DEGREE OF PROTEIN DENATURATION IN WASTE FROM NATURAL SILK PROCESSING IN A HIGH-FREQUENCY FIELD

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The quality of waste solutions from processing natural silk (NSW) is determined by the content of the protein fibrion [1, 2]. Therefore, research was carried out to determine the degree of protein denaturation in a high-frequency (HF) field (sample 2) relative to that of the usual method of dissolving NSW at 116°C for 4-6 h (sample 1). The solution protein content of each sample was found by spectrophotometry [3]. It was found that the protein content in the solution of sample 1 was 7.26 mg/mL; of sample 2, 10.6 mg/mL. The amino-acid composition was found for each sample. Table 1 shows that the total content of amino-acids was 9.65% for sample 1; 3.34% for sample 2.

Therefore, dissolving NSW at 116°C for 4-6 h (sample 1) destroyed more protein than dissolving NSW in a HF field (sample 2), where the protein was preserved to a greater extent, which was the goal of the work. Thin-layer chromatography on KSK cellulose (Fig. 1) also indicated that protein in sample 1 was denatured to a greater extent than in sample 2. The degree of hydrolysis of peptide bonds in the two samples was studied by IR spectroscopy. The IR spectrum of sample 1 contained several strong bands. Absorption near 1650 cm^{-1} was due to stretching vibrations of NHCO groups, which was indicative of denaturation of peptide bonds and was not observed in sample 2.

TABLE 1. Amino-Acid Composition of NSW Solutions Produced by Various Methods, %

Amino acid	Solution composition	
	1	2
Asp	0.34	0.22
Thr	0.32	0.10
Ser	0.34	0.02
Gln	0.40	0.28
Pro	0.48	0.48
Gly	0.33	0.14
Ala	0.40	0.18
Cys	0.32	-
Val	0.81	0.22
Met	0.55	0.02
Ile	0.51	0.06
Leu	0.51	0.14
Tyr	0.73	0.06
Phe	0.76	0.22
His	0.82	0.26
Lys	1.1	0.54
Arg	0.85	0.22
	Σ 9.65	Σ 3.34

Tryptophan (Trp) was not determined

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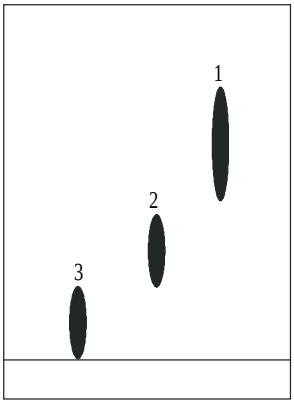

Fig. 1. Thin-layer chromatography: sample 1 (1), sample 2 (2), starting NSW (3).

Thus, the results led to the conclusion that the protein content in solution is greater and the protein is less hydrolyzed (denatured) if the NSW are dissolved in a HF electric field. Furthermore, this method can decrease the time needed to make a homogeneous solution of the NSW to 30 min.

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