



Flavor solutions designed for
plant-based sports nutrition



POWDER



BAR



RTD



SYNERGY[®]
INSPIRING TASTE™

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38% of consumers globally say that they have looked to improve their diets in the last two years by increasing their intake of plant protein



AN EXCITING MARKET OPPORTUNITY

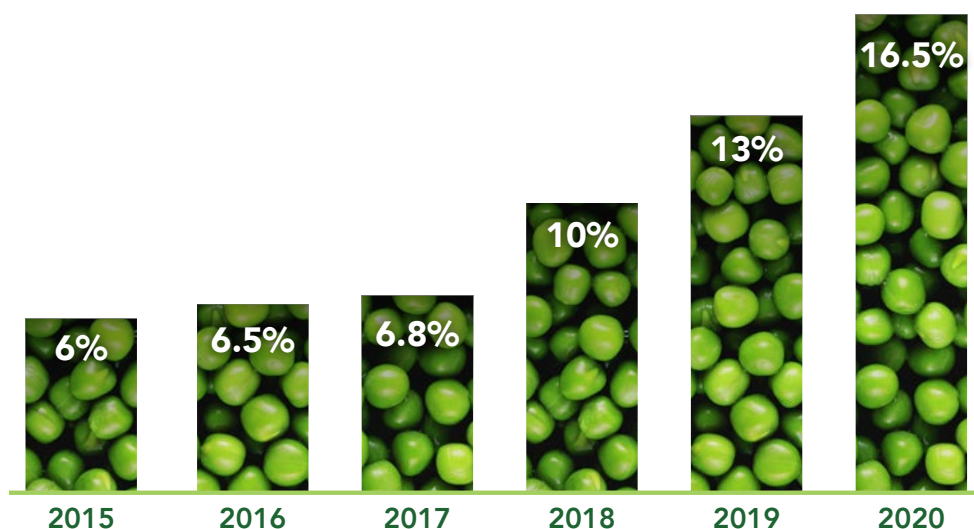
The global plant-based protein supplements market is projected to reach USD 7.4 billion by the end of 2025, with annual growth predicted to outstrip the overall sports nutrition market. Plant-based protein appeals to consumers who are looking to improve their health while at the same time, embracing a more sustainable diet, especially as they take a more holistic approach to their health and well-being.

Global plant-based performance nutrition launches show a rise in launch activity.

The increased interest in plant-based protein is evident by the increasing number of products being launched that carry a vegan/no animal ingredient claim.

In the last 6 months to July 2020, 16.5% of total launches in performance nutrition featured a vegan/no animal ingredient claim, an increase of **10 percentage points** since 2015.

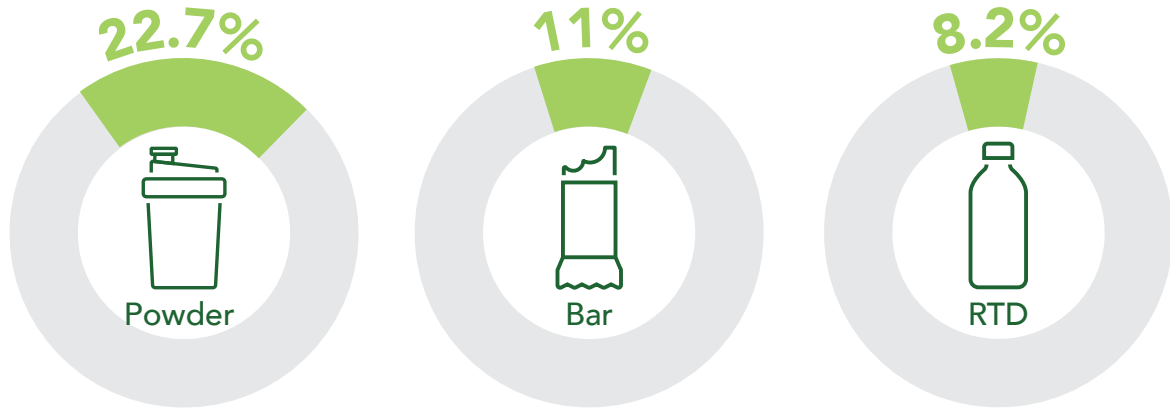
Global Plant-based Performance Product Nutrition Launches
(Mintel, Last 6 years)



