

After adding the yeast to the must, fermentation should begin within several days. If fermentation does not start within 5 days, it is probably because of a poor nutrient balance or a weak strain of yeast. The best remedy is to rack the must into a sterilized fermentation vessel and begin again by adding new viable yeast.

In other cases, yeast activity may stop in the middle of the fermentation period. All activity stops and the specific gravity indicates that there is adequate sugars still available for fermentation.

The most common cause of this behavior is that the alcohol produced by the yeast has reached a level in the mead that is too high to support yeast activity. When the level reaches approximately 12 percent, yeast metabolism is inhibited.

# Basic Recipes/Formulas

*Recipes for mead abound—with each mead maker having his/her own slant on what and how much to use as well as how to put it altogether to create the right flavor and bouquet. Below are a few basic recipes for mead and variations of mead to get you started. Use the guidelines in the equipment and process sections to produce your mead.*

## Basic Mead Recipes

### Morse
### Traditional Mead Recipe

| Ingredients | Amount |
|---|---|
| Honey (preferably goldenrod) | 3.5 lb |
| Water | 1 gal |
| Ammonium phosphate | 4 g |
| Urea | 4 g |
| Cream of tartar | 4 g |
| 1:1 mixture of tartaric and citric acid | 4 g |
| Yeast | |
| Anti-foam agent | Optional |

Morse, R. A. 1980. "Making Mead (Honey Wine)." Wicwas Press, Cheshire, Conn.

### "Wassail Mead"
### Yield: 5 gallons

| Ingredients | Amount |
|---|---|
| Light clover honey | 12.5 lb |
| Acid blend | 4 tsp |
| Yeast nutrient | 5 tsp |
| Water | to make 5 gal |
| Wine yeast | sufficient for 5 gal |
| Optional: | 1/3 tsp sodium or potassium metabisulfite |

Original specific gravity: 1.110

Source: Papazian, C. 1986. Brewing Mead. Wassail! Page 175 in "Mazers of Mead." Brewers Publications, Boulder, Colo.

### "St. Elizabeth's Day" Mead
### Yield: 5 gallons

| Ingredients | Amount |
|---|---|
| Honey | 18 lb |
| Water | 5 gal |
| Yeast nutrient | 2 oz |
| Stock sodium bisulfite solution (add after fermentation) | 5 tsp |
| Tartaric acid | 5 tbsp |
| Liquid oak essence (optional) | 30 mL |
| Prise de Mousse Yeast | 10 g |

Original brix: 25 °
Total acid: 6-6.5%

Burch, B. 2000. Making Sense of Making Mead. Zymurgy: For the Homebrewer and Beer Lover. 23(3): 39-40.

# Mead Variations

## Mulsum or Melomel
## Yield: 5 gallons

| Ingredients | Amount |
|---|---|
| Light clover honey | 9 lb |
| Crushed Fruit (such as raspberries, blackberries, marionberries, loganberries, mangoes, currants, peaches, plums or cherries) | 10-15 lb |
| Yeast nutrient | 5 tsp |
| Water | to make 5 gal |
| Wine yeast | sufficient for 5 gal |
| Sodium metabisulfite | 1/3 tsp |
| Acid blend | to bring level to 0.4 to 0.5% |

Approximate original specific gravity: 1.100 to 1.120

Special Instructions: Boiling grape or any other fruit juice will "set" the fruit pectin and prevent the mead from clarifying. Therefore, sulfating agents should be used to disinfect the must.

Use an open fermenter (i.e., a clean fermentation pail covered with a snug aluminum foil or plastic sheet so gases can escape) for the first to ten days. Then strain out the fruit, and siphon the ferment into a closed glass fermenter. Some fruit will unavoidably be carried into the second fermenter. After two weeks, or when vigorous fermenting has subsided, siphon ferment into another fermenter leaving virtually all the fruit and some of the yeast sediment behind.

Papazian, C. 1986. Brewing Mead. Wassail! Pages 183-184 in "Mazers of Mead." Brewers Publications, Boulder, Colo.

## Raspberry Melomel
## Yield: 3 gallons

| Ingredients | Amount |
|---|---|
| Light honey | 10 lb |
| Raisins | 1/2 cup |
| Lemons | juice from 3 |
| Crushed raspberries | 1 to 2 pt |
| Champagne yeast | sufficient for 3 gal |
| Water | to make 3 gal |
| Sodium metabisulfite | 1/3 tsp |

Special Instructions: Mix all ingredients except the yeast and let sit overnight. Add the fruit directly to the must or suspend it in a cheesecloth bag.

Spence, P. 1997. "Mad About Mead! Nectar of the Gods." Lluewellyn Publications, St. Paul Minn.

## Sack Mead
## Yield: 5 gallons

| Ingredients | Amount |
|---|---|
| Light clover honey | 15 lb |
| Acid blend | 4 tsp |
| Yeast nutrient | 6 tsp |
| Water | to make 5 gal |
| Wine yeast | sufficient for 5 gal |
| Sodium or potassium metabisulfite (optional) | 1/3 tsp |

Approximate original specific gravity: 1.120 to 1.130

Note: To make "Sack Metheglin," add gruit as described in the "Metheglin" recipe.

Source: Papazian, C. 1986. Brewing Mead. Wassail! Page 179 in "Mazers of Mead." Brewers Publications, Boulder, Colo.

## Pyment or Clarre
## Yield: 5 gallons

| Ingredients | Amount |
|---|---|
| Light clover honey | 7 lb |
| Grape juice | 2.5 gal |
| Water | to make 5 gal |
| Yeast nutrient | 5 tsp |
| Wine yeast | sufficient for 5 gal |
| Sodium metabisulfite | 1/3 tsp |
| Acid blend | to bring level to 0.4 to 0.5% |

Approximate original specific gravity: 1.100 to 1.120

Special Instructions: See "Mulsum" directions.

Caution: Do not add grape skins to closed glass fermenter as they will plug the escape vent and could cause an explosion. Use an open fermenter (i.e., a clean fermentation pail covered with a snug aluminum foil or plastic sheet so gases can escape) for the first to ten days, if adding crushed fruit.

Papazian, C. 1986. Brewing Mead. Wassail! Page 181 in "Mazers of Mead." Brewers Publications, Boulder, Colo.

## Metheglin
## Yield: 5 gallons

| Ingredients | Amount |
|---|---|
| Light clover honey | 12 lb |
| Acid blend | 4 tsp |
| Yeast nutrient | 5 tsp |
| Water | to make 5 gal |
| Wine or champagne yeast | sufficient for 5 gal |
| Sodium or potassium metabisulfite (optional) | 1/3 tsp |

Gruit

1 oz leaf hops or any of the following:

- 1 to 2 oz freshly grated ginger
- 2 to 4 oz lemongrass
- 1 to 2 oz crushed cinnamon bark
- Crushed fennel, anise, caraway seed or cloves
- Crushed hot chile pepper (with or without seeds)
- Combination of these and any other spice, herb, bark and seeds

Approximate original specific gravity: 1.110

Special Instructions: Make a strong extract of gruit ingredients by boiling spices in small amount of water for 15 minutes. Add at bottling time or after vigorous fermentation has subsided.

Papazian, C. 1986. Brewing Mead. Wassail! Page 180 in "Mazers of Mead." Brewers Publications, Boulder, Colo.

