TABLE 1: COMPILATION of VOLATILE COMPOUNDS DETECTED IN FERMENTED SAUSAGES (adapted from Dainty & Blom, 1993)

ALKANES

pentane	6,8,13
hexane	6,8,13
heptane	6,8,13
octane	6,8,10,13
nonane	6,7,8,13
decane	8,9
dodecane	9
n-tridecane	9
n-tetradecane	9
2,2,3-trimethylnonane	6,13
2,2-dimethyl-decane	9
methylene-cyclopentane	8

ALKENES

methyl branched alkene	8
heptene	6,13
octene	6,13
nonene	7
dodecene	9
tetradecene	9
octadecene	9
hexadecene	9
4-methyl-1-pentene	6,13
4,4-dimethyl-2-pentene	9

ALDEHYDES

acetaldehyde	2,3,4,9,13
ethanal	1,2,3,4,6
propanal	1,2,3,4,9
butanal	1,2,3,9
pentanal	1,3,4,6,7,9,10,13
hexanal	2,3,4,5,6,7,8,9,10,13
heptanal	2,3,4,5,6,8,9,10,13
octanal	2,3,4,5,9
nonanal	3,5,6,7,9,10,13
decanal	3,5,9
2-butenal	3
2-pentenal	3
2-hexenal	2,3,4,6,13
2-heptenal	3,4,7,9,10
2-octenal	3,7
2-decenal	3
2-undecal	3
2,4-hexadienal	4,9
2,4-heptadienal	4,9
2,4-octadienal	5,9,13
2-methylpropanal	1,2,3,4,6,8,9,13
2-methylbutanal	4,6,8,10,13
3-methylbutanal	1,4,6,7,8,9,10,13
2-methyl-2-butenal	5
2-methyl-2-pentenal	5
methylpentanal	3
2-pentenal (branched)	4
2-hexenal (branched)	4
benzeneacetaldehyde	8,13

KETONES

propan-2-one	1,2,3,4,6,8,9,13
butan-2-one	1,2,3,4,6,8,9,10,13
pentan-2-one	3,4,5,6,9,10,13
hexan-2-one	3,6,9,13
heptan-2-one	3,5,6,7,9,10,13
heptan-4-one	10
octan-2-one	3,5,6,7,9,13
nonan-2-one	10
nonan-4-one	3,5,7,9
decan-2-one	3
undecan-2-one	3,5
tridecan-2-one	3
pentadecan-2-one	3
pentan-3-one	1,4,5
octan-3-one	7
3-methylpentan-2-one	10
4-methylpentan-2-one	5,7
3-hexen-2-one	10
3-methylhexan-2-one	6,13
5-methylhexan-2-one	5
4-ethyl-3-hexanone	8
6-methyl-5-hepten-2-one	6,7,9,13
dimethyloctenone	5
butan-2,3-dione	1,2,4,6,7,8,9,13
pentan-2,3-dione	7
octan-2,3-dione	6,13
1-hydroxypropan-2-one	8
3-hydroxybutan-2-one	6,7,10,13
cyclopenatanone	10
cyclohexanone	10
2-methyl-2-cyclopenten-1-one	8
3-methyl-2-cyclopenten-1-one	8

ESTERS/ACETATES

methyl acetate	8
ethyl acetate	6,7,8,9,10,13
ethyl propanoate	7,8,9,10
ethyl lactate	7
ethyl butanoate	7,8,10
ethyl isobutanoate	10
ethyl pentanoate	7
ethyl hexanoate	7,9,10
ethyl heptanoate	7
ethyl octanoate	7,9,10
ethyl 2-butenoate	8
ethyl pentenoate	7
ethyl hexenoate	7
ethyl 2-methylpropanoate	7
ethyl 2-methylbutanoate	7,10
ethyl 3-methylbutanoate	7,10
ethyl methylpentanoate	7
propyl acetate	6,10,13
hexyl acetate	7
1-methylpropyl acetate	10
2-methylpropyl acetate	7
2-methylpropyl propanoate	7
2-methylbutyl formate	10
3-methylbutyl acetate	7,10
bornylacetate	9

ORGANIC ACIDS

formic acid	1,2,3
acetic acid	1,2,3,6,7,9,10,11,12,13
propanoic acid	1,2,3,9,10,11,13
butanoic acid	1,2,3,6,7,8,9,11,12,13
pentanoic acid	2,9,12
hexanoic acid	6,7,9,10,13
2-methylpropanoic acid	1,2,9,10,12
3-methylbutanoic acid	1,6,9,10,12
2-methylpentanoic acid	6,7,8,9,13
3-methylpentanoic acid	7,8,9,13
2-methyl hexanoic acid	8
butenoic acid	6
propandioic acid	6
butandioic acid	6
methylenebutandioic acid	6

ALCOHOLS

ethanol	6,8,9,13
propan-1-ol	6,13
butan-1-ol	7,9
butan-2-ol	7,9,10
pentan-1-ol	5,7,13
1-penten-3-ol	6,10,13
3-penten-2-ol	6,13
hexan-1-ol	6,7,13
hexen-1-ol	7,9
hexen-2-ol	5,9
heptan-1-ol	7
heptan-2-ol	7
octan-1-ol	7,9
1-octen-3-ol	5,6,7,10,13
1-hexadecanol	9
2-methylpropan-1-ol	7,8,10
2-methylbutan-1-ol	7
3-methylbutan-1-ol	6,7,10,13
3-methylbutan-2-ol	5
4-methylpentan-1-ol	10
2-ethylhexan-1-ol	7
3-methyl-1-hexen-3-ol	5
1,3-butanediol	8,9,10,13
2,3-butanediol	13
1-methoxy-2-propanol	10
1,3-dimethoxy-propan-2-ol	8
furfurylalcohol	8
2-butoxyethanol	8,13
cyclohexanol	10

AROMATES

ethylbenzene	9,13
propylbenzene	9
m-xylene	8,13
o-xylene	8,13
p-xylene	8,9,13
4,5-dimethyl-1,3-benzenediol	8
toluene	8,9,13
phenol	8,9
p-guaiacol	8,9

FURANS

furan	8
tetrahydrofuran	6,13
2-methylfuran	8
2-ethyl furan	6,13
2-pentyl furan	6,13
2-methoxyfuran	9

TERPENES AND SPICE RELATED COMPOUNDS

alpha-thujene	8,9
thujanol	9
alpha-pinene	8,9
beta-pinene	8
3-methyl apopinene	8
sabinene	8,9
alpha-phellandrene	8,9
delta-3-carene	8,9
4-carene	9
alpha-terpinene	8
gamma-terpinene	8
limonene	8,9,13
ocimene	8
terpinolene	8
delta-elemene	9
copaene	9
delta-selinene	9
myristicine	9
alfa-cubebene	9
camphene	9
methyleugenol	9
eugenol	9
beta-myrcene	9
alfa-humulene	9
alfa-caryophyllene	9
beta-caryophyllene	9
gamma-terpineol	9
alfa-terpineol	9
terpinen-4-ol	9
linalol	9
p-cymene	8,9
saffrol	9
camphor	9
delta-verbenone	9

NITROGEN CONTAINING COMPOUNDS

dimethyl-1H-pyrazole	8
pyrazine	8,9
2,6-dimethylpyrazine	6,7,9,13
2,3,5-trimethylpyrazine	7
4-acetyl pyrazole	8
3,4-dihydro-2H-pyran	8
organic nitrates	7
N,N-dimethyl methanamine	13
aromatic amine	8,9

SULFUR CONTAINING COMPOUNDS

methanethiol	8,9
propanethiol	8
1-methylthio-propane	8
3-methylthio-1-propene	8
1-methylthio-1-propene	8,10
3((1-methylethyl)thio)-1-propene	8
3,3'-thoibis-1-propene	7,8
2-propenyl disulphide	8
methyl 2-propenyl disulphide	7
di-2-propenyl disulphide	7
dimethyl disulphide	6,8,9,10,13
methylisopropyl disulfide	8

HLORIDE COMPOUNDS

chloromethane	13
ichloromethane	13
ichloroethane	8,13
ichloroethene	9
trachloroethene	8,9,13
chloropentane	8

mpounds found in study :

Cantoni et al. (1966)
Langner (1969)
Langner (1972)
Halvarson (1973)
Berger et al. (1990)
Monteil (1991)
Dainty & Blom (1993)
Johansson et al. (1993)
Verplaetse (1994)
. Stahnke & Zeuthen (1992)
. De Ketelaere et al. (1974)
. Ordonez et al. (1989)
. Berdagué et al. (1993b)

TABLE 2 : COMPILATION of VOLATILE COMPOUNDS DETECTED IN DRY CURED HAM (adapted from Buscailhon & Monin, 1994)

ALKANES

pentane	1,2,4,6,7
hexane	1,2,4,6,7
heptane	1,2,4,6,7
octane	2,6
nonane	2,3,7
decane	1,2,3,4,6,7
undecane	3
dodecane	3
tridecane	3
pentadecane	3
hexadecane	3
octadecane	3
branched alkanes	1,2,3,4,6,7

ALKENES

heptene	2,6,7
octene	1,2,4,6,7

ALDEHYDES

acetaldehyde	5
propanal	5
2-methyl propanal	2,4,7
butanal	2
3-methyl butanal	2,3,4,6,7
2-methyl butanal	2,7
pentanal	1,2,4,5,6,7
pentenal	6
hexanal	1,2,3,4,5,6,7
2-hexenal	1,4,6
heptanal	2,5,6,7
octanal	2,3,5,6,7
phenylacetaldehyde	2,3,5,7
nonanal	1,2,3,4,7
2-nonenal	3
decanal	1,2,3,4,7
undecanal	3
tetradecanal	3
pentadecanal	3
9-octadecenal	3
octadecanal	3

KETONES

propanone	1,2,4,5,6,7
2,3-butanedione	1,2,4,7
2-butanone	1,2,3,4,5,6,7
3-methyl-2-butanone	3,4
3-pentanone	2,7
2-pentanone	1,2,4,5,6,7
3-hydroxy 2-butanone	2,3,7
3-methyl-2-pentanone	2,4,7
2,3-pentanedione	1,4
2-hexanone	1,2,4,6,7
methyl-hexenone	6
2-heptanone	1,2,3,4,6,7
6-methyl-5-heptene-2-one	1,4,6
2-octanone	2,6,7
trans-geranyl-acetone	3
cyclohexanone	5

ESTERS

ethyl acetate	1,2,4
butyl acetate	1,4
methyl hexadecanoate	2

ORGANIC ACIDS

acetic acid	7
butanoic acid	7
hexanoic acid	3
octanoic acid	3
nonanoic acid	3
undecanoic acid	3
pentadecanoic acid	3
9-hexadecenoic acid	3
hexadecanoic acid	3
linoleic acid	3
oleic acid	3

ALCOHOLS

ethanol	1,2,4,6,7
2-methyl 1-propanol	1,4,6,7
1-butanol	1,4
2-butoxy ethanol	2,7
3-methyl 1-butanol	1,2,3,4,6,7
2-methyl 1-butanol	1,2,3,4,6,7
2-methyl 3 buten-2-ol	1,4
3-methyl 3-buten-1-ol	1,2,4,7
1-penten-3-ol	4
1-pentanol	1,2,3,4,6,7
1-hexanol	2,3,6,7
1-heptanol	2,6
1-octen-3-ol	1,2,3,4,6,7
1-octanol	2,3,6
phenyl-2-ethanol	2,3,7

AROMATES

toluene	1,2,4,6
methylbenzene	7
ethylbenzene	3,6
p-xylene	1,2,4,6,7
m-xylene	1,2,4,6,7
o-xylene	1,2,4,6,7
styrene	1,4
phenol	6
guaiacol	6

FURANES

2-ethyl furane	2,4,7
butyl furane	2,7
2-pentyl furane	2,7

LACTONES

gamma-pentalactone	1,4
gamma-hexalactone	1,3,4
gamma-nonalactone	3

TERPENES	
limonene	2,6,7
farnesol	3
NITROGEN CONTAINING COMPOUNDS	
2,6-dimethyl pyrazine	2,3,4,7
1-methyl 2-pyrrolidinone	3
SULFUR CONTAINING COMPOUNDS	
dimethyl disulfide	1,2,4,6,7
CHLORIDE COMPOUNDS	
dichloromethane	1,4
trichloromethane	1,2,3,4,7
tetrachloroethene	2,3,7
2,2-dichloroethanol	1,4

Compounds found in study :

1. Buscailhon et al. (1993a)
2. Berdagué et al. (1992)
3. Berdagué et al. (1991b)
4. Buscailhon et al. (1993b)
5. Melgar et al. (1990)
6. Verplaetse (1994)
7. Berdagué et al. (1993a)

TABLE 1. Results of microbiological analysis.

	J_1O		J_2O		J_3O	
	S	D	S	D	S	D
Mesophyles	1	7.33	5.50	7.90	9.69	5.76
Psychrotrophics	0.00	0.00	0.00	7.46	0.00	8.85
Halotolerant bacteria	6.34	5.76	5.49	7.39	5.60	8.43
Enterobacteriaceae.	0.00	0.00	0.00	2.25	0.00	0.00
Clostridium sp.	0.00	0.00	0.00	0.00	0.00	0.00
Staphylococci	0.00	4.44	2.47	6.01	0.00	4.93
Micrococaceae	0.00	4.19	4.10	5.80	0.00	3.96
Lactic bacteria	0.00	6.13	1.90	3.83	0.00	4.79
Enterococacceae	0.00	0.00	0.00	0.00	0.00	0.00
Clostridium	0.00	0.00	0.00	0.00	0.00	0.00
perfringens	<3	<3	<3	<3	<3	<3
Coliforms	Abs	Abs	Abs	Abs	Abs	Abs
Salmonellae						

TABLE 1. Results of microbiological analysis. Continuation.

	J_1H		J_2H		J_3H		J_4H		J_5H		J_6H	
	S	D	S	D	S	D	S	D	S	D	S	D
Mesophyles	9.73	9.16	7.07	7.80	8.61	7.07	8.90	6.19	7.88	6.61	6.13	5.17
Psychrotrophics	8.04	0.00	6.74	0.00	7.87	6.91	8.05	4.80	6.36	5.96	5.80	4.69
Halotolerant bacteria	9.36	8.88	7.50	8.11	8.59	7.14	8.97	6.08	8.04	6.60	5.74	5.14
Enterobacteriaceae.	5.05	0.00	3.61	0.00	0.00	3.69	0.00	5.02	0.00	4.19	0.00	1.77
Clostridium s.p.	0.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Staphylococci	0.00	5.14	4.65	6.13	>7.0	3.11	7.56	3.07	6.61	4.96	3.95	3.20
Micrococaceae	0.00	6.21	6.29	6.97	>7.0	2.84	8.23	4.60	7.07	4.61	4.66	3.98
Lactic bacteria	0.00	2.30	0.00	2.90	0.00	6.41	2.55	0.00	1.77	4.16	4.09	2.79
Enterococacceae	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Clostridium	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
perfringens	1483	1483	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
Coliforms	Abs	Abs	Abs	Abs	Abs	Abs	Abs	Abs	Abs	Abs	Abs	Abs
Salmonellae												

TABLE 1. Results of microbiological analysis. Continuation.

	J_1M		J_2M		J_3M		J_4M		J_5M	
	S	D	S	D	S	D	S	D	S	D
Mesophyles	-	4.69	-	4.84	-	5.84	5.60	3.25	4.00	0.00
Psychrotrophics	-	0.00	-	0.00	-	0.00	0.00	0.00	0.00	0.00
Halotolerant bacteria	-	0.00	-	5.90	-	4.69	5.46	0.00	6.60	7.60
Enterobacteriaceae.	-	0.00	-	0.00	-	0.00	0.00	0.00	0.00	0.00
Clostridium s.p.	-	0.00	-	0.00	-	0.00	0.00	0.00	0.00	0.00
Staphylococci	-	0.00	-	0.00	-	0.00	0.00	0.00	4.30	2.30
Micrococaceae	-	0.00	-	3.47	-	2.69	3.00	3.20	3.00	0.00
Lactic bacteria	-	0.00	-	0.00	-	0.00	2.56	0.00	0.00	0.00
Enterococacceae	-	0.00	-	0.00	-	0.00	0.00	0.00	0.00	0.00
Clostridium perfringens	-	0.00	-	0.00	-	0.00	0.00	0.00	0.00	0.00
Coliforms	-	<3	-	<3	-	<3	<3	<3	<3	<3
Salmonellae	-	Abs	-	Abs	-	Abs	Abs	Abs	Abs	Abs

Abs = Absence; - = Non tested

TABLE 2. Average values of microbiological analysis from non altered ham.

	OLIVENZA		HIGUERA		MONTANCHEZ	
	S	D	S	D	S	D
Mesófilos	4.28	4.59	6.34	3.54	5.13	3.21
Psicotrofos	4.87	<1	6.14	<1	4.93	<1
Micrococaceas	6.85	2.35	4.14	1.98	<1	2.59
Enterobactereas	<0.5	0.00	<1	0.00	<0.5	0.00
Coliformes t.	<0.5	0.00	<1	0.00	<1	0.00
Coliformes f.	<0.5	0.00	<1	0.00	<1	0.00
Enterococos	0.00	0.00	0.00	0.00	0.00	0.00
Clostridium s.r.	<1	0.00	1.5	0.00	1.9	0.00
B. Acidolácticas	<0.5	0.00	<0.5	<0.5	0.00	<1

TABLE 3. Average values of Phisico-chemical parameters.

PARAMETER	NON-SPOILED HAMS	SPOILED HAMS
pH	6.0	5.94
a_w	82.0	88.86
humidity (%)	38.0	46.94

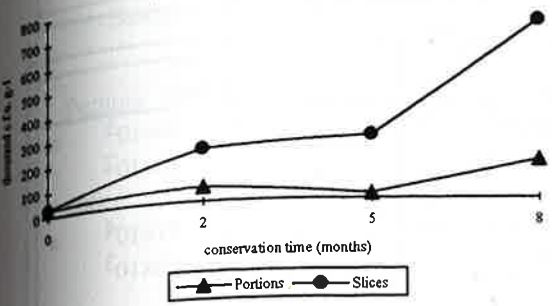


Fig. 1 - Evolution of mesophyle counts (c.f.u. g-1), during a 8 months period, for two kinds of samples (portions and slices).

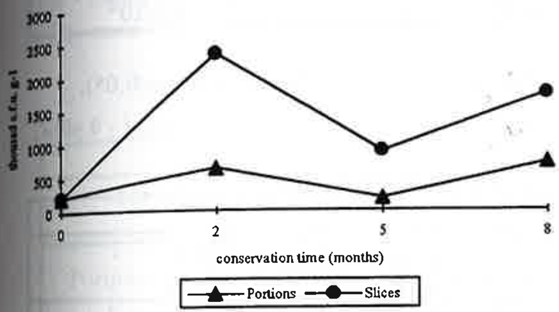


Fig. 2 - Evolution of psychrotrophic counts (c.f.u. g-1), during a 8 months period, for two kinds of samples (portions and slices).

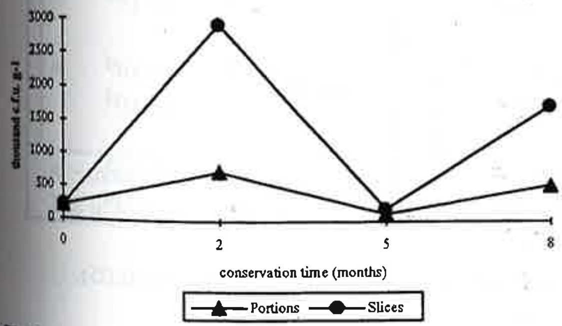


Fig 3 - Evolution of yeast counts (c.f.u. g-1), during a 8 months period, for two kinds of samples (portions and slices).

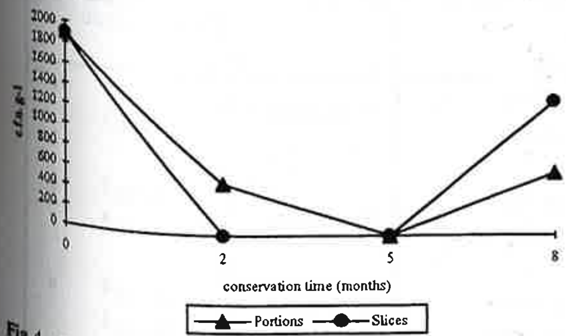


Fig 4 - Evolution of mould counts (c.f.u. g-1), during a 8 months period, for two kinds of samples (portions and slices).

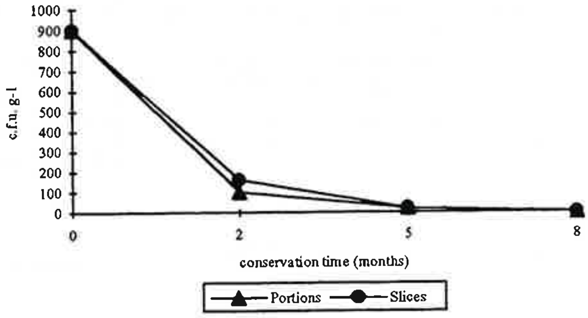


Fig 5 - Evolution of lactobacilli counts (c.f.u. g-1), during a 8 months period, for two kinds of samples (portions and slices).

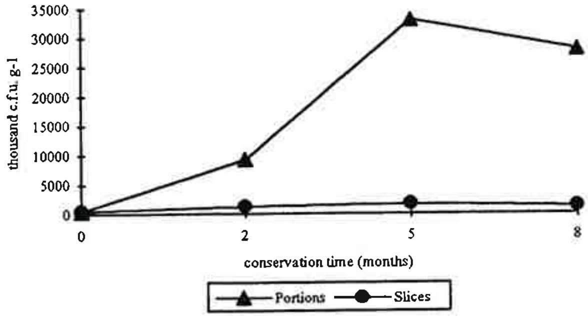


Fig 6 - Evolution of *Micrococaceae* counts (c.f.u. g-1) at the surface of the samples, during a 8 months period, for two kinds of samples (portions and slices).

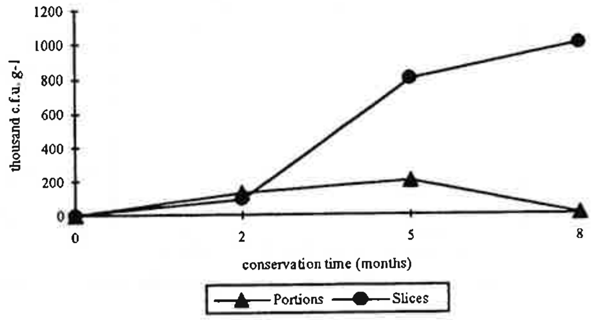


Fig 7 - Evolution of *Micrococaceae* counts (c.f.u. g-1) at the depth of the samples, during a 8 months period, for two kinds of samples (portions and slices).

Table 1 - Used medium for: mesophyle, psychrotrophic, mould and yeast total counts

Gelatine	40g
Tryptone Glucose Extract Agar-Oxoid	24g
Tributyrin	5g
Tween 80	5g
Bleu-Nile sulphate - Ciba- solution (a)	10ml
Distilled water	1000ml

(a) Bleu-Nile-sulphate - 66mg; distilled water - 100 ml.

Table 2 - Mesophyle counts (c.f.u. g^{-1}) - means of several analised factor levels.

Factor											
Sample presentation				Time (Portions)				Time (Slices)			
Portions	$\bar{x}$	77×10^3	a	0 months	$\bar{x}$	29×10^3	a b	0 months	$\bar{x}$	29×10^3	a
	s	24×10^3			s	26×10^2			s	26×10^2	
Slices	$\bar{x}$	37×10^4	a	2 months	$\bar{x}$	58×10^3	a b	2 months	$\bar{x}$	21×10^4	a
	s	15×10^4			s	17×10^3			s	60×10^3	
				5 months	$\bar{x}$	20×10^3	a	5 months	$\bar{x}$	25×10^4	a
					s	55×10^2			s	19×10^4	
				8 months	$\bar{x}$	15×10^4	b	8 months	$\bar{x}$	70×10^4	a
					s	57×10^3			s	46×10^4	

$\bar{x}$ - mean; s - standard deviation.
The mean values within same column followed by different letters are significantly different ($p\leq0.05$).

Table 3 - Psychrotrophic counts (c.f.u. g^{-1}) - means of several analised factor levels.

Factor											
Sample presentation				Time (Portions)				Time (Slices)			
Portions	$\bar{x}$	50×10^4	a	0 months	$\bar{x}$	22×10^4	a	0 months	$\bar{x}$	22×10^4	a
	s	12×10^4			s	6×10^4			s	6×10^4	
Slices	$\bar{x}$	16×10^5	b	2 months	$\bar{x}$	62×10^4	a	2 months	$\bar{x}$	23×10^5	a
	s	37×10^4			s	16×10^4			s	63×10^4	
				5 months	$\bar{x}$	18×10^4	a	5 months	$\bar{x}$	86×10^4	a
					s	7×10^4			s	44×10^4	
				8 months	$\bar{x}$	70×10^4	a	8 months	$\bar{x}$	17×10^5	a
					s	28×10^4			s	78×10^4	

$\bar{x}$ - mean; s - standard deviation.
The mean values within same column followed by different letters are significantly different ($p\leq0.05$).

Table 4 - Yeast counts (c.f.u. g^{-1}) - means of several analised factor levels.