Powder is the most popular format

At 23% the powdered sports nutrition segment has the highest number of vegan/no animal ingredients claims globally. This is unsurprising as many plant based ingredients have been developed specifically for powdered supplements. As the functionality of plant based powders increase, we should also see the percentage share of vegan/no animal ingredients claim rise in the ready to drink and bar categories.

Global launches with a vegan/no animal ingredient claim



Percentage of total launches in performance nutrition that featured a vegan/no animal ingredient claim (Last 12 months to July 2020).



57%

of consumers find plant-based claims appealing when it comes to sports nutrition products



WHAT CONSUMERS WANT AND WHY

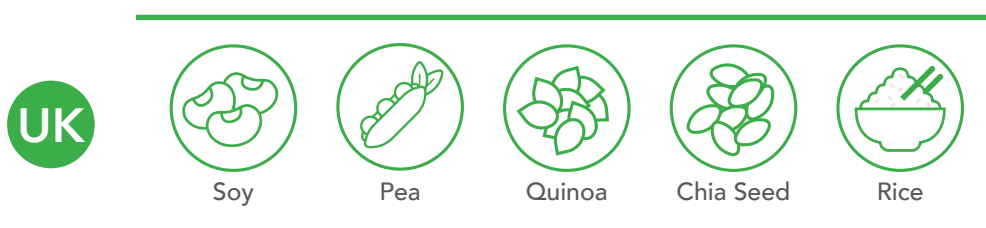
Taste factors can make plant-derived proteins less appealing

Consumers expectations are skyrocketing, they want plant-based protein to deliver on their nutritional targets without compromising on taste. A recent FMCG Gurus Sports Nutrition survey revealed that over **57% of consumers** say that they find plant-based claims appealing when it comes to sports nutrition products, however concerns around taste and texture are proving to be key barriers to purchase.

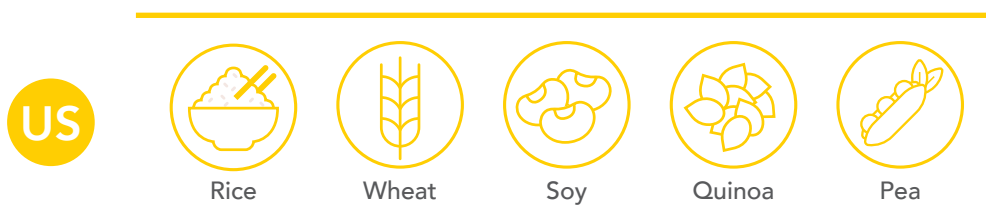
Our plant-based survey

In August 2020, we conducted a survey in the UK and the US with consumers who had purchased plant-based nutritional products in the past 6 months. Of those surveyed, the majority identified as Flexitarian, with a small number identifying as either Vegetarian (7%) or Vegan (5%).

The survey also revealed that consumers are quite interested in the protein source, with the UK respondents ranking their top 5 plant-based protein sources as:



Whereas in the US the list slightly differed with top 5 sources ranking as follows:

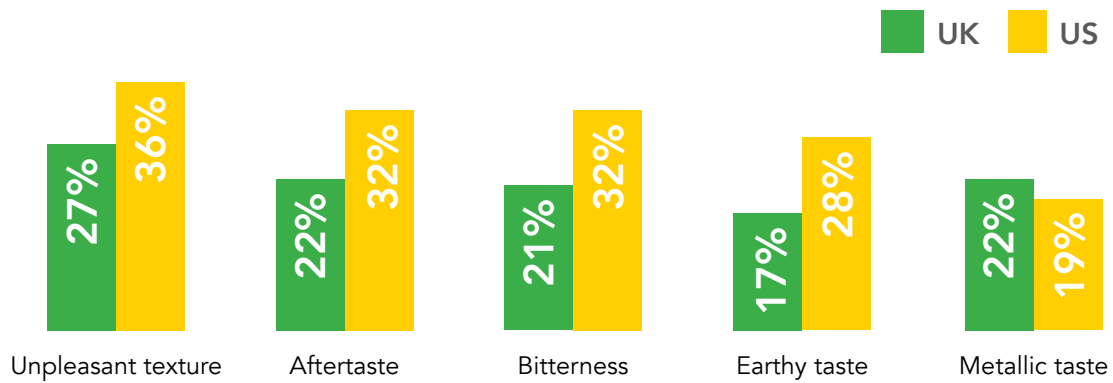


The survey results revealed that consumers in both the UK and the US are most likely to be concerned about texture, with aftertaste and bitterness also ranking highly as significant taste challenges. Less than **30%** of those surveyed felt that there were no taste related challenges with plant-based products.



Taste challenges in plant-based products

When it comes to plant-based products, are you concerned about any of the following taste challenges?



Many successful brands have tapped into the importance of positioning plant-based products around sensory appeal as opposed to just the health and sustainability benefits. This can be achieved by pairing plant-based protein with specifically designed flavors that work with the base, ensuring that any off-notes or bitterness is not apparent in the final product.



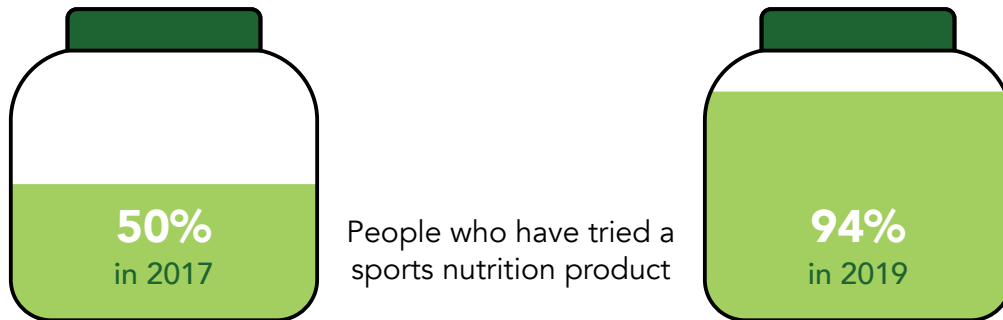
46% of consumers believe that the taste of plant-based protein is inferior to the taste of dairy-based protein



SATISFYING CONSUMERS TASTE REQUIREMENTS

The need for variety and regional adaptation

Over the past decade the sports nutrition market has exploded across the globe. Market penetration is continuing to grow, proving the wide appeal of sports nutrition. For example, two identical surveys conducted by FMCG Gurus showed that the number of people **who had not tried any type of sports nutrition product** had dropped from 50% in 2017, to just 6% in 2019.