## Honey Hop Metheglin
## Yield: 1 gallon

| Ingredients | Amount |
|---|---|
| Wildflower honey | 3 lb |
| Leaf hops | 1 oz |
| Lemon and lime | juice and peel from half of each |
| Yeast energizer | 1 tsp |
| Montrachet Yeast | 1 packet |
| Water | to make 1 gal |

Special Instructions: Add half of hops in a mesh bag to honey dissolved in 6 pints water and heat to just below boiling. Hold for one hour. Then add citrus peel and juice, remaining hops and yeast energizer. Boil for 1 hour, remove from heat and let cool overnight.

Source: Spence, P. 1997. "Mad About Mead! Nectar of the Gods." Lluewellyn Publications, St. Paul, Minn.

## Cyser
## Yield: 5 gallons

| Ingredients | Amount |
|---|---|
| Light clover honey | 7 lb |
| Apple juice | 4.5 gal |
| Water | to make 5 gal |
| Yeast nutrient | 5 tsp |
| Wine yeast | |
| Sodium or potassium metabisulfite | 1/3 tsp |
| Acid blend | to bring level to 0.4 to 0.5% |

Approximate original specific gravity: 1.100 to 1.115

Special Instructions: See "Mulsum" directions.

Papazian, C.1986. Brewing Mead. Wassail! Page 182 in "Mazers of Mead." Brewers Publications, Boulder, Colo.

## "Rockport Still Mead"
## Yield: 3 gallons

| Ingredients | Amount |
|---|---|
| Orange blossom honey | 9 lb |
| Fermex yeast nutrient | 3 tsp |
| Yeast hulls | 1.5 tsp |
| Yeast energizer | 1/2 tsp |
| Wyeast No. 3184 mead yeast | sufficient for 3 gal |

Approximate original specific gravity: 1.116
Final specific gravity: 1.0212
Boiling time: 5 min.
Primary fermentation: 30 days at 68 ºF (20 ºC) in glass
Secondary fermentation: 90 days at 68 ºF (20 ºC) in glass
Tertiary fermentation: 2 years at 68 ºF (20 ºC) in glass

Turczyn, A. 2000. Winner's Circle. Zymurgy: For the Homebrewer and Beer Lover. 23(3): 47.

## Prickly Pear/Mesquite Melomel Sparkling
## Yield: 5 gallons

| Ingredients | Amount |
|---|---|
| Prickly Pear Puree | 7 lb |
| Mesquite honey | 12 lb |
| Yeast nutrient | 1 tbsp |
| Acid blend | 4 tsp |
| Dry mead yeast Wyeast #3632 | sufficient for 5 gal |
| Corn sugar for bottling | 1 cup |

Burch, B. 2000. Winner's Circle. Zymurgy: For the Homebrewer and Beer Lover. 23(3): 41.

## Bit O' Honey Cyser
## Yield: 5 gallons

| Ingredients | Amount |
|---|---|
| Fresh pressed sweet cider, tested and adjusted for acid | 5 gal |
| Clover honey | 2 lb (or enough to bring the specific gravity to approximately 1.065) |
| Ale or mead yeast starter | sufficient for 5 gal |

Special Instructions: Simmer honey with a small amount of cider until honey warms and thins. Then add to 1 gallon of cider in glass carboy. Add the yeast and then top with remaining cider. It takes at least six months for cyser to clear and taste acceptable. After bottling, it should age at least four months.

Correnty, P. "The Art of Cidermaking." Brewers Publications, Boulder, Colo.

# Selected Resources and References

## BOOKS


- Correnty, P. "The Art of Cidermaking." Brewers Publications, Boulder, Colo.
- Furness, C. 1972. "Honey Wines and Beers." Northern Bee Books, West Yorkshire, UK.
- Gayre, R. and Papazian, C. 1986. "Mazers of Mead." Brewers Publications, Boulder, Colo.
- Morse, R. 1980. "Making Mead (Honey Wine)." Wicwas Press, Cheshire, Conn.
- Spence, P. 1997. "Mad About Mead! Nectar of the Gods." Lluewellyn Publications, St. Paul, Minn.


## ARTICLES


- Berthold, R. 1998. Making a New Type of Mead. Bee Culture. 126(6): 32-34.
- Berthold, R. 1997. A New Concept in Mead Making. American Bee Journal. 137(10): 729-731.
- Berthold, R. 1992. A New Concept in Mead Making. American Bee Journal. 132(2): 97-101
- Burch, B. 2000. Making Sense of Mead. Zymurgy: For the Homebrewer and Beer Lover. 23(3): 38-41, 60-61.
- Kime, R.M., Morse, R. A. and Steinkraus, K.H. 1998. Mead: History, Current Technology and Prospects. American Bee Journal. 138(2): 121-123.
- Kime, R.A., McLellan, M.R. and Lee, C.Y. 1991. An Improved Method of Mead Production. American Bee Journal. 131(5): 394-395
- Kraus, B. 2000. When Mazers and Mashers Meet: The Magic of Brewing with Honey. Zymurgy: For the Homebrewer and Beer Lover. 23(3): 34-37, 58-59.
- Rollins, G. 2000. Making Mead. Bee Culture. 128(12): 29-31.
- Schramm, K. and McConnel, D. 2000. Mastering Mead Formulation: The Art and Science of the Sacred Honey Brew. Zymurgy: For the Homebrewer and Beer Lover. 23(3): 26-29, 54-57.
- Steinkraus, K.H. and Morse, R.A. 1966. Factors Influencing the Fermentation of Honey in Mead Production. J. Apicultural Res. 5(1): 17-26.
- Weaver, M. and Weaver, B. 2000. Thoroughly Modern Mead. Bee Culture. 128(7): 40-41.
- White, J. W., Jr., Riethof, M.L., Subers, M.H. and Kushnir, I. 1962. Composition of American Honeys. U.S. Dept. Agric. Tech. Bull. 1261: 1-124.


## INTERNET SITES


- Mead-Lover's Digest, an online distribution of articles from readers. Subscribe by e-mail sent to mead-request@talisman.com with the word "subscribe" in the subject line.
- www.talisman.com/mead, Web site for *Mead Lover's Digest* and other material.
- www.best.com/~davep/mme, The "Mead Made Easy" book by Dave Polaschek in electronic format.
- www.brewery.org/brewery/Mhall.html, collection of links to mead-related pages.
- www.brewery.org/brewery/library/beeslees.html, collection of mead recipes, formulas and tables.
- www.solorb.com/gfc/mead/mead.html, Mead Maker's Page on mead basics and terminology
- www.gotmead.com, Web site with mead-making basics and links.

# Honey in Beer

## What type of honey works best in microbrewed beers?

From a technical standpoint, virtually any type of honey can be used in the brewing process. The United States produces over 300 types of honey, with the colors ranging from water white to dark amber and the tastes from delectably mild to distinctively bold. Each type of honey contributes something different in terms of end-product color, aroma, rounding effect and flavor.

In lagers, brewers tend to prefer mild honeys such as clover honey. Other floral sources such as alfalfa, wildflower, buckwheat, sage or citrus are excellent ingredients in porters, stouts and herb or spice beers.

From a marketing standpoint, brewers may also consider using honeys which are unique to their regions or that will specially appeal to specific consumer groups.

Retailers say one reason for the growth of the microbrews is that people like to buy locally produced products. Some brewers have capitalized on this preference and even add statements on their labels such as “made with honey from our county.