Factor											
Sample presentation				Time (Portions)				Time (Slices)			
Portions	$\bar{x}$	46×10^4	a	0 months	$\bar{x}$	22×10^4	a b	0 months	$\bar{x}$	22×10^4	a
	s	11×10^4			s	52×10^3			s	52×10^3	
Slices	$\bar{x}$	16×10^5	b	2 months	$\bar{x}$	74×10^4	b	2 months	$\bar{x}$	29×10^5	b
	s	44×10^4			s	17×10^4			s	62×10^4	
				5 months	$\bar{x}$	12×10^4	a	5 months	$\bar{x}$	19×10^4	a
					s	46×10^3			s	84×10^3	
				8 months	$\bar{x}$	53×10^4	a b	8 months	$\bar{x}$	17×10^5	a b
					s	21×10^4			s	86×10^4	

$\bar{x}$ - mean; s - standard deviation.
The mean values within same column followed by different letters are significantly different ($p\leq0.05$).

Table 5 - Mould counts (c.f.u. g^{-1}) - means of several analised factor levels.

Factor											
Sample presentation				Time (Portions)				Time (Slices)			
Portions	$\bar{x}$	37×10	a	0 months	$\bar{x}$	19×10^2	a	0 months	$\bar{x}$	19×10^2	a
	s	13×10			s	11×10^2			s	11×10^2	
Slices	$\bar{x}$	36×10	a	2 months	$\bar{x}$	50×10	a	2 months	$\bar{x}$	0	a
	s	28×10			s	32×10			s	0	
				5 months	$\bar{x}$	0	a	5 months	$\bar{x}$	0	a
					s	0			s	0	
				8 months	$\bar{x}$	50×10	a	8 months	$\bar{x}$	13×10^2	a
					s	19×10			s	92×10	

$\bar{x}$ - mean; s - standard deviation.
The mean values within same column followed by different letters are significantly different ($p\leq0.05$).

Table 6 - Lactobacilli counts (c.f.u. g^{-1}) - means of several analised factor levels.

Factor											
Sample presentation				Time (Portions)				Time (Slices)			
Portions	$\bar{x}$	40	a	0 months	$\bar{x}$	90×10	a	0 months	$\bar{x}$	90×10	a
	s	19			s	57×10			s	57×10	
Slices	$\bar{x}$	64	a	2 months	$\bar{x}$	10×10	a	2 months	$\bar{x}$	16×10	a
	s	49			s	10×10			s	14×10	
				5 months	$\bar{x}$	20	a	5 months	$\bar{x}$	20	a
					s	20			s	20	
				8 months	$\bar{x}$	0	a	8 months	$\bar{x}$	0	a
					s	0			s	0	

$\bar{x}$ - mean; s - standard deviation.
The mean values within same column followed by different letters are significantly different ($p\leq0.05$).

Table7 - Micrococcaceae counts at the surface of the samples (c.f.u. g^{-1}) influenced by the presentation of the samples and by the conservation time.

Time	Portions	Slices
0 months	46×10^4	46×10^4
2 months	93×10^5	13×10^5
5 months	33×10^6	17×10^5
8 months	28×10^6	13×10^5

Table 8 - Micrococcaceae counts at the depth of the samples (c.f.u. g^{-1}) influenced by the presentation of the samples and by the conservation time.

Time	Portions	Slices
0 months	$<10\times10$	$<10\times10$
2 months	13×10^4	93×10^3
5 months	20×10^4	80×10^4
8 months	60×10^2	10×10^5

Table 9 - Coliforms counts (number of bacteria g^{-1}) influenced by the presentation of the samples and by the conservation time.

		Time			
		0 Months	2 Months	5 Months	8 Months
Surface	Portions	> 10 < 100	< 1	< 1	> 1 < 10
Surface	Slices		< 1	< 1	< 1
Depth	Portions	< 10	< 1	< 1	< 1
Depth	Slices		> 1 < 10	< 1	< 1

Table 10 - Group D streptococci counts (c.f.u. g^{-1}) influenced by the presentation of the samples and by the conservation time.

		Time			
		0 Months	2 Months	5 Months	8 Months
Surface	Portions	< 100	> 10 < 100	< 10	< 10
Surface	Slices		< 10	< 10	< 10
Depth	Portions	< 10	< 10	< 10	< 10
Depth	Slices		< 10	< 10	< 10

Table 11 - Sulphite-reducing clostridia spores counts (number of spores g^{-1}) influenced by the presentation of the samples and by the conservation time.

		Time			
		0 Months	2 Months	5 Months	8 Months
Surface	Portions	> 10 < 1 000	< 1	> 1 < 10	< 1
Surface	Slices		> 1 < 10	> 1 < 10	< 1
Depth	Portions	< 10	< 1	< 1	< 1
Depth	Slices		> 1 < 10	< 1	< 1

Table 12 -.Positive-coagulase staphylococci counts (c.f.u. g^{-1}) influenced by the presentation of the samples and by the conservation time.

		Time			
		0 Months	2 Months	5 Months	8 Months
Surface	Portions	< 1	> 1 < 10	< 1	< 1
Surface	Slices		> 1 < 10	< 1	< 1
Depth	Portions	< 1	< 1	< 1	< 1
Depth	Slices		< 1	< 1	< 1

Table 1.- Experimental desing

HAMS (NUMBER)	FATTENING PERIOD GAIN (KG)	JUDGES (NUMBER)	SESSIONS (NUMBER)	KIND OF TEST
6	34,5 KG	15	6	TASTING
			6	VISUAL
6	46,0 KG	15	6	TASTING
			6	VISUAL
6	57,5 KG	15	6	TASTING
			6	VISUAL

Table 2.- PCA coefficients of tasting test.

VARIABLES	COEFICIENT PC1	COEFICIENT PC2
COLOR (1)	0,03	0,50
MARBLING (2)	-0,14	-0,37
FLAVOUR (3)	-0,29	-0,12
TASTE (4)	-0,34	0,29
TASTE INTENSITY (5)	-0,41	0,10
TASTE PERSISTENCE (6)	-0,44	0,02
FAT FLUIDITY (7)	-0,31	0,12
JUICINESS (8)	-0,36	-0,24
TENDERNESS (9)	0,01	-0,20
SALTING (10)	-0,12	-0,60
GENERAL ACCEPTABILITY (11)	-0,42	-0,16

() = variable code

Table 3.- Stepwise regression model for acceptability in tasting test.

INDEPENDENT VARIABLE : ACCEPTABLITY	COEFIFCIENT
CONSTANT	1,321144
TASTE INTENSITY	0,524884
FAT FLUIDITY	0,360215

R^2 = 0,7470

Table 4.- PCA coefficients of visual test

VARIABLE	COEFICIENT PC1	COEFICIENT PC2
COLOR (12)	0,49	0,25
MARBLING (13)	-0,62	0,02
FAT COLOR (14)	-0,33	0,64
FAT PRESENCE (15)	0,16	0,72
GENERAL EVALUATION (16)	-0,49	0,03

TABLE 5.- Matrix correlation. Variable of tasting test.

	1	2	3	4	5	6	7	8	9	10	11
1	1	-.46	-.04	.14	.21	-.04	.07	-.33	.19	-.35	.28
2		1	.31	.15	-.05	.21	.18	.48	-.38	.49	.01
3			1	.56	.63	.40	-.04	.28	.01	.13	.45
4				1	.82	.80	.41	.36	-.29	-.03	.89
5					1	.77	.29	.31	.12	.01	.77
6						1	.67	.50	-.10	.07	.79
7							1	.61	-.23	-.17	.64
8								1	-.31	.28	.50
9									1	.19	-.21
10										1	-.21
11											1

TABLE 6.- Matrix correlation. Variable of visual test.

	12	13	14	15	16
12	1	-.65	-.06	.16	-.39
13		1	.49	-.22	.55
14			1	.18	.26
15				1	-.10
16					1

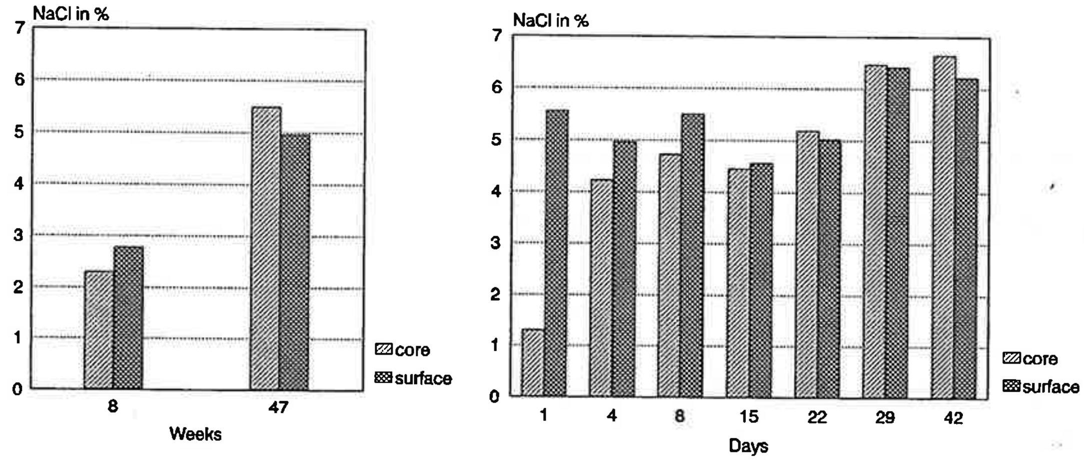
TABLE 7.- Matrix correlation. Variable of tasting and visual test.

	12	13	14	15	16
1	.65	-.67	-.30	.01	-.35
2	-.44	.81	.42	.03	.57
3	.31	.31	.31	-.07	.16
4	.42	.04	.42	.07	-.06
5	.61	-.06	.41	-.01	-.06
6	.38	.08	.47	.39	.02
7	.21	.01	.28	.60	.02
8	-.25	.62	.65	.25	.17
9	.42	-.42	.09	.27	-.22
10	-.37	.43	.58	.06	.08
11	.48	-.58	.43	.22	-.05

Brine-cured hams with nitrate as curing adjunct

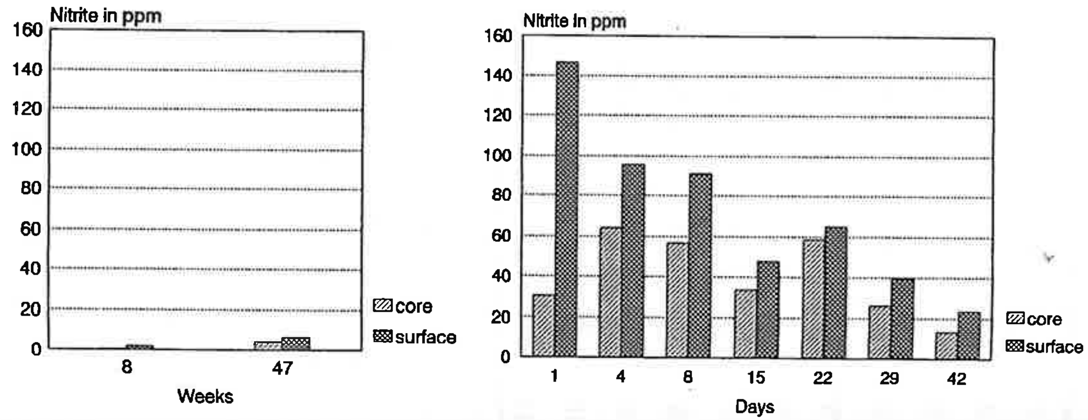
Hams salted by a tumbler, only with nitrite as curing adjunct

Fig. 1: Salt content (NaCl)



Lau; BAFF 1994

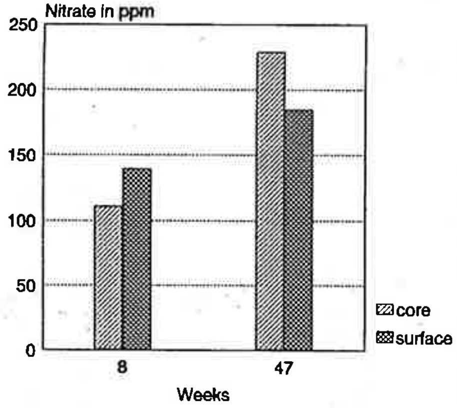
Fig. 2: Nitrite content



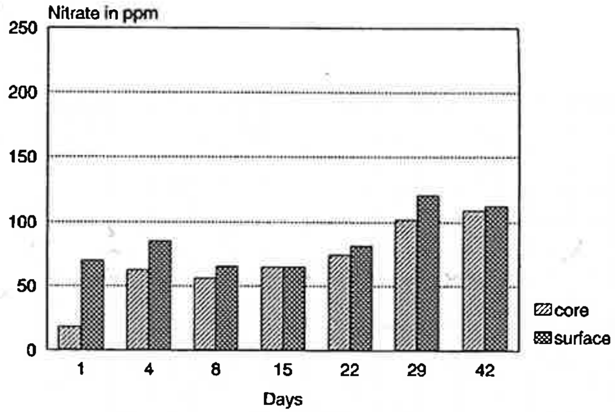
Lau; BAFF 1994

Fig. 3: Nitrate content

Brine-cured hams with <u>nitrate</u> as curing adjunct



Hams salted by a tumbler, only with <u>nitrite</u> as curing adjunct



Lau; BAFF 1994

TABLE 1: Mean and standard deviations obtained in the physico-chemical hams caracterization at the end of salting process. (pH1:5.6-5.9).

	r (m)		T1 NaCl	T1 Moist	T2 NaCl	T2 Moist
SMo	0.010	x	8.25	61.03	7.84	59.05
		sd	2.57	0.46	1.76	1.56
SMm	0.029	x	2.78	68.73	4.20	64.87
		sd	1.16	1.69	1.57	0.64
SMi	0.048	x	1.80	69.35	1.13	70.63
		sd	0.39	2.86	0.34	2.02
STo	0.069	x	0.31	68.22	0.69	70.57
		sd	0.15	4.10	0.21	1.63
STm	0.088	x	0.71	70.92	0.41	74.08
		sd	0.35	2.68	0.11	0.35
STi	0.107	x	1.13	69.42	0.68	73.18
		sd	0.35	4.21	0.33	1.56
BFo	0.131	x	0.34	71.83	0.78	72.20
		sd	0.12	3.76	0.31	2.15
BFm	0.153	x	0.61	69.45	0.82	72.55
		sd	0.43	2.24	0.36	2.04
BFi	0.172	x	1.95	70.63	2.67	63.26
		sd	1.36	4.51	1.11	3.77

x:mean; sd:standard deviation; o:outer; m:middle; i:inner
NaCl:% wet basis; moist:% moisture.

FIGURE 1: Distribution of salt diffusion coeficient

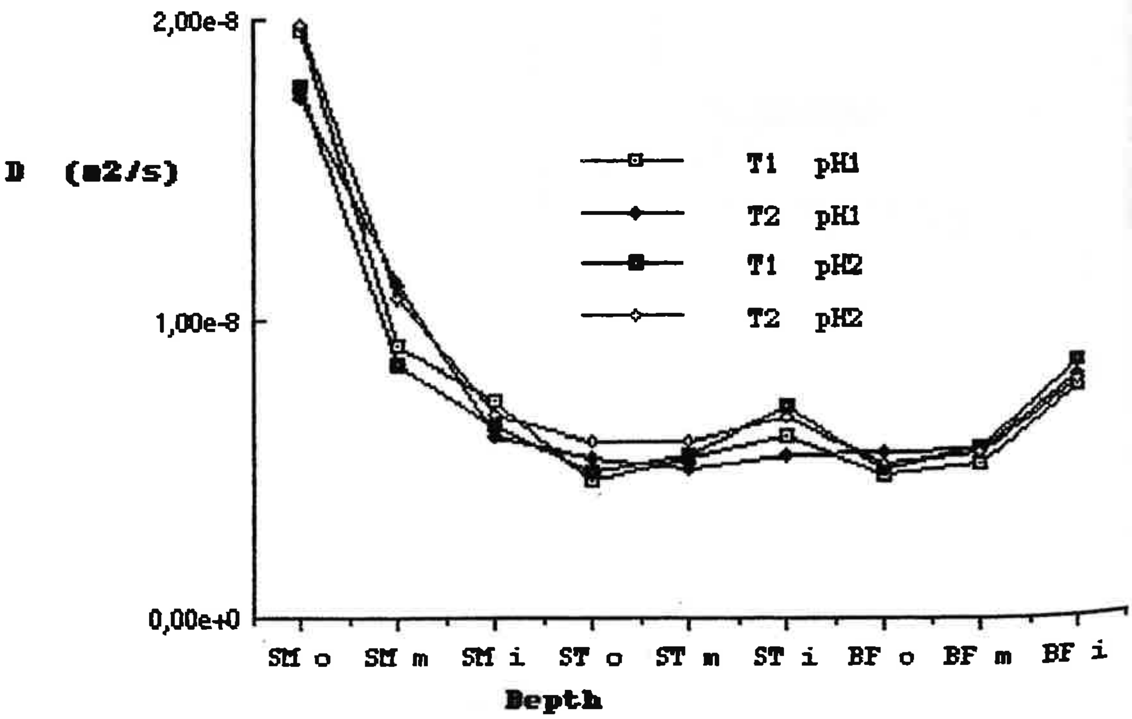


TABLE 2: Mean and standard deviations obtained in the physico-chemical hams caracterization at the end of salting process. (pH2:>6)

	r(m)		T1 NaCl	T1 Moist	T2 NaCl	T2 Moist
SMo	0.010	x	7.20	63.05	8.64	50.40
		sd	0.94	2.11	1.32	1.73
SMm	0.029	x	2.30	70.77	3.91	65.15
		sd	0.81	2.27	1.15	5.02
SMi	0.048	x	1.11	75.20	1.54	69.53
		sd	0.40	1.01	0.41	5.55
STo	0.069	x	0.37	76.03	1.01	70.27
		sd	0.02	1.85	0.45	3.25
STm	0.088	x	0.64	74.25	0.95	72.45
		sd	0.26	1.82	0.14	2.69
STi	0.107	x	1.44	74.00	1.47	70.12
		sd	0.46	0.20	0.12	4.99
BFo	0.131	x	0.42	75.12	0.53	72.73
		sd	0.18	0.62	0.11	4.51
BFm	0.153	x	0.78	74.85	0.81	70.97
		sd	0.27	0.87	0.08	2.64
BFi	0.172	x	2.39	70.45	2.61	62.42
		sd	0.23	1.27	0.89	5.59

x:mean; sd:standard deviation; o:outer; m:middle; i:inner
NaCl:% wet basis; moist:% moisture.

FIGURE 2: Distribution of salt concentration

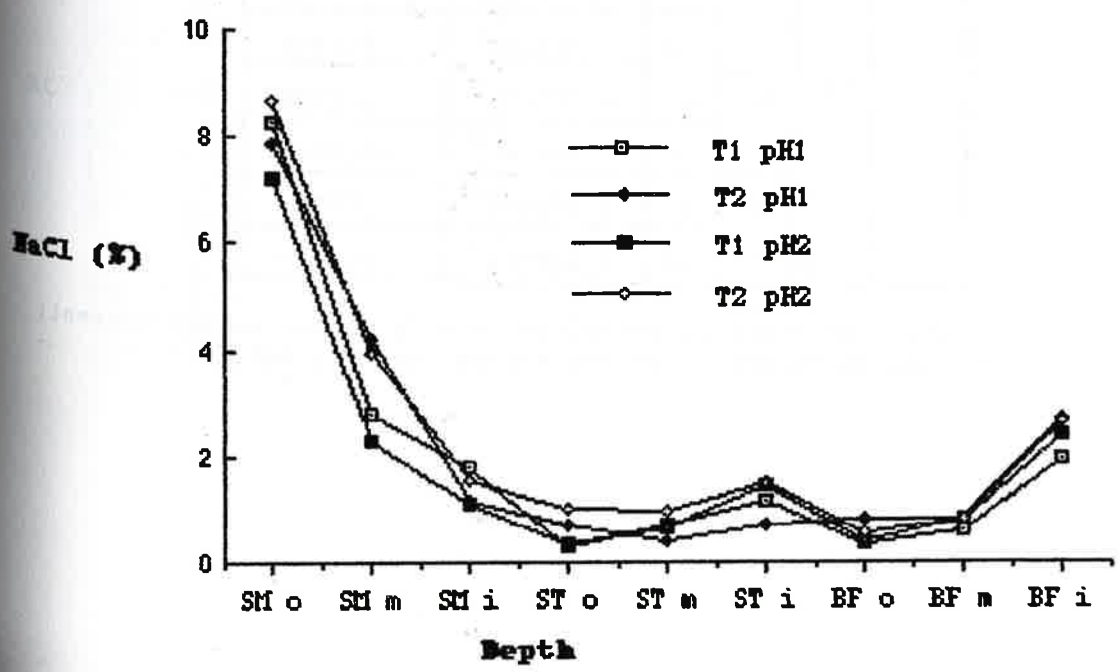
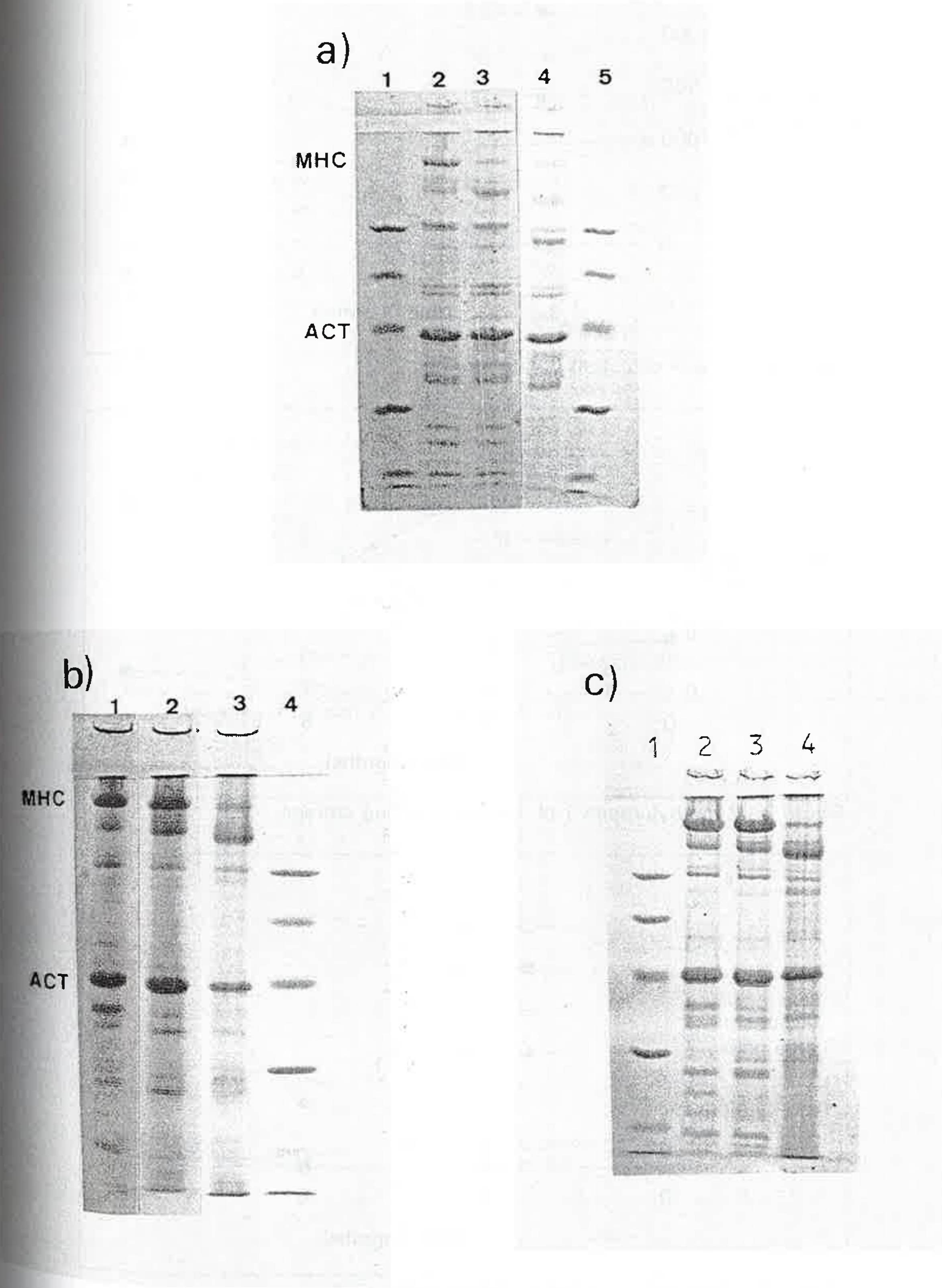


TABLE 3: Diffusion coefficient and the theorical salt concentration.

pH	T			D	C
pH1	T1	SM	x	1.200×10^{-8}	13.0603
			sd	6.685×10^{-9}	8.0983
		ST	x	5.358×10^{-9}	2.3961
			sd	7.043×10^{-10}	1.3645
		BF	x	5.868×10^{-9}	3.3714
			sd	1.597×10^{-9}	2.9285
	T2	SM	x	1.157×10^{-8}	12.4757
			sd	5.646×10^{-9}	7.6554
		ST	x	5.235×10^{-9}	2.1578
			sd	2.570×10^{-10}	0.5025
		BF	x	6.436×10^{-9}	4.4210
			sd	1.431×10^{-9}	2.5395
pH2	T1	SM	x	1.089×10^{-8}	11.5434
			sd	6.022×10^{-9}	7.8656
		ST	x	5.802×10^{-9}	3.2443
			sd	1.121×10^{-9}	2.0837
		BF	x	6.438×10^{-9}	4.4249
			sd	1.898×10^{-9}	3.3624
	T2	SM	x	1.242×10^{-8}	13.5965
			sd	6.664×10^{-9}	8.1816
		ST	x	6.173×10^{-9}	3.9354
			sd	4.752×10^{-10}	0.8702
		BF	x	6.192×10^{-9}	3.9742
			sd	1.489×10^{-9}	2.6849

x: mean; sd: standard deviation; D: m^2/s diffusion coefficient; C: g/g ds theorical concentration; ds: dry solid.


a)
1 2 3 4 5
MHC
ACT
b)
1 2 3 4
MHC
ACT
c)
1 2 3 4

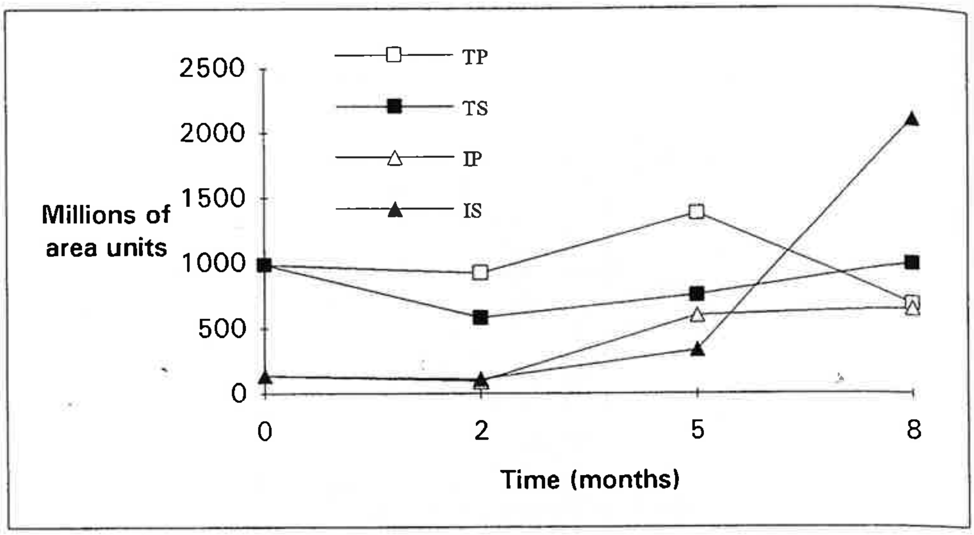


Figure 1.- Ethanol evolution during storage.