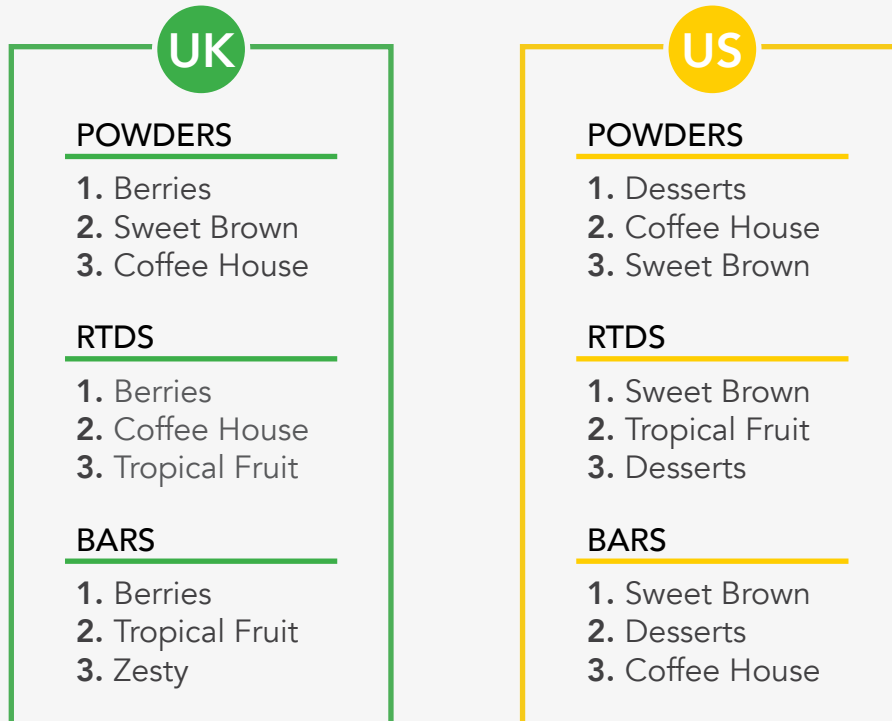
Consumers have become more discerning in their tastes and are also keen to have flavor variety in their products. Our consumer survey revealed that, unsurprisingly, the main reason for purchasing plant-based products was to improve the individual's overall health and nutrition. However the second biggest purchase driver globally was variety or to try new things.

Selection of our flavors for plant protein powder



Our survey revealed that **26%** of respondents in the **UK** and **40%** of respondents in the **US** purchase plant-based nutrition to add variety and to try new things.

Additionally, our survey revealed that flavor preference varied considerably between application and region:



The **UK** showed a clear preference for berry or fruity profiles across all applications. Coffee house, and tropical fruit were also popular flavor profiles, with zesty profiles (such as lemon and lime) making an appearance in bar applications.

Although berries were rated as the top profile, they were followed closely by other leading flavor profiles, indicating the need to have a relatively broad portfolio to cover consumer taste preferences.

The **US** showed a strong preference for sweet brown and dessert type profiles, with coffee house featuring strongly.

Understanding consumer taste preference is key and based on our survey results we set about developing applications using flavor profiles identified in our survey, tailored for each region.

***Berries**

- raspberry
- strawberry
- blueberry
- blackberry

***Coffee House**

- latte
- espresso

***Tropical Fruit**

- pineapple
- coconut
- mango
- watermelon

***Sweet Brown**

- caramel
- butterscotch
- vanilla

***Desserts**

- birthday cake
- creme brulee

***Zesty**

- lemon
- lime
- orange

THE SCIENCE OF PERFECT PAIRING

Our Analytical Approach

To fully understand the flavor matrix of any ingredient, our sensory and research team adopts a four-step approach:

Step 1: Sensory profiling

A team of expert tasters taste and train on the agreed flavor descriptors which are commonly found in plant-based protein sources. After familiarising themselves on the descriptors, the panel individually profile the protein, in terms of characterizing descriptors and their strength according to the predefined criteria.

The results are then averaged to give us a map of the flavor profile. To the right (Fig. 1) you can see the results for a selected pea protein.

