Honey refractometers measure moisture content

Honey refractometers are used by beekeepers and honey packers to measure the moisture content of honey. Technically, refractometers measure the refractive index of a substance.

Explanation: Light travels at different speeds through different materials. The refractive index is just a comparison between two numbers: the speed of light through a vacuum and the speed of light through the material you are testing—in this case honey.

Light also changes direction after it passes through different materials. If you measure the difference between the angle of incidence (light coming in) and the angle of refraction (light coming out) of a substance you can use this number to determine the refractive index. This is how a refractometer actually works.

Explanation: If you look at a straw in a glass of water you will see it looks distorted. This is because light moves faster through just the glass than it does through the glass and the water combined. Likewise, light will move faster through honey that has few solids than it will move through honey that has many solids. In other words, the refractive index of honey will change based on the amount of solids (sugars and other substances) in it.

Refractometers also make corrections based on temperature, because the refractive index will change slightly as the temperature changes.

Now, to make this all the more perplexing, the amount of solids in a liquid is measured on a scale called the Brix scale.

1 degree Brix (written °Bx) means 1 g of sucrose per 100 g of aqueous solution. When the solution consists solely of sucrose and water, this means that you can calculate the total volume of water present because 1 g of water has a volume of exactly 1 mL by definition. For example, a 100-mL solution measuring 10 °Bx contains 90 mL of water, since the total mass of the solution is 100 g, 10 g of which is by sucrose and 90 g of which therefore must consist of water.

The Brix of honey can be from about 70 to 88.

Now here is where confusion sets in. While most refractometers give a reading in Brix (solids in water), honey refractometers give readings of water in honey. This is (kind of) the opposite of Brix.

Explanation: This type of reading is used in honey refractometers, so beekeepers don't have to subtract the Brix reading from 100 to get the moisture level. It's just a convenience. However, it can get really confusing when a beekeeper uses a refractometer designed for another purpose—such as brewing. Not only are these designed to be most accurate in other ranges, the readings are in Brix—not 100 minus Brix. It is best to use a refractometer designed for your specific purpose.

Once you understand how a honey refractometer works, it is simple to use. There are many variations in design, but these are the basic steps:

Calibrate the device with distilled or deionized water

Put a drop of honey on the prism

Close the trap door that flattens the specimen

Focus the eyepiece

Read the scale

Two things are especially important for getting accurate results:

Make sure the container of honey from which your sample comes is well-mixed

Take multiple readings, and average the readings

Explanation: Honey is a variable product which differs from hive to hive, even from cell to cell. And honey that sits for a while will have a different moisture content at the surface than at the bottom. So before testing, always make sure the honey is thoroughly combined.

Human error also plays a part. Sometimes a reading goes awry for no apparent reason and sometimes the scales are just misread or misunderstood. To be on the safe side, multiple readings are always a good idea.

One last thing: read the directions. All these devices come with detailed instructions which should be followed to the letter.

https://www.irmco.com/products/what-does-brix-mean/

Table 5.6 Honey Conversion Table – °Brix, Specific Gravity and % Moisture Relationships*

% Moisture	Specific Gravity (20 °C)	°Brix at 20°C (Refractometer 0 - 90 range)	Refractive Index at 20 °C	% Moisture	Specific Gravity (20 °C)	°Brix at 20 °C (Refractometer 0 - 90 range)	Refractive Index at 20 °C
13	1.4525	85.66	1.5041	17	1.4239	81.45	1.494
13.2	1.451	85.45	1.5035	17.2	1.4225	81.25	1.4935
13.4	1.4495	85.24	1.503	17.4	1.4212	81.04	1.493
13.6	1.4481	85.03	1.5025	17.6	1.4197	80.83	1.4925
13.8	1.4466	84.82	1.502	17.8	1.4184	80.63	1.492
14	1.4453	84.61	1.5015	18	1.4171	80.42	1.4915
14.2	1.4438	84.39	1.501	18.2	1.4156	80.21	1.491
14.4	1.4428	84.18	1.5005	18.4	1.4143	80.01	1.4905
14.6	1.4409	83.97	1.5	18.6	1.4129	79.8	1.49
14.8	1.4395	83.76	1.4995	18.8	1.4115	79.59	1.4895
15	1.4381	83.55	1.499	19	1.4101	79.39	1.489
15.2	1.4367	83.34	1.4985	19.2	1.4087	79.18	1.4885
15.4	1.4352	83.13	1.498	19.4	1.4074	78.97	1.488
15.6	1.4338	82.92	1.4975	19.6	1.406	78.77	1.4876
15.8	1.4324	82.71	1.497	19.8	1.4046	78.56	1.4871
16	1.431	82.5	1.4965	20	1.4033	78.35	1.4866
16.2	1.4295	82.29	1.496	20.2	1.402	78.15	1.4862
16.4	1.4282	82.08	1.4955	20.4	1.4006	77.94	1.4858
16.6	1.4267	81.87	1.495	20.6	1.3992	77.74	1.4853
16.8	1.4254	81.66	1.4945	20.8	1.3979	77.53	1.4849

* Data from the table complied by H.D. Chetaway. National Research Laboratories - Ottawa. Temperature corrections are as follows: Specific Gravity = .0006 per °C or .00033 per °F; °Brix value = .09 per ° C or .05 per ° F; Refractive Index = .00023 per °C or .00013 per °F. If the temperature is above 20°C, add the correction; if it is below 20°C subtract the correction.