UENCE OF BLOOD PLASMA ACIDIFICATION ON HAEME PIGMENT NITROSATION AND CURED COLOUR DEVELOPMENT LASMA GEL /LIVEX/

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fluence of the pig blood plasma acidification to pH=6.3 by 10% solutions of: lactic, propionic, acetic, formic ydrochloric acids on the curing efficiency of hemoglobine content in it was evalueted. It was found that a acidification resulted in approx. 20% increase of haeme pigment conversion to nitrosopigment in comparison ontrol sample and that when the cured plasma was used for the livex processing the colour of the obtained x gel was fairly stable and sensorically typical and characteristic of cured, cooked processed meat products.

ODUCTION

e investigations on the hemoglobin curing and use of the resulting nitroso form for processed meat products uring purposes were carried out by several authors./MÖHLER and BAUMAN,1971, PALMIN at al 1973, SHAHIDI at al , SHAHIDI and PEEG, 1988/.

e authors´ experience indicates that substantial increase of the hemoglobin reactivity with the nitrate i.e. e pigment conversion to the nitrosopigments is possible since the changes in globin conformation resulted thermal denaturation, treatment by acids and/or enzymes. /JARMOLUK at al,1991/.

RIALS and METHODS

e studies were performed on three separate batches of commercially manufacturéd pig blood plasma stabilized sodium citrate, frozen and defrosted at 4-6^{o}C for 24 h, before further use. Thawed blood plasma was acidi- to pH=6.3 by 10% solutions of: lactic /A/, propionic /B/, acetic /C/, formic /D/ and hydrochloric /E/ acids. ified blood plasma was cured at 4-6^{o}C for 1 hour using nitrite and sodium ascorbate in the molar ratio of sodium ascorbate: $NaNO_2$ and hemine as 9:3:1. Samples of cured blood plasma were then destabilized according atented procedure /PATENT/ and using pig brain tissue homogenate as an enzymic activator /stimulator/ for a pre-gelation. /DUDA at al,1989/. The resulted gels of plasma i.e. the raw livex formed was then pasteurized water bath at 80^{o}C until 80^{o}C was reached in the core of the sample. /DUDA and JARMOLUK,1985/. In each of the epetitions of the study the following 7 variants of livex experimental batches were processed:

LK_1 - not acidified and not cured plasma
LK_2 - not acidified, cured plasma
LA - lactic acid acidified plasma, cured
LB - propionic acid acidified plasma, cured
LC - acetic acid acidified plasma, cured
LD - formic acid acidified plasma, cured
LE - hydrochloric acid acidified plasma, cured

n the obtained thermally denaturated plasma gel /livex/ the degree of haeme pigment conversion to the nitroso- ent /by HORNSEY,1957/ and the physical parameters of the colour using reflectance colorimeter "Minolta" 200b were determined. The colorimetr was calibrated using producers white standard with the following coeffi- ns: Y = 87.8 ; x = 0.309 and y = 0.315. The livex colour physical parameters was expressed in the system of a^* and b^* and additionally by calculating the hue parameter according to equation: $tg^{-1} b^*/a^*$ and the chroma the colour defined /calculated/ as $/a^* + b^*/^{1/2}$. /HUNTER and HAROLD,1987/. The physical parameters of the rimental material colour were determined upon completion of the livex processing and the colour stability er 1,3,5 and 7 hours of continuous illumination of samples by fluorescent white light with an intensity of Lux. The data obtained in the study were analysed statistically, using programme - "Statgraphics 2.1" and IBM puter.

RESULTS and DISCUSSION

An average value of defrosted plasma pH was 8.1 and was by approx. 0.5 pH units higher than the initial value. The pH of the control livex samples /LK_1 and LK_2/ i.e. processed from not acidified plasma, after thermal treatment, decreased to the level of pH=7.71, while processed from acidified plasma increased from the initial 6.3 by approx. 0.1 pH unit. Tab.1.

Table 1. Influence of pig blood plasma acidification to pH=6.3 on gelation time of raw livexes, their pH after thermal treatment and on the degree of haeme pigment conversion to nitrosopigments /n=3/.

Parameters	Variant of livexes							LSD
	LK_1	LK_2	LA	LB	LC	LD	LE	
pH	7.71^b	7.71^b	6.40^a	6.42^a	6.39^a	6.40^a	6.41^a	0.06
Gelation time /s/	78.0^a	82.0^a	247.0^c	251.0^c	224.0^b	264.0^d	314.0^e	6.30
Degree of haeme pigment conversion /%/	-	12.2^a	14.4^c	13.9^b	15.1^d	15.2^d	14.9^d	0.37

Means with different superscripts are significantly different at $p \leq 0.05$

The acidification of the plasma used for the experimental livex manufacturing, irrespectively of the acid used and in spite of using the enzymic activator of plasma gelling, caused about a triple delay in the dynamic of fibrin net forming after plasma destabilization. Tab.1.