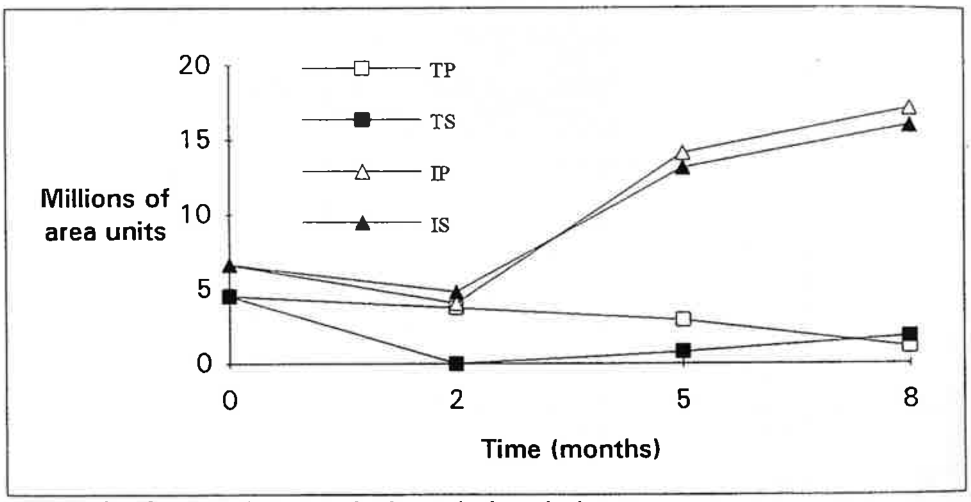


Figure 2.- 2-methylpropan-1-ol evolution during storage.

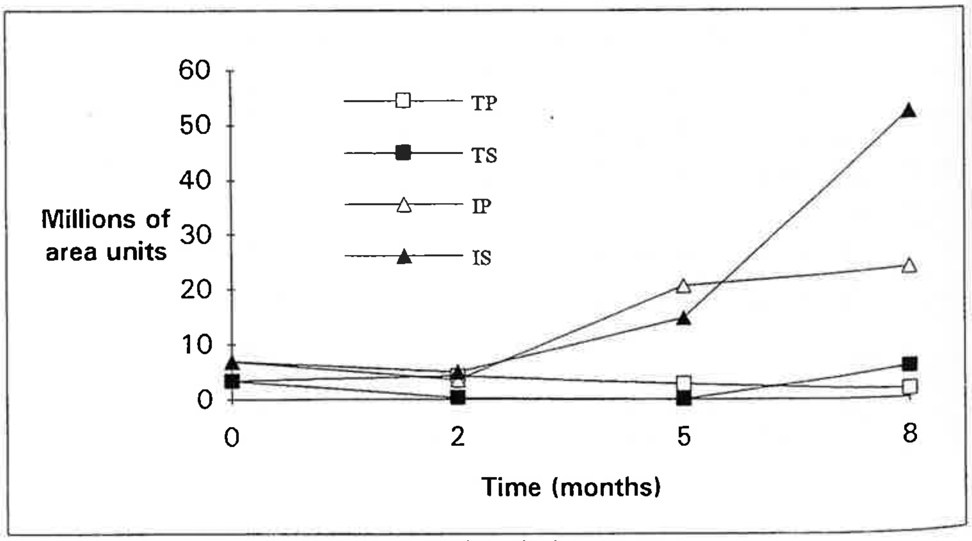


Figure 3.- 3-methylbutan-1-ol evolution during storage.

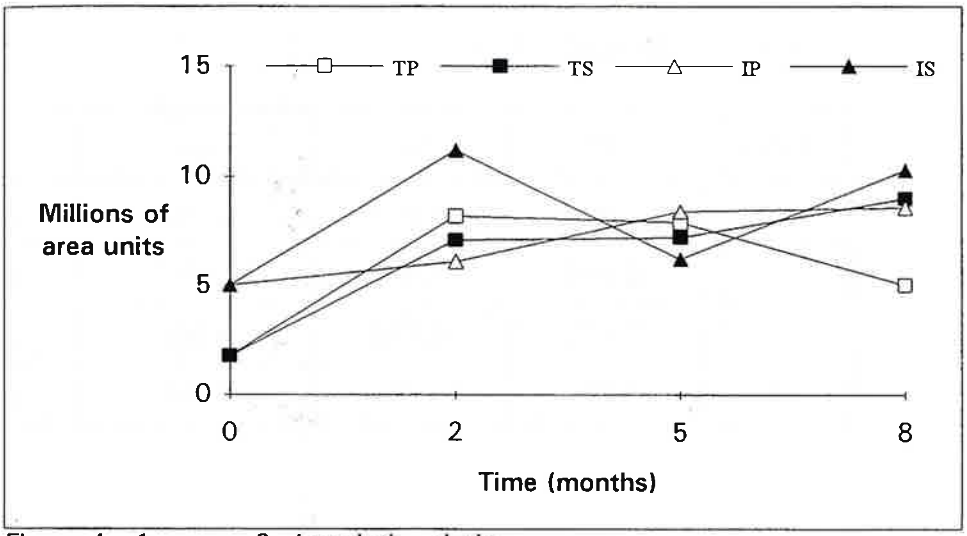


Figure 4.- 1-penten-3-ol evolution during storage.

Table 1.- a_w average values.

TIME	TP	TS	IP	IS
0	0.822	0.822	0.856	0.856
2	0.898	0.894	0.930	0.932
5	0.882	0.878	0.908	0.906
8	0.872	0.878	0.906	0.908

Table 2.- Chloride average values.

TIME	TP	TS	IP	IS
0	5.0	5.0	4.9	4.9
2	4.7	4.7	3.9	3.9
5	5.1	4.9	4.5	4.4
8	5.3	5.0	4.9	4.8

Table 3.- Mesophyles and psicrophyles average values. (log. u.f.c./g)

	TP		TS		IP		IS	
TIME	Mesoph.	Psicroph	Mesoph	Psicroph	Mesoph	Psicroph	Mesoph	Psicrop
0	4.46	5.34	4.46	5.34	6.04	6.68	6.04	6.68
2	4.76	5.79	4.32	6.36	7.15	7.26	6.43	6.94
5	4.30	5.26	4.40	5.93	6.36	6.66	5.95	6.53
8	5.18	5.85	5.85	6.23	6.72	7.08	6.62	7.15

Table 1: Volatile compounds identified in altered and non altered Iberian dry-cured ham.

COMPOUNDS	Area/10^6 altered Ham	Area/10^6 non altered Ham
SULPHUR COMPOUNDS		
Hydrogen sulfide	-	28.9
Carbon disulfide	136.7	39.3
Methanethiol	968.6	19.7
Dimethyl disulfide	356.0	-
Dimethyl trisulfide	62.6	-
ALDEHYDES		
Acetaldehyde	13.4	36.9
2-methylpropanal	14.6	58.7
Butanal	-	14.0
3-methylbutanal	97.3	200.7
2-methylbutanal	65.5	170.8
Pentanal	-	83.4
Hexanal	-	195.6
Heptanal	16.8	12.2
Octanal	-	9.0
Nonanal	-	9.0
Phenylacetaldehyde	-	5.7
KETONES		
2-propanone	591.8	38.4
2-butanone	122.4	93.1
2-pentanone	101.8	26.7
4-methypentan-2-one	9.4	-
3-methylpentan-2-one	53.7	-
2-hexanone	7.9	4.4
2-heptanone	64.8	10.3
2-octanone	231.8	-

ALCOHOLS		
Ethanol	128.0	331.9
1-penten-3-ol	-	28.2
2-methylpropan-1-ol	40.6	-
3-methylbutan-1-ol	115.1	18.6
2-methylbutan-1-ol	31.2	-
ESTERS		
Acetic acid,ethyl ester	-	22.4
2-methylpropenoic acid, methyl ester	33.0	-
2-methylbutanoic acid, ethyl ester	-	3.1
3-methylbutanoic acid, ethyl ester	11.5	7.9
N-ALKANES		
Pentane	-	39.2
Hexane	49.6	-
Heptane	80.4	-
Octane	134.5	58.0
Decane	-	8.9
HIDROCARBONS AROMATICS		
Toluene	45.5	17.1
Ethylbenzene	-	48.3
1,2-dimethylbenzene	20.2	61.8
Styrene	12.2	-
2,3-dihydro-1H-Indene	6.0	3.8
TERPENOIDS		
α-Pinene	-	6.8
Δ3-Carene	-	8.2
L-limonene	-	5.0

CHLORIDE COMPOUNDS		
Dichloromethane	46.1	206.3
Trichloromethane	258.0	321.2
ETERS		
Ethane, 1,1'oxybis	106.4	-
FURANS		
2-penthylfuran	9.9	-
NITROGEN DERIVATES		
2-propanamine	5.4	-
Propane,2-isocianate	39.4	-

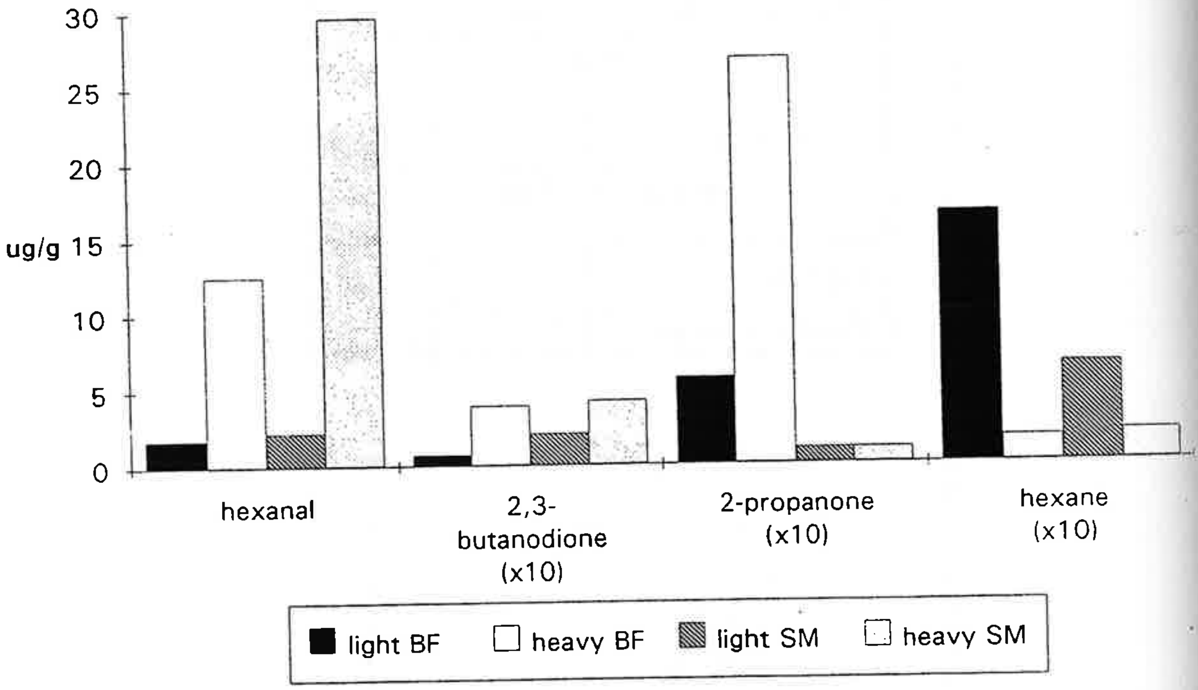

30
25
20
ug/g 15
10
5
0
hexanal
2,3-
butanodione
(x10)
2-propanone
(x10)
hexane
(x10)
light BF
heavy BF
light SM
heavy SM

Table 1 – COMPOSITION OF LIPIDS ISOLATED FROM UZICE BEEF PRSHUTA ("sol"- A and "rozbratna" – B) DURING THE OBSERVED PHASES OF PROCESSING (1, 2 and 3) AND STORAGE (4 and 5)

Lipid fractions (%)		I phase		II phase		III phase		IV phase		V phase	
		A	B	A	B	A	B	A	B	A	B
NEUTRAL LIPIDS	total	82.08	87.16	82.49	87.42	83.20	87.49	83.92	88.61	83.44	88.35
	hydrocarbons	0.89	0.91	0.70	0.69	0.67	0.55	0.51	0.60	0.44	0.39
	cholesterol esters	1.59	1.65	1.67	1.80	2.02	1.95	2.31	2.16	1.59	1.42
	triglycerides	88.70	87.10	87.50	86.80	87.46	86.67	85.53	85.51	85.46	85.43
	cholesterol	1.90	4.30	2.48	4.78	1.50	3.81	1.55	3.57	1.52	3.60
	diglycerides	3.59	2.40	3.84	2.28	3.80	2.90	4.13	2.54	5.59	3.00
	monoglycerides	2.01	2.09	2.41	2.07	3.01	2.12	3.71	2.84	3.09	3.01
	free fatty acids	1.32	1.55	1.40	1.58	1.54	2.00	2.26	2.78	3.31	3.15
PHOSPHOLIPIDS		16.76	11.38	16.20	11.35	15.29	11.13	14.70	10.14	14.75	10.10
GLUCOLIPIDS		1.16	1.46	1.31	1.23	1.51	1.38	1.38	1.25	1.81	1.55

Table 2 - FATTY ACIDS COMPOZITION OF LIPIDS FROM UZICE BEEF PRSHUTA DURING THE OBSERVED PHASES OF PROCESSING (1, 2 and 3) AND STORAGE (4 and 5)

Fatty acids (%)	" S O L "					" R O Z B R A T N A "				
	I	II	III	IV	V	I	II	III	IV	V
C 12	0.091	0.068	0.138	0.246	0.181	0.124	0.102	0.320	0.161	0.207
$C\ 14^{1=}$	0.258	0.169	0.206	0.290	0.230	0.281	0.292	0.238	0.233	0.207
C 14	2.037	1.459	1.790	2.567	2.392	0.268	2.403	2.057	2.172	2.158
C 15	0.302	0.330	0.372	0.829	0.601	0.422	0.295	0.456	0.796	0.556
$C\ 16^{1=}$	2.540	2.377	2.217	2.003	1.971	2.423	2.062	2.067	1.959	2.178
C 16	23.436	23.653	24.044	21.617	21.667	23.872	21.543	21.757	21.446	25.080
$C\ 17^{1=}$	1.208	1.727	1.074	1.208	1.378	1.372	1.001	1.495	1.797	1.346
C 17	0.828	1.527	0.918	1.112	1.391	1.228	0.908	1.382	1.684	1.298
$C\ 18^{3=}$	0.107	0.103	0.063	0.065	0.052	0.091	0.072	0.070	0.059	0.040
$C\ 18^{2=}$	2.378	2.153	1.992	1.399	1.228	2.419	2.552	1.630	1.582	1.226
$C\ 18^{1=}$	36.990	35.091	32.179	27.907	27.247	34.342	32.669	28.200	27.394	27.035
C 18	18.274	21.089	25.120	28.083	30.467	19.067	24.790	27.840	29.029	30.699
C 19	0.207	0.229	0.225	0.417	0.223	0.194	0.227	0.187	0.381	0.199
$C\ 20^{5=}$	0.256	0.165	0.102	0.114	0.114	0.239	0.218	0.144	0.152	0.116
$C\ 20^{4=}$	0.172	0.141	0.082	0.139	0.133	0.266	0.179	0.135	0.141	0.150
$C\ 20^{3=}$	0.462	0.379	0.192	0.243	0.280	0.508	0.532	0.396	0.317	0.328
$C\ 20^{2=}$	0.484	0.301	0.167	0.252	0.169	0.444	0.274	0.241	0.181	0.144
$C\ 20^{1=}$	0.129	0.111	0.056	0.049	0.057	0.137	0.089	0.077	0.080	0.086
C 20	0.414	0.372	0.235	0.446	0.573	0.588	0.602	0.590	0.642	0.775
SFA	45.589	48.727	52.542	55.317	57.495	47.763	50.870	54.589	56.311	60.972
MUFA	41.125	39.475	35.732	31.457	30.883	38.555	36.113	32.077	31.463	30.852
PUFA	3.988	3.242	2.598	2.212	1.976	3.967	3.827	2.616	2.432	2.004

Table 1. Effect of injecting dark, firm and dry (DFD) and pale, soft and exudative (PSE) suspensions into PSE and normal quality loins respectively on processing yields (n = 9) and drip loss (n = 12) of Canadian-style bacon.

Treatment	Cooking(%)	Chilling(%)	Peeling(%)	Drip loss(%)
100% PSE	89.85[a]	88.03[a]	86.81[a]	3.39[a]
91% PSE + 9% DFD	92.07[b]	90.29[b]	89.30[b]	2.43[a]
100% normal	91.55[ab]	89.78[b]	88.71[b]	2.75[a]
91% normal + 9% PSE	92.60[b]	91.04[b]	90.10[b]	2.51[a]

Means with the same letter are not significantly different.

Table 2. Water-holding capacity (WHC) (n = 6) and protein solubility (n = 6) of PSE and DFD suspensions.

Suspension	WHC(%)	Protein solubility(%)
PSE	52.19 ± 3.78	29.45 ± 1.17
DFD	82.00 ± 1.87	37.01 ± 1.12

Table 3. Effect of injecting dark, firm and dry (DFD) and pale, soft and exudative (PSE) suspensions into PSE and normal quality loins respectively on pH (n=6) and color (n=24) values of Canadian-style bacon.

Treatment	pH	L-value	a-value	b-value
100% PSE	5.97[a]	64.09[a]	7.11[a]	5.67[a]
91% PSE + 9% DFD	5.95[a]	63.41[a]	7.28[ab]	5.80[a]
100% normal	6.22[b]	59.07[b]	7.68[bc]	4.57[b]
91% normal + 9% PSE	6.23[b]	54.05[c]	8.04[c]	4.29[b]

Means with the same letter are not significantly different.

Table 4. Effect of injecting dark, firm and dry (DFD) and pale, soft and exudative (PSE) suspensions into PSE and normal quality loins respectively on texture (n=12) of Canadian-style bacon.

Treatment	Peak force (kg)	Energy (J)
100% PSE	15.83[a]	0.75[a]
91% PSE + 9% DFD	19.02[a]	0.79[ab]
100% normal	29.45[b]	1.13[b]
91% normal + 9% PSE	25.74[b]	1.04[ab]

Means with the same letter are not significantly different.

Table 5. Effect of injecting dark, firm and dry (DFD) and pale, soft and exudative (PSE) suspensions into PSE and normal quality loins respectively on the sensory analysis* (n=42) of Canadian-style bacon.

Treatment	Texture	Juiciness	Color	Overall acceptability
100% PSE	4.04[a]	2.88[a]	3.15[a]	3.73[a]
91% PSE + 9% DFD	3.48[b]	2.08[b]	4.15[b]	3.19[ab]
100% normal	2.36[c]	2.40[ab]	3.00[a]	2.38[c]
91% normal + 9% PSE	2.88[c]	2.56[ab]	3.00[a]	2.67[bc]

Means with the same letter are not significantly different.

*5-point hedonic scale
1 = very firm, juicy, red and highly acceptable respectively
5 = very soft, dry pale and unacceptable respectively

DIRECT SALTING OF FROZEN HAMS. F.LEON CRESPO ET AL.

Table 1.- Analysis of Variance and Duncan test for salt content data of group 1 (thaw) and group 2 (unthaw) hams.

Source of variation	Sum of Squares	d.f.	Mean square	F-ratio	Sig.level
COVARIATES					
DAYS OF SALTING	137.9926	1	137.9926	22.211	.0000
DEPTH IN MEAT	2000.8244	1	2000.8244	322.043	.0000
MAIN EFFECTS					
GROUP	16.2140	1	16.2140	2.610	.1072
RESIDUAL	2062.6835	332	6.2129		
TOTAL (CORRECTED)	4217.7145	335			

MULTIPLE RANGE ANALYSIS: 95 PERCENT DUNCAN

Level	Count	LS Mean	Homogenous Groups
1	168	2.3560714	X
2	168	1.9167262	X

CONTRAST 1-2 : DIFFERENCE = 0.43935

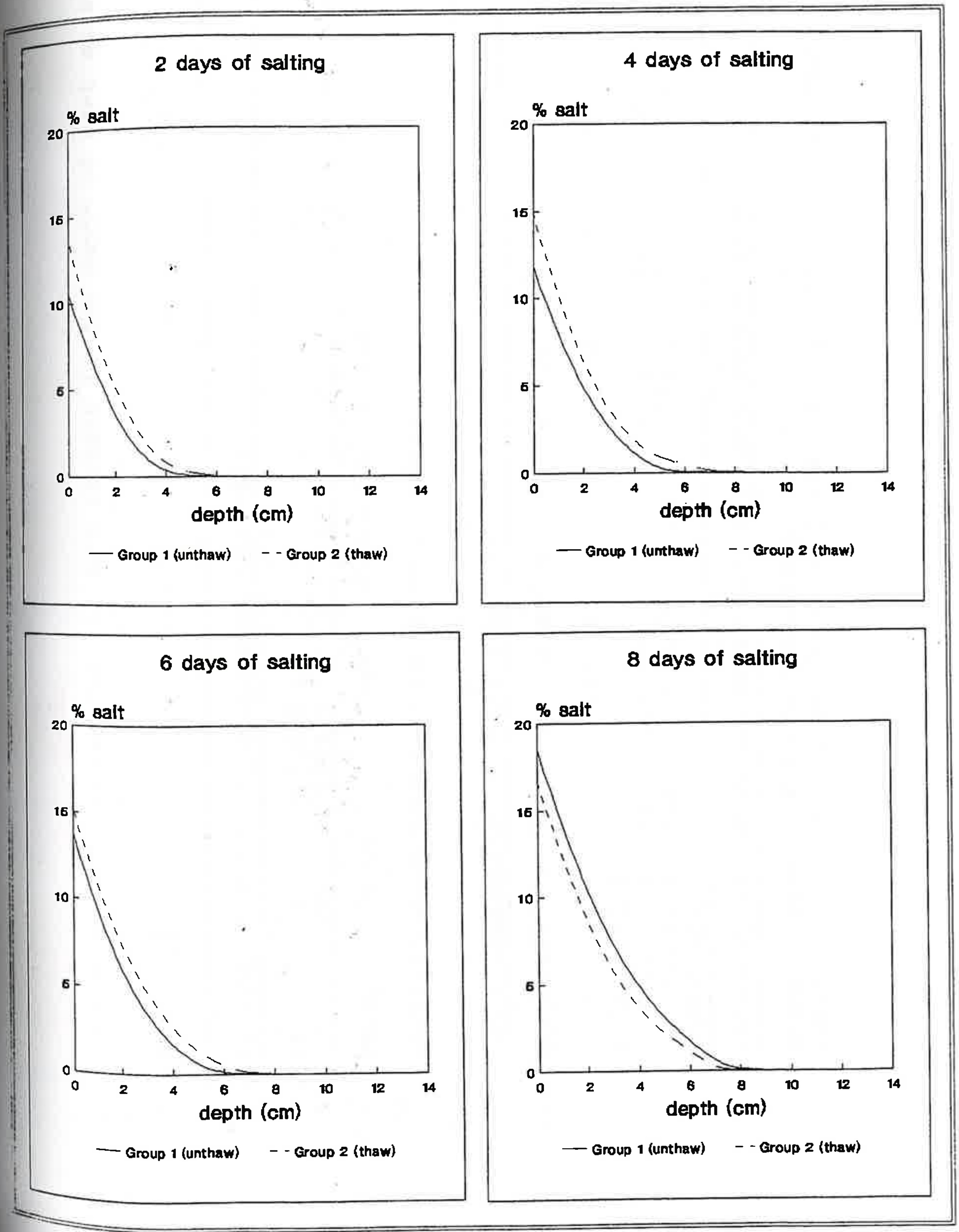
Table 2.- Model fitting results for salt content in the depth of meat at selected times of salting for group 1 (thaw) and 2 (unthaw) hams.

