

Rape without bitter substances – researchers discover new ways of extracting protein

Rapeseed not only contains oil but also highly valuable protein. However, protein extracts from rape have an intensive, bitter off-flavour. Food chemist Thomas Hofmann and his team have now identified the substance largely responsible for this bitter taste. This marks a first step towards making rapeseed accessible as a protein supply for humans.



Rape is a promising source of protein. The photo shows the tip of the main shoot of a rapeseed plant in full bloom at TU Munich's research farm in Roggenstein.

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Rapeseed contains high-value protein

According to the United Nations Food and Agriculture Organization (FAO), food demand will roughly double by 2050 due to the world's growing population. "Shortages are to be anticipated in this context, particularly in protein supplies", says Thomas Hofmann, head of the Chair of Food Chemistry and Molecular Sensory Science at the Technical University of Munich (TUM). It is therefore vital to find new sources of plant protein to feed mankind. Hofmann, who is also the director of the Leibniz-Institute for Food Systems Biology, goes on to state that rapeseed is a good domestic source.

The reason being that rapeseed not only contains oil but also highly valuable protein that offers a number of vital amino acids. Each year, around 1.12 million tonnes of raw protein are incurred globally during rapeseed oil production. Although farmers have long since been using the rapeseed cake formed during oil extraction as a protein feed in livestock fattening, rapeseed has not played a role as a protein source in human nutrition to date. One reason for this is that the accompanying substances contained in the rapeseed severely impair the taste of the protein isolates obtained from rape. These substances include very bitter tasting secondary plant

components, for instance. Hofmann and his team therefore conducted investigations to determine precisely which bitter substances cause the unpleasant off-taste of rapeseed protein.



Corinna Dawid and Christoph Hald in the laboratory with a beaker full of rapeseed.
(Photo: © Sabrina Schalk/TUM)

The key substance that causes rapeseed protein to taste bitter

The researchers examined three different protein isolates using mass spectrometry analysis methods and taste tests. The first isolate involved an extract of all of the proteins contained in rapeseed meal. The second isolate primarily contained cruciferin and the third napin, these being the two principle storage proteins of rapeseed. All three of the protein extracts revealed a protein content of 80 to 90 percent.

The investigations showed for the first time that a compound called kaempferol-3-O-(2''-O-sinapoyl- β -sophoroside) is the key substance that has so far made protein extracts from rapeseed inedible. The cruciferin isolate, in particular, contained a very high quantity of this bitter substance, 390 milligrammes per kilogramme. While the rapeseed meal and the napin isolate revealed less than one tenth of this quantity, they still had a bitter taste in the sensory test.

"Since we now know what causes the bitter off-flavour, it is much easier to develop suitable technological procedures or breeding strategies that will enable rapeseed to be used to produce tasty, protein-rich foods", says co-author Corinna Dawid, head of the Phytometabolomics Research Group at TUM.

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