## How should honey be used in the brewing process?

Brewers generally add honey to the kettle toward the end of fermentation and avoid exposing honey to high temperatures for an extended period of time. This is done to prevent the loss of honey volatiles which contribute to the flavor of the final products.

Please contact the National Honey Board for documents with practical recommendations for processing honey prior to usage and for incorporating honey in various types of beer.

## Is honey considered a brewing adjunct?

Brewing adjuncts are added, among other reasons, to extend capacity and they contribute little to the quality of the product. For this reason, microbrewers generally avoid brewing adjuncts. Honey does contribute fermentable sugars but it also contributes a flavor and aroma of its own and adds value to beers by increasing their consumer appeal. Honey beer is often lighter and “crisper” than all-malt beer, but it does not lack character. In the United States, there is a consensus among brewers: they consider honey to be a high-value functional ingredient, not just a brewing adjunct.

## Are all honey beers sweet?

No. Honey’s carbohydrates are over 95% fermentable and adding honey early in the brewing process will yield a product with no residual sweetness. Honey is often

used to obtain a lighter, dryer, more refreshing beer than an all-malt beer. However, brewers may choose to add honey late in the process and stop fermentation shortly after the addition of honey to preserve a sweet flavor. This technique yields excellent results for the manufacture of some herb and spice beers in which honey helps balance and smooth bitter or sour-tasting flavor compounds.

## Does honey beer taste like honey?

Consumers often ask this question and there is no single answer. The typical flavor of honey is a combination of sweetness, acidity and aromatics. Honey's carbohydrates being fermentable, it is honey's flavor compounds that remain in beer. In other words, honey beer as it is produced in the United States does not taste like a diluted, alcoholic solution of honey!

This being said, in some countries or in products such as mead, honey is used as the unique or major fermentable ingredient (as opposed to using malt) and these products tend to have a strong honey flavor but they would not be marketed as "beers" in the United States.

The strength of the honey flavor in honey beer depends upon four major factors: the stage of the brewing process at which the honey is added; the type of beer; the quantity of honey used and the type of honey used. To best preserve the aromatics of honey and obtain a stronger honey flavor, brewers pre-process honey at low temperatures and add it at the end of the kettle boil so it is exposed to high temperatures for a minimal amount of time.

## How does honey affect the flavor of microbrewed beers?

Through several mechanisms: first, honey contributes its own flavor, second, honey has an impact on how the four basic tastes are perceived and third, honey has a "smoothing" or "rounding" effect on the overall flavor profile.

Obviously, the extent to which honey affects the flavor of beers depends upon the type of honey selected (floral source), the amount of honey added and the brewing technique used. Sensory research conducted for the National Honey Board has shown that honey can decrease the perception of sourness and bitterness. When added to beer, this means that honey tends to reduce the bitterness provided by hops (to which some consumers may object) without masking the desirable flavor components that hops provide. Brewers say that honey gives a nice "roundness" to the beer which is very desirable.

## Does honey reduce the shelf-life of microbrewed beers?

There is no evidence that is does or reason that it would. In fact, brewers have reported that some honey beers improve with age. For example, the maker of a holiday spice beer, who uses one pound of honey per gallon of beer and obtains a product with a higher alcohol content, claims honey beer can be aged like wine and tastes better after two years of storage.

## Can honey be used in larger-scale brewing operations?

Honey is used successfully in very large scale operations such as in the production of breakfast cereals. Manufacturers who use large volumes of honey in their products and who require a high level of ingredient consistency, simply use a blend of honeys which is custom-prepared for them by their suppliers. The honey industry is well equipped to supply brewers, small and large, with consistent and high-quality products.

## How can honey help a small brewer make unique products?

With more than 300 different types of honey in the United States to

choose from, brewers can use honey to help them add value and attract specific market segments.

## Are melomel and cyser some types of honey beers?

Melomel is a type of mead which is flavored with fruits other than apple. Cyser is a variety of melomel made with honey and apple juice. These products are types of meads, which are fermented beverages made from honey. Meads are sometimes called "honey wines" or "honey beers" (in the case of sparkling mead), but they are not truly beers that are grain-based.

## Which are some of the major floral sources of honey and which ones work best in each type of beer?

Table 1 summarizes the flavor and color profiles of some typical American honeys. Variations may occur within a floral source, depending upon the geographic origin of the honey.

| Floral Source | Typical Color | Typical Flavor | Suggested Use in Beers* |
|---|---|---|---|
| **Clover** | Light | Mild | • Herb beers, spice beers<br>• Ales, brown ales, stouts<br>• Light beers, dry beers |
| **Alfalfa** | Light | Mild | • Ales, lagers |
| **Sage** | Light | Mild | • Pale ales |
| **Tupelo** | Light | Distinct, delicate | • Ales, lagers |
| **Orange Blossom** | Light | Mild, heavy bodied | • Ginger, spice beers<br>• Holiday beers<br>• Light beers |
| **Raspberry** | White to light | Delicate | • Ales<br>• Spice, fruit beers |
| **Blueberry** | Medium to dark | Distinct, fruity | • Spice, fruit beers<br>• Stouts |
| **Wildflower** | Medium to dark | Medium to strong | • Pale ales<br>• Specialty beers |
| **"Industrial" blend** | Medium | Medium | • Cream stouts, porters |
| **Buckwheat** | Dark | Strong | • Stouts, porters |

*Data in this table are based recommendations made by brewers. Please note that many other floral sources exist that may yield excellent results. These are suggestions only.

# Honey and Homebrewing

## *A Sweet History*



Honey. For tens of thousands of years "the universal sweetener" was almost the only available source of sugar in the countries where it was used. Ancient civilizations looked on the making of honey as a miracle, and even today, after much scientific research, honey remains something of a mystery.

Honey is made by honey bees from the nectar that they collect from flowers. The nectar itself is a sweet liquid produced by flowering plants to attract insects helpful in pollination. Honey contains much less moisture than the original nectar. About 80 percent of honey is sugars, mostly fructose and glucose. Maltose, sucrose and other complex carbohydrates are present in varying amounts, as are proteins, amino acids, vitamins and minerals. Although relatively low in nutrients, honey contains more nutrients than refined sugars. As a rule, darker honeys contain higher amounts of minerals than lighter honeys.

## Historical Use of Honey in Beer

The earliest alcoholic beverages were probably made from diluted fermented honey. The beer that the early Anglo-Saxons drank was a brew of water and honeycomb made in a clay pot, to which herbs may have been added for flavoring.

Around the world, present-day brewers continue to experiment with beer additives. In Germany, where beer drinking is serious business, the use of wheat as an adjunct has gradually grown in popularity, while in England, oatmeal or lactose is generally used to impart body. In Belgium, brewers have long been known for their use of sugars and spices in brewing ales.

Many modern brewers have come to value the use of all-natural ingredients in their beers. One such ingredient is honey, which is used in a variety of beers from herb and specialty beers to traditional and flavored mead. The use of honey in beers has become popular with the rise of micro- and homebrews. In addition, homebrewing has become increasingly popular with nearly one million Americans making their own beer according to the American Homebrewers Association.

A honey beer research project, conducted on behalf of the National Honey Board, determined the potential, usage level and benefits of using honey in beer produced by microbrewers.

