

USE CASE

Al-Driven Ingredient Replacement for Cocoa in Food & Beverage

Unlock cocoa-like taste, texture, and performance using Science-Based AI on the VIP Platform

Target

Predict and design cocoa replacement blends and molecules that replicate the full sensory experience of real cocoa—aroma, mouthfeel, flavor, and color—while reducing cost, improving sustainability, strengthening supply chain resilience, and meeting compliance.

Challenge

Cocoa is a cornerstone ingredient in food and beverage products. But rising costs, climate volatility, and unstable supply chains are putting pressure on manufacturers to find viable, scalable replacements.

- Replicating cocoa's complex sensory and functional properties such as aroma, bitterness, mouthfeel, emulsification, and thermal stability is both scientifically challenging and operationally risky.
- Traditional R&D is slow, costly, and often fragmented. It lacks the data integration needed to predict how substitutes will perform in real-world formulations.
- New ingredients must function seamlessly in existing processing and formulation environments. This requires deep chemical understanding and predictive accuracy.
- Regulatory restrictions cause further complication: labeling requirements and compositional limits determine whether a product can legally be called "chocolate" or must use alternative naming.

Solution

NobleAl uses data-efficient Science-Based Al on the VIP Platform to accelerate the discovery and design of cocoa replacement blends. By analyzing chemical composition, processing conditions, and performance outcomes, our models predict key attributes like flavor, aroma, mouthfeel, and texture—without trial and error.

Using inputs like SMILES strings, ingredient sources, and process steps, the platform simulates how formulation ratios and methods influence real-world behavior. Al identifies high-performing combinations with ingredients like carob, chicory root, or fermented legumes that replicate cocoa's profile while reducing cost and improving sustainability and resilience.

For more novel approaches, NobleAI can design bioidentical molecules based on GC-MS data and generative AI to mimic cocoa's key chemical drivers.

The VIP Platform also accounts for regulatory constraints. Cocoa and its substitutes are subject to strict composition and labeling rules in markets like the EU and US. NobleAI helps optimize ingredient blends to meet both sensory and functional targets while staying within regional compliance thresholds, ensuring your products remain legally marketable and commercially viable.