Multiple regression polynomical equations	R-SQ(adj.)	F-ratio	Sig.level
2 Days			
Group 1: Y= 13.672-5.739X+0.727X^2-0.028X^3	0.9225	80.313	0.0000
Group 2: Y= 10.569-4.506X+0.577X^2-0.022X^3	0.8267	33.256	0.0000
4 Days			
Group 1: Y= 14.771-5.502X+0.641X^2-0.024X^3	0.9741	252.035	0.0000
Group 2: Y= 11.760-4.541X+0.544X^2-0.020X^3	0.9117	69.791	0.0000
6 Days			
Group 1: Y= 15.182-4.846X+0.488X^2-0.015X^3	0.8669	44.403	0.0000
Group 2: Y= 13.754-5.074X+0.596X^2-0.022X^3	0.9494	126.209	0.0000
8 Days			
Group 1: Y= 16.611-5.039X+0.507X^2-0.016X^3	0.9590	156.790	0.0000
Group 2: Y= 18.483-4.979X+0.436X^2-0.012X^3	0.9481	414.669	0.0000

Y= SALT CONTENT (%); X= DEPTH OF MUSCLE (cm)

DIRECT SALTING OF FROZEN HAMS. F.LEON CRESPO ET AL.

Figure 1.- Salt penetration in hams of group 1 (thaw) and group 2 (unthaw).



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COVARIATES					
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DEPTH IN MEAT	2000.8244	1	2000.8244	322.043	.0000
MAIN EFFECTS					
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RESIDUAL	2062.6835	332	6.2129		
TOTAL (CORRECTED)	4217.7145	335			

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Multiple regression polynomical equations	R-SQ(adj.)	F-ratio	Sig.level
2 Days			
Group 1: Y= 13.672-5.739X+0.727X^2-0.028X^3	0.9225	80.313	0.0000
Group 2: Y= 10.569-4.506X+0.577X^2-0.022X^3	0.8267	33.256	0.0000
4 Days			
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Y= SALT CONTENT (%); X= DEPTH OF MUSCLE (cm)

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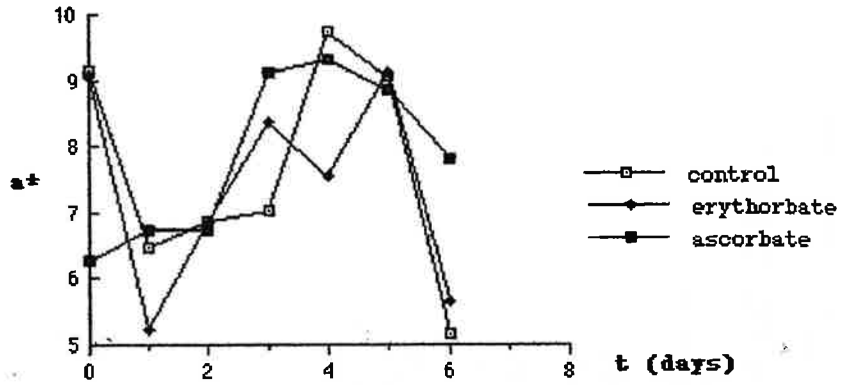


Figure 1.- Redness evolution during "Longaniza de Pascua" processing.

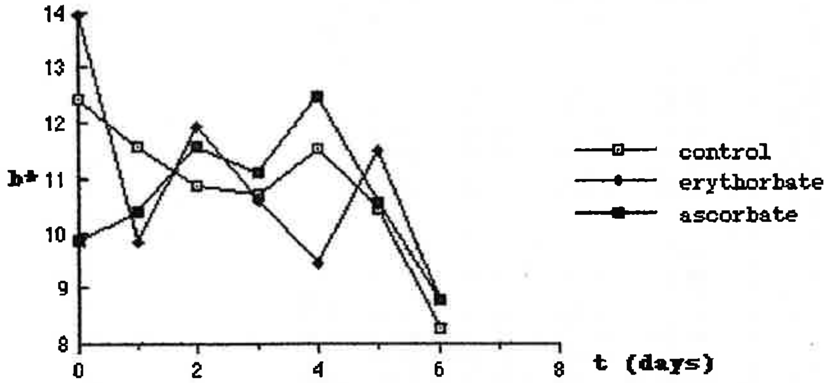


Figure 2.- Yellowness evolution during "Longaniza de Pascua" processing.

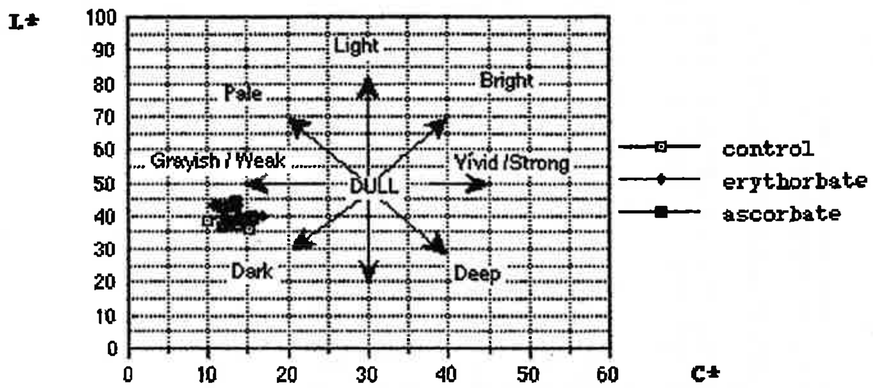


Figure 3.- Tone colour evolution during "Longaniza de Pascua" processing.

Table 1.- Evolution of colour parameters in Chorizo with Oppm tocopherol during fermentation and ripening phases.

	time		L*	a*	b*	C*	hº
FERMENTATION	0*	X	33.68	21.99	29.03	36.42	52.97
		se	6.56	6.28	7.36	9.66	0.91
	24*	X	31.35	28.52	35.69	45.69	51.32
		se	1.82	3.20	4.98	5.88	0.77
	30*	X	27.82	20.72	24.50	32.19	49.97
		se	6.84	4.07	0.88	1.95	6.57
	36*	X	29.87	23.40	28.47	36.85	50.58
		se	3.42	0.38	0.79	0.37	1.23
	42*	X	31.88	23.20	27.43	35.93	49.69
		se	0.50	4.40	5.98	7.41	0.82
	48*	X	30.85	19.83	22.45	29.94	48.52
		se	5.15	0.79	1.66	1.76	0.98
	54*	X	29.69	19.64	24.40	31.34	51.43
		se	4.37	4.65	3.31	5.49	2.87
RIPENING	5**	X	29.13	23.14	28.60	36.82	51.27
		se	1.98	4.99	2.37	4.98	3.76
	8**	X	37.99	24.38	33.55	41.48	54.06
		se	3.50	2.65	0.87	2.65	2.26
	11**	X	38.84	18.13	19.54	26.76	43.89
		se	7.26	11.62	16.77	20.12	8.65
	12**	X	44.08	14.25	17.13	22.38	48.53
		se	4.85	3.90	9.16	9.49	8.07
	13**	X	32.94	11.04	6.76	13.12	28.68
		se	1.03	3.03	5.26	5.26	13.87
	14**	X	37.39	25.65	29.23	38.89	48.65
		se	1.91	2.20	4.00	4.46	1.46
	18**	X	36.92	13.79	11.48	17.94	39.80
		se	3.05	0.53	0.13	0.49	0.77
	21**	X	38.70	19.79	20.13	28.25	44.91
		se	1.61	6.45	8.56	10.62	3.06

X:mean ; se:standard error
*:hours ; **:days

Table 2.-Evolution of colour parameters in Chorizo with 100ppm tocopherol during fermentation and ripening phases.

	time		L*	a*	b*	C*	hº
FERMENTATION	0*	X	31.60	22.97	29.03	36.71	51.26
		se	1.44	0.48	7.36	0.99	0.29
	24*	X	36.31	28.31	35.69	47.58	47.58
		se	3.39	2.48	4.98	7.72	3.23
	30*	X	25.27	16.03	24.50	24.87	49.90
		se	2.48	1.28	0.88	1.92	0.13
	36*	X	28.54	22.53	28.47	34.23	48.65
		se	1.27	1.13	0.79	3.70	2.92
	42*	X	31.83	24.32	27.43	38.05	49.74
		se	0.79	4.98	5.98	10.48	3.54
	48*	X	34.85	16.12	22.45	27.84	56.00
		se	5.04	9.69	1.66	12.72	6.47
	54*	X	28.12	20.52	24.40	31.13	48.72
		se	0.97	3.56	3.31	5.63	0.37
RIPENING	5**	X	28.29	22.99	28.60	36.56	51.02
		se	4.43	6.40	2.37	10.35	0.23
	8**	X	32.04	23.45	33.55	37.78	51.64
		se	1.31	0.14	0.87	0.11	0.40
	11**	X	51.71	12.16	19.54	21.38	58.81
		se	16.38	10.57	16.77	11.61	14.67
	12**	X	47.65	9.03	17.13	15.79	55.46
		se	12.87	2.60	9.16	2.96	4.07
	13**	X	41.26	17.08	6.76	25.63	45.33
		se	14.08	1.34	5.26	8.17	13.66
	14**	X	38.66	25.06	29.23	37.44	47.99
		se	6.58	1.47	4.00	2.06	0.20
	18**	X	43.92	12.65	11.48	18.06	45.65
		se	2.11	4.30	0.13	5.93	0.69
	21**	X	35.81	15.86	20.13	20.50	38.07
		se	2.59	1.42	8.56	4.25	8.53

X:mean; se:standard error
*:hours ; **:days

Table 3.-Evolution of colour parameters in Chorizo with 500 ppm tocopherol during fermentation and ripening phases.

	time		L*	a*	b*	C*	hº
FERMENTATION	0*	X	30.27	21.93	26.94	34.73	50.90
		se	3.27	4.75	5.40	7.18	0.46
	24*	X	43.40	18.85	27.97	34.11	55.64
		se	18.74	4.84	5.79	2.08	12.24
	30*	X	30.70	22.69	25.96	34.48	48.62
		se	2.57	4.71	6.97	8.34	1.78
	36*	X	30.87	26.02	29.71	39.50	48.80
		se	0.04	1.28	0.50	0.47	1.88
	42*	X	27.26	22.61	25.19	33.87	47.99
		se	1.42	0.29	2.98	2.41	3.02
	48*	X	29.61	23.96	28.45	37.19	49.89
		se	6.33	0.84	1.27	1.51	0.27
	54*	X	28.70	20.29	23.28	30.94	49.39
		se	2.30	5.69	2.38	5.52	5.14
RIPENING	5**	X	28.27	20.72	23.32	31.21	48.12
		se	0.83	2.65	5.26	5.69	2.83
	8**	X	44.28	8.40	11.59	14.32	53.93
		se	13.11	0.76	1.94	2.01	2.12
	11**	X	43.23	13.90	18.03	22.84	50.70
		se	3.02	4.96	10.34	11.18	6.80
	12**	X	41.27	20.56	21.83	30.01	46.22
		se	6.00	5.11	7.82	9.19	3.29
	13**	X	40.92	20.78	24.49	32.12	49.58
		se	1.66	3.76	5.25	6.44	0.97
	14**	X	36.13	16.32	14.87	22.08	42.27
		se	0.66	2.39	2.65	3.55	0.91
	18**	X	35.50	14.35	10.58	17.83	36.29
		se	1.34	2.21	2.18	3.07	1.43
	21**	X	39.27	18.93	19.26	27.01	45.32
		se	1.97	3.083	4.31	5.23	1.77

X:mean ; se:standard error
*:hours ; **:days

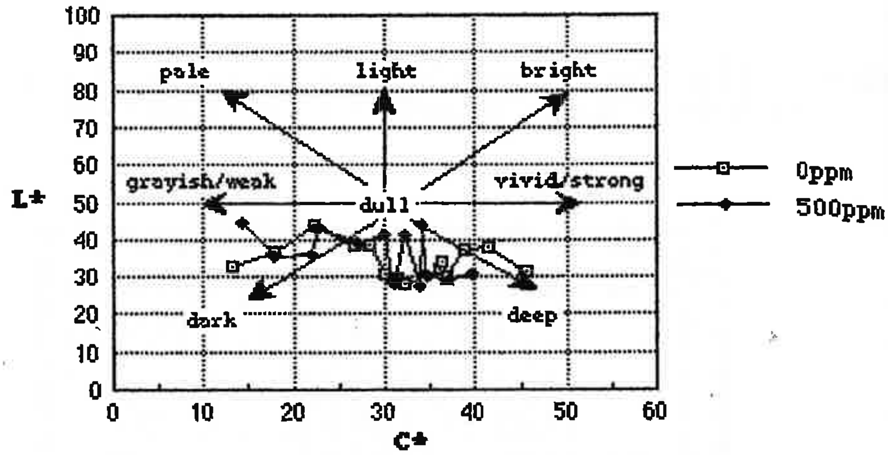


Figure 1.- Colour tone evolution

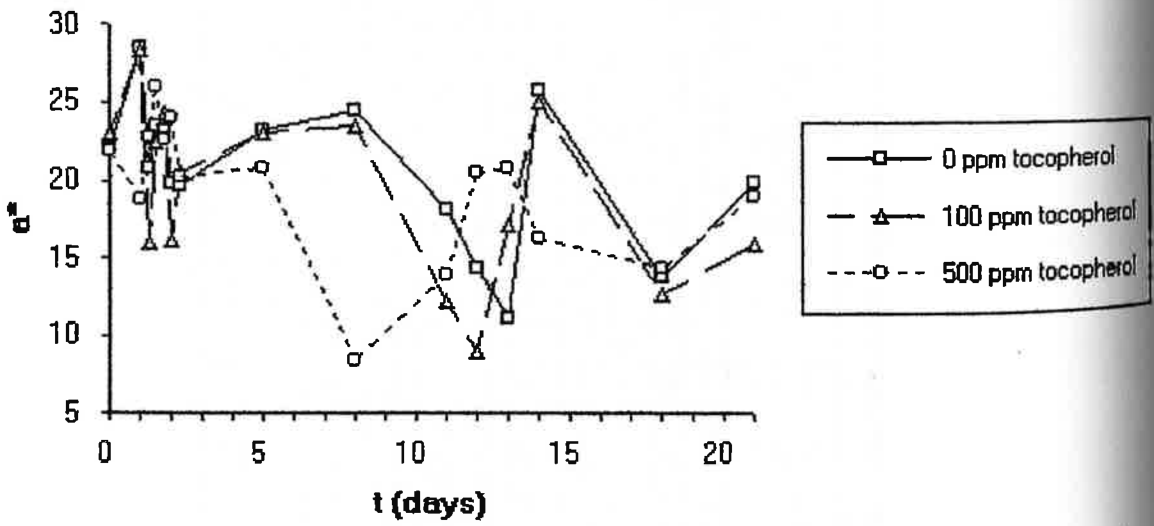


Fig.2.-Evolution of a* in "Chorizo".

TABLE I (colour parameters evolution during ripening)

	Z		L*	a*	b*	IN	ID	ITP	hº	C*
0	t	X	28.79	17.01	27.28	2.49	2.19	1.80	58.0	32.15
		se	2.88	1.70	2.73	0.25	0.22	0.18	5.81	3.21
	m	X	28.16	17.26	24.34	1.88	2.67	2.09	54.6	29.84
		se	2.82	1.73	2.43	0.19	0.27	0.21	5.47	2.98
	b	X	27.92	19.13	25.64	2.75	2.43	1.84	53.2	31.99
		se	2.79	1.91	2.56	0.28	0.24	0.18	5.33	3.19
24	t	X	46.34	5.83	9.38	0.78	1.20	1.85	56.3	11.11
		se	4.73	0.73	0.94	0.01	0.01	0.01	9.47	4.10
	m	X	52.89	5.48	11.07	0.79	1.91	1.75	63.7	12.35
		se	0.26	0.67	0.66	0.04	0.02	0.05	1.44	0.89
	b	X	43.52	7.75	10.27	0.72	2.42	2.23	53.3	12.87
		se	0.87.7	0.78	3.05	0.03	0.32	0.21	2.62	4.24
48	t	X	47.09	6.43	10.00	0.79	2.01	1.88	56.7	11.90
		se	4.71	0.88	1.00	0.00	0.05	0.04	3.91	2.84
	m	X	54.47	7.00	11.79	0.76	2.07	1.96	59.3	13.71
		se	0.59	0.72	0.86	0.01	0.05	0.05	0.75	1.11
	b	X	47.30	7.83	10.02	0.73	2.31	2.19	51.9	12.72
		se	0.85	0.66	1.41	0.02	0.03	0.02	1.60	1.52
54	t	X	45.21	8.01	9.87	0.78	2.23	2.06	50.9	12.71
		se	4.79	0.04	0.65	0.02	0.02	0.02	1.72	0.53
	m	X	53.63	7.52	10.96	0.75	2.14	2.02	55.5	13.30
		se	2.51	0.10	0.35	0.02	0.09	0.08	1.21	0.24
	b	X	50.76	7.28	10.61	0.75	2.17	2.05	55.3	12.87
		se	1.69	0.66	1.97	0.02	0.02	0.01	2.54	2.00
72	t	X	41.36	6.14	8.42	0.82	1.83	1.62	53.9	10.42
		se	2.52	0.61	1.24	0.06	0.06	0.00	0.85	1.65
	m	X	51.94	6.57	11.11	0.93	1.76	1.56	59.2	12.91
		se	2.96	0.47	1.67	0.01	0.01	0.00	2.00	1.67
	b	X	48.14	7.64	10.53	0.91	1.94	1.68	54.0	13.01
		se	0.61	0.52	0.10	0.01	0.03	0.02	1.61	0.39
78	t	X	40.97	8.07	10.23	1.00	1.87	1.64	52.1	13.03
		se	2.83	0.81	3.68	0.18	0.08	0.00	2.06	5.03
	m	X	50.00	7.61	10.40	0.88	1.95	1.74	53.8	12.88
		se	0.97	0.25	0.28	0.00	0.01	0.03	0.15	0.37
	b	X	46.49	8.27	10.28	0.87	2.09	1.85	51.1	13.19
		se	0.94	0.01	0.11	0.01	0.01	0.02	0.26	0.10

t: zone1; m: zone2; b: zone3; X: mean; se: standar desviation

TABLE II (colour parameters evolution during ripening)

	Z		L*	a*	b*	IN	ID	ITP	hº	C*
312	t	X	37.22	8.10	7.55	0.87	2.18	1.97	42.22	11.10
		se	1.59	1.38	2.84	0.08	0.02	0.01	0.06	2.93
	m	X	40.74	6.22	6.04	0.82	1.98	1.81	44.31	8.68
		se	0.54	0.91	0.14	0.02	0.15	0.11	3.51	0.75
	b	X	38.68	6.34	6.12	0.81	2.05	1.88	43.90	8.81
		se	1.99	0.78	1.00	0.00	0.07	0.06	1.20	1.26
384	t	X	36.05	5.93	5.37	0.81	2.03	1.87	42.15	8.00
		se	0.66	0.08	0.28	0.00	0.02	0.02	1.91	0.13
	m	X	38.69	6.25	5.36	0.79	2.06	1.90	40.62	8.23
		se	1.10	0.37	0.26	0.02	0.00	0.02	0.32	0.45
	b	X	37.24	6.45	5.76	0.79	2.12	1.93	42.00	8.66
		se	0.31	0.65s	0.01	0.02	0.10	0.04	4.20	0.86
456	t	X	34.67	11.58	11.08	1.08	2.32	2.07	43.40	10.02
		se	1.20	1.16	1.11	0.39	0.26	0.15	1.07	1.00
	m	X	38.44	8.59	8.96	0.91	2.15	1.94	45.92	12.42
		se	0.04	1.05	2.04	0.12	0.07	0.06	3.09	1.24
	b	X	37.24	6.88	6.74	0.80	2.17	1.99	44.36	9.63
		se	1.71	0.10	0.42	0.02	0.02	0.05	1.36	0.36
720	t	X	33.84	9.91	10.08	0.91	2.47	2.28	45.67	14.13
		se	3.46	3.36	3.03	0.17	0.22	0.18	1.15	1.41
	m	X	37.11	7.31	6.57	0.75	2.37	2.20	41.97	9.83
		se	0.17	0.16	0.17	0.01	0.03	0.02	1.37	0.01
	b	X	36.83	7.98	7.20	0.73	2.51	2.34	42.06	10.74
		se	0.21	0.30	0.21	0.01	0.04	0.03	0.27	0.36
864	t	X	36.13	8.80	7.56	0.87	2.39	2.14	41.31	11.71
		se	3.61	0.89	0.82	0.04	0.46	0.31	4.13	1.34
	m	X	35.04	7.22	6.78	0.77	2.34	2.15	43.23	9.90
		se	0.91	0.25	0.03	0.00	0.04	0.02	0.86	0.20
	b	X	33.46	6.80	6.35	0.77	2.31	2.14	43.17	9.31
		se	1.17	0.92	0.14	0.00	0.13	0.09	3.24	0.77

t: zone1; m: zone2; b: zone3; X: mean; se: standar desviation

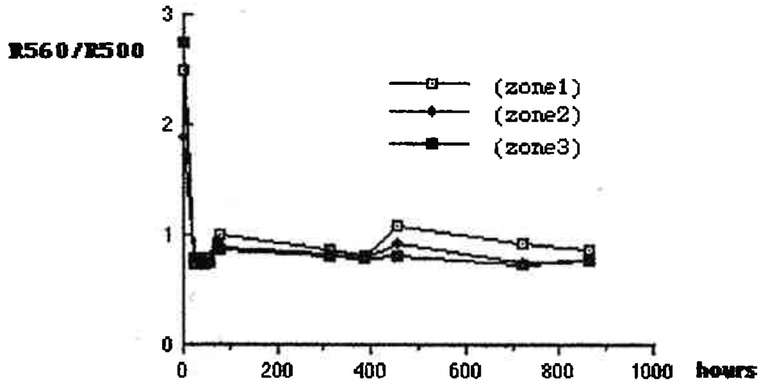


Figure 2. IN evolution in "lomo embuchado"

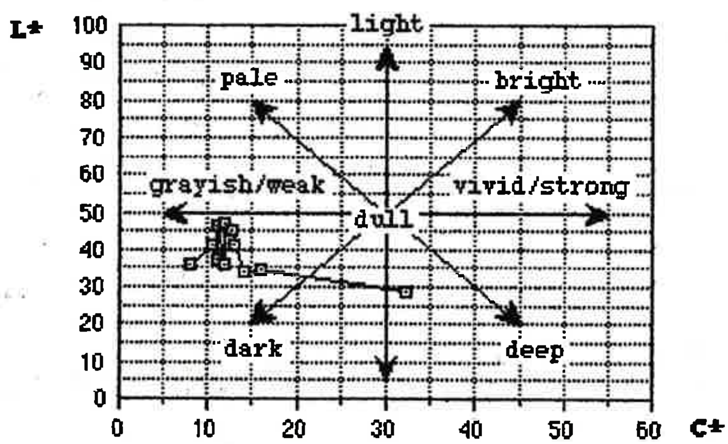


Figure 1. Colour tone evolution in "lomo embuchado"

