

BIOTECHNOLOGICAL ASPECTS OF ORGANIC BIOPOLYMERS PROCESSING

EFFECT OF ENZYMES ON VEGETABLE TANNING OF LEATHER

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Biotechnological methods are widely used in medicine, pharmacy, agriculture, food industries, no exception and the leather industry. For centuries leather tanning methods have been improved by the use of enzymes in order to provide leather semi-manufactured products with better properties and to reduce the use of harmful chemicals and their environmental pollution.

The aim of the research is to determine the effect of proteolytic enzyme on the properties of leather processed by vegetable tannins (quebracho and mimosa). The results obtained reveal the effect of the enzyme and tannin treatment on the exhaustion and penetration of tannins through the leather.

Pieces of chromed bovine hide after shaving (7 x 10 cm) taken from butt part were used for the experiments: shrinkage temperature 109.7°C; chromium oxide content 4.3%; moisture content 57%; average thickness 1.5mm. New enzymatic preparation (EP) *Vilzim PRO N* produced by JSC “Baltijos Enzimai” (Lithuania) was chosen for the investigation (determined by Anson method activity 1700-1800 u/g at 40°C). Two methods of enzymatic treatment were applied: A) treatment by enzyme and tannins in one bath (6 hours); B) enzymatic treatment (6 hours) was carried out before vegetable tanning (2 hours). Temperature of both processes 37°C.

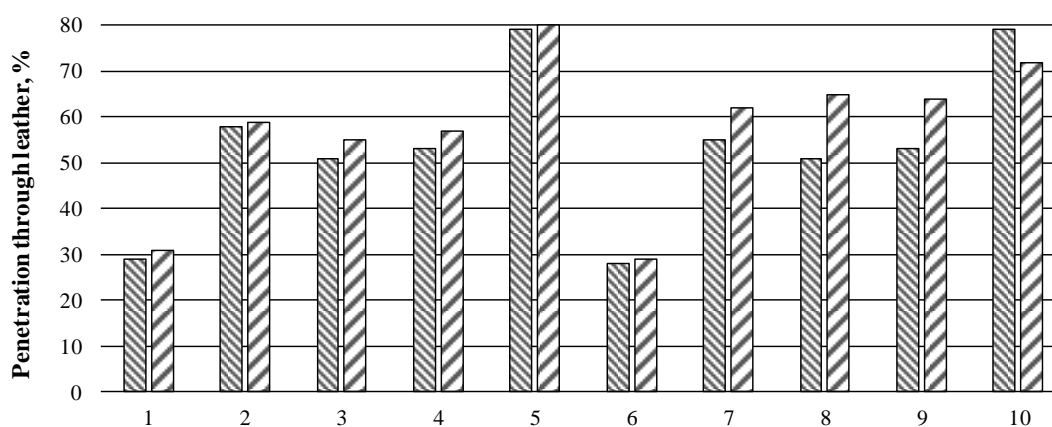


Figure 1. Dependence of tannins penetration on the method of treatment by enzyme: 1,2,6,7 – treatment by enzyme and tannin in one bath; 3,4,5,8,9,10 – separate treatment by enzyme and tannins. 1,6 – EP 1%, tannin 4%; 2,7 – EP 3%, tannin 8%; 3,8 – EP 1%, tannin 8%; 4,9 – EP 3%, tannin 8%; 5,10 – EP 1%, tannin 16%.

Amount of tannins used was varied from 4% up to 16%. Control samples were treated in the same way like experimental but without use of enzymatic preparation.

Firstly, the penetration of tannins was assessed (Fig. 1) dependently on such factors as follow: method of treatment (treatment by enzyme and tannins separately or simultaneously); amount of enzyme preparation; sort (quebracho or mimosa) and amount of tannins. Afterwards, the exhaustion of tannins was evaluated (Fig. 2).

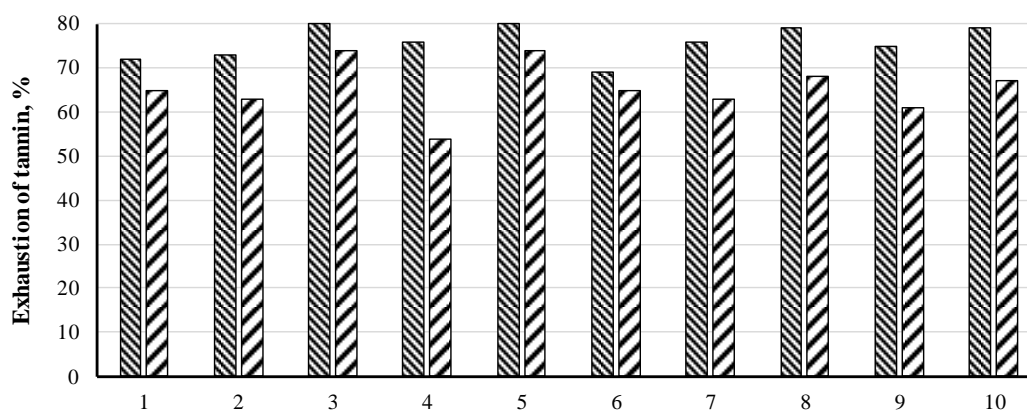


Figure 2. Dependence of tannins exhaustion on the method of treatment by enzyme: 1,2,6,7 – treatment by enzyme and tannin in one bath; 3,4,5,8,9,10 – separate treatment by enzyme and tannins. 1,6 – EP 1%, tannin 4%; 2,7 – EP 3%, tannin 8%; 3,8 – EP 1%, tannin 8%; 4,9 – EP 3%, tannin 8%; 5,10 – EP 1%, tannin 16%.

The samples after treatment by EP (3%) and tannins (8%) in one bath were fatliquored and dried. The shrinkage temperature and amount of matter extractable by dichlormethane were determined. The results are presented in Table.

Table. Indexes of fatliquored samples

Tannins	Sample	Matter extractable by dichlormethane, %	Shrinkage temperature, °C
Quebracho	Control	6.8	113.3
	Experimental	8.2	114.2
Mimosa	Control	7.3	112.7
	Experimental	8.0	113.8

When using the enzyme, the consumption of tannins is decreased, but tannins penetrate deeper into the leather compared to the tanning when the EP is not added. During fatliquoring the treated with enzyme leather absorbs more fatliquoring materials. The sort of tannins has not influence on the effect.

Therefore, the results have shown that the proteolytic EP Vilzim PRO N actively affects even chromed collagen and has influence on the vegetable tanning process and on tanned leather properties as well.