Production of protein preparates from rapeseeds

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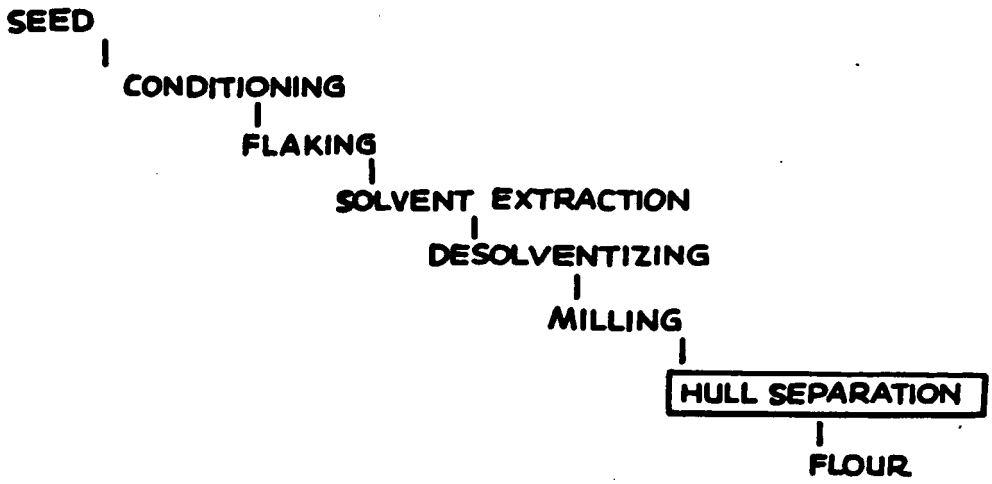
Untill recently, one of the main problems accompanying production of edible protein preparates from rapeseeds was the removal of glucosinolates, viz. of the compounds possessing well known harmful properties /1/. New rapeseed varieties, conteining negligible amount of glucosinolates, seemed to be the solution to the problem. Nevertheless, it appeared that the simplest protein preparate, i.e. flour, obtained from low-glucosinolate rapeseed varieties, does not qualify to standards of foodstuffs. The flour has undesirable taste and odour /2/. It also contains substances harmful to pregnant rats /3, 4/. It is generally thought that thefollowing compounds are responsible for low organoleptic quality of rapeseed flour: residue and bound fats /5/, remains of solvent /6/, and phenolic compounds /7/. Content of the latter compounds in rapeseeds is almost 10 times higher than in soybeans /8/. Component which causes complications in pregnant rats has not been discovered as yet. Its presence in the rapeseeds has been determined only after removal of the glucosinolates /3, 4/.

In order to obtain edible protein preparat from rapeseeds, characterized by high nutritive value and organoleptic quality, ethyl alcohol was used for the removal of undesireble compounds, similarly as in case od soybean.

MATERIAL AND METHODS

Flour obtained from low-glucosinolate rapeseeds of the Start and Górczański varieties was used. The procedure is presented in Fig. 1. Hulls were removed from rapeseed meal with the method described by Sosulski /9/. Particular components were determined with methods described in our previous works /7, 10/.

FIG.1 SCHEME OF THE FLOUR PRODUCTION PROCEDURE.



RESULTS

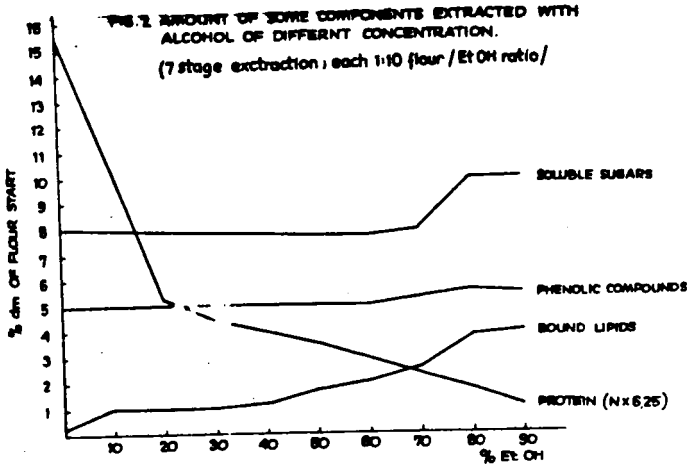
Use of ethyl alcohol for the flour extraction was decided upon due to good solubility of the compounds to be romoved in this alcohol, and the fact that it is widely used in food industry. The following compounds were to be removed: glucosinolates, phenolic compounds, bound fat, non-protein N and soluble sugars. Overall content of these compounds in flours of both rapeseed varieties was similar /Table 1/.