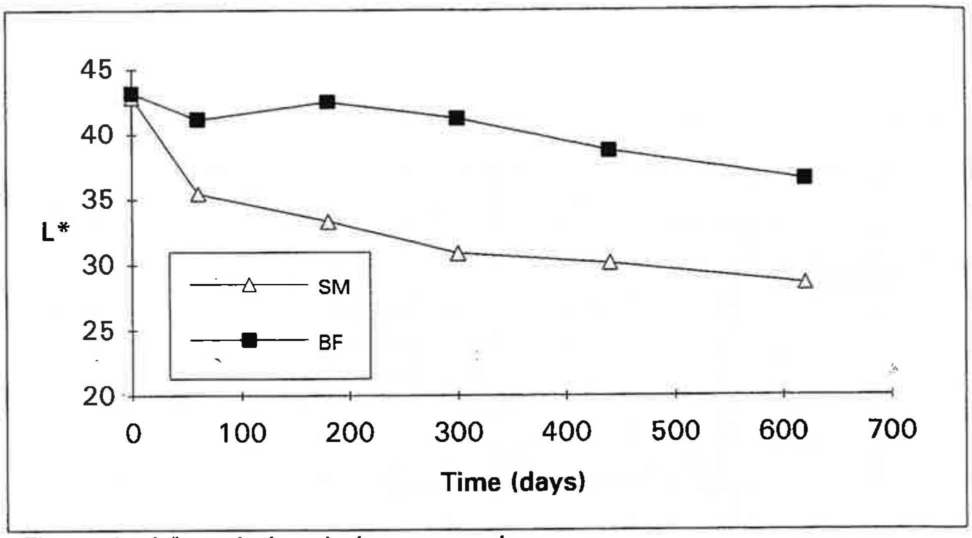


Figure 1.- L* evolution during processing

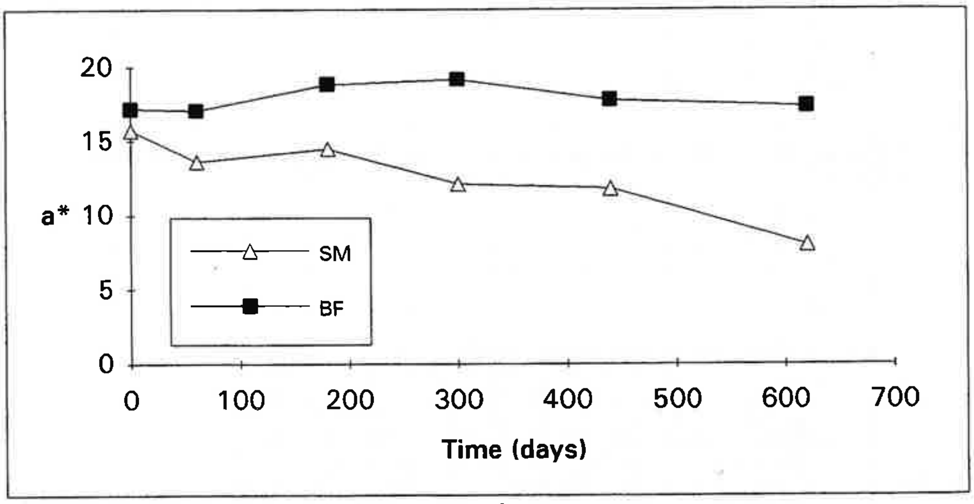


Figure 2.- a* evolution during processing

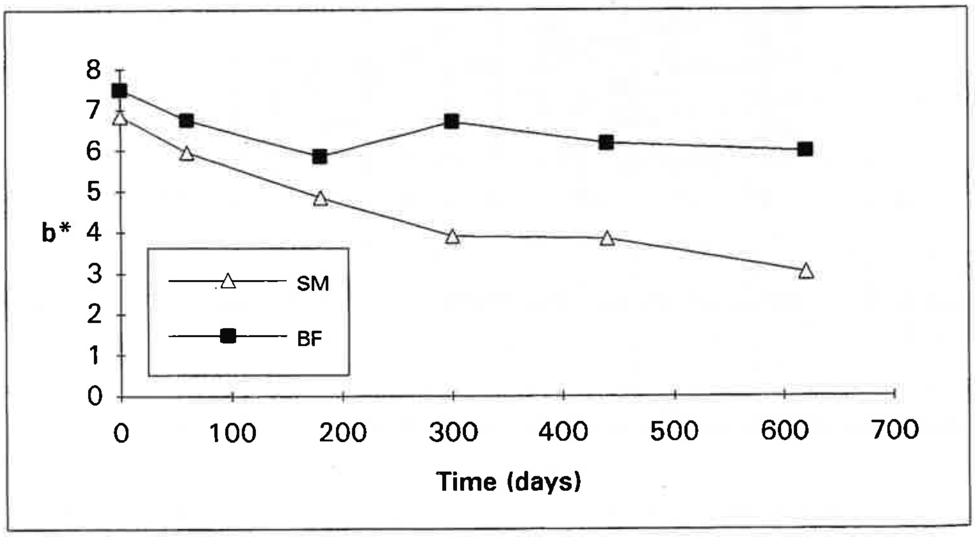


Figure 3.- b* evolution during processing

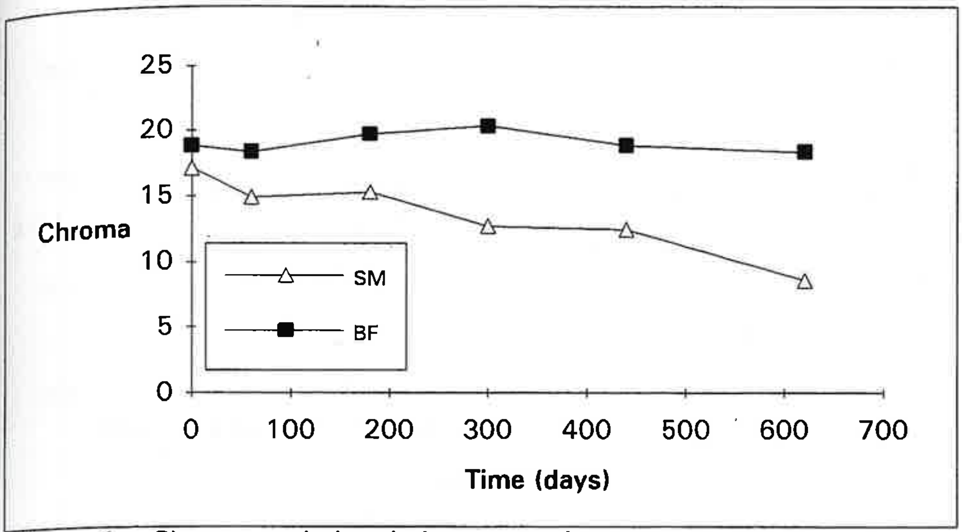


Figure 4.- Chroma evolution during processing

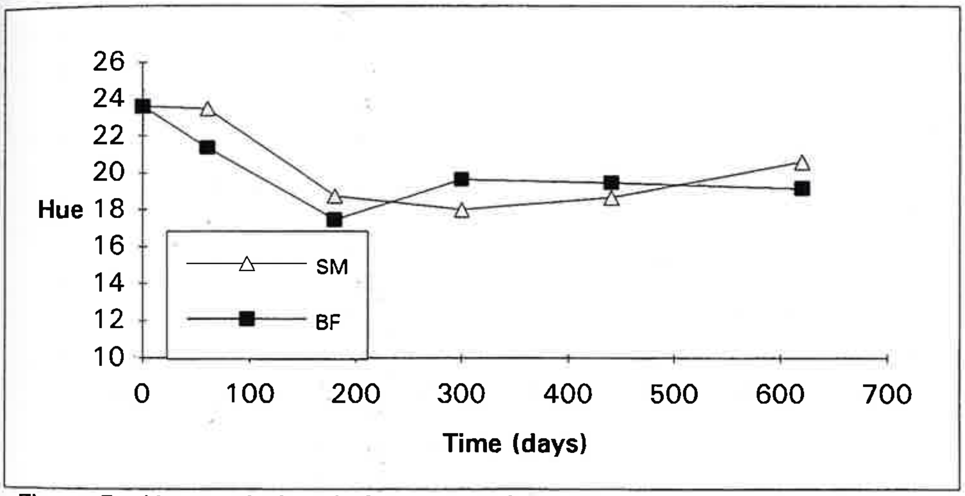


Figure 5.- Hue evolution during processing

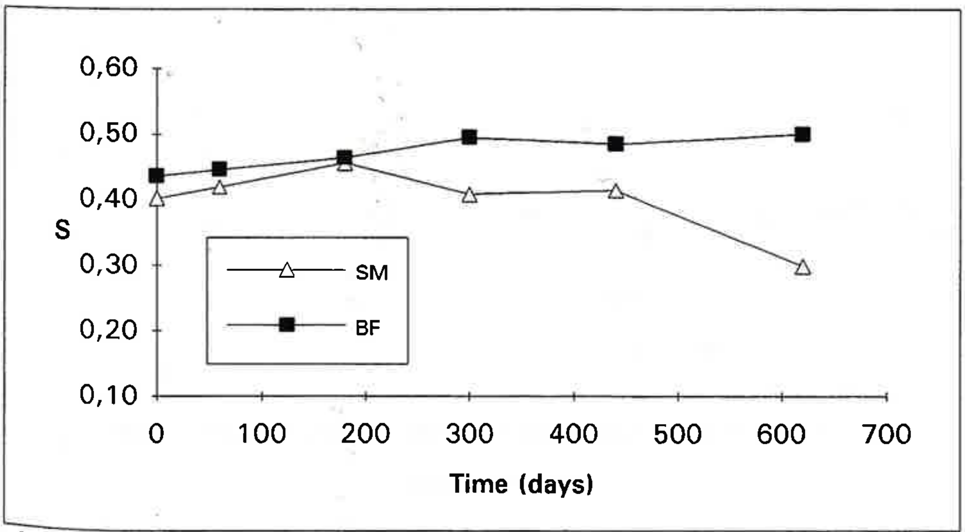


Figure 6.- Saturation (S) evolution during processing

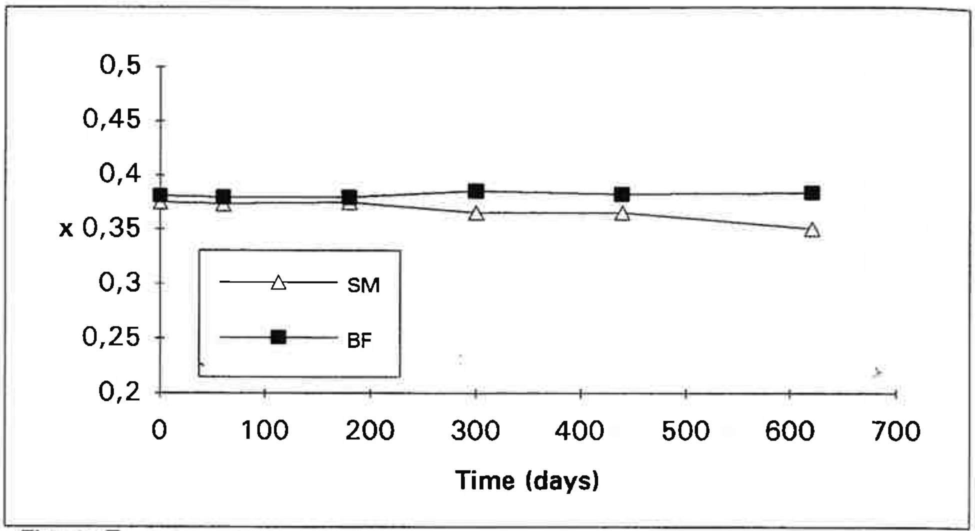


Figure 7.- 'x' evolution during processing

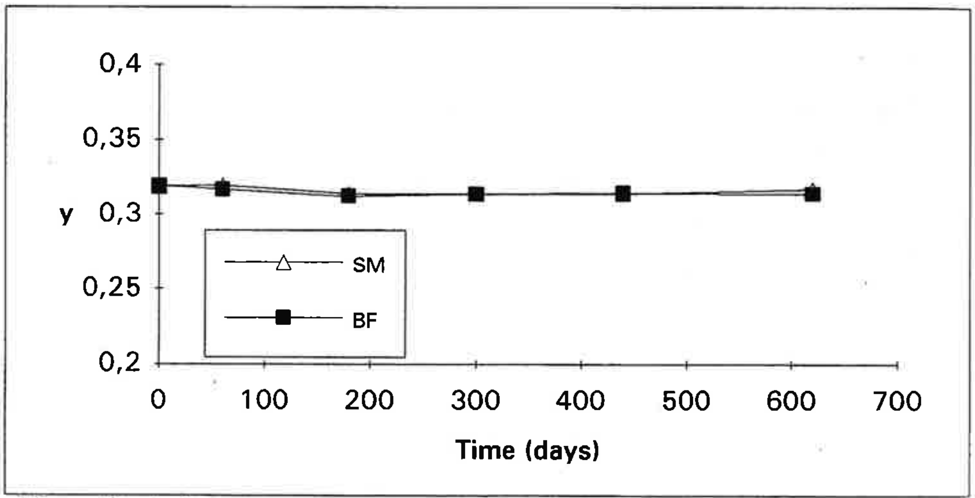


Figure 8.- ' y' evolution during processing

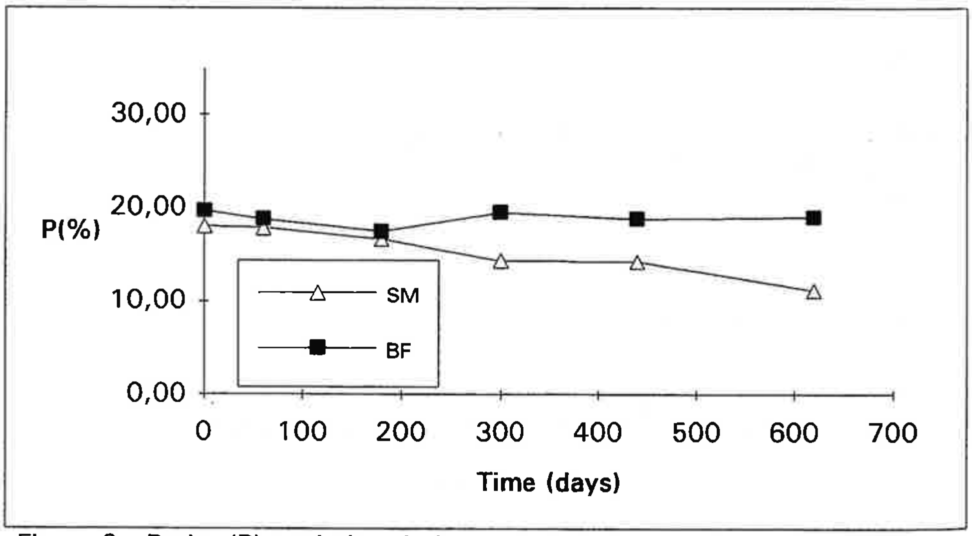


Figure 9.- Purity (P) evolution during processing

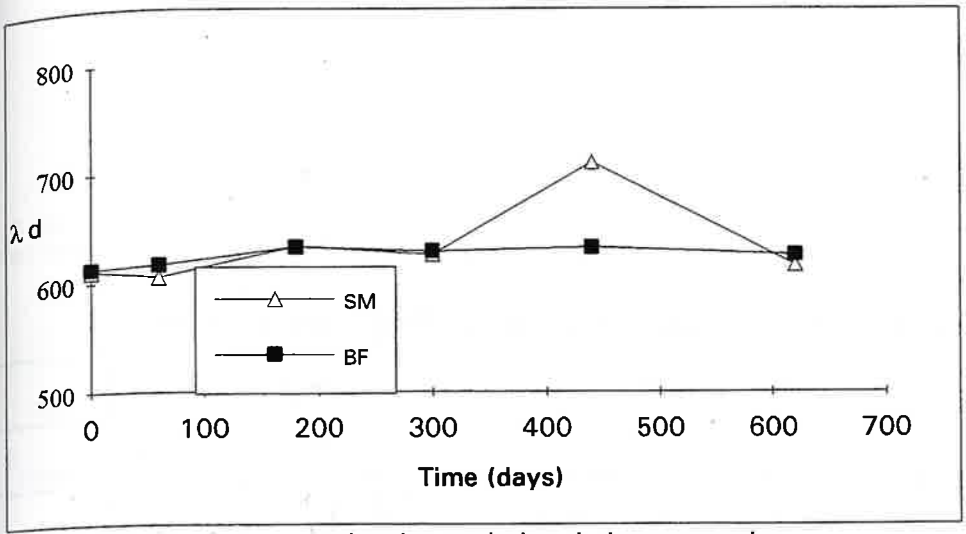


Figure 10.-Dominant wavelenght evolution during processing

Figure 1: Colour tone for each zone and muscle

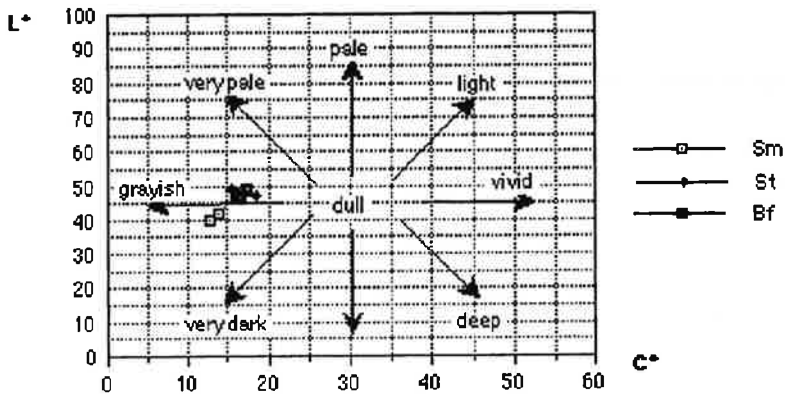


TABLE 1:Mean and standard deviations obtained in the physico-chemical hams caracterization at the end of salting process. (pH1:5.6-6)

		T1			T2		
		pHinn	Moist (%)	NO2 (ppm)	pHinn	Moist (%)	NO2 (ppm)
SMo	x	5.55	61.03	72.48	5.65	59.05	50.10
	sd	0.07	0.46	3.48	0.21	1.55	21.17
SMm	x	5.60	68.73	18.45	5.74	64.86	17.63
	sd	0.08	1.69	6.27	0.22	0.63	17.52
SMi	x	5.78	69.35	6.88	5.87	70.63	1.06
	sd	0.09	2.86	5.00	0.31	2.02	1.00
STo	x	5.98	68.21	2.07	5.93	70.56	2.47
	sd	0.10	4.10	1.99	0.23	1.63	2.29
STm	x	5.91	70.91	3.19	6.03	74.08	0.00
	sd	0.16	2.67	2.80	0.24	0.35	0.00
STi	x	5.93	69.41	2.83	5.90	73.18	0.09
	sd	0.14	4.21	2.42	0.32	1.56	0.06
BFo	x	5.84	71.83	0.59	5.92	72.20	0.00
	sd	0.12	3.75	0.56	0.31	2.15	0.00
BFm	x	5.67	69.45	1.59	5.90	72.55	0.00
	sd	0.07	2.24	1.10	0.29	2.04	0.00
BFi	x	5.75	70.63	4.97	5.71	63.26	0.28
	sd	0.05	4.51	2.22	0.26	3.77	0.24

x:mean; sd:standard deviation; o:outer; m:middle; i:inner; moist:moisture

TABLE 2:Mean and standar desviations obteined in the physic-chemical hams caracterization at the end of salting process.(pH2>6).

		T1			T2		
		pHinn	Moist (%)	NO2 (ppm)	pHinn	Moist (%)	NO2 (ppm)
SMo	x	5.76	63.05	58.94	5.68	59.40	68.78
	sd	0.14	2.11	10.52	0.13	1.73	7.85
SMm	x	5.97	70.76	20.48	5.85	65.15	15.70
	sd	0.26	2.26	19.8	0.19	5.02	3.34
SMi	x	5.98	75.20	5.95	6.01	69.53	1.61
	sd	0.15	1.01	5.73	0.26	5.55	1.13
STo	x	6.25	76.03	0.36	6.20	70.26	0.44
	sd	0.22	1.85	0.16	0.23	3.25	0.37
STm	x	6.20	74.25	0.14	6.20	72.45	0.00
	sd	0.16	1.81	0.12	0.32	2.69	0.00
STi	x	6.08	74.00	5.74	6.11	70.11	1.73
	sd	0.26	0.20	5.55	0.39	4.99	1.56
BFo	x	6.14	75.11	0.21	6.24	72.73	0.05
	sd	0.26	0.62	0.16	0.24	4.50	0.03
BFm	x	6.07	74.85	0.90	6.20	70.96	0.02
	sd	0.24	0.86	0.41	0.31	2.63	0.01
BFi	x	5.84	70.45	3.69	6.10	62.41	1.93
	sd	0.17	1.26	2.91	0.34	5.59	1.14

x: mean; sd: standard deviation; o:outer; m:middle; i:inner; moist:moisture

TABLE 3: Mean and standard deviations obtained for the colour parameters and Reflectance ratios in the hams at the end of the salting process. (pH1:5.6-6.0)

			SMo	SMm	SMi	STo	STm	STi	BFo	BFm	BFi
T1	L*	x	40.09	41.96	47.21	47.21	49.12	47.97	47.38	46.33	48.77
		sd	2.16	4.62	2.67	5.43	1.25	2.57	4.18	3.72	5.96
	a*	x	9.15	9.40	10.18	11.72	8.99	9.41	10.04	10.03	10.99
		sd	1.05	1.14	0.77	3.78	1.21	1.80	3.56	3.00	3.68
	b*	x	8.62	9.97	12.36	14.17	12.50	13.17	12.60	12.90	13.31
		sd	1.90	3.99	2.27	0.33	2.88	1.40	2.97	0.36	2.42
	ΔE	x	23.82	24.61	25.99	24.93	27.98	27.11	26.29	25.62	26.39
		sd	1.30	0.73	2.02	5.91	0.74	2.28	3.98	4.21	5.50
	h^0	x	42.96	42.96	49.86	51.32	54.08	54.67	52.09	52.76	51.08
		sd	2.71	7.99	4.47	9.22	2.78	3.28	6.71	7.52	5.97
	C*	x	12.59	13.81	16.07	18.56	15.47	16.25	16.20	16.45	17.33
		sd	12.59	3.68	2.02	2.53	2.96	2.06	4.23	2.12	4.01
	IN	x	0.78	0.76	0.74	0.67	0.73	0.72	0.69	0.69	0.67
		sd	0.00	0.04	0.02	0.04	0.04	0.03	0.02	0.02	0.01
	ID	x	2.50	2.51	2.55	3.10	2.44	2.55	2.70	2.77	2.91
		sd	0.22	0.16	0.11	0.75	0.20	0.19	0.46	0.42	0.56
	ITP	x	2.26	2.28	2.29	2.82	2.21	2.34	2.52	2.56	2.68
		sd	0.17	0.17	0.06	0.63	0.20	0.15	0.38	0.32	0.44
T2	L*	x	33.22	35.43	40.01	44.46	47.19	44.55	45.05	44.45	44.92
		sd	2.71	4.32	5.50	13.36	5.27	3.44	8.62	8.14	8.15
	a*	x	8.31	9.10	9.57	8.65	8.91	10.77	6.80	7.33	7.31
		sd	2.07	1.94	2.79	0.78	1.72	3.30	1.27	1.72	2.36
	b*	x	6.56	8.70	10.85	11.26	12.34	12.80	11.71	11.88	11.58
		sd	0.69	1.41	1.81	2.98	2.59	3.09	1.97	2.75	3.31
	ΔE	x	24.00	23.49	24.15	27.95	27.22	24.50	28.63	27.88	28.24
		sd	2.25	2.12	1.68	3.42	2.07	1.28	2.36	1.66	1.40
	h^0	x	39.01	44.69	49.14	51.79	54.12	50.34	59.66	58.35	57.86
		sd	4.58	4.91	3.27	4.92	4.10	2.35	1.35	0.65	2.11
	C*	x	10.63	12.65	14.58	14.24	15.28	16.75	13.56	13.98	13.71
		sd	2.01	2.22	3.30	2.81	2.92	4.47	2.31	3.26	4.05
	IN	x	0.79	0.76	0.74	0.72	0.69	0.70	0.69	0.66	0.65
		sd	0.02	0.04	0.04	0.16	0.06	0.02	0.04	0.04	0.05
	ID	x	2.52	2.69	2.72	2.66	2.56	2.85	2.37	2.51	2.54
		sd	0.22	0.27	0.41	0.88	0.06	0.43	0.21	0.08	0.02
	ITP	x	2.26	2.39	2.44	2.40	2.35	2.58	2.24	2.32	2.32
		sd	0.16	0.21	0.35	0.76	0.08	0.32	0.22	0.11	0.00

x: mean; sd: standard deviation; o:outer; m:middle; i:inner; IN: R560/R570; ID: R570/R650; ITP: R630/R580

TABLE 4: Mean and standard deviations obteined for the colour parameters and refectance ratios in the hams at the end of the salting process (pH2>6)

			SMo	SMm	SMi	STo	STm	STi	BFo	BFm	BFi
T1	L*	x	36.81	40.60	46.80	46.22	47.76	51.20	44.46	46.68	44.96
		sd	1.58	1.74	3.07	3.49	6.18	2.11	2.60	1.93	2.59
	a*	x	7.18	7.92	8.60	10.69	7.35	5.68	6.84	6.95	7.49
		sd	1.50	3.41	2.89	2.69	4.00	0.59	1.05	1.79	1.31
	b*	x	6.51	9.57	12.41	13.29	11.80	11.51	9.93	10.77	10.60
		sd	0.80	2.71	3.13	1.40	1.04	1.30	0.37	1.31	0.92
	ΔE	x	25.34	25.22	27.36	25.25	28.61	31.69	27.39	28.26	27.02
		sd	1.57	2.91	0.82	3.72	6.37	1.22	1.99	1.94	0.09
	h^0	x	42.41	51.11	56.30	51.80	60.06	63.95	55.69	57.45	54.88
		sd	3.44	5.38	2.56	6.55	13.61	3.25	5.02	4.20	2.48
	C*	x	9.72	12.49	15.16	17.26	14.21	12.91	12.11	12.86	13.00
		sd	1.61	4.21	4.22	2.22	2.60	1.38	0.28	1.97	1.50
	IN	x	0.79	0.73	0.70	0.66	0.67	0.69	0.70	0.66	0.62
		sd	0.07	0.01	0.00	0.05	0.04	0.00	0.04	0.05	0.02
	ID	x	2.24	2.43	2.50	2.98	2.49	2.13	2.29	2.39	2.60
		sd	0.18	0.45	0.34	0.61	0.65	0.07	0.27	0.29	0.12
	ITP	x	2.03	2.26	2.32	2.70	2.33	1.99	2.19	2.25	2.39
		sd	0.12	0.34	0.31	0.56	0.62	0.07	0.27	0.34	0.15
T2	L*	x	32.35	36.45	39.12	42.81	41.32	43.58	41.75	41.96	41.05
		sd	1.66	1.56	1.78	4.82	5.57	4.13	1.79	2.21	3.60
	a*	x	7.37	9.33	10.18	10.15	8.74	8.82	7.65	8.52	8.89
		sd	0.48	0.45	0.12	2.79	2.19	2.41	0.74	1.40	1.66
	b*	x	5.71	8.07	9.97	11.01	10.48	11.42	9.52	10.13	9.90
		sd	1.11	0.56	0.76	1.86	2.21	1.92	0.83	1.44	1.66
	ΔE	x	24.98	23.00	22.89	24.36	25.01	25.66	25.90	24.96	24.46
		sd	0.70	0.62	0.62	1.82	1.88	1.64	0.28	1.43	1.99
	h^0	x	37.41	40.43	44.11	47.93	50.79	53.23	50.66	49.98	48.13
		sd	3.53	2.28	2.62	4.10	5.60	3.69	4.01	2.28	3.42
	C*	x	9.35	12.38	14.30	15.05	13.75	14.54	12.26	13.26	13.32
		sd	1.05	0.53	0.48	3.20	2.83	2.99	0.78	1.94	2.20
	IN	x	0.80	0.75	0.72	0.67	0.65	0.68	0.71	0.65	0.64
		sd	0.02	0.02	0.00	0.05	0.01	0.00	0.01	0.01	0.00
	ID	x	2.34	2.65	2.81	2.92	2.78	2.67	2.40	2.72	2.83
		sd	0.10	0.15	0.06	0.49	0.32	0.35	0.09	0.23	0.28
	ITP	x	2.11	2.42	2.56	2.67	2.54	2.47	2.23	2.50	2.59
		sd	0.11	0.15	0.08	0.38	0.29	0.31	0.06	0.21	0.21

x: mean; sd: standard deviation; o:outer; m:middle; i:inner
IN: R560/R570; ID: R570/R650; ITP: R630/R580

Table 1.- Regression equations for different parameters under study.