*For formulas, research monographs, technical article reprints and practical tips, please call the Honey Hotline at 1-800-356-5941.*

# Special Properties of Honey

**PRACTICAL REASONS FOR USING HONEY IN BEER**
The flavors of honey suggest a natural marriage with the sweet flavors of malted barley; the floral, spicy tones of late addition hops; and the perfume of yeast fermentation esters. The National Honey Board's study showed that honey is an excellent beer ingredient when used at recommended levels and, added at the appropriate stage, the flavor and aroma imparted by honey is exceptional.

Honey can be used in virtually any type of beer. It is generally used in herb beers, specialty beers, traditional mead and flavored meads. For mead production, since the honey is diluted, most experts recommend using a strong-tasting type of honey, such as buckwheat. Some mead producers claim that fresh, unprocessed honey is the best choice.

**HONEY'S FLAVOR CONTRIBUTION TO BEERS**

- **Herb Beers** (1.5 lbs. honey for 5 gallons) Ginger, cinnamon, cloves, orange peel and many other types of herbs and spices are used. These items are especially popular in Christmas and holiday beers. Lake Front Brewing (Milwaukee, Wisc.) produces holiday Spice Beer that uses a total of 180 pounds of honey in each batch!

- **Specialty Beers** (2.5 lbs. honey for 5 gallons) Special brewing adjuncts that add a characteristic note are popular in this category. Such fermentables include honey, as well as molasses, brewer's caramel, chocolate, etc. Honey, fruits and herbs are used in these products for flavoring only (not a major ingredient as in flavored meads).

- **Traditional Meads** (up to 20 lbs. honey for 5 gallons) Mead styles include sparkling, dry, medium and sweet. Mead requires the use of nutrients and additives to accelerate production. Mead takes from several weeks to one year to produce, and derives benefits from aging. Traditional meads are available on a limited basis in the United States and can be found in specialty stores. Mead is gaining popularity, as several meaderies are scheduled to open in the near future.

- **Flavored Meads** ( 10-12 lbs. honey for 5 gallons)
  Melomel: a fruit flavored mead (other than apple).
  Cyser: a Melomel made with honey and apple juice.
  Clarre or Pyment or Pymeat: a Melomel made with grape juice.
  Hippocras: a Pyment made with herbs.
  Metheglin: a Melomel flavored with spices or herbs.

**HONEY'S EFFECT ON BEER**
In honey, wild yeasts and bacteria are ubiquitous, yet they are kept in stasis due to honey's low water content (average 17 percent). As soon as honey is diluted in water or wort (the liquid extraction of the malt), these microbes are free to grow and proliferate. Many homebrewers have reported a high incidence of bacterial and wild yeast contamination when introducing honey to their beers.

*For formulas, research monographs, technical article reprints and practical tips, please call the Honey Hotline at 1-800-356-5941.*

The possible incorporation of honey's diastatic enzymes (alpha-amylase and beta-amylase) to beer could pose further complications for brewing with honey. These enzymes are present in malted barley and are activated and manipulated by the brewer with specific temperature regimes during the mashing process. Diastatic enzymes are responsible for the conversion of the complex carbohydrates of the malt starch into a balance of fermentable sugars and unfermentable dextrins. The dextrin complement (average 25-35 percent) consists of partially degraded complex carbohydrates that contribute importantly to the final extract, body and texture of a beer. It is essential that the brewer prevent further degradation of these dextrins into simple fermentable sugars by diastatic enzymes.

Boiling the wort effectively destroys these enzymes along with any yeasts or bacteria that may have survived to this stage. If honey were added to the boiling wort, there is little doubt that it would be rendered sterile and enzymatically deactivated. Unfortunately, it would also likely be rendered without much positive contribution of flavor to the beer.

## How to Use Honey in the Homebrewing Process

Sterilization is needed to control honey's diastatic enzymes as well as its yeast and bacterial count. Honey should be added in such a way so that its diastatic enzymes (alpha-amylase and beta-amylase) do not degrade the dextrins (non-fermentable carbohydrates) in beer into simple sugars, thereby destroying the texture and body of the end product. The yeast and bacteria in honey, which are generally in stasis due to honey's low water activity, can grow and proliferate when diluted during beer making. This will adversely affect the microbiological profile of the end product.

### COMPENSATING FOR HONEY IN THE BREWING TECHNIQUE

The carbohydrates in honey must be considered to comprise approximately 95 percent fermentable sugars (fructose, glucose, maltose and sucrose), whereas the carbohydrates in premium beers may comprise 65-75 percent fermentable sugars. The 25-35 percent of the carbohydrates remaining unfermented are dextrins (beta glucans) which provide body and richness to the finished beer. Honey added to fermenting beer wort not only decreases the dextrin content of the beer proportionately by dilution, but it also increases the potential alcohol content of the finished beer by increasing the proportion of fermentable sugars in the wort. The saccharization which occurs during mashing converts the starches in grain to fermentable sugars. The brewer should consider using higher saccharization temperatures to promote dextrin formation and retention. The brewer should also consider starting with a lower gravity in the wort to reduce overall potential alcohol when brewing with honey.

### HONEY: HEAT TREATMENT

The following method is recommended for pasteurizing honey for homebrewing:

1. Preheat the oven to 176°F.
2. Place the honey in a sanitized oven-proof saucepan.
3. Heat the honey on the stovetop to 176°F. The honey should be stirred occasionally.
4. When the honey reaches 176°F, cover the pan and place it in the oven.
5. The trick for the homebrewer will be maintaining the pasteurization temperature for the required time. Use a thermometer that is reliable, and hold the honey in the oven at 176°F for 2 and 1/2 hours.

*For formulas, research monographs, technical article reprints and practical tips, please call the Honey Hotline at 1-800-356-5941.*

6. At the end of the pasteurization process, bring the honey temperature down to the beer temperature by placing it in an ice bath.

**HOW TO USE HONEY IN THE HOMEBREWING PROCESS**
Honey should be added to the beer at high kraeusen (peak of fermentation activity), diluted (with hot pasteurized water) to the original specific gravity of beer and cooled to the temperature of the fermenting beer. There should be an increase in mash temperature if more honey is being used to compensate for the dilution factor. Brewers should aim for mash temperatures between 155-162°F to promote more dextrins.

## Where and How to Get Variety Honeys

Homebrewers may want to purchase honey from a local beekeeper or honey packer, or from a warehouse store, as typical supermarkets sell honey in relatively small containers. To receive a list of honey suppliers please contact the National Honey Board at 303-776-2337 or download a suppliers guide at www.nhb.org.

**CHOOSING THE HONEY**
When choosing the type of honey to use, there are three factors to consider: aroma, flavor, color and body. Aroma and flavor are influenced by the flowers from which the nectar is gathered. Color can also be attributed to the flower, and varies from nearly clear to very dark. Body depends on 1) floral source and 2) how the honey is extracted from the comb and blended.

**RECOMMENDED HONEYS AND THEIR LEVELS FOR BREWING**
Apart from the considerations of dilution of dextrins, free-amino nitrogen and other nutrients, ideal honey usage levels can be quite variable. Honey's primary contribution to beer is its characteristic aroma and flavor. Most brewers will want to keep that flavor in the background as an aromatic nuance complementing the other flavors in their beers. The following percentages of honey (as percent weight of total grain bill) are suggested based on the National Honey Board's beer research:

- **3-10%** - A subtle honey flavor is contributed to the ale or lager. Most commercially available honeys such as clover, alfalfa, orange blossom, sage and mixed wildflower are very mild in aromatic flavor intensity.

