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CONTENTS

PRODUCT DEVELOPMENT UTILISING SHEEP MILK WHEY

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ABSTRACT

Authors investigated the use of whey issued in the cheese making from sheep milk. First of all they emphasise the nutritional value of whey shortly. The further part of paper they report the result relating the experimental cheese making, the cheese yield, the distribution of the raw milk constituents between the cheese and whey.

They developed a technology for soft cheese from sheep milk whey. Beyond the technology operation and parameters they gave transferring ratios in the course of production. They processed a possible technology for making whey cheese. In their experiments the whey cheese yield was 10.23% and the transfer of total solids from sheep milk into whey cheese was 44.32% respectively.

Authors feel it necessary to make more experiments in order to reach higher yield and more advantageous sensory properties for the dairy adaptation.

1. INTRODUCTION

The whey is emerging in the course of cheese, quark and casein production. It was considered as invaluable product and strived to escape from it even draining into the sewage system.
It has been cleared out that the whey contains really valuable components in the point of view of nutrition and the amount of them can not be neglected even economic reason as well.

We have to discuss the nutritional value of the individual whey constituents shortly. More than 200 different substance can be identified in the milk and the can be found in the whey as well. It can be mentioned that the effect of the amount of the fat in the whey is low but the lactose, minerals, organic acids, vitamins and last but not least the proteins have higher levels. The Casein residues and whey proteins are not only important due to their energy content but their constituents like Lactoferrin contains iron, the immunoglobulin anabolisms and carriers of the different antibodies. The whey proteins are rich in Cystein (1.9-6.5%). It has to be to special emphasised the Tryptohane occurring in all fractions but in the whey protein has the highest content of it (3.7%). The whey proteins are in really significant amount in lot of fraction (10%) compared to demands of a developing body (7%). Furthermore it can be say that the composition of the whey proteins is well balanced and more valuable compared to the casein proteins in the point of view of nutrition HAENLEIN (1995).

Furthermore the processors, lasting the environment with "pollutant", can calculate finings because of the more and more sever environmental prescriptions. ANON (1973),

HORTON (1975). The above mentioned facts explain why the researches, dealing with utilisation of whey, have been begun in the last decades.

The first direction of the researches can be directed to decrease the fat and protein content of whey reaching higher yield in the production. Another branch is the total or individual utilisation of whey for chemical industry (e.g. alcohol production) for feed industry (veal feed), or for human consumption (whey drink, whey cheese).
The other ways of utilisation of whey are also known from the literature CASALIS (1975), KROSITZ, ZEGARRA (1976).

1. Feed (directly and for silage)
2. Processing to evaporated whey
3. Production of whey powder
4. Production of whey protein concentrate
5. Whey-yeast production
6. Flavoured whey drinks
7. Lactose production
8. Lactic acid production
9. Alcohol production

In this article we focus several possible utilisation of sheep milk whey, the yield and composition of whey from Kashkaval cheese production and the development of a soft whey cheese in pilot plant experiments.

2. MATERIAL AND METHODS

The investigations were carried out in an East Hungarian cheese making plant. The composition of the produced cheese and whey, the amount of milk constituents in the arising by-product and its composition were determined by the following methods.
Milk composition: IDF Standard 141B:1996
The yield was measured by gravimetric method. Yield= kg cheese/100 litres milk
Casein and whey protein content: HPLC, SDS PAGE
pH, acidity (SH°): MSZ 3707:1981:

3. RESULTS

Kashkaval cheese production

In the point of view of further processing the composition and properties of the whey deriving from different places are not the same. Additionally differences can be found within one kind as well (rennet) such in case of whey of soft semi-hard and hard cheeses. Thus the composition of the whey is constant. The composition is mainly influenced by the three factors:

1. The composition of the milk and the ratio between the components. Its main influencing factor is the art of the animal
2. Significant fluctuation can be observed in the individual milk samples depending on variant, on the individual animal on the lactation period etc.
3. The operations applied during the cheese and casein production have significant influence on the whey composition.

The average composition of the investigated sweet and acid cow milk whey and sheep milk whey is shown in Table 1. As it could be expected the composition of the whey of Kashkaval cheeses made in industrial circumstances differed from cow and ewe's milk whey. It contained 2 times more protein and 5-6 times more milk fat compared to cow milk ones.

Table 1 Average composition of whey from cow and sheep milk

COMPONENT	SWEET WHEY	ACID WHEY	WHEY FROM SHEEP MILK
Total solids	6.50	5.80	7.80
Lactose	4.70	4.00	4.10
Protein	0.90	0.90	1.80
Fat	0.25	0.20	1.25
Minerals	0.60	0.75	0.70

After compilation of our investigations regarding to sheep milk whey we elaborated a whey chase making production technology. The composition of the final product was the followings: Dry matter 58%, Relative fat content 51%, Absolute fat content 30%. The yield of the cheese production was ≈580 litres/100 kg cheeses.