PARAMETER	P(TAIL)	EQUATION	Nº
L*	0.0000	L*= 41.45-0.51D-0.01C-0.94DZ	1
a*	0.0000	$a^*=20.87-1.41D-2.74Z+0.98\times10^{-3}DC -0.27\times10^{-3}DX$	2
b*	0.0000	b*=17.30-1.09D	3
h*	0.0000	$h^*=39.56+0.51\times10^{-5}CX$	4
C*	0.0000	C*=26.84-1.67D	5

D = day; X = lux; C = concentration of tocopherol;
r = correlation coeficient; Z = light; Nº = equation number

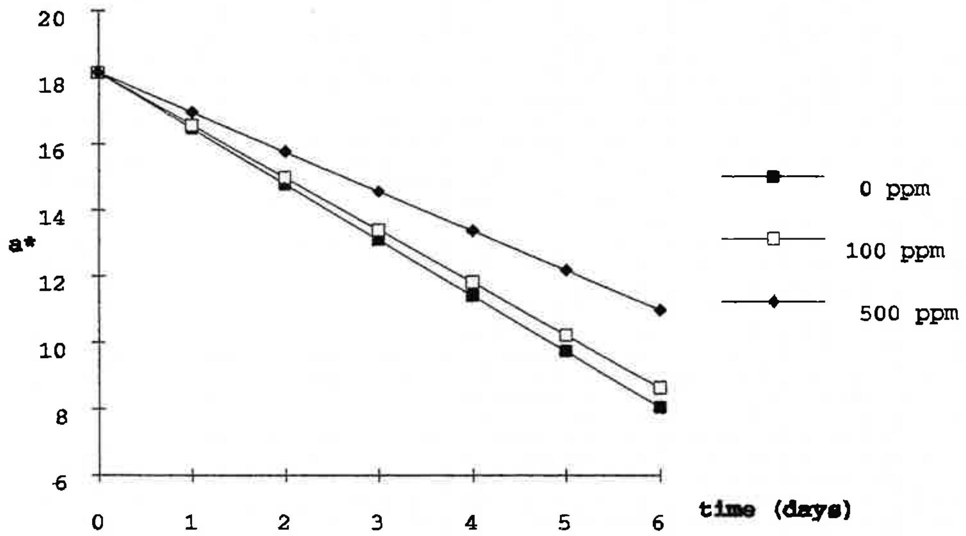


Figure 1.- Redness linear regression of "Chorizo" with different concentrations tocopherol added to paprika exposed to 1000lux.

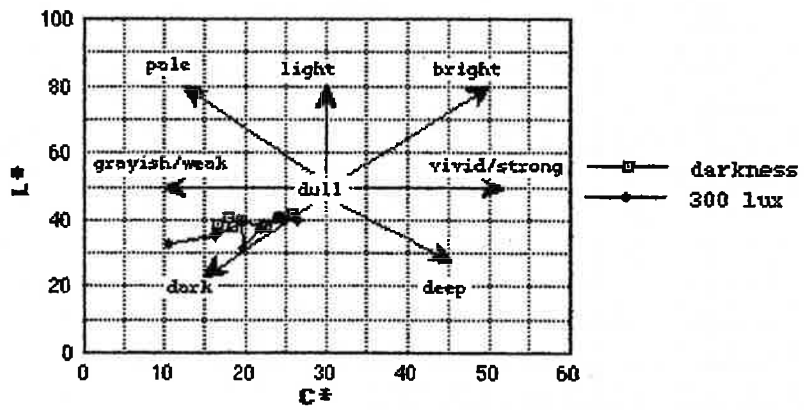


Figura 2.- Evolution of colour tone in "Chorizo" with 100 ppm tocopherol added to paprika.

TABLE 1 - COMPOSITION (Kg)

Pork trimmings with 75% of lean meat	500
Pork trimmings with 50% of lean meat	90
Pork belly and jowl lard	250
Potable chilled water or crusted ice	100
Salt (nitrite added 0.6%)	24
Pimiento (*Capsicum annum*) raw paste (salt added 10%)	22.5
Dried pimiento (50/50 mild & hot)	10
Sodium polyphosphate (Curafos - BK Ladenburg)	2.5
Dry powdered garlic	0.5
L - ascorbic acid	0.45
BHA + BHT (50/50) (Termox - Kemin)	0.05

TABLE 2 - FLOW-SHEET

Trimmings + Lard CCP2

Water, red pimiento paste, salt, powdered garlic, ground paprika, polyphosphates, nitrite, BHA+BHT and L-ascorbic acid

Collagen casings → Soaked

Griding

Blending + Seasoning

Ripening CCP2
(4-10°C)

Stuffing

Heating and pre-smoking CCP1
(65°C-60′,95%RH; 70°C-60′,85%RH; 75°C-60′,75%RH)
(ASF virus lethal value > 13D; pathogens free)

Country style smoking
(45°C-12h)

Cooling CCP2
(Air conditioned)

Cold canning covered with vegetable oil CCP2

Packing
(16-24°C)

This plan fulfil the seven HACCP principles (USDA - FSIS, 1991).

TABLE 3 - MICROBIOLOGICAL ANALYSIS

Manufacture date	91/12/22				
Month	To	T1	T2	T3	T4
TPC (CFU g^{-1})	$45x10^3$	$34x10^3$	$12x10^4$	$71x10^3$	10^5
D-Group *Streptococci* (CFU g^{-1})	< 10^2	< 10^2	< 10^2	< 10^2	< 10^2
Coliforms (MPN g^{-1})	< 10	< 10	< 10	< 10	< 10
Faecal coliforms (MPN g^{-1})	< 1	> 1 < 10	< 1	< 1	< 1
Sulfite reducing *Clostridia* spores (CFU g^{-1})	< 10	10^2	< 10	< 10	< 10
Staphylococci (CFU g^{-1})	< 1	< 1	< 1	< 1	< 1
Salmonella 25 g	Neg.	Neg.	Neg.	Neg.	Neg.

Manufacture date	92/01/08				
Month	To	T1	T2	T3	T4
TPC (CFU g^{-1})	$19x10^4$	$44x10^4$	$20x10^4$	10^5	$27x10^4$
D-Group *Streptococci* (CFU g^{-1})	< 10^2	< 10^2	< 10^2	< 10^2	< 10^2
Coliforms (MPN g^{-1})	> 10 < 100	< 10	< 10	> 10 < 100	< 10
Faecal coliforms (MPN g^{-1})	< 1	< 1	> 1 < 10	> 1 < 10	< 1
Sulfite reducing *Clostridia* spores (CFU g^{-1})	< 1	> 1 < 10	> 1 < 10	> 1 < 10	> 1 < 10
Staphylococci (CFU g^{-1})	< 1	< 1	< 1	< 1	< 1
Salmonella 25 g	Neg.	Neg.	Neg.	Neg.	Neg.

TABLE 4 - CHEMICAL ANALYSIS

Manufacture date	91/12/22				
Month	To	T1	T2	T3	T4
Weight loss at 105°C (%)	36.6	36.8	35.7	36.6	36.9
Ether Extract (%)	39.0	38.7	40.8	39.3	39.5
Crude Protein (%)	18.49	18.37	18.85	18.37	18.60
Total ash (%)	5.25	5.18	5.04	5.11	5.03
TVBN(mg NH_3/100g)	57.3	60.3	62.8	63.0	68.6
TBA (mg malonic aldehyde/kg)	0.10	0.13	0.17	0.21	0.24
Acidity (% oleic acid)					
Chorizo	0.64	0.72	0.78	0.82	0.82
Oil	0.26	0.31	0.40	0.47	0.60
pH	6.00	6.02	6.01	5.95	6.02
a_w 25°C	0.88	0.89	0.88	0.88	0.89

Manufacture date	92/01/08				
Month	To	T1	T2	T3	T4
Weight loss at 105°C (%)	34.2	32.2	34.7	34.0	33.0
Ether Extract (%)	40.1	42.1	41.6	40.9	41.8
Crude Protein (%)	18.76	18.25	18.56	19.00	18.63
Total ash (%)	5.74	6.15	5.25	5.63	5.57
TVBN (mg NH_3/100g)	56.3	57.6	62.4	69.6	74.7
TBA (mg malonic aldehyde/kg)	0.19	0.30	0.35	0.41	0.70
Acidity (% oleic acid)					
Chorizo	0.19	0.20	0.25	0.30	0.33
Oil	0.26	0.30	0.37	0.42	0.60
pH	5.78	5.62	5.74	5.55	5.85
a_w 25°C	0.88	0.88	0.89	0.89	0.88

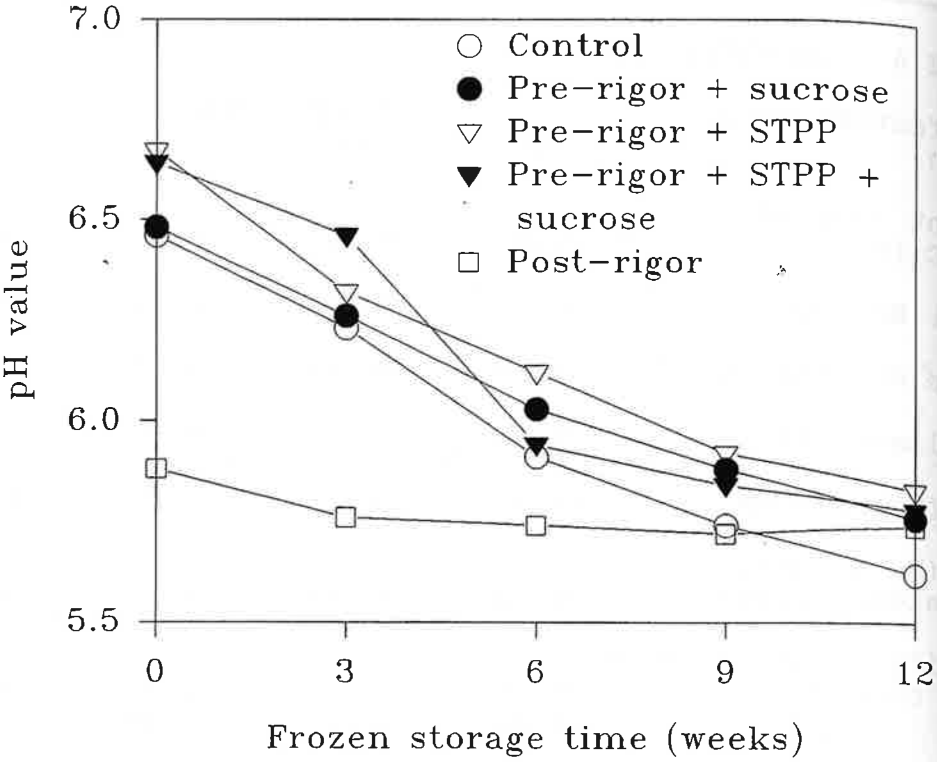


Figure 1 Change in pH values of pre− and post−rigor porcine ground meat during frozen storage

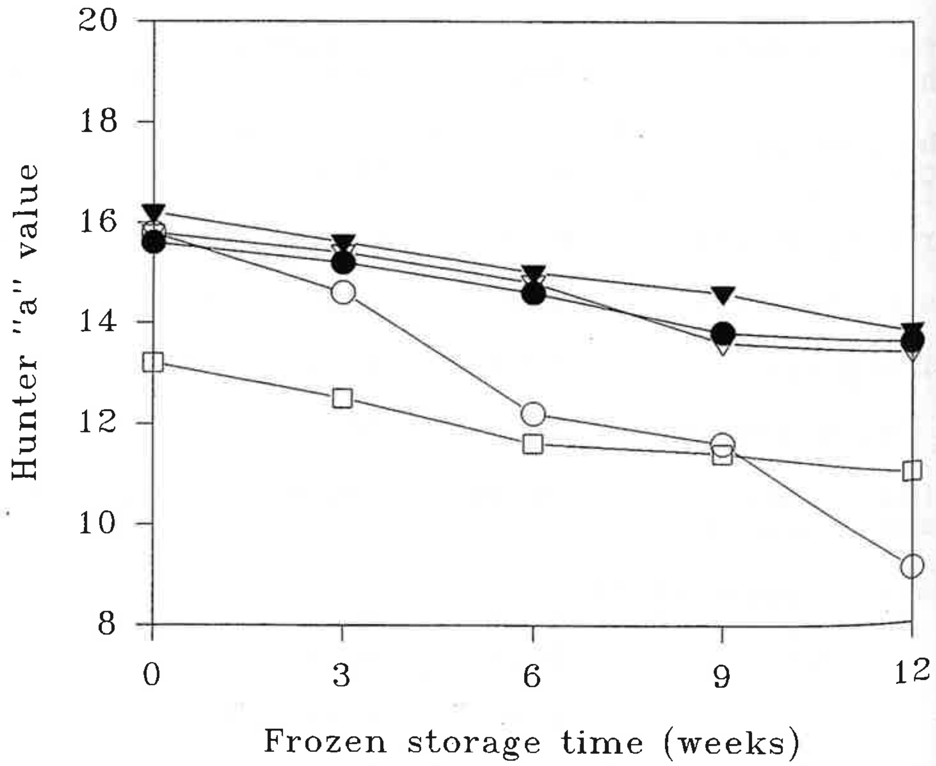


Figure 2 Change in Hunter "a" value of pre− and post−rigor porcine ground meat during frozen storage
Symbols are the same as Figure 1

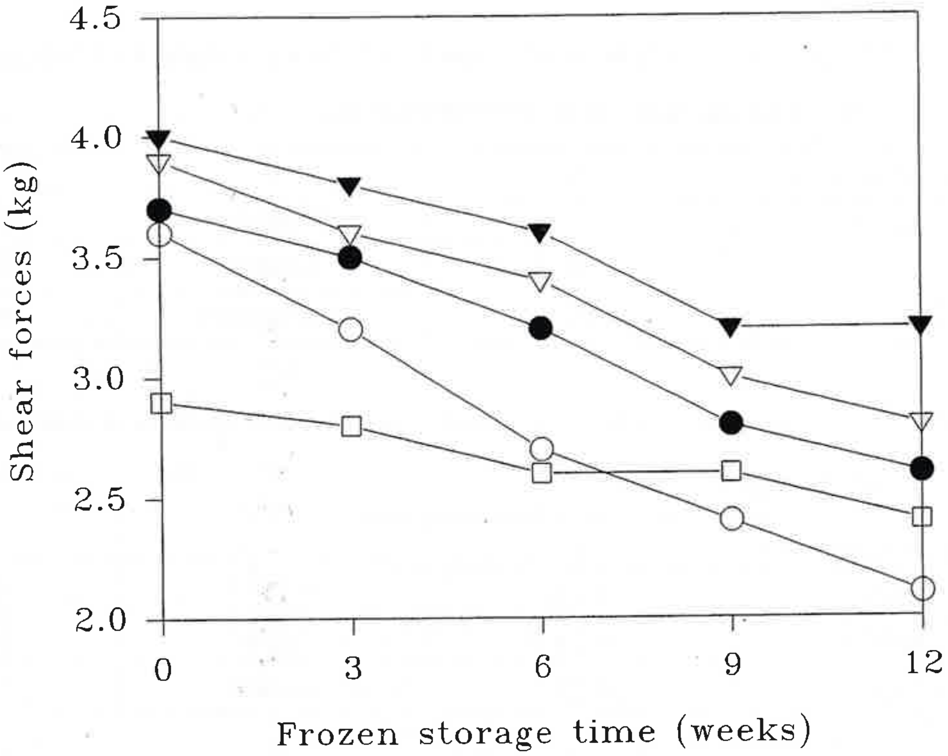


Figure 3 Change in shear force of model sausage prepared from pre– and post–rigor meat during frozen storage. Symbols are the same as Figure 1

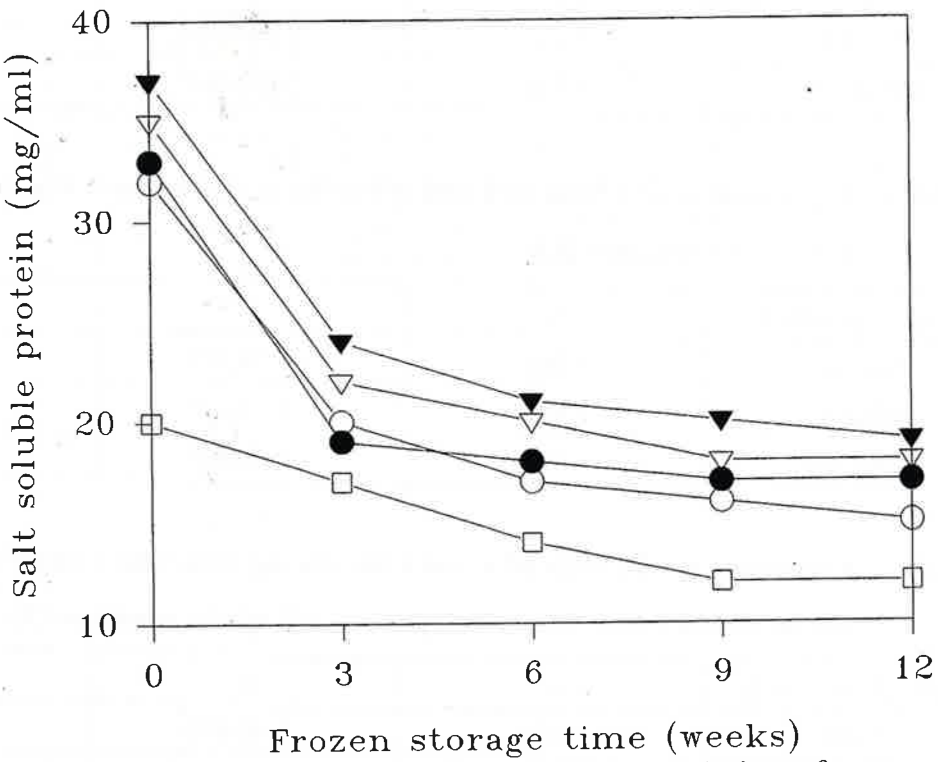


Figure 4 Change in salt soluble protein of pre–and post rigor porcine ground meat during frozen storage Symbols are the same as Figure 1.

Table 1. **Regression coefficients of a and b for the a_w -values as a function of the period of ripening (t) of the equation (1)**

Type of products	a	b	R
M160	0.9941	- 0.005864	0.9730
M483	0.9925	- 0.005625	0.9683
Control	0.9921	- 0.005018	0.9709

Table 2. **Regression coefficients of a and b for the a_w-values as a function of pH of the equation (1)**

Type of products	a	b	R
M160	- 0.2113	0.2075	0.8580
M483	- 0.1331	0.1940	0.8688
Control	- 0.2325	0.2103	0.9796

Table 3. **Regression coefficients of a and b for the a_w-values as a function of dry matter of the equation (1)**

Type of products	a	b	R
M160	1.205	- 0.006131	0.9840
M483	1.186	- 0.005544	0.9851
Control	1.235	- 0.006608	0.9589

Table 4. **Regression coefficients of a and b for the a_w-values as a function of weight loss of the equation (1)**

Type of products	a	b	R
M160	1.064	- 0.00475	0.9908
M483	1.054	- 0.00423	0.9793
Control	1.035	- 0.00392	0.9896

Table 5. **Regression coefficients of a and b for the a_w-values as a function of the colour characteristics (red colour component, a*) of the equation (1)**

Type of products	a	b	R
M160	1.495	- 0.03498	0.7740
M483	1.431	- 0.0306	0.7561
Control	2.10	- 0.0705	0.6434

Table 6. **Multiple regression coefficients of a_w in relation to period of ripening (t), pH and colour characteristics (red colour component, a*)**

Type of products	β_o	β_1	β_2	β_3	R_M
M160	- 0.1756	- 0.4146.10^{-2}	0.161	0.0164	0.9918
M483	0.01112	- 0.3983.10^{-2}	0.141	0.0118	0.9953
Control	0.1547	- 0.2152.10^{-2}	0.134	0.4267.10-2	0.9958

Table 7. **Influences of the micrococcal starter cultures on the kinetics of weight loss of sausages**

Type of products	Δm_k(%)	k_1(d^{-1})
M160	44.04 ± 6.05	0.135 ± 0.048
M483	46.30 ± 8.03	0.129 ± 0.056
Control	43.34 ± 5.06	0.108 ± 0.029

Table 8. **Influences of the micrococcal starter cultures on the kinetics of the changes in the dry matter content of sausages**

Type of products	Q_o (%)	B (%)	k_2 (d^{-1})	R
M160	32.48 ± 0.53	23.57 ± 1.04	3.97 ± 0.08	0.998
M483	32.61 ± 0.83	25.28 ± 1.04	3.79 ± 0.075	0.998
Control	34.90 ± 0.60	18.36 ± 1.06	3.42 ± 0.123	0.995

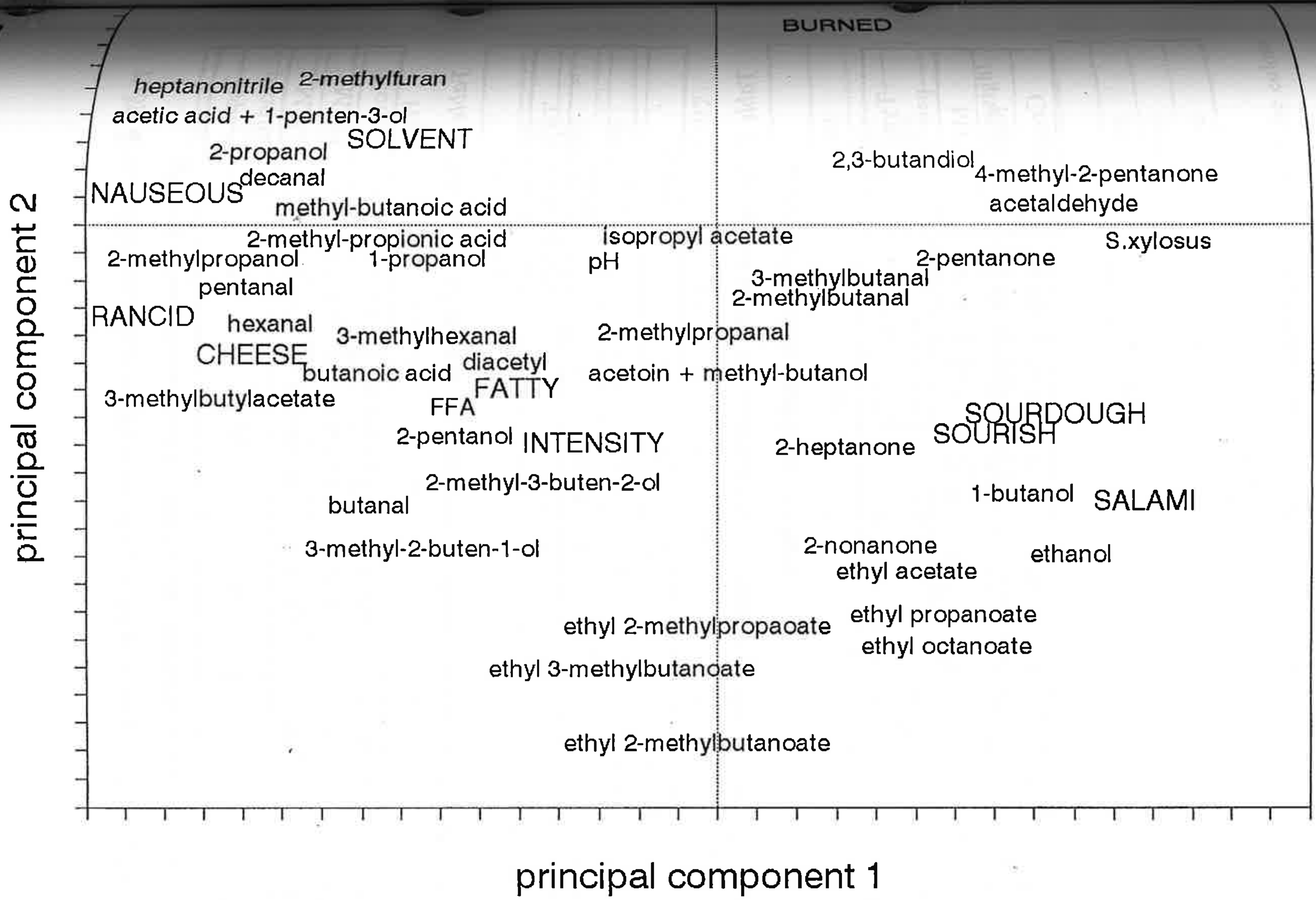


Figure 1 Loading plot from PLS analysis of sensory scores and content of volatile compounds. Table 2 shows the variation explained by the principal components.