- **11-30%** - A distinctly noticeable honey flavor note will develop. Stronger hops flavors, caramelized or roasted malts, spices or other ingredients should be carefully considered when formulating recipes to balance stronger honey flavors at this higher level.

- **More than 30%** - The flavor of the honey will likely dominate the other flavors in the beer. The beverage should probably be considered in a category of its own.

Flavor preference is a highly subjective consideration. The permutations of brewing technique, various yeast strains, diverse malts, adjuncts, hops, herbs and spices along with the many variations of honey types, seasons and sources will keep the innovative honey homebrewer creating new recipes for a very long time!

*For formulas, research monographs, technical article reprints and practical tips, please call the Honey Hotline at 1-800-356-5941.*

# Honey-Ginger Spice Beer

*Ingredients for 5 gallons of final product (5.5 gallons fermented wort)*

| **Ingredients** | **Quantity** | |
|---|---|---|
| | | |
| **Grains:** | **Lb.** | **Oz.** |
| 2-row pale malt | 6-1/4 | |
| Munich (10L) | 1/2 | |
| Wheat | 3-1/4 | |
| | | |
| **Hops:** | | |
| Northern Brewer (8% alpha acid - 21% util) | | 1/2 (90 minutes for bittering) |
| Cascades (5% alpha acid - 21% util) | | 1 (90 minutes for bittering) |
| Cascades (5% alpha acid - 11% util) | | 1/2 (90 minutes for flavoring) |
| Fuggles | | 1/2 (10 minutes for aroma) |
| | | |
| **IBU:** approx. 31 (International Bittering Units) | | |
| | | |
| **Spices:** | | |
| Crystallized ginger | | 2 (chopped and added 5 minutes before end of boil) |
| Cinnamon sticks, cloves, coriander | | 1/8 (in hop bag at end of boil) |
| | | |
| **Water Treatment:** (adjust with salts to approximate depending on water analysis) | | |
| Calcium | 100 ppm | |
| Sulfate | 300 ppm | |
| Chloride | 30 ppm | |
| | | |
| | | |
| **Mash Temperature:** | 160°F | |
| **Original Gravity:** | 1060 | |
| **Terminal Gravity:** | 1015 | |
| **Honey:** 3/4 lb. Citrus (orange blossom) honey, pasteurized and added to fermentation according to prescribed method. For more information see "Honey & Homebrewing" available for download at www.nhb.org/foodtech/. | | |

This "all grain" recipe was developed by a microbrewer. It has been scaled down for homebrewing batches. The most important factors contributing to the success of the resulting beer are the addition of honey at high kraeusen, and the compensating higher mash temperatures. Since different brewing systems yield different extraction rates, all brewers should take their experience into account when interpreting any recipe.

**Recommended procedure for a adding honey to beer:**
Honey should be added to the beer at high kraeusen (peak of fermentation activity), diluted (with hot pasteurized water) to the original specific gravity of beer and cooled to the temperature of the fermenting beer. There should be an increase in mash temperature if more honey is being used to compensate for the dilution factor. Brewers should aim for mash temperatures between 155-162°F to promote more dextrins.

# Honey-Chamomile Ale

*Ingredients for 5 gallons of final product (5.5 gallons fermented wort)*

| **Ingredients** | **Quantity** | |
|---|---|---|
| | | |
| **Grains:** | **Lb.** | **Oz.** |
| 2-row pale malt | 7 | |
| Munich (10L) | 3/4 | |
| Carapils (dextrin malt) | 1/2 | |
| | | |
| **Hops:** | | |
| Centennial (9% alpha acid - 21% util) | | 3/4 (90 minutes for bittering) |
| Cascades (5% alpha acid - 11% util) | | 1/2 (30 minutes for flavoring) |
| Fuggles | | 1/2 (10 minutes for aroma) |
| Mount Hood | | 1/2 (end of boil) |
| | | |
| **IBU:** approx. 25 (International Bittering Units) | | |
| | | |
| **Spices:** | | |
| Chamomile | | 1 (in hop bag at end of boil) |
| | | |
| **Water Treatment:** (adjust with salts to approximate depending on water analysis) | | |
| Calcium | 100 ppm | |
| Sulfate | 300 ppm | |
| Chloride | 30 ppm | |
| | | |
| | | |
| **Mash Temperature:** | 158°F | |
| **Original Gravity:** | 1045 | |
| **Terminal Gravity:** | 1011 | |
| **Honey:** 3/4 lb. clover honey, pasteurized and added to fermentation according to prescribed method. For more information see "Honey & Homebrewing" available for download at www.nhb.org/foodtech/. | | |

This "all grain" recipe was developed by a microbrewer. It has been scaled down for homebrewing batches. The most important factors contributing to the success of the resulting beer are the addition of honey at high kraeusen, and the compensating higher mash temperatures. Since different brewing systems yield different extraction rates, all brewers should take their experience into account when interpreting any recipe.

**Recommended procedure for a adding honey to beer:**
Honey should be added to the beer at high kraeusen (peak of fermentation activity), diluted (with hot pasteurized water) to the original specific gravity of beer and cooled to the temperature of the fermenting beer. There should be an increase in mash temperature if more honey is being used to compensate for the dilution factor. Brewers should aim for mash temperatures between 155-162°F to promote more dextrins.

# Honey-Nut Brown Ale

*Ingredients for 5 gallons of final product (5.5 gallons fermented wort)*

| **Ingredients** | **Quantity** | |
|---|---|---|
| | | |
| **Grains:** | **Lb.** | **Oz.** |
| 2-row pale malt | 8.5 | |
| Caramel (120L) | 1 | |
| Carapils (dextrin malt) | 1/2 | |
| Roasted barley | 1/8 | |
| Chocolate malt | 1/8 | |
| | | |
| **Hops:** | | |
| Northern Brewer (8% alpha acid - 21% util) | | 1/2 (90 minutes for bittering) |
| Cascades (5% alpha acid - 21% util) | | 1 (90 minutes for bittering) |
| Cascades (5% alpha acid - 11% util) | | 1/2 (30 minutes for flavoring) |
| Fuggles | | 1/2 (10 minutes for aroma) |
| Fuggles | | 1/2 (end of boil for aroma) |
| | | |
| **IBU:** approx. 31 (International Bittering Units) | | |
| | | |
| **Water Treatment:**<br>(adjust with salts to approximate depending on water analysis) | | |
| Calcium | 30 ppm | |
| Sulfate | 100 ppm | |
| Chloride | 30 ppm | |
| | | |
| | | |
| **Mash Temperature:** | 160°F | |
| **Original Gravity:** | 1060 | |
| **Terminal Gravity:** | 1016 | |
| **Honey:** 3/4 lb. clover honey, pasteurized and added to fermentation according to prescribed method. For more information see "Honey & Homebrewing" available for download at www.nhb.org/foodtech/. | | |

This "all grain" recipe was developed by a microbrewer. It has been scaled down for homebrewing batches. The most important factors contributing to the success of the resulting beer are the addition of honey at high kraeusen, and the compensating higher mash temperatures. Since different brewing systems yield different extraction rates, all brewers should take their experience into account when interpreting any recipe.

