Measuring Acidity in Orange Juice

Description
Fruit juices naturally contain different acids which greatly contribute to a juice’s taste and flavor. Generally, a higher acid content results in a tangier flavor. Consumers have come to expect certain taste profiles from various juices. For example, we expect orange juice to taste more acidic compared to pear or peach juice. The types of acids present in a fruit depend on the fruit type. Citrus fruits contain mostly citric acid, whereas apples contain malic acid predominantly. These acids can also provide health benefits for those consuming them. For example, citric acid helps inhibit the formation of kidney stones.

Mass production of orange juice can be deceptively simple. Once the fruit is harvested and transported to a processing plant, the juice is extracted using industrial machinery which pierces and presses the fruit to efficiently release juice without incorporating bitter oils from the orange rind. The juice is then filtered and pasteurized to improve shelf stability and kill bacteria. Often, batches of juice are deoxygenated to allow for long term storage in holding tanks. When ready for final processing, citric acid, vitamins, sugar and other flavorings may be added depending on the product line being manufactured.

Monitoring acidity levels is important to fruit juice manufacturers as it enables them to maintain a consistent taste between batches. Acidity is often measured via titration: a base, such as sodium hydroxide (NaOH) is added until all acids present have been neutralized. The titratable acidity (TA) is then expressed in units of the most prevalent acid, which in orange juice is citric acid. Companies may supplement orange juice with extra citric acid to provide additional flavor. Orange juice typically contains between 8 and 14 grams per liter of citric acid.

Application
A fruit juice manufacturer contacted Hanna Instruments interested in testing acidity in their products. They were previously testing acidity using manual titration but found the process cumbersome, time consuming, and lacking in accuracy, and therefore wanted a simpler solution. The quality control technicians performing the analysis had limited technical knowledge and wanted a product that was highly accurate but still easy to use. Hanna Instruments suggested the HI84532 Mini Titrator for Fruit Juice Analysis. The customer appreciated the intuitive menu and “Tutorial Mode” option that walked the technician through the titration step-by-step. In addition, the HI84532 expresses results in terms of multiple acid types including citric, malic, and tartaric acid. This allowed them to easily test a variety of different juices and obtain results in the preferred units without worrying about converting their results. The manual titrations performed by the technicians and the automatic titration by the HI84532 both determined the endpoint based on a fixed pH of 8.1 per the AOAC method. However, it was clear that the HI84532 provided more accurate and repeatable results due to the precision piston drive pump dosing system. The titrator automatically generates titration reports that can be transferred via USB to a computer. This data management feature enabled them to streamline their data organization and reduce manual recordkeeping. Overall, the HI84532 proved to be a valuable tool for testing and tracking TA of their various juices.