



# Natural Appeal

Bakers can satisfy consumer demands for clean-label products using honey as a sweetener and functional ingredient.

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**B**ees travel a long way to bring nature's contribution to modern products. In fact, bees travel at about 15 miles per hour to gather nectar, and a hive must fly more than 50,000 miles to collect enough for a pound of honey. That's a lot of ground to cover to satisfy consumers' demand for natural sweetness.

"Honey is the ideal sweetener because it not only imparts exceptional flavors in all bakery foods, but it also sweetens baked products naturally and gives bakers a 'clean label' alternative to other sweeteners," said Emily Manelius, communication specialist, National Honey Board.

James Mitchell, innovations and development manager, Ciranda, Inc., Hudson, WI, added that honey is natural and comes in an organic form, both of which are desirable attributes for many products. Because of honey's high sweetness level, he said, products made with honey rather than sugar can include less sugars, thus achieving slight calorie reductions.

**FUNCTION JUNCTION.** Honey has many functional benefits in bakery foods, Ms. Manelius said. It helps extend the shelf life of products with a natural ingredient. Honey's fructose

content holds in a bakery food's moisture, and it has high acidity (average pH 3.91), which inhibits mold growth.

According to research published in 2004 by M.A. Mundo, O.I. Padilla-Zakour and R.W. Worobo in the *International Journal of Food Microbiology*, honey has the capacity to serve as a natural food preservative because of the generation of hydrogen peroxide, which acts as an antibacterial agent. Other researchers identified compounds such as flavonoids, particularly caffeic and ferulic acids, as the most likely contributors to the antimicrobial activity.

In addition, honey can be used to add flavor and aroma to different products. According to the National Honey Board, there are more than 300 kinds of honey in the US, originating from such diverse floral sources as clover, eucalyptus and orange blossom. This simple, yet complex, variety of flavors allows food manufacturers to launch complete product lines of honey-sweetened foods, all with different flavor profiles.

For example, a product with buckwheat honey offers a robust flavor, while a clover or alfalfa honey provides a simpler, lighter honey taste. This is mainly because darker honeys

generally contain higher amounts of minerals than lighter honeys, said Joe Hickenbottom, vice-president, sales and marketing, Malt Products, Corp., Saddle Brook, NJ. In general, lighter-colored honeys are mild in flavor, while darker honeys have a

▼ Beyond natural sweetening, honey can help baked goods retain moisture and resist mold.

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▲ Even savory products such as flatbreads can benefit from honey's natural sweetening and moisture-retention qualities.  
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stronger profile (see "Functional Characteristics of Honey" below).

**SWEETENING LOGISTICS.** Replacing existent sweeteners completely with honey usually changes the nature of the existing product, most prominently flavor and consistency. Honey's acidic nature requires the addition of a small amount of baking soda, according to the National Honey Board — about 0.2 oz of baking soda per 12 oz of honey.

On a dry weight basis, honey is about 25% sweeter than sucrose. Mr. Mitchell recommended balancing

### Honey's Antioxidant Activity

| Honey source  | Oxygen radical absorbance capacity (μmol TE per g) | Total phenolics (mg per kg) |
|---|--|-----------------------------|
| IL Buckwheat  | 16.95±0.76   | 796±32                      |
| Buckwheat   | 9.81±0.34  | No data                     |
| NY Buckwheat  | 9.75±0.48  | 456±55                      |
| Soy   | 8.34±0.51  | 269±22                      |
| Hawaiian Christmas Berry  | 8.87±0.33  | 250±26                      |
| Clover  | 6.53±0.70  | No data                     |
| Tupelo  | 6.48±0.37  | 183±9                       |
| Fireweed  | 3.09±0.27  | 62±6                        |
| Acacia  | 3.00±0.16  | 46±2                        |
| Sugar analog (40% fructose, 30% glucose, 10% maltose and 20% water) | 1.00±0.16  | No data                     |

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moisture levels when using honey to replace sugar and lowering oven temperatures since honey browns more than most sweeteners. If a processor replaces a syrup-type sweetener such as high-fructose corn syrup (HFCS), he said, the focus is generally on moisture differences, sweetness levels and flavor.

Blending honey with HFCS can reduce overall cost yet provide properties similar to those of pure honey, Mr. Hickenbottom said, stressing that processors must label their products accordingly to avoid misleading consumers.

