4.

gembloux faculté universitaire des sciences agronomiques

AVEVE Aveve Group

WalAgri

MRW - Direction Générale des Technologies, de la Recherche et de l'Energie

EFFICIENCY OF SIEVING OR CLASSIFICATION FOR DRY FRACTIONATION OF OAT MILLS AND BETA-GLUCANS ENRICHMENT

Olivier Roiseux[2], Erik Vanderbeke[3], Christophe Blecker[1], Marianne Sindic[1], Vinciane Van Remoortel[1] and Claude Deroanne[1]

[1]Gembloux Agricultural University, Department of Food Technology (Head : Prof. C. Deroanne)
Passage des Déportés 2, 5030 Gembloux, Belgium ; contact e-mail : atisa@fsagx.ac.be ; http://www.fsagx.ac.be/ta
[2]Wal.Agri S.A. – R&D, Sombreffe, Belgium ; contact e-mail : roiseux.o@walagri.be ; http://www.walagri.be
[3]AVEVE Group – Merksem, Belgium ; contact e-mail : erik.vanderbeke@aveve.be ; http://www.aveve.be

INTRODUCTION

There is an increasing interest for nutritional and health claims in food products. It is well known that oat and in particular β-glucans (Fig. 1) contribute to cholesterol lowering leading to an health claim in countries like Finland, UK and USA. This potential is now in discussion into CE (1924/2006). However, formulation of a product with such an heath claim is difficult due to modifications of hydration like water holding of viscosity linked with increase levels of β-glucans and the higher solubility of oat proteins (Table 1).
For testing to solve this technical problem, fractions with an increased level of β-glucans can be produced. Nevertheless, an increase in β-glucans is linked to an increase, which is not always wished, in insoluble fibre too because of the presence of β-glucans in the outer part of the grain. Moreover, oat milling is technically difficult due to the presence of husks and high lipid content of the grain (Table 1).

Table 1 : General composition of different common cereals

	Wheat	Maize	Barley	Oat
Proteins	9-16 %	10-12 %	9-12 %	12-15 %
of which soluble	15 %	7 %	24 %	65 %
Fat	2-3 %	4-10 %	1-2 %	6-8 %
Crude fibre	2-3 %	2-3 %	5-6 %	3-4 %
β-glucans	0,5 – 1,5 %	0,1 %	2,0 – 9,0 %	2,5 – 6,6 %

DRY FRACTIONATION

With the aim to produce cereal ingredients concentrated in β-glucans, we investigated sieving and classification (Fig. 2) process on common and naked (without adherent husks) oat (Fig. 3) flours from different origins. Dry fractionation process permits to label oat fractions as natural ingredients.

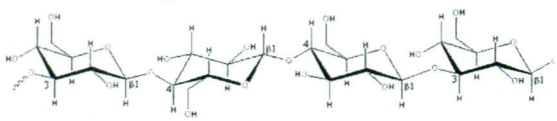

Fig. 1. Chemical structure of β-(1,3)-(1,4)-glucans

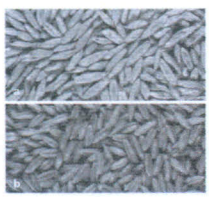

Fig. 3. Common (a) and naked (b) oat kernels

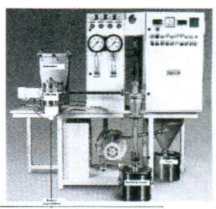

Fig. 2. Classification process (pilot-scale)

CHEMICAL COMPOSITION

We found increasing levels of β-glucans in common and naked oat fractions from classifications (Tables 2) and sieving (Table 3). Composition in dietary fibres (AOAC 991.43), proteins, antioxidant activity (AA) and starch were also investigated.
Beta-glucans intake in raw materials is high for the two naked oat varieties (4,0 % DM), but lower for common oat varieties (from 2,0 to 2,5 % DM) because of taking account of husks. By classification on the two types of oats, we can double concentration of β-glucans. For common oat varieties, it seems possible to valorise the grain and the husk without peeling (Table 3).

Table 2 : Composition (% of DM) of naked oat fractions from classification

Fractions	β-glucans	Proteins	AA[1]	IDF[2]	SDF[3]	TDF[3]
A	7,2 %	16,8 %	++++	21,4 %	7,5 %	29,0 %
B	5,0 %	15,2 %	+++	16,7 %	6,2 %	22,9 %
C	1,9 %	11,2 %	+	7,1 %	3,5 %	10,5 %
D	1,5 %	10,1 %	++	7,5 %	1,2 %	8,6 %

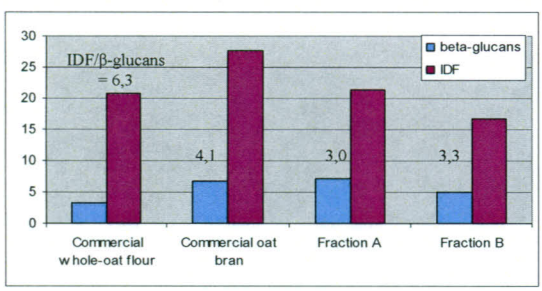

Fig. 4. Composition (in % DM) of commercial oat and classified naked aot fractions

For naked oat varieties, the relationship between β-glucans and insoluble dietary fibres are also original (Fig. 4). Indeed, in comparison with commercial whole-oat flour and oat bran (from common oat after dehusking) which is a classical source of β-glucans in the agro-food industries, the ratio between insoluble dietary fibre and β-glucans contents were lower. So, it can be of interest for certain food processes for which excess of insoluble fractions is not desirable.

Table 3 : Beta-glucans intake of naked and common oat fractions from sieving

Fractions	Naked oat	Common oat
A	6,0 %	5,1 %
B	6,2 %	4,6 %
C	5,9 %	4,1 %
D	4,9 %	3,8 %
E	2,3 %	2,3 %
F	1,5 %	1,3 %

IN CONCLUSION, the development of a more efficient process will lead to the production of several fractions containing increasing levels of β-glucans. Moreover, the enrichment in β-glucans lead to an increase in proteins and DF intake, and also to an higher AA.

PERSPECTIVES

Investigate the influence of raw material dry matter and particle size of oat flour on the classification

Analyse the distribution of the protein solubility into the fractions

Characterise the compounds responsible of the AA