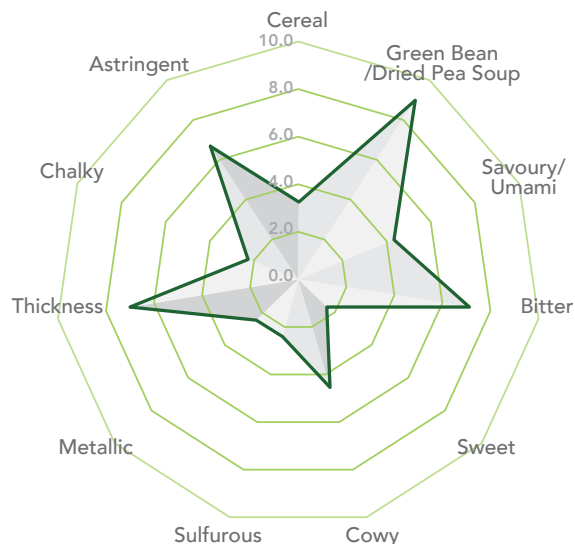


Fig. 1 — pea protein flavor profile example

Step 2: GC-MS

The next step in understanding the flavor profile of the plant-based protein is GC-MS (Gas Chromatography-Mass Spectrometry).

GC-MS is an analytical technique that allows the separation and identification of flavor compounds within a protein. To the left (Fig. 2) shows a sample chromatogram, which is representative of the typical compounds identified in a plant-based protein sample.

However, one of the biggest challenges with aroma compounds is that a high concentration doesn't necessarily result in lots of aroma. A small concentration of an exceptionally volatile aroma compound, for example, could drastically impact the overall flavor. Which is why we incorporate one final analytical method.

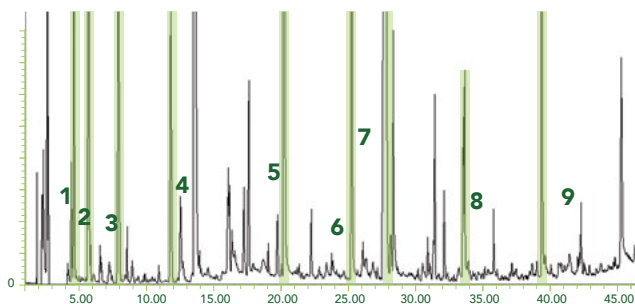


Fig. 2 — Each peak represents a different aroma compound, with a taller peak indicating a higher concentration of the compound. These compounds can be cross referenced to our database and identified – giving us the flavor “fingerprint” of the ingredient.



Step 3: GC-O

GC-O (Gas Chromatography-Olfactometry) reintroduces our trained human assessors. Using a nose cone, our trained panellists smell the sample as it passes through the GC, recording any aromas they detect as well as the intensity. These recordings are time-stamped meaning that they can be cross referenced with the data from the GC-MS to identify which compounds are responsible for the aromas detected.

Combining the two gives us a complete understanding of the flavor matrix of the protein, and which aromas need to be masked or in some instances augmented.

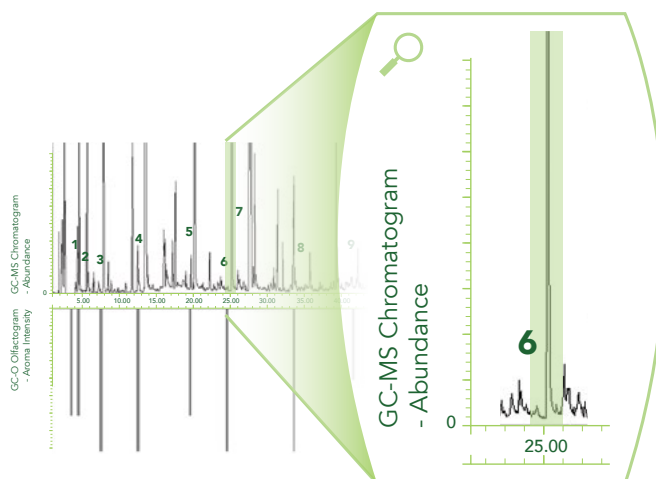


Fig. 3 — Magnified sample of the GC-O

Step 4: Flavor pairing

Now that we understand the aroma compounds which are responsible for the flavor profile of the base protein, we can start to look at flavors which will work with the base, rather than against it.

