

# COOKIES & BISCUITS AS SOURCE OF FIBRE & PROTEIN

## - A TWIST TO MAKE GOODIES HEALTHIER

The human body needs at least 35g fibre/day to work properly, e.g. for our digestive well-being and preferable is a mix of soluble and insoluble fibre. Protein is vital for our cells to build and repair tissues as well as to produce enzymes, hormones and other necessary components for our muscles, organs, skin, hair and as carrier of oxygen in the blood. Proteins are made up of various amino acids which we need a balance of - nine of them are the essential amino acids and cannot be produced by the body itself.

Bakery products are potentially good fibre and protein sources, not only soft bread but even more cookies, crisp rolls, biscuits, crackers etc. Various studies show how added fibre and protein can have a positive health and application impact on those tasty products which is interesting from a consumer perspective. The studies are mainly with fibre which contains both soluble & insoluble fibre, the protein used is from plants. There seems to be a debate if plant protein contains the essential amino acids the human body needs – we don't take part in this discussion but recommend a varied and balanced diet where plant protein can

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contribute in different ways.

Some examples are fibre from apple, sugar beet, potato. The antioxidant effect prevents oxidation of the fat in cookies and biscuits formulations, thereby prolonging shelf life. A bakery tested fibre in crisp rolls as those rolls are commonly dipped in tea or coffee just before consuming. A few % fibre reinforced the product and made it take longer to dissolve in a hot drink. This is a good scenario unless you prefer to lose part of the crisp roll into the cup if it is dipped a few seconds too long.

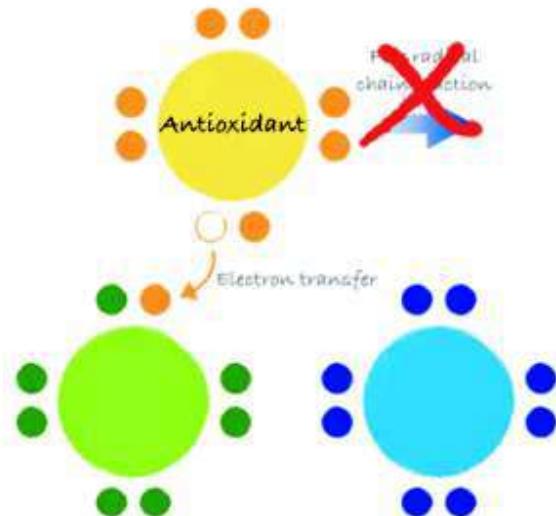
**Cookie studies with plant fibre**  
In a study (Gadhe et al 2017) high levels, up to 20%, Beet fibre from the sugar beet was tested to find out the upper limit of added fibre. The authors mention: "It was seen that fibre in the cookie formulation improved the acceptance of the product. The product was acceptable up to a 10% level, as further sugar beet fibre incorporation led to increased browning in the product and reduction in textural acceptability.

The darkening may be due to Maillard reactions between sugars and amino acids, due to a higher percentage of protein and sugar content in fibre rich cookies (Arshad et al., 2007)".

Another study (Pasha et al 2016) came up with a similar conclusion with Beet fibre in cookies: "12% level is considered as the best source of dietary fibre in bakery products and can be considered as the prospective choice to address metabolic syndromes". Chaudhary and Awasthi (2009) also reported a decrease in the appearance scores of biscuits with an increased level of bran.

With those studies in mind, there are possibilities to boost a cookie or biscuit with plant fibre as Beet fibre or similar fibre from apple, pear etc. and reach health claim levels. Concerning the darkening effect, this result may also be due to the off-white colour of Beet fibre and its protein content (10%) may contribute to the Maillard reaction.





Source: from article by Dr Jacqui Adcock on [What are antioxidants? And are they truly good for us?](#) from the Conversation (with author's permission)

This indicates the upper limits of fibre addition, a lower addition (5-10%) could be preferable to get an optimal balance of taste, functionality and fibre intake – for pure functionality to reinforce structure in cookies we have seen fine results with 1-2% fibre addition.

