pisane™

plant protein, feed the planet

PISANE™ C9 - C9 premium pea protein Ingredient characteristics

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Pea crops are very common in Northern Europe. Pea is an annual legume, with rapid growth. Yellow peas (*Pisum sativum*) are known since centuries as a healthy vegetable food and have been part of the human balanced diet thanks to the absence of lipids and their high protein, starch and fibre content. Yellow peas are harvested at maturity.

Pea ingredients are made from carefully selected peas. The separation technique of the pea components (proteins, fibres, and starch) is based on an aqueous separation process without the use of organic solvents using only acids and bases.

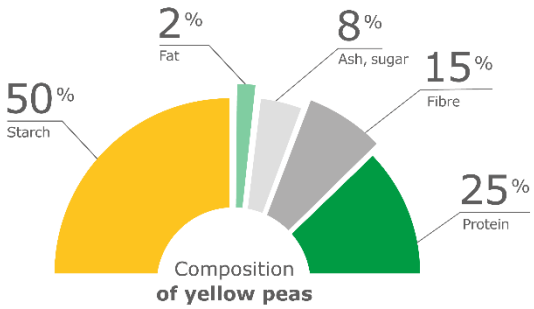

Figure 1 Composition of yellow peas

Following this separation, we recover the pea fibre to make **SWELITE™**, ideal for its functional performance and quality. **NASTAR™** is our amylose rich pea starch, with a gelling and thickening capability. From hull we get **EXAFINE™**, our easy to incorporate and cost-effective insoluble pea hull fibre.

Figure 2 Process flow chart, COSUCRA

We also obtain **PISANE™**, an ingredient rich in essential nutrients for health, taste and sustainability.

II. PISANE™: global overview

A. General characteristics

	PISANE™ C9 PISANE™ C9 Premium
Aspect	Powder
Colour	Cream
Particle size	d(0.9) ≤ 200µm
Density - Tapped	~0.55 kg/l
pH (10% in water)	~7.8
Isoelectric point (pH(I))	~ 4.8
Dry matter	~95% (min 93%)
Shelf-life	2 years in original sealed bags

B. Nutrition facts

Per 100g product	
Energy kcal **Energy** kJ	413 1728
Proteins (g)	81.7
Carbohydrates (g)	0.7 / 2.1*
of which (total) sugars	0.0
Of which added sugars	0.0
Dietary fibre (g)	1.4
Fat (g)	9.0
of which saturated	2.1
Sodium (mg)	2 000.0
Salt (g)	5.0

*Carbohydrates which contains dietary fibres

C. Microbiological characteristics

PISANE™ C9 and PISANE™ C9 Premium are ready-to-eat ingredients.

PISANE™ C9 Premium differs from PISANE™ C9 by its additional microbiological guarantees. It offers additional spore level controls related to its intended use being higher moisture applications requiring storage at ambient shelf-life.

Please refer to Technical Data Sheet for further details.

III. Functional properties

A. Wettability / dispersibility

Due to its fine particle size, PISANE™ C9 and PISANE™ C9 Premium have a low wettability. This is not an issue when it is used in dry mixes processes but if it is dispersed in water, it requires shear to be well dispersed. Nevertheless, it has a good dispersibility and it does not make lumps during its dispersion in water. It is recommended to dissolve the protein in ambient water to avoid lumps formation due to steam.

B. Solubility

Solubility is measured in cold water on 3% pea protein solutions.

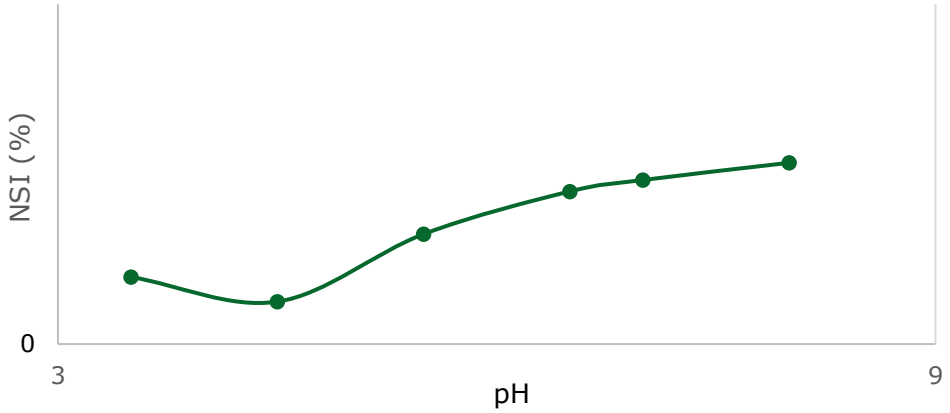

Figure 3 Solubility profile related to the pH

The isoelectric point of PISANE™ C9 / C9 Premium is pH ~4.8.