The science of flavor pairing is simple – flavors which share multiple key aroma compounds are likely to pair better than those that do not. Chocolate and hazelnut are a perfect example – both are rich in aroma compounds which deliver cocoa, roasted and nutty aromas hence the two are highly compatible.

Armed with the knowledge of the key aroma compounds in the protein, our flavor creation and application teams can look to develop flavors that pair naturally with the protein (such as coffee caramel) or even alter certain elements of flavors to help them to complement the base.

To date we have extensively evaluated and created flavors to work with a wide range of plant-based proteins including rice, pea, hemp, pumpkin, soy and sunflower seed.

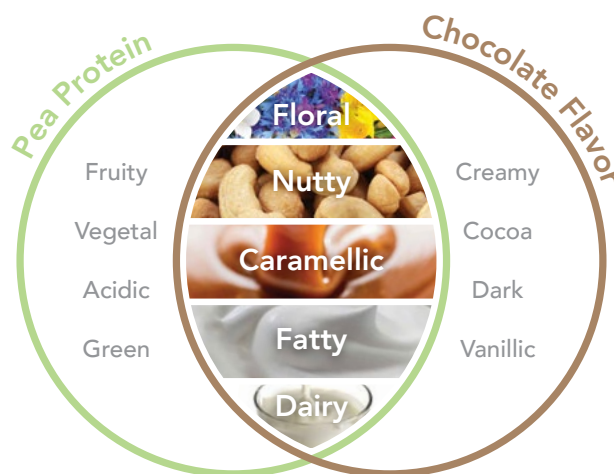


Fig. 4 — Finding the right notes to pair chocolate and pea protein



REBALANCING CORE FLAVORS

Core flavors remain a fundamental part of sports nutrition product ranges. Over the last 12 months **32%** of all product launches were with either chocolate, strawberry or vanilla flavored. In 2010 **37%** of all product launches contained the same three core flavors, so as we can see this is an enduring pattern that has remained largely consistent over the past decade.

While flavors that pair naturally with the protein base are always the best fit, as highlighted above, there remains a demand and a consumer expectation for the 'core flavors' of chocolate, strawberry and vanilla – for many brands, going without simply isn't an option.

These flavors are not natural pairings, which is why our flavorists need to get creative, developing a flavor which works with the notes that are inherent in the protein base.

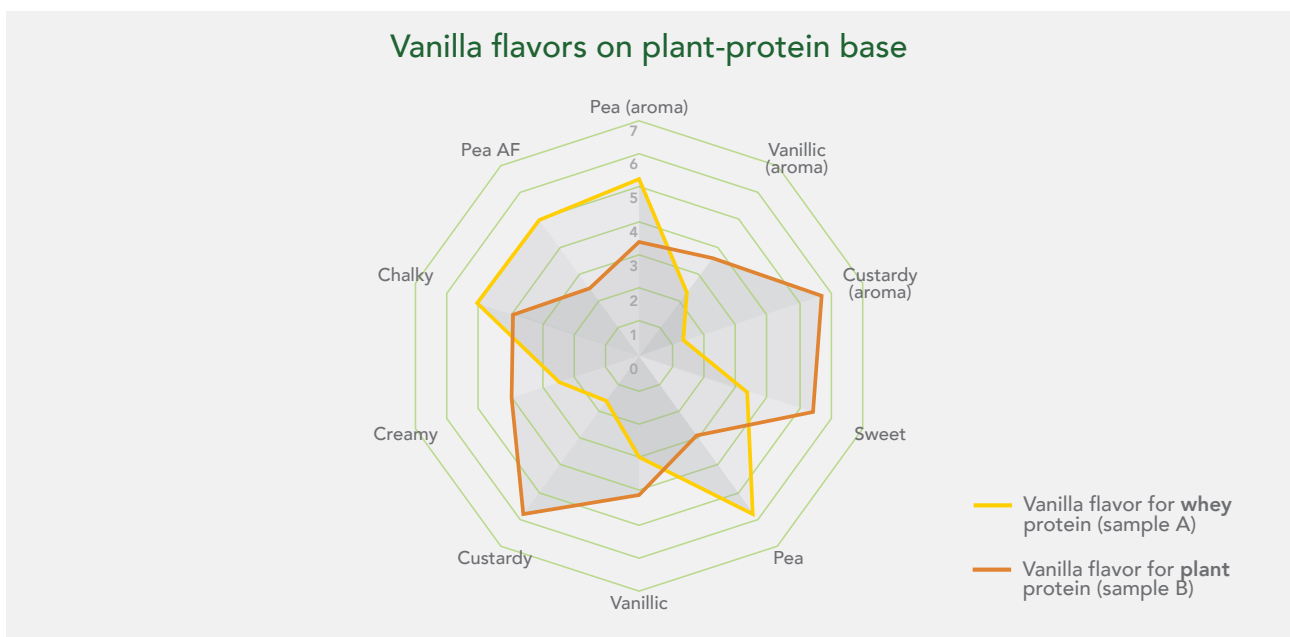
Tailoring flavors for plant-protein versus whey protein