Table 1

Sensory descriptor	Regression coefficients of the significant effects					
	TEM	PED	NIT	NAT	GLU	SAL
Intensity	-	-	-	-	-	-
Salami	÷0.37***	÷0.27***		÷0.30***		÷0.23***
Sourdough		÷0.24*		÷0.25*		
Sourish				÷0.12*		
Cheese	+0.52***			+0.25*		
Fatty		÷0.06**			÷0.13***	÷0.07**
Rancid	+0.17***			+0.14***	÷0.09***	÷0.07***
Nauseous	+0.34***			+0.27***	÷0.16**	÷0.10*
Burned						+0.27**
Solvent	+0.24*			+0.60***		

Table 1 Significant main effects.

*** = $p<0.001$, **=$p<0.01$, *=$p<0.05$. TEM=fermentation temperature, PED=*P. pentosaceus*, NAT=nitrate, NIT=nitrite, GLU=glucose, SAL=salt. + or ÷ in front of a coefficient indicates whether the factor increases or decreases the intensity of the aroma note.

Table 2

% variance explained	Principal components	
	PC1	PC2
X-matrix (GC peak areas)	19.2	11.9
Y-matrix (sensory scores)	30.8	8.3

Table 2 PLS analysis of relative GC peak areas and sensory scores.

Table 1 - Characteristics of the identified strains of Lactic acid bacteria

	GROUP					
	A	B	C	D	E	F
Number of isolates	6	2	1	3	1	5
Production of gas from glucose	-	-	-	+	-	-
Growth in acetate agar	+	+	+	+	+	+
Citrulline from arginine	+	-	+/-	+	-	-
Presence of mDAP	-	-	-	-	-	+
Configuration of the lactic acid	DL	DL	DL	DL	DL	DL
Acid production from:						
L Arabinose	+	-	+	+	-	v
Ribose	+	+	+	+	+	+
D Xylose	v	-	-	+	-	v
Galactose	+	+	+	+	+	+
Manose	+	+	+	-	+	+
Rhamnose	v	-	+	-	-	v
Manitol	-	-	-	-	+	+
Sorbitol	-	-	-	-	+	+
Amygdaline	+	-	-	-	+	+
Esculine	+	v	+	+	+	+
Salicine	+	v	-	-	+	+
Celiobiose	+	-	-	-	+	+
Maltose	+	+	-	+	+	+
Lactose	v	v	+	-	+	+
Melibiose	v	-	+	+	+	+
Sucrose	v	-	+	-	+	+
Trehalose	+	v	+	-	+	+
Melezitose	-	-	-	-	+	v
Rafinose	v	-	-	-	-	v
Gluconate	v	-	+	+	+	+

A - *Pediococcus pentosaceus;* B - *Lactobacillus curvatus;* C - *L. sake;* D - heterofementative rods; E - *L. pseudoplantarum; F* - L. *plantarum;* v - variable; (+/-) - positive with 0,03% of glucose and negative with 2%; mDAP - *meso* Diaminopimelic acid

Table 2 - Characteristics of the identified strains of *Micrococcaceae*

	GROUP										
	A	B	C	D	E	F	G	H	I	M16	M69
Number of isolates	2	6	2	1	3	1	1	1	1	1	1
Resistence to lysostaphin	+	-	-	-	-	+	+	-	+	+/-	+
Resistence to lysosyme	+	+	+	-	+	-	-	+	+	+/-	+
Configuration of lactic acin	D>L	DL	v	L	L>D	L	DL	L>D	DL	L>D	L
Pigment	PO	v	CY	CY	PO	O	Y	CY	Y	CY	CY
Urease	-	+	+	+	+	-	+	-	+	+	+
Arginine dehydrolase	-	v	-	-	-	-	-	-	-	+	-
Ornithine decarboxylase	-	-	-	-	-	-	-	-	-	-	-
Esculine (hydrolysis)	-	-	-	+	-	-	-	-	+	-	-
Nitrate reduction	-	+	-	+	-	+	-	+	+	+	-
Acetoin production	-	v	+	-	+	-	-	-	-	-	+
β-galactosidase	-	-	-	+	v	-	-	-	-	+	-
Resistence to novobiocin	-	-	-	+	+	-	-	(+)	-	-	-
β-Glucuroniadase	-	+	-	+	-	-	-	-	-	-	-
Fermentation of:											
Glucose	+	+	+	+	+	(+)	-	+	+	+	+
Fructose	+	+	+	+	+	(+)	-	+	+	+	+
Mannose	+	-	-	+	-	-	-	(+)	-	-	-
Maltose	+	+	+	+	+	-	-	-	-	-	+
Lactose	v	-	v	+	+	-	-	-	-	-	+
Trehalose	+	+	-	+	+	-	-	-	-	-	-
Manitol	-	v	-	+	+	-	-	(+)	-	-	-
Raffinose	-	-	-	-	-	-	-	-	-	+	-
Ribose	-	-	-	(+)	-	-	-	-	-	-	-
Celiobiose	-	-	-	-	-	-	-	-	-	+	-
Sucrose	+	+	+	+	+	-	-	(+)	-	(+)	+
N-Acetyl-glucosamine	-	v	-	+	+	-	-	-	-	-	-
Turanose	v	v	-	-	v	-	-	-	-	(+)	-
Arabinose	-	-	-	+	-	-	-	-	-	-	-

A - *Micrococcus kristinae;* B - *Staphylococcus Warneri;* C - *S. hominis/S. epidermidis;* D - *S. xylosus;* E - *S. saprophyticcus;* F - *M. reseus; G - M. luteus;* H - *S. auricularis/S. capitis;* I - M. *varians;* v -variable; (+/-) - doubtful reaction; (+) weak reaction; PO - pale orange; CY - cream yellow; O - orange; Y - yellow

Table 1
CHANGES IN SOME GENERAL PARAMETERS DURING SACISSON RIPENING

	Minced mix	Fermented	2nd week drying	finished product	
Moisture (%)	56.26 ± 0.27 [a]	56.63 ± 0.39 [a]	50.06 ± 0.11 [b]	39.49 ± 0.34 [c]	***
Water activity	0.95 ± 0.00 [a]	0.94 ± 0.00 [b]	0.93 ± 0.00 [c]	0.89 ± 0.00 [d]	***
pH centre	5.85 ± 0.01 [a,1]	5.16 ± 0.02 [b,1]	4.92 ± 0.02 [c,1]	4.87 ± 0.02 [d,1]	
pH periphery	5.85 ± 0.01 [a,1]	5.06 ± 0.02 [b,2]	4.82 ± 0.02 [c,2]	4.89 ± 0.02 [d,1]	
NaCl (%)	4.51 ± 0.21 [a]	7.29 ± 0.22 [b]	7.43 ± 0.07 [b]	7.36 ± 0.05 [b]	***
Soluble sugar (% glucose)	9.50 ± 0.14 [a]	9.14 ± 0.12 [b]	7.39 ± 0.10 [c]	4.95 ± 0.08	***
Total sugar (% glucose)	17.53 ± 0.71 [a]	16.98 ± 0.20 [a]	13.42 ± 0.15 [b]	6.92 ± 0.30 [c]	***

* All the values are refered to dry sample

** Any two means followed with the same superscript are not significantly different (p>0.05). Letters compared among the different phases of the process, numbers between center and perifhery.

Table 2
CHANGES OF PROTEIN FRACTION DURING SAUCISSON RIPENING

	Minced mix	Fermented	2nd week drying	finished product	
Sarcoplasmic solubility (%)	35.12 ± 1.11 a	25.96 ± 0.74 b	28.0 ± 0.60 c	25.82 ± 0.48 d	***
Myofibrillar solubility (%)	34.2 ± 0.96 a	34.17 ± 1.25 b	21.46 ± 0.40 c	11.63 ± 1.0 b	***
Proteolysis index (%)	8.57 ± 0.98 a	14.08 ± 0.52 a	17.33 ± 0.41 b	16.26 ± 0.44 c	***
Denaturalitation index (%)	5.67 ± 0.43 a	19.16 ± 0.61 b	28.22 ± 1.25 c	35.33 ± 1.5 c	***
Total free aminoacids (mg/g)	24.85 ± 1.47 a	28.99 ± 1.88 b	40.87 ± 2.5 c	35.90 ± 0.99 d	***

* All the values are refered to dry sample
** Any two means followed with the same superscript are not significantly different ($p>0.05$).

Table 3
CHANGES OF FATTY FRACTION DURING SAUCISSON RIPENING

	Minced mix	Fermented	2nd week drying	finished product	
Iodine value (% I_2)	71.23 ± 0.19a	71.24 ± 0.24a	71.05 ± 0.46a	71.49 ± 0.61a	NS
Acidity value (mg KOH/g.fat)	24 ± 0.13a	6.99 ± 0.13b	9.60 ± 0.15c	17.00 ± 0.58d	***
Peroxide index (meq O_2/Kg.fat)	13.14 ± 0.18a	25.73 ± 0.46b	32.81 ± 5.42c	56.84 ± 1.64d	***
Carbonyl index (umolCO/g fat)	11.44 ± 0.79a	24.76 ± 3.12c	19.06 ± 1.79b	17.00 ± 0.24ab	***
C16:0/C16:1	8.47 ± 0.09a	9.01 ± 0.09ab	9.10 ± 0.30b	9.42 ± 0.07b	*
C18:0/C18:1+C18:2+C18:3	0.17 ± 0.01a	0.19 ± 0.00b	0.19 ± 0.00b	0.23 ± 0.01c	***

* All the values are refered to dry sample
** Any two means followed with the same superscript are not significantly different ($p>0.05$).

Table 4

CHANGES OF COLOR PARAMETERS DURING SAUCISSON RIPENING

		Minced mix	Fermented	2nd week drying	finished product	
Nitrites (ppm Na NO_2)		222.26 ± 5.88 a	1.40 ± 0.21 b	6.89 ± 1.13 c	2.40 ± 0.23 b	***
Nitrates (ppm K NO_3)		216.54 ± 8.79 a	102.75 ± 11.88 b	89.88 ± 8.10 b	105.87 ± 6.72 b	***
Chemical conversion index (%)		69.25 ± 4.70 a	75.47 ± 3.17 a	85.68 ± 3.88 b	90.45 ± 1.99 b	**
Nitrosation index		1.196 ± 0.009 a	0.980 ± 0.001 b	0.968 ± 0.001 c	0.961 ± 0.001 d	***
Lightness (L*)	center	44.71 + 0.54 a	43.46 ± 0.26 b,1	46.30 ± 0.27 c,1	45.07 ± 0.20 a,1	
	periphery	44.71 + 0.54 abc	43.47 ± 0.27 a,1	45.08 ± 0.28 b,2	44.27 ± 0.27 c,2	
Redness (a*)	center	21.71 + 0.43 a,1	20.21 ± 0.19 b,1	18.00 ± 0.18 c,1	17.61 ± 0.18 c,1	
	periphery	21.71 + 0.43 a,1	20.70 ± 0.21 b,1	18.72 ± 0.19 c,2	16.92 ± 0.20 d,2	
Yellowness (b*)	center	7.82 + 0.28 a,1	4.38 ± 0.08 b,1	6.31 ± 0.13 c,1	6.11 ± 0.11 c,1	
	periphery	7.82 + 0.28a,1a	4.36 ± 0.07 b,1	5.84 ± 0.13 c,2	5.35 ± 0.14 d,2	
Croma (C*)	center	23.12 ± 0.44a,1	20.71 ± 0.201 b,1	19.12 ± 0.18 c,1	18.76 ± 0.18 c,1	
	periphery	23.12 ± 0.44a,1	21.18 ± 0.21 b,1	19.69 ± 0.20 c,1	17.83 ± 0.20 d,2	
Hue (H*)	center	19.86 ± 0.66 a,1	12.29 ± 0.22 b,1	19.29 ± 0.35 a,1	19.34 ± 0.36 a,1	
	periphery	19.86 ± 0.66 a,1	12.06 ± 0.18 b,1	17.35 ± 0.37 c,2	17.32 ± 0.44 c,2	

* All the values are refered to dry sample
** The same superscrip not significative differences (p>0.05). Letters compared among the different fases of the process, numbers between center and perifhery

Table 1. **Proteolytic activity of selected micrococcal strains on casein and meat extract (μmol tyrosine/ml)**

Strain	12°C		30°C			
	72 h		6 h		72 h	
	casein	meat extr.	casein	meat extr.	casein	meat extr.
M32	0.24	0.10	–	–	0.77	0.27
M33	0.09	–	0.04	–	0.15	–
M35	0.01	0.02	–	–	0.06	0.06
M56	0.03	–	–	–	0.10	–
M59	0.07	0.01	–	–	0.09	0.03
M80	0.05	0.18	–	–	0.32	–
M130	0.10	0.05	0.04	0.04	0.34	–
M160	0.16	0.78	0.05	0.05	0.62	1.08
M224	0.03	0.02	0.03	0.03	0.05	–
M232	0.05	0.10	–	–	0.39	0.34
M247	0.04	–	–	–	0.04	–
M274	–	–	–	–	0.07	–
M281	0.23	–	–	–	0.61	–
M306	0.03	–	–	–	0.04	–
M318	0.24	0.05	0.01	0.01	0.56	0.22
M319	–	–	–	–	0.02	–
M321	0.01	0.01	–	–	0.03	0.02
M323	0.02	0.50	–	–	0.07	0.91
M324	0.04	–	–	–	0.07	0.06
M325	0.09	–	–	–	0.07	0.05
M326	0.03	–	–	–	0.05	–
M328	0.18	–	–	–	0.07	–
M329	0.11	0.10	0.05	–	0.54	0.23
M333	0.04	0.05	–	–	0.05	–
M334	–	–	–	–	0.02	–
M338	–	0.07	–	–	0.03	0.14
M348	–	–	–	–	0.03	0.09
M405	0.09	–	–	–	0.20	0.05
M411	0.16	0.01	0.06	–	0.55	0.03
M449	0.06	–	0.02	0.02	0.09	0.30
M456	0.10	0.15	–	–	0.39	0.33
M483	0.01	0.40	–	–	0.06	0.53
M537	0.06	0.05	–	–	0.06	0.41
M544	0.24	0.10	–	–	0.77	0.27
M545	0.01	0.01	–	–	0.06	0.59
M557	0.03	0.20	–	–	0.07	0.91
M558	0.04	0.05	–	–	0.05	–
M559	0.02	0.01	–	–	0.07	–
M560	0.04	0.03	–	–	0.04	–
M566	0.07	–	–	–	0.09	0.03
M570	–	–	–	–	0.03	0.14
M571	–	0.10	–	–	0.03	0.14
M575	0.03	–	0.03	–	0.07	0.15
M576	0.04	–	–	–	0.04	–
M591	0.03	–	–	–	0.10	–
M593	0.01	–	–	–	0.03	–
M594	0.01	0.05	–	–	0.03	–
M598	0.01	0.02	–	–	0.03	–
M613	0.23	–	–	–	0.61	–
M614	0.03	–	–	–	0.04	–
M615	–	–	–	–	0.02	–
M623	–	–	–	–	0.02	–
M627	0.04	–	–	–	0.07	0.06
M630	0.09	–	–	–	0.07	0.05
M633	0.04	–	–	–	0.08	0.06
M634	0.04	–	–	–	0.02	–

n = 3

Table 2 . **Influence of NaCl (2.4%) and $NaNO_3$ (0.016 %)on the proteolytic activity of selected micrococcal strains, µmol tyrosine / ml**

Strain	Incubation temperature - 12°C			
	Meat extract		Meat extract + NaCl and $NaNO_3$	
	48 h	7 d	48 h	7d
M32	0.04	0.27	0.09	0.51
M59	0.02	0.31	0.11	0.52
M160	0.22	0.73	0.27	0.90
M318	0.08	0.06	0.23	0.58
M321	0.01	0.03	0.04	0.35
M323	0.14	0.46	0.16	0.49
M456	0.18	0.21	0.35	0.56
M483	0.02	0.53	0.04	0.56

n = 3

Table 3. **Changes in the composition of free amino acids of lukanka produced by use of micrococcal starter cultures**

Amino acids (mg/100 g dry matter)	Sausage mix	Period of ripening														
		24th h			3rd d			6th d			13th d			Finished product		
		M160	M483	Control	M160	M483	Control	M160	M483	Control	M160	M483	Control	M160	M483	Control
Lysine	41.02 ± 1.02	185.69 ± 1.06	251.00 ± 4.86	443.77 ± 7.86	265.90 ± 2.29	185.42 ± 3.26	103.96 ± 3.15	397.01 ± 4.09	243.62 ± 2.69	133.70 ± 3.60	402.52 ± 2.97	359.02 ± 2.25	144.16 ± 4.56	581.79 ± 2.80	395.33 ± 4.50	165.38 ± 3.17
Histidine	230.80 ± 0.42	551.65 ± 16.24	392.28 ± 4.36	105.08 ± 3.86	456.89 ± 4.57	586.21 ± 6.44	387.10 ± 3.78	828.34 ± 4.56	658.69 ± 6.86	598.16 ± 4.39	720.30 ± 5.63	629.77 ± 2.76	543.33 ± 3.61	1441.87 ± 3.62	654.38 ± 2.96	482.21 ± 3.73
Arginine	19.40 ± 0.49	trace	14.70 ± 0.22	40.95 ± 1.80	–	trace	94.55 ± 1.36	trace	–	63.03 ± 1.56	6.83 ± 0.16	–	46.41 ± 1.55	12.34 ± 0.90	20.12 ± 1.13	trace
Aspartic acids	9.53 ± 0.28	16.84 ± 0.35	91.06 ± 2.39	69.02 ± 1.43	81.53 ± 2.64	29.35 ± 0.93	41.55 ± 2.43	39.99 ± 1.97	35.47 ± 1.95	12.52 ± 0.98	147.14 ± 3.25	98.92 ± 3.68	11.26 ± 1.23	131.79 ± 2.08	61.80 ± 2.97	20.84 ± 2.24
Threonine	25.17 ± 0.36	66.24 ± 0.88	91.03 ± 2.32	31.78 ± 0.47	80.18 ± 2.39	89.64 ± 3.99	51.09 ± 2.87	52.80 ± 1.90	81.78 ± 2.87	35.36 ± 1.94	132.47 ± 3.30	115.20 ± 3.32	53.13 ± 2.90	129.90 ± 1.95	148.05 ± 1.70	72.48 ± 2.42
Serine	30.31 ± 0.62	256.35 ± 5.87	225.70 ± 3.72	211.71 ± 4.00	154.19 ± 2.75	288.02 ± 3.64	201.72 ± 5.01	209.62 ± 4.84	321.78 ± 4.18	217.31 ± 3.35	412.21 ± 2.73	197.03 ± 5.21	281.57 ± 3.51	287.03 ± 2.80	185.09 ± 2.26	284.20 ± 3.96
Glutamic acid	64.71 ± 0.45	220.74 ± 3.10	304.39 ± 5.06	77.48 ± 3.16	372.60 ± 2.53	149.29 ± 2.69	118.96 ± 3.13	222.81 ± 3.71	295.87 ± 3.84	79.37 ± 0.53	503.96 ± 4.06	404.17 ± 1.34	113.42 ± 3.80	447.21 ± 4.01	552.14 ± 2.90	198.84 ± 6.75
Proline	94.45 ± 1.12	78.09 ± 2.53	97.64 ± 2.52	31.45 ± 0.95	112.95 ± 2.26	53.31 ± 1.46	43.97 ± 1.56	83.10 ± 2.24	70.97 ± 0.51	72.15 ± 3.06	112.68 ± 4.30	103.21 ± 3.92	63.65 ± 1.38	117.71 ± 4.00	69.60 ± 1.93	79.78 ± 3.62
Glycine	60.76 ± 1.85	91.08 ± 2.00	74.56 ± 2.37	76.07 ± 2.88	77.87 ± 4.03	98.19 ± 0.83	70.47 ± 0.12	96.39 ± 2.94	74.08 ± 2.60	86.28 ± 1.34	171.12 ± 3.49	86.63 ± 0.98	73.94 ± 2.47	100.62 ± 1.21	147.59 ± 3.97	80.04 ± 1.66
Alanine	180.14 ± 5.45	317.04 ± 4.01	202.84 ± 5.77	227.79 ± 2.71	254.36 ± 5.01	327.34 ± 6.09	219.47 ± 4.39	335.83 ± 3.53	285.94 ± 4.02	258.79 ± 4.02	532.47 ± 3.66	313.94 ± 3.33	276.24 ± 4.84	275.52 ± 2.26	253.03 ± 4.04	305.31 ± 4.84
Cystine	trace	trace	–	trace	trace	trace	28.09 ± 0.90	trace	trace	trace	–	–	trace	trace	22.90 ± 4.23	
Valine	128.96 ± 2.74	96.74 ± 3.20	88.88 ± 1.94	37.66 ± 1.79	136.25 ± 1.96	112.61 ± 3.20	66.70 ± 1.54	132.77 ± 4.30	129.17 ± 1.45	64.44 ± 1.49	136.56 ± 5.93	154.32 ± 1.30	72.66 ± 3.64	187.66 ± 2.01	137.74 ± 3.94	84.44 ± 2.56
Methionine	46.96 ± 2.41	46.91 ± 0.30	59.23 ± 3.06	12.31 ± 0.28	60.80 ± 1.78	54.77 ± 2.75	33.26 ± 1.93	54.62 ± 2.23	59.25 ± 1.77	34.16 ± 3.17	85.24 ± 1.34	78.66 ± 1.73	33.46 ± 1.67	95.50 ± 1.55	93.74 ± 2.53	41.52 ± 2.42
Isoleucine	79.32 ± 1.99	63.06 ± 3.61	81.61 ± 2.40	20.92 ± 1.79	104.55 ± 4.35	72.22 ± 1.84	47.18 ± 0.97	71.42 ± 2.45	79.61 ± 2.01	47.74 ± 2.09	107.84 ± 2.50	113.70 ± 1.60	50.00 ± 3.35	135.70 ± 5.34	144.03 ± 1.39	59.67 ± 3.67
Leucine	167.42 ± 3.78	201.64 ± 3.34	207.83 ± 3.05	41.80 ± 0.56	243.36 ± 3.07	166.12 ± 4.16	97.48 ± 3.01	200.89 ± 5.68	208.50 ± 2.94	102.35 ± 4.21	283.57 ± 3.41	265.53 ± 2.66	104.73 ± 2.93	336.26 ± 1.24	329.20 ± 3.02	127.60 ± 2.09
Tyrosine	118.84 ± 0.40	50.84 ± 1.77	20.24 ± 1.01	37.99 ± 0.37	35.23 ± 0.72	69.50 ± 2.19	53.42 ± 2.99	75.54 ± 7.50	31.79 ± 1.28	55.16 ± 3.12	23.79 ± 1.46	38.22 ± 0.98	42.10 ± 2.99	78.88 ± 1.72	88.30 ± 2.79	40.65 ± 2.16
Phenylalanine	93.91 ± 0.58	69.41 ± 2.83	88.40 ± 1.39	28.07 ± 1.92	125.03 ± 2.49	93.85 ± 1.21	55.33 ± 1.63	105.67 ± 2.88	71.53 ± 1.30	56.81 ± 0.68	147.99 ± 2.04	133.30 ± 4.37	51.19 ± 2.38	160.33 ± 4.33	154.23 ± 2.19	73.71 ± 1.36
Total	1391.70 ± 1.60	2312.70 ± 7.78	2291.39 ± 7.36	1493.85 ± 4.39	2561.69 ± 1.86	2375.84 ± 1.65	1714.30 ± 13.47	2906.80 ± 35.15	2648.05 ± 6.17	1919.33 ± 15.34	3926.69 ± 23.92	3091.62 ± 18.22	1961.25 ± 8.89	4520.11 ± 1.28	3457.27 ± 14.78	2116.67 ± 8.03

Table 1. **Lipolytic activity of selected micrococcal strains expressed as quantity of titratable free fatty acids**

Strain	mg KOH/g fat	Strain	mg KOH/g fat
M32	4.85	M411	9.07
M33	9.68	M449	4.72
M35	1.97	M456	6.98
M56	6.51	M483	11.24
M59	3.69	M544	5.18
M80	5.40	M545	2.31
M130	1.20	M557	4.85
M160	4.10	M558	4.23
M224	4.23	M559	4.88
M232	3.79	M560	4.27
M247	2.09	M566	3.49
M274	3.65	M570	3.64
M281	3.20	M571	3.67
M306	4.17	M575	4.27
M318	5.22	M576	2.06
M319	2.50	M591	6.47
M321	2.71	M593	6.44
M323	4.86	M594	2.75
M324	1.47	M598	2.89
M325	2.63	M613	3.19
M326	1.59	M614	4.16
M328	3.80	M615	2.53
M329	4.23	M627	1.47
M333	4.26	M630	2.65
M338	3.67	M633	1.46
M348	2.89	Control	1.03
M405	3.50		

n =3.