**Recommended procedure for a adding honey to beer:**
Honey should be added to the beer at high kraeusen (peak of fermentation activity), diluted (with hot pasteurized water) to the original specific gravity of beer and cooled to the temperature of the fermenting beer. There should be an increase in mash temperature if more honey is being used to compensate for the dilution factor. Brewers should aim for mash temperatures between 155-162°F to promote more dextrins.

# Buckwheat-Honey Oatmeal Stout

*Ingredients for 5 gallons of final product (5.5 gallons fermented wort)*

| **Ingredients** | **Quantity** | |
|---|---|---|
| | | |
| **Grains:** | **Lb.** | **Oz.** |
| 2-row pale malt | 9 | |
| Chocolate malt | 1 | |
| Munich (10L) | 3/4 | |
| Caramel malt | 1/4 | |
| Black malt | 1/4 | |
| Flaked oatmeal | 1/2 | |
| | | |
| **Hops:** | | |
| Northern Brewer (8% alpha acid - 21% util) | | 1 (90 minutes for bittering) |
| Cascades (5% alpha acid - 21% util) | | 1/2 (90 minutes for bittering) |
| Cascades (5% alpha acid - 11% util) | | 1/2 (30 minutes for flavoring) |
| Fuggles | | 1/2 (10 minutes for aroma) |
| Northern Brewer | | 1/2 (end of boil for aroma) |
| | | |
| **IBU:** approx. 34 (International Bittering Units) | | |
| | | |
| **Water Treatment:** (adjust with salts to approximate depending on water analysis) | | |
| Calcium | 30 ppm | |
| Sulfate | 100 ppm | |
| Chloride | 30 ppm | |
| | | |
| | | |
| **Mash Temperature:** | 158°F | |
| **Original Gravity:** | 1066 | |
| **Terminal Gravity:** | 1016 | |
| **Honey:** 3/4 lb. buckwheat honey, pasteurized and added to fermentation according to prescribed method. For more information see "Honey & Homebrewing" available for download at www.nhb.org/foodtech/. | | |

This "all grain" recipe was developed by a microbrewer. It has been scaled down for homebrewing batches. The most important factors contributing to the success of the resulting beer are the addition of honey at high kraeusen, and the compensating higher mash temperatures. Since different brewing systems yield different extraction rates, all brewers should take their experience into account when interpreting any recipe.

**Recommended procedure for a adding honey to beer:**
Honey should be added to the beer at high kraeusen (peak of fermentation activity), diluted (with hot pasteurized water) to the original specific gravity of beer and cooled to the temperature of the fermenting beer. There should be an increase in mash temperature if more honey is being used to compensate for the dilution factor. Brewers should aim for mash temperatures between 155-162°F to promote more dextrins.

# Honey-Sage Pale Ale

*Ingredients for 5 gallons of final product (5.5 gallons fermented wort)*

| **Ingredients** | **Quantity** | |
|---|---|---|
| | | |
| **Grains:** | **Lb.** | **Oz.** |
| 2-row pale malt | 7 | |
| Carapils (dextrin malt) | 0.5 | |
| | | |
| **Hops:** | | |
| Northern Brewer (8% alpha acid - 21% util) | | 1 (90 minutes for bittering) |
| Cascades (5% alpha acid - 11% util) | | 1.5 (30 minutes for bittering) |
| Cascades | | 0.5 (10 minutes for flavoring) |
| Hallertauer | | 0.5 (end of boil for aroma) |
| | | |
| **IBU:** approx. 37 (International Bittering Units) | | |
| | | |
| **Spices:** | | |
| Fresh sage | | 0.125 (chopped and put in hop bag) |
| | | |
| **Water Treatment:** (adjust with salts to approximate depending on water analysis) | | |
| Calcium | 120 ppm | |
| Sulfate | 350 ppm | |
| Chloride | 30 ppm | |
| | | |
| | | |
| **Mash Temperature:** | 156°F | |
| **Original Gravity:** | 1045 | |
| **Terminal Gravity:** | 1011 | |
| **Honey:** 1/2 lb. honey, pasteurized and added to fermentation according to prescribed method. (Sage honey will yield an excellent product.) For more information see "Honey & Homebrewing" available for download at www.nhb.org/foodtech/. | | |

This "all grain" recipe was developed by a microbrewer. It has been scaled down for homebrewing batches. The most important factors contributing to the success of the resulting beer are the addition of honey at high kraeusen, and the compensating higher mash temperatures. Since different brewing systems yield different extraction rates, all brewers should take their experience into account when interpreting any recipe.

**Recommended procedure for a adding honey to beer:**
Honey should be added to the beer at high kraeusen (peak of fermentation activity), diluted (with hot pasteurized water) to the original specific gravity of beer and cooled to the temperature of the fermenting beer. There should be an increase in mash temperature if more honey is being used to compensate for the dilution factor. Brewers should aim for mash temperatures between 155-162°F to promote more dextrins.

# Hard Honey Cider

## What is hard cider?

For most Americans, the word cider conjures up images of freshly pressed apple juice. However, in all other parts of the world, the word cider refers to the fermented, alcoholic beverage made from pressed juice.

Hard cider, the American term for the alcoholic beverage, is a light-tasting, slightly sweet drink with approximately the same alcohol content as beer. Hard cider is typically made from a blend of juices from bittersweet and culinary apples.

Cider is produced in four main styles: *still* cider is uncarbonated, *sparkling* cider is lightly carbonated, *New England hard cider* may be still or sparkling, but contains elevated levels of alcohol (over 8 percent) and *specialty hard cider* is made with added sugar, honey, molasses, or fruit.

*Hard cider* refers to the fermented beverage made from the juice of apples. *Unfermented or sweet cider* is fresh pressed apple juice.

Hard cider can range from sweet to dry depending on the type of apples and yeast used and the length of fermentation. It can be pasteurized and filtered to produce a draft hard cider, or left unfiltered as in farmhouse hard cider.

## Where did hard cider originate?

Hard cider is believed to have developed from wine making technology in the Basque country of northern Spain. Celts then spread cider-making technology throughout the northern coast of Europe as they traveled from Spain to England and Ireland.

The European hard cider industry flourished until the industrial revolution when thousands left their farms for cities and beer became the beverage of choice. However, interest in hard cider continued among the American colonists who brought apples and cider-making technology to the New World.

During the colonial period, hard cider was the beverage of choice. It was cheaper than beer and could easily be made at every farmhouse. It wasn't until the 1900's that hard cider decreased in popularity. Prohibition and the mass production of beer during the American industrial revolution led to its downfall. Today, however hard cider is making a strong comeback and there is increasing awareness and appreciation of this traditional beverage.

The United Kingdom leads the world in hard cider production and consumption, but the United States is catching up. There are approximately 60 cider manufacturers in the UK and approximately 30 in the U.S. Of the 30 in the U.S., about two-thirds produce draft hard ciders and the remaining third produces farmhouse hard ciders.

Hard cider produced in England is generally more tannic and ale-like due to their use of ale yeast and bittersweet apples. The cider made in the U.S. is generally sweeter and more champagne-like.

## Honey's advantages in hard cider

Honey imparts a sweet, smooth, mellow taste and pleasant floral scent to hard cider. It also increases the alcohol content of the cider by increasing the specific amount of sugars available for fermentation.

