Water-binding capacity

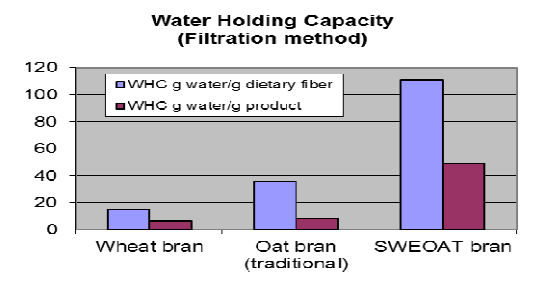
We have established that SWEOAT Brans are rich in beta glucans, the water-soluble dietary fibers present in oats. The ability to immobilize water and to form viscous solutions or gels by covalent cross-linking are important attributes of beta glucans and can have direct functional implications in the food applications that are including oat brans. Other components naturally present in oat brans can also bind water but to a much lower extent than beta glucans.

Assessment

In order to measure the ability of dietary fibers to bind or hold water, different methods can be used (1):

A. Water-binding capacity is measured by centrifugation of the developed gel.
This method is not really applicable for SWEOAT Brans since a large part of the fibers remains in the supernatant. Another disadvantage is that the results highly depend on the g-force applied.

B. Water-holding capacity is measured by filtration of the developed aqueous gel.
In the figure, the water-binding capacity of SWEOAT Bran BG22 is compared to other cereal fiber products after filtration of a mix 2g product in 100ml water. The water retention capacity of the oat beta glucan is much higher than the dietary fibers present in wheat bran.



C. Assessment directly in the application, by measuring the water content in the final product and correlate it to the content of bran in SWEOAT Bran. Other parameters can also be used such as water activity, water loss during further processing (heat treatment, frying, freeze/thaw cycles), texture, mouthfeel, juiciness, compactness, etc.

The methods (C), developed by Robertson & Eastwood (2) have been found to be the most appropriate for these purposes.

Replace fat in meat products?

SWEOAT Brans have shown good results in replacing fat and binding water. Some of the fat-rich components of the sausage recipe were replaced by SWEOAT Bran BG16 and BG22. Sensory, physical and chemical tests were applied. The following table gives the compositional data of a well-accepted product.

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	Water (%)	Fat (%)	Protein (%)	Ashes (%)
Reference: Original Sausage recipe	56,7	21,6	10,1	2,70
Sausage-meat with 2% SWEOAT Bran BG16	72,0	8,0	8,0	2,60
Sausage (full-prepared) with 2% SWEOAT Bran BG16	69,9	8,6	8,6	2,79

Table 1: Composition of sausages without (Reference) and with SWEOAT Bran BG16.

	Water (%)	Fat (%)	Protein (%)	Ashes (%)
Reference: Original Sausage recipe	56,7	21,6	10,1	2,70
Sausage-meat with 3% SWEOAT Bran BG22	71,3	8,0	8,5	2,70
Sausage (full-prepared) with 3% SWEOAT Bran BG22	71,1	8,1	8,6	2,72

Table 2: Composition of sausages without (Reference) and with SWEOAT Bran BG22.

Replace fat in buns and cakes, prolonging shelf life

In 2002, the Swedish SIK together with Swedish Oat Fiber performed a project with the aim to develop a liquid margarine, containing oat beta glucans - that could bear the health claims, but also a margarine that could prolong the shelf life of baking products and thus increase the profitability for the bakeries.

It turned out to be difficult to add the required amount of beta glucans to reach the levels of official health claims, mainly because of the viscosity.

On the other hand it gave very positive results for reduced fat and prolonged shelf life. In baking goods with high content of fat, like buns and cakes, you could by adding 0.15% beta glucans, reduce the flour amount with 10% and fat by 50%, and add 16.5% water - gain the same sensory properties like in a reference product. The crumb of the buns and cakes was also perceived to be softer than the reference products, for a longer time.

The conclusion was that in cakes and buns with high amount of fat (and flour), you can drastically reduce the fat content, maintaining the same sensory quality. It also concludes that the use of oat beta glucans in the dough may prolong shelf life, as beta glucan absorbs water, which means that you may increase the water content in the baked goods.

References:

1. *Chaplin, M. F., Fibre and water binding, Proceedings of the Nutrition Society (2003), 62, 223-227.*
2. *Robertson, J.A. and Eastwood, M.A., An investigation of the experimental conditions which could affect water-holding capacity of dietary fibre. J. Sci. Food Agric., 1981, 32, 819-825.*