Insoluble Dietary Citrus Fibers

A new interesting functional ingredient for multiple food applications.

by Teresa Cruces Vergara

The physiological effect of dietary fibers and consumer’s awareness

Complex carbohydrates and lignin that cannot be digested or absorbed in the small intestine, and that can be partially or completely fermented in the large intestine, are called fibers. There are different classifications for fibers; however, the most common classification used is solubility (soluble, insoluble).

Soluble fibers are dissolved in water and they are totally fermented in the colon, they include: gums, pectin, b-glucans, mucilages and some hemicellulose; whereas insoluble fibers pass largely intact through our intestines and include cellulose, hemicellulose and lignin.

The physiological effects are related to the physicochemical and functional properties of dietary fibers. In general total fiber intake influences several metabolic processes, including the absorption of nutrients, carbohydrates, and fat metabolism. In addition, they have an influence on colonic fermentation and production of stool. Insoluble fibers, such as those from citrus peel, have an effect on the promotion of regular bowel movement, leading to a prevention of constipation. Both delayed glucose absorption, the induction of satiety and therefore also weight control is shown. Fibers also have a cholesterol reduction effect by decreasing fat absorption and, although more research is needed, they appear to protect against colon, gastric and breast cancer.

Consumers become increasingly aware of the benefits of fiber for disease prevention but they cannot always meet the recommendations due to the low consumption of fruit, vegetables and whole grains in developed countries. The terms fibers and dietary fibers are understood and accepted by the consumers as health issues, which is why food products containing fibers are in strong demand. Following this trend, food manufactures have started to develop several applications in order to include fibers in a wide variety of products.

Vegetable fiber sources

There is a great variety of raw materials, mainly processing by-products, from which dietary fibers are obtained. The main characteristics of the commercialized fibers products are: total dietary fibers with a content of above 50%, moisture below 9%, a content of lipids and proteins with a low caloric value, and with a much preferred neutral flavor and taste.

When plant fibers are added to a food product, they contribute to water retaining properties and to the viscosity of the product.

Citrus fibers have better quality than most other dietary fibers, due to the presence of associated bioactive compounds, such as flavonoids, polyphenols and carotene.

New insoluble dietary citrus fiber

A new fiber from citrus peel containing mainly insoluble fibers can now be found on the market. (See table 1)

Table 1: The dietary fiber composition of citrus peel based Ceamfibre 7000

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<tr>
<td>Total dietary</td>
<td>86,5%</td>
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<tr>
<td>Soluble fiber</td>
<td>1,5 %</td>
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<td>Insoluble fiber</td>
<td>85%</td>
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Fibers are being widely used in the market today and they have been added to food items, not only due to their beneficial effects on food nutritional properties and consumer’s health, but also due to their functional and technological properties. In this regard, this new fiber product from citrus peel presents a neutral pH which expands the application possibilities to a wider range of food applications, where a natural and neutral flavor is important. Moreover, this citrus peel fiber is an all-natural food ingredient. Consequently, no E-number is needed, leading to a clean label and, furthermore, fibers are derived from a non-allergen source.

Fibers addition have proved successful in improving cooking yield, due to their high water binding capacity (1:10), oil absorption (1:4), drip loss control, reduced fat/meat/solid content, form stability, prevention of jelly formation and fat separation, substitution of other gums or ingredients, improvement of texture of the final food product, and the creation of cost effective products by reducing formulation costs.

Application in meat products

Both functional properties and health beneficial effects of the insoluble dietary citrus fibers make this fiber a useful ingredient in the development of different meat products.

The main functionality of the citrus peel fibers in a meat system is their water binding capacity; this property increases not only the yield but also the quality of the end product. (See Table 2)

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When water is retained in a meat product cooking losses are reduced, whereby, a more cost-effective product is created as well as a more juicy meat texture is achieved.
Extension of MDM meat by applying insoluble citrus fiber

When meat is to be extended, it is important to retain the added water and, at the same time, maintain the meat texture and eating quality. Fibers help to both texturize and bind water in the meat system due to the porosity of the fiber structure. By hydrating the fibers with water, the water occupies the fiber pores, contributing to its texture.

