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TECHNOLOGICAL ASPECTS OF DEFATTED SUNFLOWER MEAL ADDITION TO THE PRODUCTION OF HYPERPROTEIC SPAGHETTI AND BREAD. C. Della Gatta, E. Alba, A.R. Piergiovanni, L.G. Bruno.

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SUMMARY

The results concern the use of defatted sunflower meal with a high protein content (55.3%) added to durum wheat semoline (12.5% of protein) or to the flour (8.3% of protein).
Quantities of 5%, 10%, 15% and 20% of sunflower meal were added and the spaghetti and bread obtained were rich in protein content.
The nutritional quality increased up to double the protein content.
The sunflower meal is obtained from an integral breeding programme (oil and protein).

INTRODUCTION

The protein supply in the diet of people living in under-developed countries has been studied by many researchers.
Actually, while industrial countries have a surplus of animal-origin proteins, the countries around the Equator do not produce enough food-stuff to satisfy local population protein needs. These needs colud be met by means of an appropriate selection and cultivation of leguminous crops. Unfortunately, however, leguminous products are not devoid of nutritional hazards (Gupta, 1987).
Since sunflower products seem to have no toxic nutritional components, and since they are rich in essential aminoacid content (Lausani et al., 1981), these products seem to be better suites for nutrition.
The only shortcoming to their use for human feed may come from the presence of chlorogenic acid, responsible for the unpleasant colour of products derived from sunflower meal.
A balanced diet could be supplied by means of a selection of sunflower lines, containing an optimal ratio of globulins and light and heavy albumins, together with lysine, metionine and cysteine components (Jaya et al., 1981).
Since industrially produced sunflower meals used for animal feed are too rich in fibres for human consumption, new technologies for defatting and dehulling sunflower seeds must be developed.
Moreover, sunflower proteins cannot be used in their natural state, hence they should be used as additives to other nutrients. Up to now, sunflower proteins have only been used as a meat substitute in hamburgers (Rossi et al., 1984) and for spaghetti (C. Della Gatta et al., 1984).

Two widely used products such as spaghetti and bread were chosen to test useful technologies from sunflower meal compounds, to obtain all vegetable products.

MATERIALS AND METHODS

The method developed by the M.A.F. project to study oleaginous plants and to select lines rich in oil and proteins was used to select the seed of the variety "Galatea", from which the defatted meal used in our experiment was obtained. The meal obtained has 55.3% protein content in dry matter, and was used as additive either to commercial durum wheat semolina (having 12.5% protein content in dry matter) or to commercial white wheat flour (having 8.3% protein content in dry matter).
Since the aim was to obtain a natural, all vegetable product, neither lysine (to improve the aminoacid ratio), nor eggs (as agglutinants and to improve the aminoacid ratio), nor malt extract (to improve the fermentation of bread dough) was added.
For spaghetti preparation, the samples of about 1 Kg each, contained a 0-20% addition of sunflower meal (0 corresponding to the test and 20% to the highest amount necessary, and with intermediate additions of 5, 10 and 15%). A 30% quota of water heated at 35 °C in a premixer was added to the omogenized semolina and the sunflower meal so as to obtain a homogeneous product in granulated form. To eliminate all the air, the product was then mixed under vacuum and then squeezed under a pressure of 150 Kg/cm through a spaghetti draw plate with holes 1.65 mm in diameter.
The dough was then cut into spaghetti 60 cm long, which were hung on the holder and dried in the oven, which through a cyclical ventilating heating system at 42 °C brought the spaghetti humidity to a 12% (a level of humidity which allows a long storage of the product). It was found that the spaghetti with high quantities of defatted sunflower meal have high protein content up to double that of the test.
The darker colour of the spaghetti obtained because of the chlorogenic acid which is soluble in hot water, disappears almost completely during cooking. Hence it seems unnecessary to try and remove this component from the flour. Moreover, the darker colour may serve to prove that the sunflower pasta is enriched.
Since semolina proteins have a more elastic structure, during the pastification process they become laminar together with those of sunflower meal.
This account for the characteristics of the pasta (spaghetti) obtained; the pasta which had undergone less addition of meal resulted more elastic; the one with more addition of meal is less sticky (table 1).
The bread samples weighed 100 g and consisted of commercial white wheat flour with a percentage of 5% to 20% of sunflower meal, 3 g of fresh barm, 1.5 g of salt and 60 ml of water in order to obtain

an omogeneous dough. The dough was then left to leaven at a temperature of 35 °C for 30 min. Thereafter it was kneaded again and left to ferment of another 30 min. The dough was then poured in light alluminum dishes previously greased with butter. The loafs were cooked in an oven at the temperature of 240 °C for 20 min.
The bread quality was evaluated by testing its volume and porosity.
With the addition of only 5% sunflower meal, the bread resulted quite good (the colour apart) but the addition is too small to be of any practical utility. To be cost effective, it should be added at least 15-20% sunflower meal to bread composition, but in this condition the bread qualities suffer and the dough is hard to leaven (table 2). Of course, the use of good semolina and good flour allows increase sunflower meal percentage, and to obtain a good technological quality of the product as well (Della Gatta et al., 1979).

CONCLUSIONS

These mixtures of meals, are not only all vegetable, but since they have a high biological value and can be rather unexpensive, could also help to improve diet quality of under-developed countries populations.

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Table 1 - Spaghetti quality

	Protein %	Cooking test		
		Residue	Quality	
Test	12.52	7.2	8.2	Excellent
5% S.M.	14.78	5.3	8.5	"
10% S.M.	16.92	8.4	8.1	"
15% S.M.	18.03	11.4	7.4	Good
20% S.M.	20.45	14.7	6.8	"
100% Sunflower meal	55.32	--	--	

Table 2 - Bread quality

	Protein %	Cooking test		
		Vol. cm^3	Spec. w.	
Test	8.32	440	0.296	Excellent
5% S.M.	10.65	450	0.289	"
10% S.M.	13.04	410	0.315	Good
15% S.M.	15.27	380	0.346	"
20% S.M.	17.84	350	0.368	Sufficient
100% Sunflower meal	55.32	--	--	