

Sour Wine, Sweet Success

BY R.J. FOSTER
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Vinegar's rich history and variety of use began over 10,000 years ago with the discovery that a cask of wine had been held beyond its shelf life. This sour wine—or *vin aigre* as the French called it—no longer provided fruity bouquet or flavor, but it offered unique flavor and functionalities that would find use throughout the food industry, starting with pickling.

“Pickling is one of the oldest methods of food preservation, right along salting and smoking,” says Sylvain Norton, Ph.D., vice president, technology and regulatory, Fleischmann's Vinegar, Cerritos, CA. “In condiments, vinegars promote microbial stability by lowering pH and water activity, and by the intrinsic antimicrobial properties of acetic acid. However, vinegars are not food additives added in formulations for a single, well-defined technological purpose. They are full-fledged food ingredients, used for their impact on a combination of factors, such as flavor, color, water retention, salt reduction, umami, water activity and starch gelatinization.”

Fermentation frenzy

Vinegar is the product of bacterial fermentation of alcohol by *Acetobacter aceti*. “The main effect of the acetic-acid fermentation is to convert the alcohol into acetic acid, but this is not the only effect,” Norton says. “The industry unit of measure is the vinegar grain, which represents acidity in grams of acetic acid per liter of vinegar. In the USA, vinegar must contain at least 4% acetic acid (40 grain). Most retail vinegars are sold between 40 and 60 grain. As an ingredient for the production of food products, vinegar is generally sold at concentrations ranging from 50 to 300 grain.”

Although classified by acetic-acid content, vinegar is not simply a dilution of acetic acid. In fact, the FDA's “Compliance Policy Guide” (Section 562.100) references a study that identified 11 components from five samples of distilled vinegar: “The volatile components consisted of aldehydes, ketones, esters and alcohols. Acetaldehyde, acetone, ethyl acetate and ethyl alcohol were present in all samples of vinegar analyzed.”

Vinegar is produced by three methods, according to Barbara Zatto, director of culinary and sales manager West, Mizkan Americas, Inc., Mount Prospect, IL. The “Orleans” and “generator” methods are traditional processes that utilize wooden barrels as fermentation vessels, and finished vinegar or “mother of vinegar” as a fermentation bacteria source.



“The submerged fermentation method is the most commonly used method in the production of vinegar,” Zatto says. “Large stainless-steel tanks called acetators are fitted with centrifugal pumps in the bottom that pump air bubbles into the tank to stir the alcohol while acetozym nutrients are piped into the tank. The nutrients spur the growth of *Acetobacter* bacteria on the oxygen bubbles. Cooling coils in the tank keep the temperature between 86° and 88°F. Within a matter of hours, the alcohol product has been converted into vinegar. The vinegar is piped from the acetators to a filtering machine.”

Vinegariety

“The workhorse of the vinegar world is white distilled vinegar, also called spirit vinegar,” notes Norton. “The name is somewhat misleading, because the vinegar itself is not distilled. It is made from distilled alcohol—essentially double-strength vodka. This product is relatively neutral in flavor profile and is used in various food applications, such as ketchup, mustard, pickles, salad dressings, hot sauces, mayonnaise, etc.”

Many regions of the world are home to traditional varieties of vinegar, each exhibiting characteristics that reflect the available raw materials and culinary history. “The most common traditional vinegar in the United States is apple cider vinegar; in France and southern Europe, wine vinegar; in the UK, malt vinegar; in Japan, rice vinegar; and in the Philippines, coconut vinegar.” Norton says, “Each of these different types of vinegar has its own unique set of properties, which can be used by chefs and processors to formulate specific food products.”

A popular choice for culinary and commercial applications throughout the world, balsamic vinegar varieties originate from the Italian provinces of Reggio Emilia and Modena. “The production of traditional balsamic vinegar is labor-intensive and time-consuming,” says Zatto. “Therefore, it is very expensive and available in limited quantities. Commercial-grade balsamic vinegar constitutes a more economical alternative to the traditional product. In the United States, products labeled as ‘balsamic vinegar’ are made from the juice of grapes, but would not carry the term ‘of Modena’ on the label. Commercial products are high-quality and suitable for use in marinades and vinaigrette dressings, and in making pan sauces.”



Flavored vinegars are those whose taste is not the direct result of their fermentation. “One could make pineapple vinegar by fermenting pineapple juice into vinegar, or by using another vinegar base, such as white wine vinegar, and adding pineapple juice, purée, flavor, etc.,” says Norton. “The second example would be called a flavored vinegar. A typical example of flavored vinegar is raspberry vinegar, which is generally a blend of red or white wine vinegar, actual raspberries, or raspberry juice concentrate, raspberry purée, raspberry flavor or any combination thereof. Another common flavored vinegar is tarragon white wine vinegar, in which tarragon leaves are soaked in white wine vinegar. Most commercial tarragon vinegars also contain tarragon flavor.”

Zatton notes that “manufacturers are constantly asking for new flavored vinegars and also new raw materials, including grains, from which to manufacture vinegar. Some manufacturers are looking for high-strength flavored vinegars, and requests for organic vinegar are on the rise. Others look to emulate trends and tastes that start in chef-driven restaurants that can translate to a broader audience—honey and fig balsamic vinegars, for example.”

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