Honey naturally raises the specific gravity of pressed apple juice and imparts a smooth honey taste to hard cider. The specific gravity of fresh pressed apple juice is approximately 0.050. At this level, fermentation of the sugars present produces a hard cider with an alcohol content of 6 percent. However, contamination by yeast and bacteria is still possible. Therefore, many manufacturers raise the specific gravity of their product to create a hard cider with a higher alcohol content and longer shelf-life.

There are four basic types of apples: **sweet apples** include Baldwin, Cortland, Delicious and Rome Beauty; **acidic apples** are Northern Spy, Winesap, Greening and Pippin; **aromatic apples** include Macintosh and Russet and **astringent apples** are basically wild apples and crabapples.

**NOTE:** Honey adds 35 gravity points per pound of honey per gallon of cider.

## Making hard honey cider

Cider making begins with apple selection. Most ciders are a blend of juices from several apple varieties. A typical blend of apples would include approximately 50 percent sweet apples, 35 percent acidic apples and 5 percent astringent apples. As a rule of thumb it takes 100 pounds of apples to make 8 gallons of juice.

### Milling and Pressing

The cider brewer must decide whether to buy fresh pressed apple juice or press it themselves. When buying pressed juice, the cider manufacturer has no control over the types of apples used and whether preservatives have been added. Milling and pressing can be expensive and laborious, but brewers have more control over the cider processed.

*Honey Cider Facts*

- Milder honeys should be added to cider because darker honeys will overpower the apple taste.
- A honey-flavored cider with a majority of the fermentable material coming from apples is a honey-flavored specialty cider.
- If the majority of fermentable material comes from honey then it is an apple-flavored mead.

Once the apples have been selected, they are milled or ground to produce apple pulp, called pomace. The pomace is then pressed to obtain apple juice. Some brewers treat the juice, called must, with sulfites to reduce bacteria and wild yeasts. Some prefer to skip this step and allow wild yeasts present in the juice to begin ferment. If fermentation with wild yeast is not preferred, one to two Campden (potassium meta-bisulphite) tablets per gallon will kill all unwanted organisms. After adding sulfite, the juice should be aerated for 24 hours before adding yeast to prevent its destruction.

Once the juice has been pressed, the specific gravity, pH and tannin level must be checked with a hydrometer and enough honey should be added to reach a specific gravity of approximately 1.060. However, the amount of honey added depends on the preferred alcohol content of the finished cider. The more honey added, the higher the alcohol content will be.

The pH of the pressed juice should be in the range of 3.9 to 4.0. To lower the pH add malic acid (the principle acid in cider) and to raise the pH add precipitated chalk. The correct level of acid is essential because it balances the alcohol in the cider and helps protect it from contamination. Tannin is found in crabapples and is what gives them their astringent taste. In cider it provides long-term structure and a pleasant dry taste.

The tannin level of the juice will need to be adjusted if the juice was pressed from sweet apples such as Red Delicious. One teaspoon of tannin powder for every five gallons of pressed juice is needed when sweet apples are used. However, if the correct blend of sweet, aromatic, acidic and astringent apples are used, acid and tannin will not need to be adjusted.

**Fermentation**

After honey has been added and any adjustments have been made, the juice is ready for fermentation. Cider undergoes two different kinds of fermentation. The first is carried out by yeast which have either been added or are naturally present. This fermentation converts sugars to ethanol and alcohol. The second fermentation involves the conversion of malic acid to lactic acid and carbon dioxide by lactic acid bacteria.

The temperatures necessary for primary and secondary fermentation are often different. Temperatures for primary fermentation depend on the type of yeast used, while secondary fermentation should occur at temperatures below 55° F (13° C).

Many types of yeasts can be used to ferment cider. Yeasts that add little character and flavor and do not mask the delicate apple taste are typically preferred. Champagne yeasts which are capable of converting more of the natural fruit sugars to alcohol and which do not impart flavor are often used by cider manufacturers.

Fermentation action usually stops within two to three months when acid and alcohol levels build up in the juice. After fermentation subsides, the cider is left for the yeast to settle and is either cold-filtered, centrifuged or simply siphoned to another bottle to separate the dormant yeast from the juice. Cider can be stored in any type of bottle that can be sealed with a cap or a cork. Capped bottles may be used to store still (uncarbonated) cider or cider that has been primed to become sparkling cider (carbonated). Corked bottles are only used with still cider because the pressure that builds inside a sparkling cider would pop the cork.

The cider should be stored for at least six months in a dark place to age. The

**Honey Hints**

To produce a more alcoholic and dry honey cider, the honey added should be allowed to ferment to completion. However, the final product will only have a slight honey flavor. To produce a sweeter, less alcoholic and more honey flavored cider, fermentation should be shortened to prevent the entire consumption of honey by the yeast.

cider should be stored at 65 to 72° F (18 to 24° C) to let the flavors mellow and the edges soften. However, the length of aging depends on the style of cider being made. Light, sparkling ciders require less time, while stronger ciders may take anywhere from three months to a year to fully mature.

## Where to find more information

*The Art of Cidermaking*, by Paul Correnty provides step by step instruction on the production of cider. The honey cider recipes on the following pages have been taken from Correnty's book with permission.
If you have access to the Internet, two interesting Web sites are:

The Real Cider and Perry page (http://web.bham.ac.uk/GraftonG/cider/homepage.htm), and The Brewery page (http://www.brewery.org/brewery/cm3/recs/11_toc.html).

Also, a quick search on the Internet can provide you with a wealth of information.

To create a sparkling cider, a small amount of sugar must be added to the cider before it is capped and stored. This process is called priming. To prime five gallons of cider boil half cup of cane or corn sugar together with a pint of water for five minutes. Let cool before mixing with your cider. Then pour into a large container before racking the cider. The sugar syrup will activate the dormant yeast still alive in the unfiltered and unsufited cider. With no escape from the capped bottles, the carbon dioxide from the yeast will be absorbed by the cider to create sparkling bubbles.

# Honey Cider Formulas

## *Bit O' Honey Cyser*

*Ingredients for five gallons*

- 5 gallons fresh pressed sweet cider, tested and adjusted for acid.
- 2 pounds clover honey (or enough to bring the specific gravity up to approximately 1.065).
- ale or mead (honey wine) yeast starter.

*Procedure:*

Simmer the honey with a bit of cider over a low flame until the honey warms and thins. Pour a gallon of sweet cider into a sanitized glass carboy to its shoulders with sweet cider. Pitch (add) the yeast, top off with the remaining sweet cider, and cover the top of the carboy with plastic wrap. Since ale or mead yeast is being used keep the cider between 65 and 75° F (18 and 24° C).

Fermentation begins very slowly as the heavier honey settles, then works very rapidly as the yeast feast on the large amounts of sugar in the blend. Wipe up and sanitize the overflow and top off and add a fermentation lock when the cider settles.

The procedures for cyser are identical to cider with a notable exception: honey takes a longer time to clear and even longer time to ferment out and taste acceptable (at least 6 months).

The honey cyser will finish dry and have a lingering honey sweetness. Cyser may be bottled still and capped or corked, or may be made sparkling with the addition of a simple syrup of one-half cup sugar and two cups water and boiled for five minutes and cooled to five gallons of cyser.

Let the bottled cyser age in a cool place for at least four months before drinking.

## *Gorman's Robust Cyser*

*Ingredients for five gallons*

- 5 gallons fresh pressed sweet cider, tested and adjusted for acid.
- 7 pounds mild honey (or enough to bring the specific gravity up to approximately 1.150).
- 1 tablespoon ground cinnamon.
- 1 pack dried Epernay wine yeast or yeast culture.