When replacing sugar with honey, the humectancy of the product also changes. In baked goods, this usually

is a good thing because the honey will help retain moisture and delay staling. Honey can replace up to half of the granulated sugar in a formulation and all of the sugar in some baked foods, but formulators need to take moisture into account. In general, they must reduce the amount of liquid called for a formula by 2 oz for each 12 oz of honey used. They must also reduce the oven temperature 25 F° to prevent over-browning.

Depending on the application, honey color and flavor are the parameters that vary the most when considering different applications. This is primarily a factor of the floral source of the honey, although over-heating or processing can cause some darkening of otherwise lighter-colored honey.

Formulators working with honey must pay special attention to the honey's hydroxymethylfurfural (HMF) value, said Alton Berquist, quality assurance, Ciranda, Inc. HMF is a compound created by fructose degradation. Because there is a great deal of fructose in honey, this value can be used as an indicator of freshness and handling of honey. Over-handling or heating can cause the HMF value to rise more quickly.

**PURITY CONCERNS.** Some importers and honey packers have been illegally importing honey by

### Functional Characteristics of Honey

| Characteristics          | Functions                     | Applications |         |        |
|--------------------------|-------------------------------|--------------|---------|--------|
|                          |                               | Bakery       | Cereals | Snacks |
| Antimicrobial properties | Spoilage delay                | X            |         | X      |
| Carbohydrate composition | Flavor enhancement            |              |         | X      |
| Color                    | Coloring agent                | X            |         |        |
| Composition              | Decreased burn perception     |              |         | X      |
| Flavor                   | Flavoring agent               | X            | X       | X      |
| Humectancy               | Moisture addition             | X            |         |        |
| Miscibility              | Water soluble                 | X            |         |        |
| Nutrition                | Healthy appeal                | X            | X       | X      |
| Preservation             | Slows staling                 | X            |         |        |
| Reducing sugars          | Enhances browning             | X            | X       | X      |
| Spreadability            | Improves reduced-fat products | X            |         |        |
| Viscosity                | Binding agent                 |              | X       | X      |
| Antimicrobial properties | Extends shelf life            | X            | X       |        |

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## Health and Wellness

Honey is a sweetener, thus it is mainly composed of sugars. The average is 38.5% fructose, 31% glucose, 7.2% maltose, 1.5% sucrose and 0.5% free amino acids, vitamins, minerals and protein.

These other compounds give honey its unique functionality and health profile. Depending on its source, honey contains a variety of phytochemicals that may serve as a dietary source of antioxidants, as well as other compounds such as organic acids and enzymes. In general, darker honeys have been shown to be higher in antioxidant content than lighter honeys. (See "Honey's Antioxidant Activity" on opposite page.)

Honey also contains a variety of oligosaccharides that may function as prebiotics or compounds that help increase populations of Bifidobacteria important to gastrointestinal health.

misrepresenting the true country of origin to circumvent dumping duties of \$1.20 per pound. This results in honey of questionable origin being sold to companies and consumers, raising safety concerns and threatening the honey industry by undercutting fair market prices. "Cheap, illegal imports hurt all legitimate US packers and beekeepers," said David Mendes, president of the American Beekeeping Federation, Atlanta, GA.

Honey in the US market must meet Grade A filtered honey standards and comply with Food and Drug Administration provisions, Mr. Hickenbottom said. No additives of any kind are permitted, and high-performance liquid chromatography (HPLC) tests can quickly assure the user of its purity. Some foreign imports have been banned since they are found to be adulterated, and Mr. Hickenbottom warned processors that Chinese honey is still under US government quarantine.

If a processor suspects an adulterated ingredient, the National Honey Board recommended sending a sample of the honey in question to a laboratory that tests honey for the presence of other sweeteners. If needed, a list of laboratories is available on its website, [www.honey.com](http://www.honey.com). Processors should know their supplier and ask what steps have been taken to ensure the purity and origin of the products. A price point substantially lower than market value is one cause for suspicion.

When its source is verified, however, honey can add instant appeal to baked products. Consumers recognize products containing honey as being sweet, flavorful and nutritious, Mr. Hickenbottom said.

Or as Ms. Manelius summed it up, "Honey is honey." It is made in a beehive, not a manufacturing plant. Because it contains no other additives or ingredients, honey can allow bakers to cash in on the natural appeal it holds for consumers. ■

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