

HOW THE CULTURAL TECHNIQUES INFLUENCE THE RAPESEED SEEDS
COMPOSITION AND THE QUALITY OF THE RAPESEED MEALS

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ABSTRACT

Changes in agronomic practices, in relation with the new european agricultural politic, can leads to a decrease of protein level in the rapeseed seeds, related to a lowering of the nitrogen fertilization. Correlatively the glucid fraction (crude fiber, soluble walls, NDF and ADF) increases. This may affect the nutritional quality of rapeseed meals.

INTRODUCTION

Until 1992, subsidies for oleaginous crops take the form of a premium by hectare, instead of a direct support of the seeds price. The cotation of european oleaginous seeds are then refering to the world cotations. As a consequence, the farmers attempt to realize the biggest profit, instead of the biggest yield.

This new aim leads to an optimization of the costs, with a decrease of the inputs (fertilizers, pesticides....) in many case.

It was important to know if those changes in crop management can alter the seeds composition and therefore their nutritional value.

EXPERIMENTAL

Samples have been taken in several agronomic trials comparing different cultural technics.

- security : where the objective is a maximum yield, whatever the price may be
- economic : where the objective is to lower the costs, without sacrificing systematically the yield

In the economic management, rapeseed receives no nitrogen during autumn, level of fertilization during spring is about half of that of security management (under 150 kg vs 200 to 240 kg). Herbicide, fungicide, and insecticide treatments are minimum.

In each trial, each variety was tested for both the agronomical practices.

After defatting by hexan extraction, the residue was analysed for its chemical composition :

- proteins (N x 6,25) by ISO 5983
- crude fiber (ISO 5498)

- Neutral detergent fiber (NDF), acid detergent fiber (ADF) and acid detergent lignin (ADL) (Giger S. and Pochet S. 1987)
- ashes (ISO 749)
- insoluble walls in the cold water (NF V18 111)

RESULTS

The agronomical practice has a strong effect on oil content (% of dry matter) of the seeds.

- security : 42,3%
- economic : 44,2%

Changes in the composition of the residue are presented in the following table :

TABLE 1. Influence of cultural technics on the composition of defatted meal (% of dry matter)

Technic	Security	Economic
Proteins (N x 6,25)	41,6	34,9
Crude Fiber	12,7	13,9
NDF	28,9	30,9
ADF	19,2	21,2
ADL	10,3	10,9
Ashes	7,2	7,9
Insoluble Walls	36,5	39,4

A strong decrease in the protein content with the economic management is to be related to the level of nitrogen fertilisation. On the other hand, the seed wall components increase (crude fiber + 1,2%, NDF + 2,0%, ADF + 3%, insoluble walls 2,9%, though it isn't possible to add all these different parameters which are not independent).

Monogastric animals are more sensitive relative to level of proteins and undigestible fraction in the diet. Predictive equations can be used to illustrate effect of fibers on the energetic value of meal for different species : Metabolizable Energy for poultry (Larbier and Leclercq, 1992), and Digestible Energy and Net Energy for pig (Noblet et al, 1989).

Though fiber content do not influence much estimation of the metabolizable energy for poultry ($\Delta\text{MEAn}=2.6\%$), it appears (Table 2) quite important for digestible energy for pigs : $\Delta\text{DE}=8.5\%$ and $\Delta\text{NE}=8.1\%$. It is to note that evolution of the nutritional unity systems (as Net energy) leads to modification of the raw material values : rapeseed meal DE for pig is 81% of wheat DE, whereas rapeseed meal NE is only 56% of wheat NE, according to the recent works of Noblet and co (1989).

TABLE 2. Effect of chemical composition on the nutritional value of defatted meal

Technic	Security	Economic
MEAn(i) (kcal/kgMS)	1664	1559
DE1(ii) (kcal/kgMS)	3466	3186
NE19(iii) (kcal/kgMS)	1787	1649

(i) for poultry : $MEAn=0.664*(4217+78.8*Fat-58.3*Ash-39.7*[Insol.Walls])$

(ii) for pig $DE1=4293-129.9*Ash+17.5*Prot+32.8*Fat-54.1*CF$

(iii) for pig $NE19=0.663*DE1-9.3*Prot+22.8*Fat-13.3*CF$

Studies on digestive physiology underlined that fibres may have negative effects on nitrogen digestibility of raw materials, on account of a lower accessibility of the enzymes to the protein fraction, and/or effects of fibres on the physical properties of the digestive track (higher viscosity?), and endogen excretion of nitrogen (desquamation of cells of the digestive wall, secretion of enzymes). Considering increasing nitrogen pollution problems by intensive animal breedings, level and stability of fiber content may become an essential index of the quality of raw materials.

CONCLUSION

These results confirm a strong effect of the agronomic practices on the quality of rapeseed, especially on the meal (protein and fiber fraction). Variability of the quality of raw materials leads to some important additional costs for the feed industry, related to increase in the safety margin when calculate of the nutritional value of a composed diet. Keeping the competitiveness of rapeseed meal as a source of proteins for animal feeding goes through a better control of the quality of this product, that is protein content and accessibility of this fraction (effect of an increase in the fiber content).

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