We have investigated the transfer of constituents into the whey and into the cheese in the course of the cheese production. Their results are shown in Table 2.

Table 2 Distribution of the raw milk constituents between the cheese and whey in the dairy firm experiments (%)

WHEY		SHEEP MILK			CHEESE
74.84	←	Water	82.04	→	7.20
0.95	←	Fat	6.14	→	5.19
0.22	←	Casein	4.45	→	4.23
1.27	←	Whey protein	1.37	→	0.10
4.65	←	Lactose	4.90	→	0.25
0.75	←	Minerals	1.10	→	0.35
82.68	←	**Total**	**100.00**	→	**17.32**

It can be seen that the majority of the substances transferred into the whey meanwhile the ratio transferring into the cheese express the yield. 56.34% and 43.66% of dry matter was transferred into the cheese and whey respectively. The results related to the Kashkaval cheese production is not published in detail here because the aim of this article was the utilisation of whey.

Utilization of whey from sheep milk for cheese production

The sheep milk and its whey arising in the cheese production has higher amount of constituents compared to the cow milk and its whey. This difference comes from the dry matter content due to the higher fat and protein content. The more disadvantageous protein/fat ratio and more unfavourable emulsion state of fat influence the utilisation of whey and the properties of products made from it. These facts and the worse microbial quality have to be taken into account in the course of our experiments.

The process flow sheet of the whey produced by us is shown in Figure 1

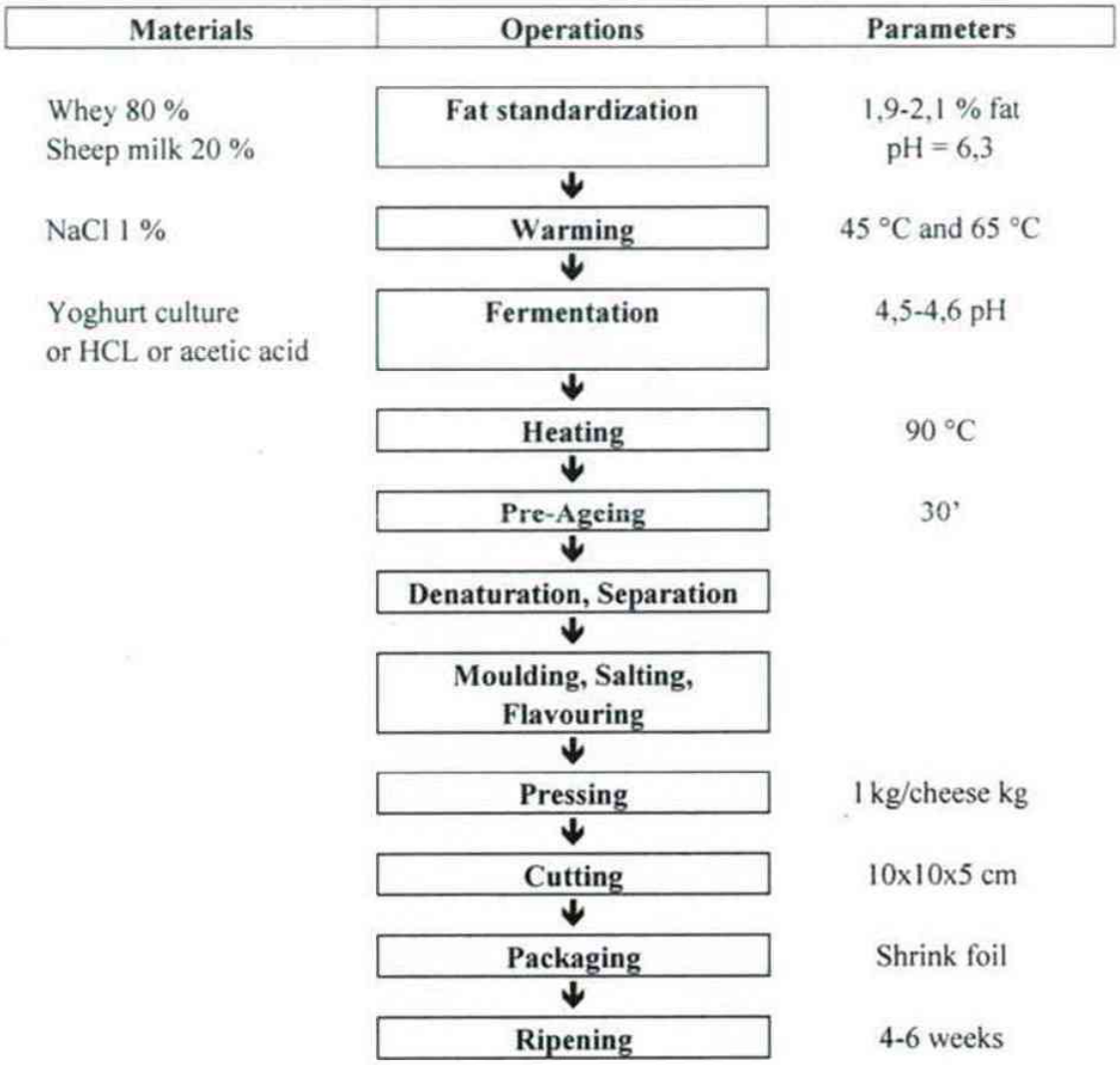

Figure 1. Process flow sheet of the experimental whey cheese

According to our opinion we have produced a soft cheese suit to the Hungarian taste.
It has to be mentioned that the precipitation of protein by acid and heat was the critical point of the production, on the one hand it influenced the yield and on the other hand the too high precipitation temperature caused changes in the taste. The precipitation process has to be optimised in further experiments.