PISANE™ C9 and PISANE™ C9 Premium are soluble proteins. At neutral and basic pH, they have good solubility.

As pH decreases, solubility of PISANE™ C9 / C9 Premium decreases.

In all applications, except for shakes, hydration of pea protein is very important for good stability, nice taste, and no fat separation. To hydrate the protein, it is advised to disperse the protein in cold water while stirring, then to perform at least one of the following processing steps:

- heat the solution to minimum 85°C
- homogenize the solution at minimum 200 bars

For shake, instant dispersion of the powder in liquid is easy and its instant solubility is sufficient to avoid sandy mouthfeel.

C. Viscosity

Compared to main plant proteins such soy protein isolates or gluten, PISANE™ C9 and PISANE™ C9 Premium are a medium viscous protein in neutral conditions. Viscosity is measured in cold water, on solutions at 13.5% protein.

PISANE™ C9 gives different textures to non-dairy applications depending on the dosage and process parameters. The homogenization and/or heat treatment enhance the viscosity while providing a creamy mouthfeel to the finished products such as non-dairy drinks or non-dairy desserts. For fermented products, a slow acidification during the fermentation allows the development of a stable and smooth texture.

D. Emulsifying capacity

PISANE™ C9 / C9 premium has a good emulsifying property. 1g pea protein can emulsify up to 500g of oil.

PISANE™ C9 / C9 premium is used, even at low concentration, for its good emulsifying properties in non-dairy applications with high fat content such as frozen desserts, culinary cream, or buttery spread.

E. Sensory profile

PISANE™ C9 / C9 Premium is evaluated at 4% in water. It is performed by 10 trained panellists (Source: PROVA).

PISANE™ C9 / C9 Premium has mainly green and tea notes. Low astringency and bitterness characteristics are detected.

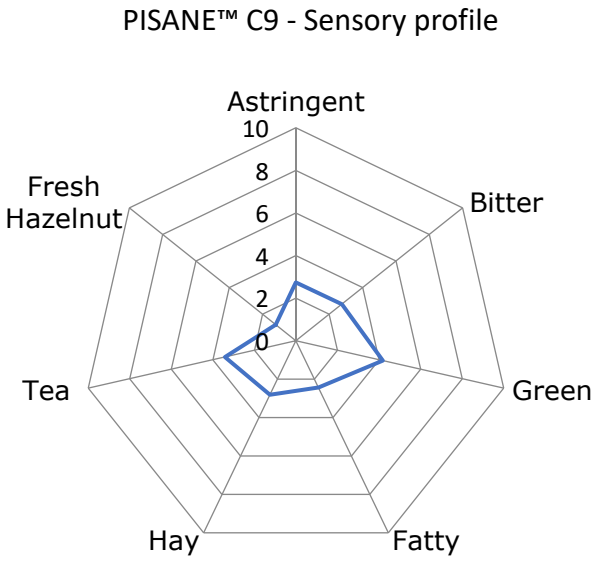

Figure 4 Sensory evaluation of PISANE™ C9

Once in the end-product, the pea protein taste is strongly reduced due to interactions with the matrix and the effect of the processing conditions (e.g., homogenizer, heat treatment). Taste of PISANE™ C9 and PISANE™ C9 Premium are more neutral:

- At neutral pH
- When solid content is high (dried pastas, …)
- In products containing some fat (encapsulation of flavours by fat)

In sweet products, pea protein taste combines also very well with chocolate, coffee, caramel, and nut flavours. Nevertheless, if some off-tastes are still detected the use of masking flavours might help.