#### Antioxidant activity and Shelf life

Antioxidants are molecules that fight damage by free radicals, unstable molecules that can harm cellular structures. Antioxidants perform by giving electrons to the free radicals and neutralizing them. Free radicals generate oxidative damage e.g. in our cells or food components e.g. oil. However, free radicals are also essential for us, the body's immune cells use free radicals to kill bacteria trying to infect us. A balance is vital, we need the right number of free radicals and the right number of antioxidants to keep them in control. Soronja-Simovic et al (2013) prepared cookies according to a basic formula, both the control and various limits of added Beet fibre: Wheat flour T-500 55.5%, powdered sugar 19.4%, vegetable oil 11.5%,



the cookies with 11% of sugar beet fibre three weeks of storage. Cookies containing 9% sugar beet fibre had the best antioxidant properties (IC<sub>50</sub> 0.58 g/ml) after six weeks of storage". Good antioxidant activity is also seen in another study (Sakac et al 2009) where they focused on the concentrated fibre itself. The antioxidant effect in the fibre may prevent the oxidation effect of the fat in the cookies and thereby delay this process to prolong fresh holding in cookies (J. W. van der Kamp et al 2010)

**Added plant protein**  
A report in International Journal of Chemical Studies 2018 (Studies on development of high protein cookies, Nihir Soni, Anant S Kulkarni, Luv Patel,

table salt 0.3%, sodium bicarbonate 0.2%, ammonium bicarbonate 0.1% and water 13%. Then 7%, 9% and 11% of wheat flour T-500 were substituted with Beet fibre. All ingredients are calculated on the % wet basis, w/w.

**Summary from the authors:**  
"The obtained results indicated that the substitution of wheat flour with sugar beet fibre in the cookies upgraded their antioxidant activity and prolongs shelf life. The highest antioxidant activity and lowest IC<sub>50</sub> values (about 0.49 g/ml) were measured in

2018 ) concludes that "Cookies also are good carriers of nutrients like carbohydrate and fat which can be enriched with protein by partially replacing refined wheat flour with protein-rich flour up to an acceptable level. Protein-energy malnutrition can be combated with such high protein cookies". For example, replacing 20% wheat flour with plant protein gave an increase from 2.9% to 6.8% protein in the final cookie.

Specific amino acids vary within different plant proteins, e.g. Carob protein(photo below) has high amounts of lysine, threonine, isoleucine and leucine, giving a high total aromatic amino acid concentration. The authors mention the antioxidant properties in some plant proteins. This will most probably, together with fibre with antioxidant properties, add a beneficial antioxidant synergy effect.

Back to the initial test in crisp rolls – a control batch without fibre was made and one with an addition of 2% Beet fibre. Samples with this fibre improved the structure, it didn't grain as the reference and performed better than the reference in the "coffee dip test". The pectin part in this fibre forms a matrix which reinforces the structure. Crisp rolls with 2 % fibre were shown to have better texture. It was generally hard to point out the crisp rolls with fibre vs the control. The fibre did not significantly change the water content or water activity.



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#### References:

- Studies on exploration and characterization of dietary fibre extracted from sugar beet (*Beta vulgaris L.*) and its incorporation in cookies. (Gadhe KS, Shere DM and Jarupla Surendar, 2017)
- Influence of Sugar beet dietary fibre on cookies shelf life. (Soronja-Simovic et al, Institute of Food Tech, University Novi Sad, 2013)
- Testing Sugar beet fibre in Crisp rolls (Producer test Scandinavia 2015)
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- Carob flour and sugar beet fibre as functional additives in bread. (Soronja-Simovic et al 2016)
- Antioxidant properties of Sugar beet fibres (Maijana B Sakac et al, 2009)
- Dietary Fibre: New Frontiers for Food and Health (J. W. van der Kamp et al 2010)
- EFSA (European Food & Safety Authority, Health claims Sugar beet fibre & Pectin, Scientific opinions 2011)
- Plant Foods Have a Complete Amino Acid Composition (John McDougall, MD, 2002)
- What is the difference between animal and plant proteins? (Medical News Today, By Jon Johnson, August 2018)
- Handbook of dietary fibre (Shoo et al 2010)
- Physico-chemical and Sensory Characteristics of Beet Root Pomace Powder Incorporated Fibre Rich Cookies (Sahni and Shere 2016)
- Biochemical Characterisation and Dietary Fibre Analysis of Sugar Beet Supplemented Cookies Imran Pasha, Muhammad Farhan Jahangir Chughtai, Sabreen Akhter, Aysha Sameen and Muhammad Sajid Manzoor. National Institute of Food Science and Technology, University of Agriculture, Faisalabad, Pakistan, 2016)

#### Conclusion:

Tasty bakery products, commonly seen as giving no significant health benefits, can be made healthier with specific plant fibres and plant proteins incorporated into the recipe. Additionally, they may get improved shelf life and structure. Cookies, biscuits and crisp rolls won't break as easy in their packaging, creating better appearance and less crumbs for producers and customers. Naturally, it can be different results in other recipe formulations – but worth trying.

The possibility to present a tasty bakery product as fibre & protein-rich with health benefits as one part in a varied and balanced diet is interesting in a world of more health-conscious people - this gives added value for the consumers. To further reduce calories there is also the option to reduce part of the sugar with plant based and safe natural sweeteners.



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