The lowering of the plasma pH below 6.0 resulted in practically total inhibition of the processes responsible for the fibrinogen transformation into fibrin and therefore processing of the livex from plasma acidified below 6.0 pH was impossible, indicating the importance of pH for fibrinogen transformation into fibrin.

An average content of the hemoglobin in plasma, expressed as hematin, amounted to 145 ppm. It was observed that the degree of haeme pigment nitrosation to nitrosopigments was influenced by the aacidification of plasma as well as was dependent on the acid used. In the control sample i.e. not acidified /LK_2/ the degree of haeme pigment conversion to nitrosopigments was on average 12.2% while in livex processed from acidified plasma ranged from 13.9% /LB/ to 15.2% /LD/. Tab.1.

In spite that the haeme pigment conversion was in acidified samples relatively small in comparison to the control sample, the observed colour of livexes processed from acidified plasma was noticeably better. The average determined values for L^*, a^* and b^* livexes processed from acidified plasma i.e.: LA, LB, LC, LD and LE were: 68.5 ; 10.6 and 9.2 respectively and in comparison to the data determined for the control samples /LK_2/ the observed colour parameters increased by 1.2 ; 2.8 and 2.0 respectively. Tab.2.

An average value for the hue determined for livexes manifactured from the acidified plasma and expressed in measure of angle were 10^o smaller in comparison to control sample LK_2. Over 2 fold increase of the colour chroma for livexes processed from acidified plasma, in comparison to control samples, was observed. Tab.2. Moreover, the colour of livexes processed from acidified plasma exhibited greater luminance and better chroma, when assessed visually and in comparison to the control sample.

The data obtained for physical parameters of colour for the illuminated samples i.e. for the colour stability are presented in Table 3. During sample illumination slight increase of colour luminance /L^*/ was observed. Simultaneously, substantial decrease of the red fraction of colour was notified and increase of the yellow tint in colour tone of illuminated samples was observed. This was reflected in changes of the hue data from the level of about 38^o for "0" time of illumination to approx. 53^o after 7 h of the experimental material illumination. It was also determined that the illumination of livex samples substantially decreases its colour chroma.

CLUSSIONS

cidification of the plasma used for livex manufacture before curing to pH=6.3 increase, although not fully isfactorily, the degree of conversion of the haeme pigment content in it to the nitrosopigments i.e. by approx. in comparison to the data determined for the control samples. This facilitates livex manufacturing with sen-ically desired pinkish colour typical of cured processed meat products.

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e 2.

Variations in physical colour parameters of experimental material /livex/ as influenced by acids used for plasma acidification /n = 3/.

olour arameters	L^*	a^*	b^*	hue	chroma
LK_1	60.14^b	2.73^a	5.49^b	63.62^e	6.13^b
LK_2	59.39^a	3.77^b	4.55^a	51.93^d	6.05^a
LA	68.97^e	10.25^c	8.94^c	41.56^b	13.67^c
LB	69.30^e	10.18^c	8.95^c	41.75^{bc}	13.63^c
LC	68.05^d	10.91^e	9.34^d	41.02^a	14.43^e
LD	68.37^d	10.58^d	9.39^{de}	42.02^c	14.20^d
LE	67.68^c	10.99^e	9.41^e	41.04^a	14.53^f
LSD	0.50	0.10	0.05	0.49	0.10

Means with different superscripts are significantly different at $p \leqslant 0.05$

Table 3.

Variations in physical colour parameters of illuminated experimental material-livex /n = 3/.

Colour parameters		L^*	a^*	b^*	hue	chroma
Illumination time /h/	0	65.47^{a}	10.75^{e}	7.71^{a}	37.97^{a}	13.33^{e}
	1	65.77^{ab}	9.60^{d}	7.85^{b}	41.62^{b}	12.49^{d}
	3	66.04^{bc}	8.11^{c}	8.03^{c}	47.01^{c}	11.48^{c}
	5	66.24^{cd}	7.21^{b}	8.16^{d}	50.92^{d}	10.95^{b}
	7	66.41^{d}	6.77^{a}	8.29^{e}	53.13^{e}	10.76^{a}
LSD		0.30	0.90	0.05	0.37	0.74

Means with different superscripts are significantly different at $p \leq 0.05$