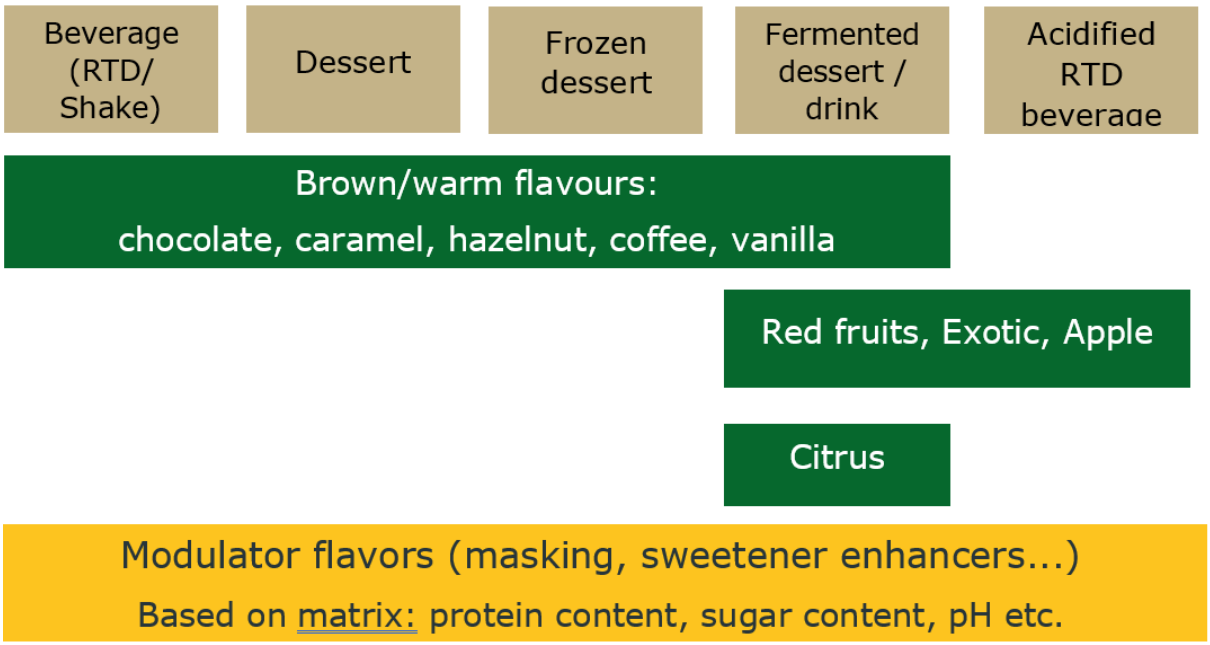

Figure 5 Flavour matching

Pea protein brings a more neutral profile during fermentation, allowing its use in cheese applications. Addition of flavours such as herbs, spices and garlic help to decrease the vegetal taste even at high concentration of protein. Ethnic flavours such as wasabi fits very well in cream cheese for sushi for example.

IV. PISANE™ sensitivities

PISANE™ C9 and PISANE™ C9 Premium are sensitive to some minerals. It is therefore recommended to avoid the use of soluble calcium or magnesium as they precipitate pea protein.

For more information, refer to the Application Study "PISANE™ C9 and PISANE™ C9 Premium in ready-to-drink beverages".

V. Health and nutrition properties

PISANE™ has a well-balanced Amino Acid Score (AAS). Among the nine essential amino-acids, only one is slightly below the FAO 2007 recommendations from the Food and Agriculture Organization (FAO). The AAS is 0.96 based on the FAO suggested amino acid pattern for adults over 18 years old. Also, 98% of the protein of PISANE™ is absorbed by the body. Therefore, the Protein Digestibility Corrected Amino Acid Score (PDCAAS) is 0.94 based on the suggested amino acids reference pattern for age group over 18 years old expressed in the report of the Joint WHO/FAO Expert Consultation from 1989.

PISANE™ is not one of the main food allergens. The production process significantly decreases the level of anti-nutritional factors: PISANE™ isoflavones levels are even below the detection threshold.

Due to the excellent nutritional quality, PISANE can provide benefits in vegan and vegetarian diets, in weight control diets, in sports nutrition, in elderly people, …

Please refer to Nutritional Library for further details.

VI. Pea protein: highly sustainable

Pea is a plant from the leguminous family. All peas that are consumed today (green peas, split peas, dry peas) belong to the *Pisum sativum* species, whatever their color is (which can vary from yellow to green) and whatever their appearance at maturity is (smooth or wrinkled).

Pea kernel is a very good source of protein thanks to its 25% protein content. As other parts of the pea kernel, including the outer hull are also valorised in the production process of PISANE™, 100% of the pea kernel is converted in various food ingredients (as PISANE™ protein, SWELITE™ as fibre, EXAFINE™ as pea hull fibre and NASTAR ™ as pea starch).

Being a plant from the leguminous family, pea has unique natural property to fix air nitrogen for protein synthesis. It requires therefore few chemical fertilizers and less intervention on the field, providing a direct environmental benefit. Furthermore, during crop rotation, pea allows for the reduction of chemical fertilization for the following crop. Besides, water requirements for pea growth are low and its cropping requires a limited number of pesticides. In comparison with animal and other vegetable protein sources, PISANE™ production is one of the most efficient in terms of energy and ground surface required to produce 1kg protein.

Finally, while processed, PISANE™ is separated from the other pea components in a gentle way using water and not organic solvents.

Please refer to CSR documents for further details.

PISANE™

Nutritional, functional and sustainable: PISANE™ C9 is the ideal pea protein for non-dairy applications (ready-to-drink beverage, yogurt, cheese…) and products for nutrition and health markets (as high protein shake). Thanks to its ideal solubility, its low viscosity and unique taste, this plant protein from yellow pea is easy-to-use in the formulation of end-products.

Nutritional, functional and sustainable: PISANE™ C9 Premium is a pea protein ideal for shelf-stable products in non-dairy and nutrition markets.

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