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Fluidization-Bed Drying and Microwave Radiation Effects on Nutritional Values of Soybean (*Glycine max L.*)

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ABSTRACT

In the present study, which focuses mainly on the influence of drying methods on the nutritional value of soybeans, two drying methods are used, the fluidized bed where three temperatures are applied: 40°C, 50°C and 60°C, and microwave drying where the powers used are 100W, 180W and 300W. For the two drying modes used, the moisture content obtained is very close. Indeed, the lowest moisture content of 0.78% was recorded at 50°C, and 1.04% at 100W. The research of the content of oils extracted from the seeds dried by the two modes made it possible to find three main fatty acids. There are linolenic acid, linoleic acid and oleic acid. The rates relating to these oils obtained are respectively equivalent to 6.21 %, 45.42 % and 32.07 % for the case of a fluidized bed and to 6.63 %, 45.76 % and 30.18% for the case of microwaves. This shows that the drying method had no influence on either the nature of the oils or their content. However, the mode of drying, on the contrary, had a consequent impact on the protein content. Indeed, when the applied drying temperature is above 50 ° C, or when the power exceeds the dose of 100W.

Key words: soybeans, fluidized bed, microwave drying, nutritional value, fatty acids.

1 Introduction

Drying is one of the oldest methods of food preservation and it is a difficult food processing operation mainly because of undesirable changes in the quality of water removal from food products in conventional air drying which may cause serious damage to the dried product [1]. The objective of the present research is to investigate the effects of microwave and fluidized bed effect of drying conditions on the quality of soybeans in terms of the composition of nutritive constituents such as proteins and fatty acids, especially linoleic and linolenic acids, using two different drying processes: the fluidized bed dryer; air temperatures 40°C, 50°C, and 60°C and the microwave powers of 100W, 180W and 300W.

2 Experimental

2.1 Fluidized bed drying

In order to study the effects of drying air temperature on the nutritional quality of soybeans, three samples weighing each 100 g were dried in a fluidized-bed dryer under drying air temperature conditions of 40°C, 50°C, and 60°C until the difference in weight between two successive measurements is less or equal to 0.002 %.

2.2 Microwave drying

soybeans samples were dried using a domestic microwave oven (Samsung, triple distribution systems, model ME83D-1W) with 2.45 GHz frequency and 800 Watt power, Three samples of 300 g of soybean were successively dried in the microwave oven under 0.3 W/g, 0.6 W/g and 1W/g of MW power densities.



3 Results and discussion

The drying of soybeans by microwave, leads to the same values obtained by fluidized bed, we note shows a slight decrease in the values of oils between the power 100w and 300w, mainly oleic acid from 30.18% to 29.45%, linoleic from 45.76% to 45.02% and linolenic from 6.63% to 6.61%, these results are similar to those of the literature [2] (Table1)

Table 1: Fatty acid composition

Fatty Acids	Parameter name	Without Drying	FB 40°C	FB 50 °C	FB 60°C	MW0.3	MW0.6	MW 1
C18:0	Stearic acid	3.53 %	3.68 %	3.61 %	3.43 %	3.49 %	3.43 %	3.29%
C18:1ω9	Oleic acid	34.17 %	30.22 %	32.07 %	31.18 %	30.18 %	29.86 %	29,45 %
C18: 2ω6	Linoleic acid	46.60 %	45.60 %	45.42 %	45.30 %	45.76 %	45.16 %	45,02 %
C18:3ω3	Linolenic acid	5.78 %	6.18 %	6.21 %	6.44 %	6.63 %	6.54 %	6.61%

Protein rate was reduced by 95% after the application of 100W during microwave drying. The application of 180W led to a value representing an increase in the protein rate compared to the Reference of 13%. By applying the power of 300W, the protein rate obtained is higher than that obtained with the power of 180W. Referring to observations made during fluidized bed drying, the level of proteins obtained at 40°C is higher than that recorded at 60°C. This can be attributed to two phenomena. The first relates to the influence temperature on the stability of proteins while the second is related to the reduction of the rate humidity

4 Conclusions

Through this present study, mainly focused on the influence of drying methods on the nutritional value of soybeans, results considered interesting are obtained. GC analysis of oils extracted from seeds dried by the two drying methods led to the detection of the main constituents. Namely linolenic acid, linoleic acid and oleic acid.

References

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