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Berry tasty: the fruits emerging from new breeding and processing

Research is helping strawberries and raspberries become more resilient to climate change and snacks become healthier.

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Supermarkets across Europe offer such regular and wide selections of strawberries, raspberries and blueberries – even in the grip of winter – that it's easy to take them for granted.

But behind the seemingly limitless domestic and foreign supplies on store shelves, the berry sector worldwide is facing a serious threat: increasingly erratic growing conditions sparked by climate change. The result is that berries are more vulnerable to pests, diseases and droughts.

Best breeds

Professor Bruno Mezzetti is seeking answers for producers in Europe. An expert in fruit-crop breeding and biotechnology at Marche Polytechnic University in Italy, he leads a project that received EU funding to increase the genetic diversity of cultivated strawberries, raspberries and blueberries in a bid to make them more resilient while retaining the traits – taste, texture and smell – craved by consumers.

Called BreedingValue and running for four years through 2024, the project focuses on germplasm: the seeds, plants and plant parts useful in crop breeding, research and conservation.

'The aim is to identify the best genetic sources, particularly for disease resistance, water resistance, resilience, adaptability, sugar and aroma,' Mezzetti said.

Berries not only titillate the tastebuds. The fruits are excellent sources of vitamins, minerals and nutrients, playing a vital role in a healthy diet and reducing the risk of cardiovascular disease, diabetes, senility and cancer.

The global market for strawberries alone in 2020 was worth about €14 billion, of which Europe's share was valued at around €3.5 billion, according to the Food and Agriculture Organization of the United Nations. Since then, the market has grown.

At issue is how the EU berry sector can meet increasing consumer demand.

‘It’s important to make sure that people have berries available at reasonable prices and good quality and that they maintain taste,’ said Dr Tuuli Haikonen, a researcher at the Natural Resources Institute Finland involved in BreedingValue.

Strawberry fields

The EU produced 700 000 tonnes of berries in 2022, according to Eurostat. Strawberries topped the list, accounting for about half of total EU berry production, followed by raspberries and currants.

Spain is the main strawberry producer in the EU with a share of more than 25%, followed by Poland and Germany.

BreedingValue brings together 20 partners in eight European countries including France, Germany, Spain and Turkey.

The focus is on boosting resilience and uncovering and enhancing sensorial traits – colour included – that are essential for consumer appeal, according to Mezzetti.

The researchers are investigating a range of plant material including wild species as well as selectively bred historical and modern varieties called cultivars.

Studying cultivars and wild relatives will help identify ways to increase the genetic diversity of cultivated berries.

‘A love story’

The researchers are providing desirable genetic traits – such as disease and water resistance and resilience – to breeding companies. They will then create new cultivars that are more resilient to climate change and disease and that have enhanced sweetness and aroma.

‘We can find resilient and sensory traits in old cultivars or from crop wild relatives,’ said Haikonen. ‘It’s a love story, in a way.’

Dr Jahn Davik, a scientist at the Norwegian Institute of Bioeconomy Research, another project partner, stressed the benefits for plant breeders.

‘The goal is to reduce the cost for the plant breeder and, at the same time, increase the efficiency of the berry-breeding process,’ he said.

Healthy snacks

While being sweet and nutritious, berries are also highly perishable. A major challenge is ensuring that they’re delivered in good condition and don’t spoil before being consumed.

This is where another EU-funded project enters the picture. Called FRIETS, it’s developing new dehydration techniques to increase the shelf life of berries, replace conventional salts and sugars and create healthier snacks.

‘Retailers want to be able to keep berries on the shelf for a long time so they don’t waste so much,’ said Marianna Lagonikou, an agronomist in the European research and development department of Greek food company Rezos Brands.

Lagonikou leads FRIETS, which runs for four years through August 2025 and involves 13 partners from five European countries: Cyprus, Greece, Malta, Romania and the UK.

The focus is on novel ways to process strawberries, raspberries and blackberries and turn them into snacks that have no added sugar, salt or chemical preservatives.

The researchers are developing fruit-drying techniques that help preserve the bioactive substances found in strawberries, raspberries and blackberries – natural antioxidants and antimicrobial compounds that have proven health benefits and extend berries' shelf life.

Tailor-made treats

The techniques include microwave vacuum drying and freeze-drying, which has a relatively gentle quality that lowers the risk of protein denaturation and enzyme inactivation. As a result, bioactive compounds can be preserved without compromising their nutritional or therapeutic value.

A third method is osmotic dehydration, in which water is removed from fruit by immersing it in a solution of glycerol – a naturally occurring alcohol that's used as a sweetening agent.

'The goal is to come up with novel preservation and products using preservation that protects all the compounds of berries,' said Professor Magdalini Krokida of the School of Chemical Engineering at the National Technical University of Athens, a FRIETS partner.

She said that smart berries can be tailor-made to the needs of specific groups such as athletes, children, the elderly and diabetics.

'If a group of people has type 2 diabetes, we can make products with reduced sugars and we can add more proteins,' Krokida said. 'It depends on the type of consumers and their needs for a special nutritional diet.'

This research chimes with an EU initiative called Food 2030 that aims to make Europe's food systems more sustainable and healthy.

Superfood-like

FRIETS is also developing ways to preserve berries with edible, seaweed-based coatings to avoid plastic packaging.

Seaweed coatings offer a protective membrane for fruits and enhance their flavour, according to Krokida.

'The edible coatings can make changes to the final product and help the preservation,' she said. 'If we want to make it more attractive for kids, we can do it.'

Her view is that, with economies of scale, seaweed-based packaging has the potential to emerge as an economically viable and ecologically sustainable alternative to traditional packaging materials.

FRIETS researchers have applied for patents on their berry products and expect approval in the coming months, with the first products due to be sold through Rezos Brands later in 2024, according to Krokida.

'Berries are something like superfoods,' she said. 'With the novel techniques, processes and technologies that we have, we will have more possibilities of cultivating berries in Europe.'

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