



# Cassava-based Products for Gluten-free Baking

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The gluten-free market continues in its popularity, from savory snacks to sweet cakes and everything in between. To produce foods that offer quality taste and texture, bakers rely on a number of wheat flour replacements. One source offering multiple solutions is the root vegetable cassava plant.

The flour and starches obtained from this plant are gluten-free, grain-free, nut-free alternatives to white flour. They serve as an alternative in cakes, brownies, muffins, cookies, bread, crackers, chips, and many other bakery products.<sup>1</sup> Additionally, cassava products can be blended with other flours, such as soy or rice, to improve the quality of baked products.<sup>2</sup>

The common name for products descended from the cassava plant, such as flour and pearls, is tapioca. It grows in tropical climates, close to the equator. These regions include several parts of South America, Africa, and Asia. The common varieties of cassava roots include Afisiafi, Bankyehemmaa, and DokuDuade.

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# Cassava Flour vs. Tapioca Starch

Cassava flour manufacturing involves the harvesting and drying of cassava roots. These roots are dried and ground while attempting to maintain a uniform particle distribution. The resulting cassava flour consists of important baking components starch, protein and fiber.

Tapioca starch manufacturing utilizes a starch extraction process. It is produced by extracting starch from raw cassava roots. It cannot single-handedly replace flour in gluten-free baking, with flour being the primary ingredient. In products such as dough or batter base, this can result in an inferior quality outcome. Tapioca starch performs better in applications that require thickening. Due to its clean taste, it's often used in delicately flavored desserts.

Additional characteristics of cassava flour include neutral to slightly nutty taste. Its neutral taste is preferred when compared to more strongly flavored gluten-free alternatives such as almond, coconut, and corn flour. It is also used as a thickener in soups, sauces, and gravy.

Cassava flour can also be used to manufacture snacks, chips, and crackers that are grain-free, gluten-free, and free of the primary 8 allergens. Additionally, the bland-neutral taste of cassava flour makes it easy to develop crackers, which can be flavored and also bake cookies, cake, and pancakes. It has also been demonstrated to have excellent extrusion properties in high protein difficult to extrude products.



## Cassava Products vs. Wheats & Starches

Grain Variety	Amylose/ Amylopectin Ratio of Starch	Moisture Content	Water Activity	pH	TTA (Total Titrable Acidity)
Hard wheat flour	11.3	11.81%	0.68	6.42	0.45%
Afisiafi cassava flour	10.9	10.75%	0.61	6.85	0.37%
Bankyehemmaa cassava flour	9.3	11.06%	0.61	7.05	0.36%
Dokusduade cassava flour	11.9	10.30%	0.61	6.42	0.41%

*Physico-chemical composition comparison of wheat flour and varieties of cassava flour.*<sup>6</sup>

Properties	Tapioca Starch	Wheat Starch	Rice Starch	Corn Starch	Potato Starch
Shape	Oval, truncated	Round, lenticular	Polygonal	Round, polygonal	Round, oval
Diameter (µm)	2–30	2.7–28.5	0.8–8.7	5–20	5–100
Crystallinity (%)	25–34	28.2–36.5	-	-	-
Amylose (Molecular weight)	500–6000	980–1570	920–1110	-	4920–6340
Chain length of amylopectin	16.1–22.8	17.7	16.9–18.1	19.7	23.1

*Comparison of different types of starches used in baking*



## “ What is your recommended formulation for a good bread-like gluten-free loaf with a decent shelf life?

To keep textural freshness, there must be enough sugar and fat in the formula. These two ingredients are very helpful in preventing staling. In addition, emulsifiers and enzymes can help with the volume and resilience of the product, preventing shortness and crumbliness. Lastly, shelf life extension enzymes like gluten-free amylase would help in preventing starch retrogradation and keeping fresh for more than two days.

## “ Is CMC or HPMC better for gluten-free bread?

Both may work as viscosity enhancers or thickeners. However, HPMC absorbs more water, swells more and functions better due to its large molecular size. It is favored in gluten-free batters over CMC. In batters, HPMC provides viscosity and emulsification that stabilizes the system and keeps the gas within the system, making the product softer.

## “ Do gluten-free flours impact the shelf life of cake? Does it matter which kind you use?

One way different kinds of gluten-free flours may impact the shelf life of cake is through its amylopectin/amylose ratio. Flours with a higher amylopectin content generally stale slower over shelf life. However, if you use an enzyme solution, you may not even see this minute difference.





## “ How is cassava flour compared to rice flour or potato starch?

Usually, flours fit better for bakery products compared to starches. It can be challenging to bake products such as bread with potato starch. On the other hand, cassava flour contains protein and fiber that amplify the dough and batter emulsification properties. Furthermore, the presence of protein and dietary fiber from cassava flour adds to the nutritional quality and functionality for a grain-free product. Compared to rice flour, it offers a grain-free solution.

Rice flour provides a lighter structure, crispiness, neutral taste and easy digestibility. It is often used in combination with other flours such as cassava flour and starches such as potato starch. High quality cassava flour can single handedly replace the use of multiple flours for gluten free baking in a number of products.



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