TAB.1 SOLUBLE SUBSTANCES OF RAPESEED FLOURS. /%/

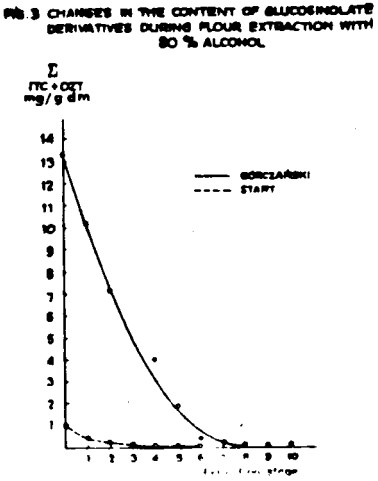
	START	GÓRCZAŃSKI
1. GLUCOSINOLATES (OZT + JTC)	0,1	1,3
PHENOLIC COMPOUNDS		
a) PHENOLIC ACIDS	0,1	0,3
b) SINAPINE	2,8	1,6
c) OTHERS	2,6	3,0
2. BOUND LIPIDS	2,7	2,9
3. NONPROTEIN NITROGEN	5,1	5,9
4. CARBOHYDRATES (SOLUBLE)	10,0	10,2

Concentration of the ethyl alcohol was selected basing on an experiment in which rapeseed flour of Start variety was extracted 7 times with different concentrations of the alcohol. It appeared that 80 and 90% alcohol was most effective for the extraction of residue fat, phenolic compounds and soluble sugars. At the same time, proteins were extracted in an insignificant percent only,

and increase of their concentration constituted the basic aim of the experiment /Fig. 2/.



80% ethyl alcohol was also effective in extracting glucosinolates, so that after 5 successive extractions of Start flour all glucosinolates were extracted, while 7 extractions of Górczański flour resulted in only traces of glucosinolates /Fig. 3/.



Moreover, it was found that temperature of extraction /i.e. 20°C and 80°C/, and its duration only slightly effected extraction rate /Fig. 4/. Lack of any effect of temperature on the rate of extraction of soluble components in d.m. was confirmed by studies on extraction multiplicity.

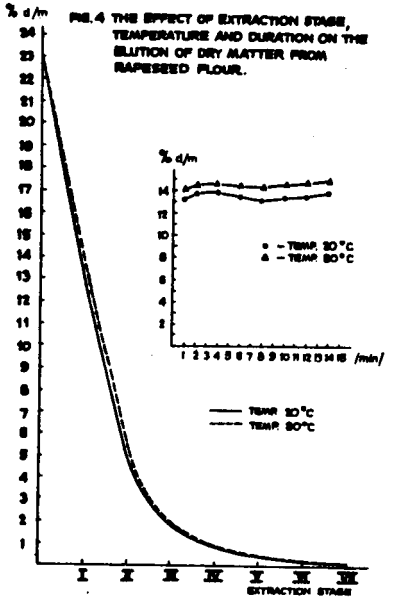


FIG.4 THE EFFECT OF EXTRACTION STAGE, TEMPERATURE AND DURATION ON THE ELUTION OF DRY MATTER FROM RAPESEED FLOUR.

Carrying out 7 flour extractions with 30% ethyl alcohol in room temperature, concentrates were produced on a semi-commercial scale. Their composition is presented in Table 2. The concentrates did not contain bound fat, sugars or glucosinolates /in Górczeński flour there were trace amounts of the latter/. Non-protein N content was noticeably lower. Proteins became more concentrated /in case of concentrate from Górczeński flour by 14%, and in case of Start flour - by 10%/, and so were cellulose and ash.

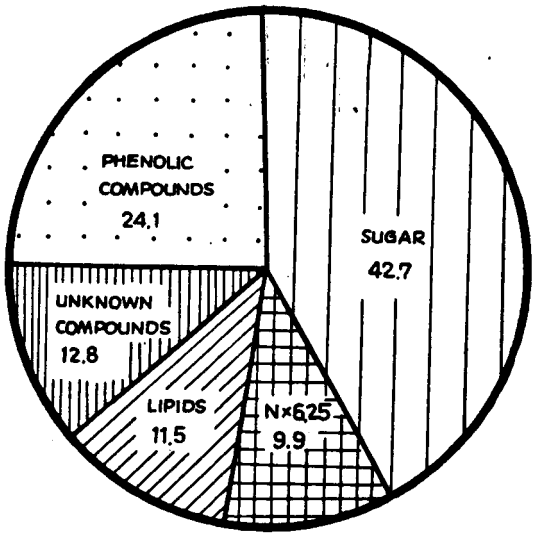
TAB. 2 CHEMICAL COMPOSITION OF RAPESEED FLOUR AND CONCENTRATE

	START		GÓRCZAŃSKI	
	FLOUR	CONCENTRATE	FLOUR	CONCENTRATE
PROTEIN (N × 6,25)	54,2	63,6	55,9	70,1
NONPROTEIN NITROGEN	5,1	1,4	5,9	1,7
BOUND LIPIDS	2,7	-	2,9	-
CARBOHYDRATES (SOLUBLE)	10,0	-	10,2	-
FIBER	2,5	4,0	2,7	4,5
ASH	9,6	10,3	8,7	10,1
PHENOLIC COMPOUNDS	5,5	tr	4,9	tr
GLUCOSINOLATES	0,10	-	1,3	tr

Protein concentrates were characterized by indifferent taste and odour, and high nutritive value. Cultured rats of F-1 generation did not differ from the control rats /11/. This suggests that the factor/s/ responsible for disturbances of pregnancy in rats were removed during the technological process of concentrate production.

Additional advantage of the method used for protein concentrate production is the possibility of reclaiming the solvent, and at least partial use of substances after solvent destilation. These substances consist of sugars, phenolic and nitrogen compounds, fats etc /Fig. 5/.

FIG.5 PERCENTAGES OF SUBSTANCES EXTRACTED FROM RAPESEED FLOUR (START)



Phenolic compounds isolated from this residue, and especially some of them, noticeably inhibited development of some gram-positive and gram-negative bacteria. This suggests the possibility of their use as preserving substances of a bacteriostatic or bactericidal action.

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