The way a flavor performs when interacting with the product's inherent flavor matrix can differ extensively, which is why tailoring flavors for specific bases is so important.

We recently completed a sensory study that compared a Synergy vanilla flavor that was specifically designed for use on a plant protein base, versus a Synergy vanilla flavor designed for use on a whey protein base. The aim of our sensory study was to prove that core flavors designed for a whey protein base will not be suitable for use on a plant protein base.

A trained sensory panel was tasked with evaluating the two vanilla flavors on a plant protein base.

The sensory results for vanilla flavors applied in a plant protein base indicate that Sample A (vanilla flavor designed for whey protein) does not cover the pea notes on aroma, flavor and aftertaste.



Above. Sensory profiling for plant-based protein measured in 10-point scale (*) represent sign. Differences at $\alpha=0.05$

On the other hand, Sample B (vanilla flavor designed for plant protein) covers the pea notes well and is significantly more custardy (aroma, flavor), sweeter and creamier (flavor).

The results showed conclusively that a vanilla flavor designed for whey protein did not mask the pea notes on aroma, flavor and aftertaste when applied in the plant protein base, confirming the need to tailor flavors to work with and enhance the specific protein base.

A closer look at a key core flavor: Vanilla

As shown in our sensory study, the way a flavor performs when interacting with the product's inherent flavor matrix can differ extensively, which is why tailoring flavors for specific bases is so important.

Despite its complexity, vanilla is perceived as quite a subtle flavor. Some of the key notes that consumers may pick up from a vanilla flavor (or vanilla flavored product) are custardy, creamy, vanillic or sweet.

Many of these notes (particularly creamy and sweet) are present naturally in a dairy base such as whey protein, however they are less prevalent in a pea base, in fact the pea may even mute or suppress these descriptors.

As a result, the success of a product is even more reliant on the flavor than usual. As such, a flavorist may look to build some masking technology (to cover the pea and vegetal notes) into the flavor, but also significantly increase desirable notes such as the creamy or custardy notes so that they stand out over the base.





LOOKING TO THE FUTURE

Together with improving the sensory qualities of plant-based proteins, processing developments may also improve technical challenges like solubility and stability. These improvements will make them applicable for use in an even wider range of products – for example, carbonated beverages, baked goods and hot beverages.

Our marketing and innovation teams track emerging protein sources, to identify the hottest new protein source that will appeal to today's consumer, who is looking for solutions that are both good for them, and good for the planet.

To find out more on our consumer trends and the 'food philosopher' click [here](#).

We also work closely with our customers on bespoke flavors for plant-based protein ensuring that they gain an edge in this dynamic and growing market segment.

We have the flavor solution for you

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