*Procedure:*

Warm the honey with a gallon of cider over low flame to thin it before adding it and the cinnamon to the carboy full of sweet cider. Pitch the yeast or yeast culture and ferment as for the Bit O' Cyser recipe. Two things to note:

1. Epernay wine yeast is used because it has a high tolerance for alcohol. It will ferment more of the honey before settling out than will a low-tolerance beer yeast.
2. With such a large amount of honey, fermenting this cider and achieving the proper balance of tastes may take considerable time, maybe up to a year, so be patient.

This cider will keep in a bottle for up to four years.

## *Ginger Honey Cider*

*Ingredients for five gallons*

- 5 gallons fresh pressed sweet cider
- 3 cups cane or corn sugar
- 2 cups clover or other mild honey
- 1 to 4 ounces freshly grated ginger
- lager or ale beer yeast culture

*Procedure:*

Dissolve the sugars and honey in one gallon of warmed cider and add to the other four gallons already in the sanitized carboy. Pitch the active yeast culture, fill the carboy to within two inches of the top and cover the opening with plastic wrap. Keep the carboy at room temperature until fermentation starts. Then carefully move the carboy to a cool place, below 55° F (13° C).

Primary fermentation at these temperatures will last at least one month, so remember to wipe down the carboy daily with sanitizing solution. At the end of primary fermentation, add the freshly grated ginger, top off the carboy with fresh cider, and attach a fermentation lock.

At this point, the cider may be left to ferment at cool temperatures. Secondary fermentation is characterized by a steady stream of rising bubbles that slowly subsides then cease when all the sugars have been converted. It will be clear and ready to bottle within two to three months.

It may take a few months for the flavors of Gingered Honey Cider to mellow after fermentation is completed. At bottling the ginger will still be sharp and not yet blended into the apple and honey base. This cider may be bottled still or made sparkling. Rack the cider into a sanitized five-gallon container and add a boiled and cooled solution of one-half cup sugar and one cup water before bottling and capping.

## *Stokes Sensational Elderberry Cider*

This is about as rich a cyser as one gets. The color is deep burgundy, the aroma is a wild mixture of crushed berries and fragrant honey with apple peeking through. And the taste…big, big, BIG! Berries and honey cascade down balanced by apple acidity and the tannin of the elderberries. The finish is rich and riotous and very long, in the end the elderberries give way to the kiss of honey. This is the first cyser made by Martin Stokes, an accomplished brewer and cidermaker who won it all in 1994 as the AHA Cidermaker of the Year.

*Ingredients for five gallons*

- 4.5 gallons fresh pressed apple juice at 65° F
- 4 12-ounce cans Seneca Granny Smith apple juice concentrate.
- 5 pounds clover honey.
- 16 pounds elderberry (these may be picked fresh and frozen until needed).
- 1 tsp. yeast nutrient.
- ½ tsp. yeast hulls.
- ½ tsp. liquid pectin enzyme.
- 1 package dried champagne yeast, rehydrated following package instructions.

*Procedure:*

Roughly crush the berries and mix them together with 3 gallons of the cider (put the rest back in the fridge) and the other ingredients except the yeast in a wide food grade plastic fermenting bucket or stainless steel fermenter. Pitch the yeast and cover with cheesecloth to keep our critters. Ferment the berries until the specific gravity drops by half. Using a large mesh strainer, strain the floating berries out then rinse them with the remaining 1 ½ gallons of sweet cider over the bucket to catch all the juice. Siphon the cyser out of the bucket into a clean 5 gallon carboy and attach a water lock. Place in a dark and quiet part of the cellar and let the cyser finish fermenting until it drops clear, another 3 or 4 months.

At this time the cyser may be primed and bottled, or left to mature in bulk. Be aware that there is much that went into this cyser and it will take at least 8 or 9 months for the tannins in the elderberries to mellow and the complex honey taste to develop. It is a good idea to make other, quicker maturing cysers for early drinking so that this one may be allowed to age gracefully…you will be glad you did!

## *Herb's Happy Honey Cider*

This cyser is pale yellow and very clean with sweet apple and honey aromas. It is medium weight and delicate in taste with a refreshing honeyed finish. This is a favorite libation of Herbert Peach, blue ribbon winner in the Cider category at the 1997 Boston Homebrew Competition.

*Ingredients for five gallons*

- 5 gallons fresh pressed sweet cider at 75° F.
- 4 cups granulated sugar.
- 2 pounds clover honey.
- M&F dried ale yeast.

*Procedure:*

In a clean carboy mix together 1 gallon of the cider, the sugar, and the liquefied honey then swirl gently until dissolved. Pour in the remaining cider. Rehydrate the dried yeast according to the package instructions and pitch. Attach water lock or blowoff tube and when yeast starts to work, bring the carboy down to cellar so that it may ferment at a temperature between 55° F and 60° F to maintain its fruity aroma.

Let the cyser ferment in a primary until only a few bubbles rise to the surface and the cyser starts to clear (3 or 4 months), then rack into a clean carboy. The fermentation will slowly continue for another month until all activity stops and the cyser is very clear. Bottle and enjoy now or bottle and age for further maturity.

# SELECTED HONEY FLORAL SOURCES

*It All Depends Where the Bees Buzzed!*

| Type of Honey | Distinguishing Characteristics | Production |
|---|---|---|
| Acacia Honey | Pale yellow color.<br>Delicate flavor. | Produced in California. |
| Alfalfa Honey | Light amber color.<br>Mild flavor and aroma. | Produced extensively throughout Canada and U.S. |
| Basswood Honey | Water-white color.<br>Strong "biting" flavor. | Produced from southern Canada to Alabama and Texas. |
| Buckwheat Honey | Dark amber color.<br>Strong, slightly malty flavor. | Produced in Minnesota, New York, Ohio, Pennsylvania and Wisconsin as well as in eastern Canada. |
| Blueberry Honey | Light amber color.<br>Distinct fruity flavor. | Produced in eastern and southeastern states and Canada. |
| Clover Honey | Color varies from water white to amber.<br>Mild, "classic honey" flavor. | Produced throughout the U.S. |
| Eucalyptus Honey | Varies greatly in color.<br>Generally strong flavor with very slight menthol notes. | Produced in California and Australia. |
| Heather Honey | Reddish brown to deep amber color. Heavy-bodied. Bittersweet, aromatic flavor. | Produced in Michigan, New Jersey and West Virginia. |
| Orange Blossom Honey | Light amber color.<br>Mild, flavor reminiscent of the scent of citrus blossoms. | Produced in Florida, southern California and southern Texas. |
| Sage Honey | Water-white color.<br>Mild flavor. | Produced in California and southwest U.S. |
| Safflower Honey | Color varies from amber to dark amber with slight greenish cast. Mild flavor. | Produced throughout the western U.S. |
| Sourwood Honey | Light amber color.<br>Mild flavor. | Produced in the eastern areas of the U.S. |
| Tupelo Honey | Light amber color with slight greenish cast.<br>Mild, distinctive flavor. Very slow to crystallize. | Produced in northeastern Florida. |
| Mixed Wildflower Honey | Varied greatly in color and flavor. Typically strong flavor. | Produced throughout the U.S. |

*DID YOU KNOW?*

*The average worker bee makes 1/12 of a teaspoon of honey in her lifetime.*