

Exploring the chemistry and properties of maltose.

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Introduction

Maltose, often referred to as malt sugar, is a disaccharide that plays a significant role in the world of carbohydrates and biochemistry. It's a natural sugar found in various foods and beverages, and its chemical structure and properties make it fascinating to scientists and essential in several industries. The molecular structure of maltose- Maltose is classified as a disaccharide, which means it is composed of two monosaccharide (simple sugar) molecules linked together. In the case of maltose, the two monosaccharides involved are glucose molecules. Specifically, maltose consists of two glucose molecules linked by an α -1,4-glycosidic bond [1].

Here's a breakdown of the chemical structure of maltose: Molecule 1: glucose (α -d-glucose), Molecule 2: glucose (α -d-glucose), Bond: α -1,4-glycosidic bond. This linkage is unique to maltose and distinguishes it from other disaccharides like lactose (glucose and galactose linked by a β -1,4-glycosidic bond) and sucrose (glucose and fructose linked by an α , β -1,2-glycosidic bond). Natural sources of maltose- Maltose is found naturally in various foods, especially those derived from plants and grains. Here are some common sources of maltose: Malting process- Maltose gets its name from the process of malting, which involves germinating and then drying cereal grains, typically barley. During germination, enzymes in the grain break down starches into maltose, which serves as a source of energy for the growing plant. Brewers and distillers use malted barley to produce beer and whiskey, taking advantage of the maltose content to support fermentation [2].

Starch-rich foods- Starchy foods like potatoes, rice, and corn contain significant amounts of starch, which consists of long chains of glucose molecules. When these foods are cooked or digested, enzymes in the body break down the starch into maltose and other simpler sugars, allowing them to be absorbed and used for energy. Malt-based foods and beverages- Maltose is a key component in malt extract, malted milk, and malted cereals. These products are made by extracting maltose from malted barley and using it as a sweetener or flavoring agent. Some vegetables- Certain vegetables, such as sweet potatoes and carrots, contain small amounts of maltose. It's worth noting that while maltose is present in these foods, it is usually not a dominant sugar. Functions of maltose in the body- Maltose serves several important functions in the human body and in various applications [3].

Here are some of its primary roles: Energy source- As a

carbohydrate, maltose is a source of energy for the body. When consumed in foods or beverages, maltose is broken down into glucose by digestive enzymes. Glucose is then absorbed into the bloodstream and used as fuel by cells throughout the body. Brewing and fermentation- In the brewing and distillation industries, maltose is a crucial component for fermentation. Yeast organisms consume maltose and convert it into alcohol and carbon dioxide. This process is at the heart of beer, whiskey, and other alcoholic beverage production. Flavor and sweetness -Maltose contributes to the sweet taste of foods and beverages in which it is present. It is less sweet than sucrose (table sugar) but adds a distinct malt flavor to products like malted milkshakes, malted candies, and certain baked goods. Properties of maltose- To gain a comprehensive understanding of maltose, it's essential to explore its key properties: Solubility- Maltose is highly soluble in water, which makes it suitable for use in various food and beverage applications. Its solubility allows for easy incorporation into recipes and formulations. Sweetness- Maltose is approximately 30-40% as sweet as sucrose (table sugar) [4].

While it provides sweetness to foods and beverages, it is less intense in flavor than some other sugars. Hygroscopicity- Maltose exhibits hygroscopic properties, meaning it can absorb and retain moisture from the surrounding environment. This property is beneficial in certain food applications, such as enhancing the texture of baked goods and preventing crystallization in syrups and confections. Fermentability- Maltose is readily fermentable by yeast and other microorganisms. This characteristic is harnessed in the brewing and distillation industries to produce alcoholic beverages. Browning reactions- Maltose is involved in maillard reactions and caramelization when exposed to heat. These reactions contribute to the development of color, flavor, and aroma in various cooked and baked products [5].

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