An interesting characteristic of insoluble citrus peel fibers is its capacity to improve MDM (mechanically deboned meat) so that the MDM can be applied in higher doses and/or with improved results in meat blends. (See Figure 2)

Citrus fibers increase the viscosity of the MDM meat mixture, which improves its processability. They also contribute to the improvement of the meat cohesiveness, leading to an eating texture.

% Syneresis of cooked and sliced ham after 1 week’s storage and stress test

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<tr>
<td>REF with no Ceamfibre 7000</td>
<td>9.6%</td>
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<tr>
<td>With 0.8% Ceamfibre 7000</td>
<td>6.4%</td>
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Table 2: Applying Ceamfibre 7000 in meat products improves water holding and juiciness.

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Figure 1: Restructured ham with 1% Ceamfibre 7000

Figure 2: Extended MDM 1:50:50 (1 part Ceamgel 1320 with Ceamfibre 7000, 50 parts MDM and 50 parts water)

Figure 3: Ceamfibre 7000 improving texture and eating quality of sausages (Left=control, right= 1.5% Ceamfibre 7000)

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Table 3: Reduction of syneresis in pork ham with Ceamfibre 7000 compared to standard brine and to brine with potato starch added.

Table 4: Clean label mayonnaise with Ceamfibre 7000SF

Table 5: When applying Ceamfibre 7000SF in low fat mayonnaise the level of guar/xanthan can be reduced considerably.

Figure 5: Increased volume with Ceamfibre 7000SF. Left: Cake with 4% Ceamfibre 7000SF + 4.4% water Middle: Cake with 4% Ceamfibre 7000SF Right: Reference without Ceamfibre 7000SF.
**Bakery jams and fruit preparations**

The baking stability in jams is a very important attribute when jam is added to bakery products in order to maintain the texture and prevent jams from being burnt during the process. Regarding this attribute, a protective effect against heat damage has been observed with just a little amount of Citrus peel fiber addition. (See Figure 7) The addition of insoluble citrus fiber in fruit preparations for yoghurt has also shown to improve texture and consistency. The fiber can optimize the cost of the fruit preparation as well as partial substituting fruit solids, starch and/or guar, and still preserve perfectly the mouth feel of the preparation.

**Conclusion:**
The advantages of using insoluble dietary citrus fibers are multiple and relevant in a wide range of food products. Main benefits are their water retaining capacity, and their cost-effectiveness by replacing ingredients/solids or substituting more expensive gums, as well as its contribution to a “clean label”.

In addition, and because of its high versatility, insoluble citrus fibers can help consumers to meet the health recommendations of dietary fiber reducing the high deficit existing in its consumption.

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**EC Lactic Acid Approval Will Improve Food Safety**

One of the global leaders in food preservation, has welcomed the European Commission’s approval of the use of lactic acid as a decontaminant for beef carcasses, half carcasses and quarters. Already widely used to reduce microbial surface contamination in the USA for some time, the use of lactic acid for this purpose in beef has been permitted in Europe since 25 February. The decision will boost food safety for consumers, according to the company.

“This regulation is great news for the European beef industry,” said Lonneke van Dijk, category manager meat at Purac. “Treating beef with a lactic acid wash has proven effective in reducing foodborne pathogens and will be a valuable additional aspect of HACCP practices in slaughterhouses, providing the European meat industry another effective solution to fight various foodborne pathogens, including E-coli and Salmonella. This, in turn, will ensure higher food safety standards and prolong shelf life.”

The company stressed that the use of lactic acid is an additional tool in the food safety armoury, not a substitute for hygienic practice.

Lactic acid and its derivatives have been used as natural antimicrobial agents in many parts of the food industry for years, so have a long history of safe use. Purac’s portfolio has formed part of multiple hurdle food safety programmes in the meat industry for several decades, and the company now holds sector expertise and technical insight to help slaughterhouses and processors maximize the safety, shelf life and appeal of their products.

The use of lactic acid for surface decontamination in beef slaughterhouses was deemed safe by EFSA (the European Food Safety Authority) in 2011.

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