The dry matter content and fat content of the produced cheese were 42% and 18% respectively. The yield was 10.23% in the experiments.
Taking into account the sensory properties of the sheep milk whey the possible further processing directions is shown on Figure2.

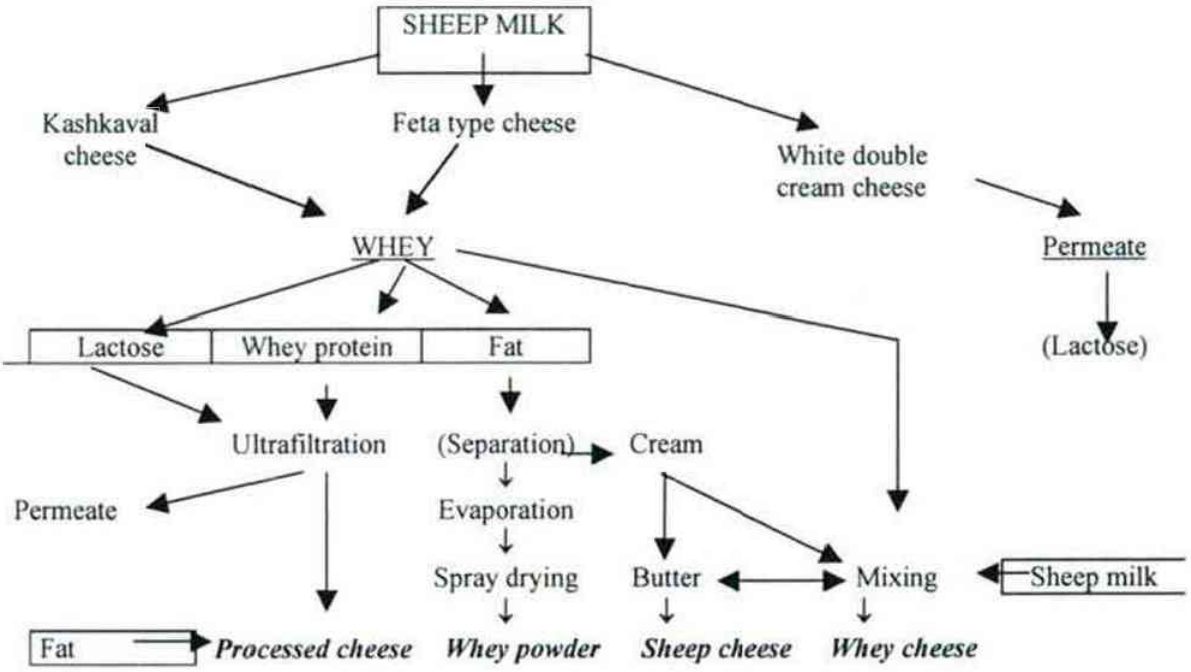

Figure 2. Processing possibility of sheep milk and sheep milk whey

4. CONCLUSION

The whey is a by product resulting from cottage cheese and cheese production contains very valuable constituents regarding both the nutritional and economic value. According to our opinion it has to be utilised at all mainly transferring the whey into milk product.
We confirmed that the composition of whey from cow and sheep milk is differing remarkably. We have discussed several further processing methods of whey and showed our special whey cheese production technology. Furthermore we developed a technology for soft cheese from sheep milk whey. Beyond the technology operation and parameters we have given transferring ratios in the course of production. It can be seen from the figures that 10.23% (yield) and 44.32% of the total solids of the raw milk transferred into the whey cheese respectively.
More experiments are needed in order to reach higher yield and more advantageous sensory properties.

REFERENCES

1. Anon (1973): Whey processing and utilisation. Results of questionnaire 473/B. Document FIL.
2. Casalis, J. (1975): Consideration sur l'utilisation du lactoserum dans l'industris alimentary. RLF (232) pp. 403-419.
3. Haenlein G,W.F. (1995): Nutrition value products of ewe and goat milk. Proceedings of the IDF/Greek National Committee of IDF/CIORVIL Seminar held in Crete, Greece p. 123-128.
4. Horton, B., S. (1975): Prevents whey pollution recovers profitable by-products. Food Engineering (1) (6).
5. Krostitz, W., Zegarra, F. (1976): Whey an underutilised protein source. FAO Industry Cooperative Program DDI: G/74/36.