Table 3 . **Influence of the micrococcal starter cultures on the quantity of the free volatile fatty acids of sausages, μg/g fat**

Type of products	Fatty acids				Total
	C_2	C_3	C4	C6	
M160	1.02 ± 0.005	0.193 ч 0.006	0.224 ч 0.005	0.286 ч 0.002	1.723 ± 0.005
M483	1.06 ± 0.112	0.199 ч 0.008	0.240 ч 0.002	0.294 ± 0.003	1.793 ± 0.035
Control	0.701 ± 0.003	0.128 ч 0.006	0.157 ч 0.006	0.205 ± 0.002	1.191 ± 0.004

n = 3.

Table 2. **Lipolytic activity of selected micrococcal strains expressed as the quantity of free non-volatile fatty acids**

Strain	Fatty acids (mg/g fat)					
	$C_{14:0}$	$C_{16:0}$	$C_{18:0}$	$C_{18:1}$	$C_{14:0}$	Total
M32	—	0.845	—	1.72	—	2.565
M33	—	1.23	0.65	1.91	0.608	4.398
M35	—	0.155	0.056	0.307	0.07	0.588
M56	—	0.84	0.36	1.32	0.674	3.194
M59	—	0.57	0.259	0.786	0.116	1.731
M80	—	0.991	0.196	1.00	0.436	2.623
M130	—	0.156	0.060	0.308	0.070	0.594
M160	—	0.45	0.243	0.865	0.398	1.956
M224	0.098	1.21	0.778	—	—	2.086
M232	0.105	1.12	0.65	—	—	1.875
M247	0.070	0.560	0.325	—	—	0.955
M274	—	0.862	0.915	—	—	1.777
M281	—	0.902	0.605	—	—	1.507
M306	—	0.663	0.269	0.983	0.168	2.038
M318	—	0.807	0.345	1.187	0.253	2.529
M319	—	0.387	0.142	0.616	0.085	1.230
M321	—	0.330	0.174	0.619	0.208	1.331
M323	—	0.526	0.460	1.01	0.397	2.393
M324	—	0.196	0.122	0.38	—	0.698
M325	—	0.559	—	0.704	—	1.263
M326	—	0.439	0.293	—	—	0.732
M328	—	0.618	—	1.22	—	1.838
M329	—	0.66	—	1.15	0.26	2.070
M333	—	0.998	—	1.056	—	2.054
M338	—	0.589	—	1.20	—	1.789
M348	—	0.455	—	—	0.946	1.401
M405	—	0.614	0.237	0.854	—	1.705
M411	—	1.60	—	2.90	—	4.50
M449	—	0.828	0.296	1.02	0.165	2.309
M456	—	1.12	0.305	1.53	0.514	3.469
M483	—	2.07	0.644	2.83	—	5.544
M544	—	0.845	—	1.72	—	2.565
M545	—	0.155	0.060	0.307	0.60	1.122
M557	—	0.526	0.460	1.010	0.397	2.393
M558	—	0.998	—	1.056	—	2.054
M559	—	0.526	0.460	1.010	0.397	2.393
M560	—	0.998	—	1.056	—	2.054
M566	—	0.570	0.259	0.786	0.116	1.731
M570	—	0.589	—	1.20	—	1.789
M571	—	0.589	—	1.20	—	1.789
M575	0.098	1.21	0.778	—	—	2.086
M576	0.070	0.560	0.325	—	—	0.955
M591	—	0.84	0.36	1.32	0.674	3.194
M593	—	0.84	0.36	1.32	0.674	3.194
M594	—	0.33	0.174	0.619	0.208	1.331
M598	—	0.33	0.174	0.786	0.123	1.413
M613	—	0.902	0.605	—	—	1.507
M614	—	0.663	0.269	0.938	0.168	2.038
M615	—	0.387	0.142	0.616	0.085	1.230
M627	—	0.196	0.122	0.38	—	0.698
M630	—	0.559	—	0.704	—	1.263
M633	—	0.196	0.122	0.38	—	0.698
Control	—	0.1032	0.1642	—	0.1998	0.4672

Table 4. **Influence of the micrococcal starter cultures on the quantity of free non-volatile fatty acids of sausages during different stages of production, mg/g fat**

Fatty acids	Type of products	Period of ripening					
		Sausage mix	24h	3rd d	6th d	13th d	Finished product
$C_{14:0}$	M160	–	0.002 ± 0	0.002 ± 0	0.004 ± 0	0.004 ± 0.001	0.004 ± 0
	M483	–	0.002 ± 0	0.003 ± 0.0025	0.005 ± 0.002	0.005 ± 0	0.004 ± 0
	Control	0.002 ± 0	0.002 ± 0	0.002 ± 0	0.002 ± 0	0.003 ± 0	0.003 ± 0
$C_{16:0}$ + $C_{16:1}$	M160	–	0.042 ± 0.001	0.050 ± 0.0022	0.091 ч 0.036	0.098 ± 0.036	0.108 ± 0.020
	M483	–	0.048 ± 0	0.071 ± 0.022	0.111 ± 0.022	0.112 ± 0.017	0.115 ± 0.021
	Control	0.041 ± 0	0.041 ± 0.007	0.047 ± 0.007	0.054 ± 0.012	0.068 ± 0.009	0.089 ± 0.008
$C_{18:0}$	M160	–	0.026 ± 0.004	0.033 ± 0.0011	0.053 ± 0.011	0.058 ± 0.014	0.067 ± 0.006
	M483	–	0.29 ± 0.005	0.046 ± 0.016	0.0623 ч 0.014	0.070 ± 0.004	0.084 ± 0.014
	Control	0.025 ± 0.005	0.025 ± 0.005	0.030 ± 0.001	0.033 ± 0.006	0.042 ± 0.003	0.062 ± 0.006
$C_{18:1}$	M160	–	0.052 ± 0.008	0.064 ± 0.003	0.104 ± 0.025	0.117 ± 0.025	0.135 ± 0.015
	M483	–	0.060 ± 0.006	0.090 ± 0.033	0.124 ± 0.051	0.137 ± 0.016	0.152 ± 0.034
	Control	0.050 ± 0.006	0.051 ± 0.008	0.062 ± 0.003	0.069 ± 0.012	0.087 ± 0.005	0.115 ± 0.014
$C_{18:2}$	M160	–	0.0080 ± 0.003	0.009 ± 0.002	0.014 ± 0.006	0.017 ± 0.006	0.021 ± 0.003
	M483	–	0.012 ± 0.006	0.018 ± 0.008	0.021 ± 0.006	0.022 ± 0.006	0.025 ± 0.008
	Control	0.063 ± 0.003	0.007 ± 0	0.008 ± 0.002	0.009 ± 0	0.017 ± 0.004	0.020 ± 0.003

n = 3

Table 1

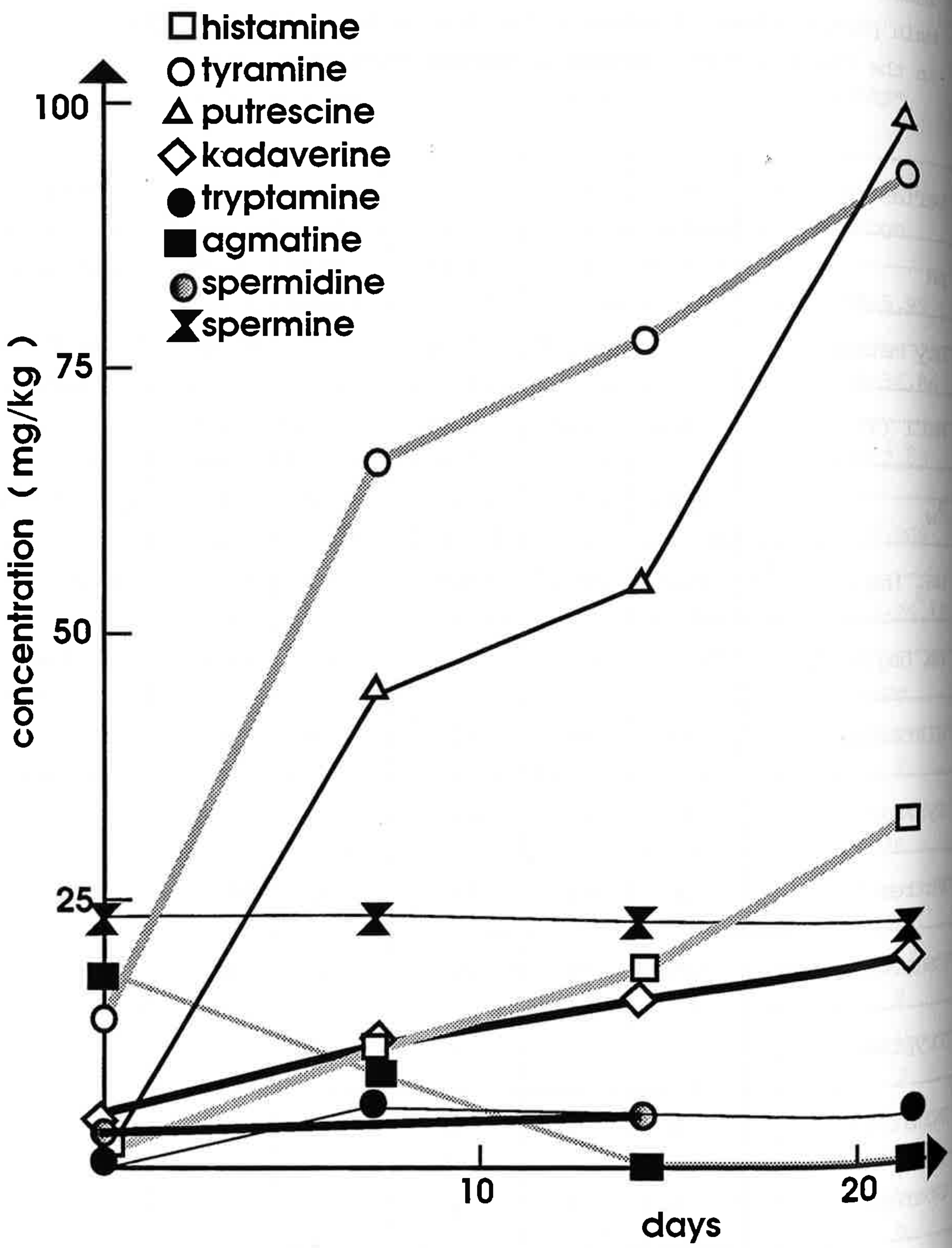
Main physico-chemical values and content of biogenic amines (BA) in the sausage batter for the production of fermented sasage "HERKULES"

Series (n = 7)	A	B	C	D	Average	Range
pH	5,81	5,74	5,82	5,56	5,73	5,50-5,95
Dry matter (%)	55,02	52,59	51,65	53,04	53,04	53,08-56,86
NaCl (%)	2,54	2,43	2,45	2,45	2,47	2,37-2,63
a_w	0,967	0,968	0,968	0,968	0,968	0,964-0,969
NH_3 (mg.100.g^{-1})	22,25	18,43	18,26	19,72	19,67	16,32-25,16
B A (mg.kg^{-1})	A	B	C	D	Average	Range
Histamine	< 1	1	1	< 1	1	< 1 - 2
Tyramine	4	3	24	8	10	1 - 36
Putrescine	1	1	1	1	1	1 - 2
Cadaverine	2	1	7	1	3	1 - 9
Tryptamine	< 1	0	0	0	0	0 - 2
Agmatine	8	11	30	7	14	1 - 38
Spermidine	2	4	3	1	2	1 - 9
Spermine	18	26	21	24	22	14 - 30
Total B A	**35**	**46**	**87**	**42**	**53**	**18 - 95**

Table 2
Main physico-chemical values and content of biogenic amines (BA) in the final product - fermented sausage "Herkules"

Series (n = 7)	A	B	C	D	Average	Range
pH	4,79	4,87	4,86	4,87	4,85	4,68-5,02
Dry matter (%)	66,98	65,88	57,30	67,50	62,58	55,41-69,50
NaCl (%)	3,13	3,29	3,23	3,19	3,21	2,75-3,65
a_w	0,951	0,951	0,959	0,951	0,953	0,947-0,964
NH_3 ($mg.100.g^{-1}$)	38,27	40,80	60,81	50,81	47,67	35,02-63,58
BA ($mg.kg^{-1}$)	A	B	C	D	Average	Range
Histamine	19	41	12	33	26	3 - 76
Tyramine	99	102	101	85	97	57 -167
Putrescine	116	114	117	81	107	20 -189
Cadaverine	23	57	25	10	29	5 -154
Tryptamine	3	9	4	3	5	0 - 19
Agmatine	0	0	0	0	0	0
Spermidine	5	5	4	4	5	3 - 12
Spermine	30	30	21	22	26	23 - 37
Total B A	**295**	**358**	**284**	**238**	**295**	**184 - 676**

PICTURE 1 AMINES DURING RIPENING



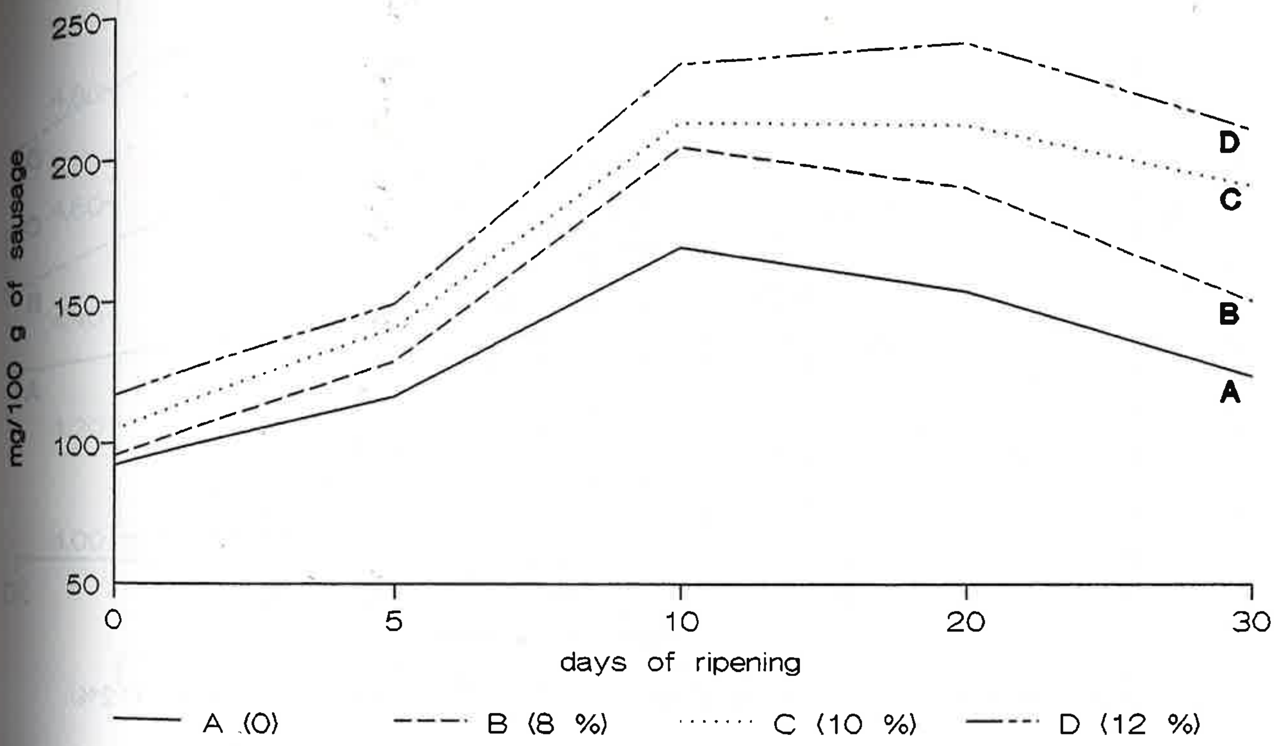


Figure 1 Changes of lactic acid content in the experimental sausages

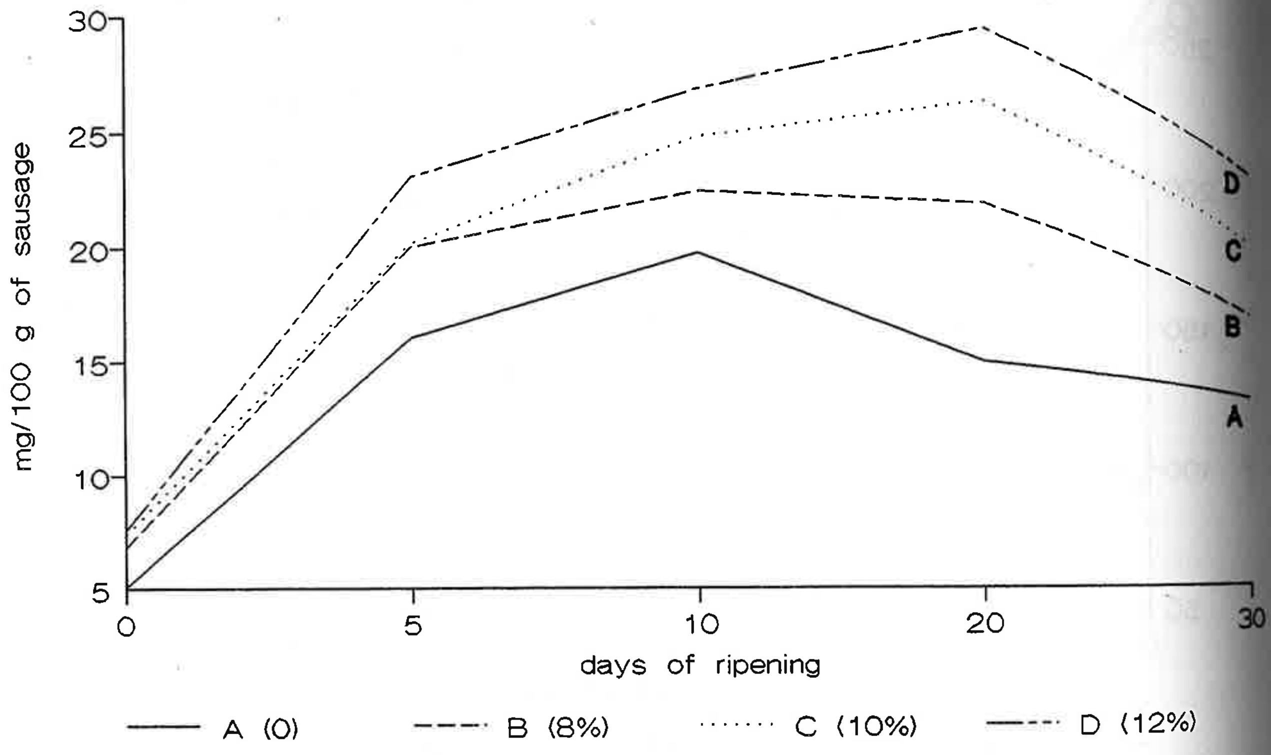


Figure 2 Changes of volatile low fatty acids content in the experimental sausages

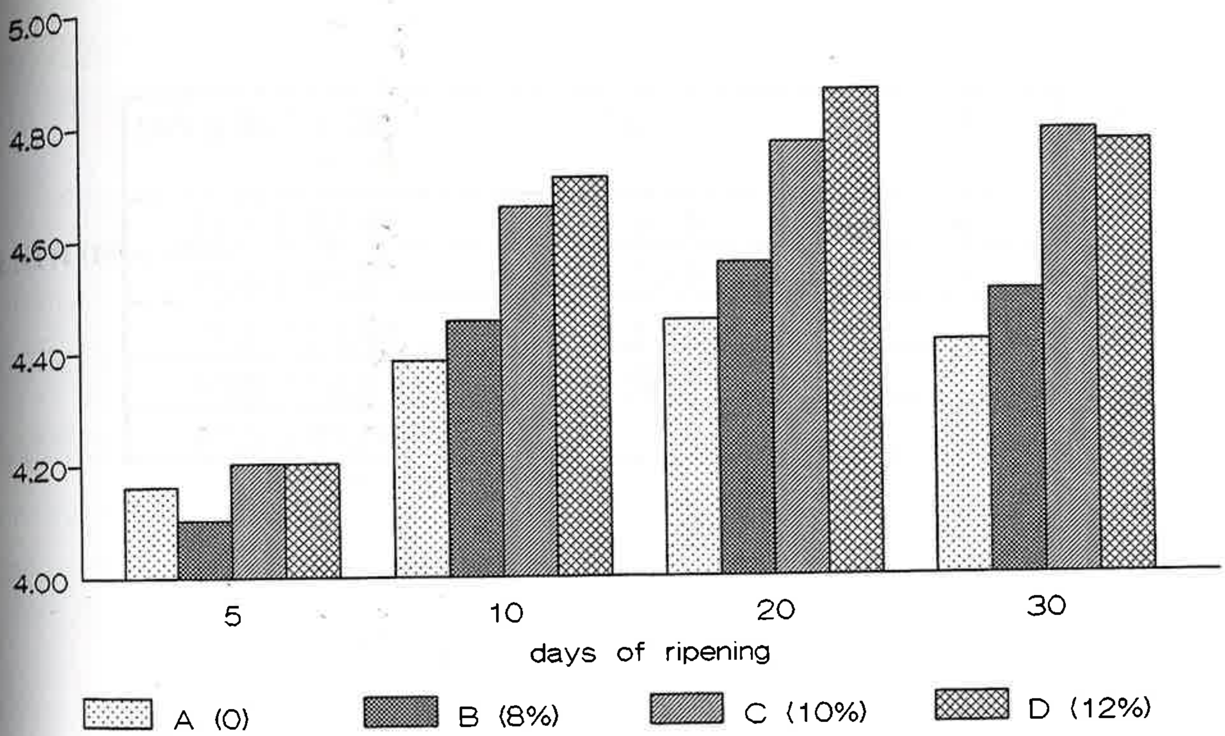


Figure 3 Overall sensoric acceptability of the experimental sausages

TABLE 1.-

Days	pH	DRY MATTER (%)
0	6,36 ± 0,05	32,10 ± 1,17
2	6,04 ± 0,03	35,04 ± 2,16
4	4,74 ± 0,07	40,65 ± 1,19
20	4,60 ± 0,09	48,67 ± 2,24
36	4,50 ± 0,03	66,35 ± 2,12

TABLE 2.-

SAMPLE	MAX.STRESS (kg/mm^2)	TOUGHNESS (kg/mm^2)
CONTROL	0,065 ± 0,012	0,051 ± 0,008
6 U/ 100 g	0,058 ± 0,008	0,042 ± 0,007
60 U/ 100g	0,049 ± 0,003	0,032 ± 0,005

Figure 1.-

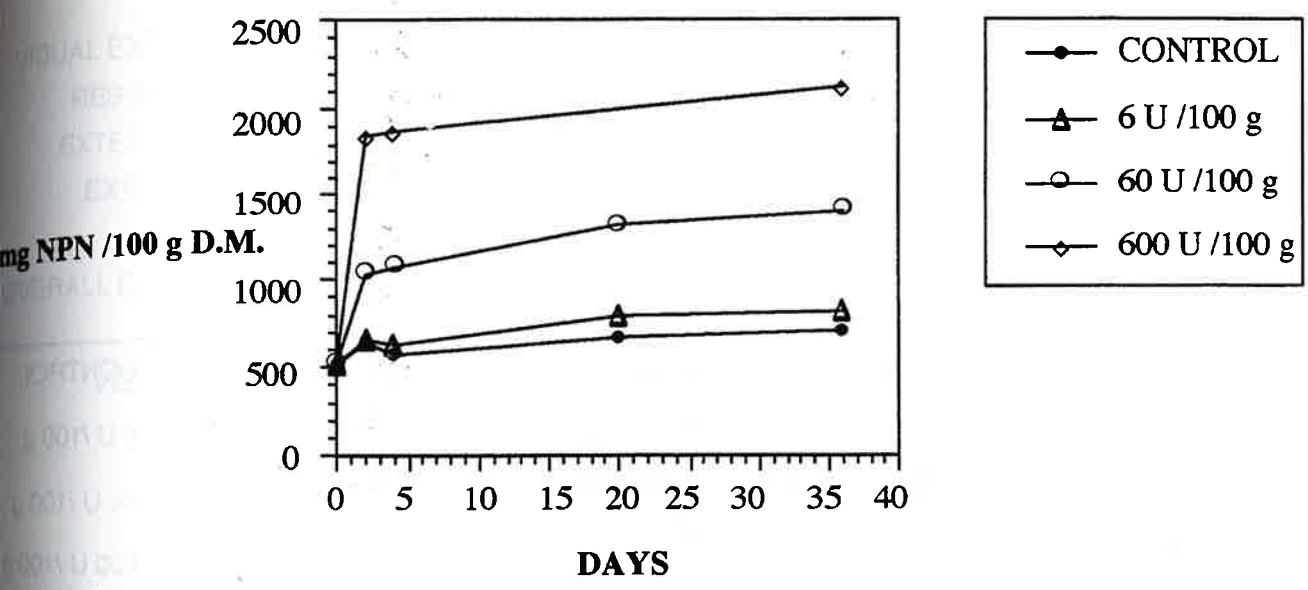


Figure 2.-

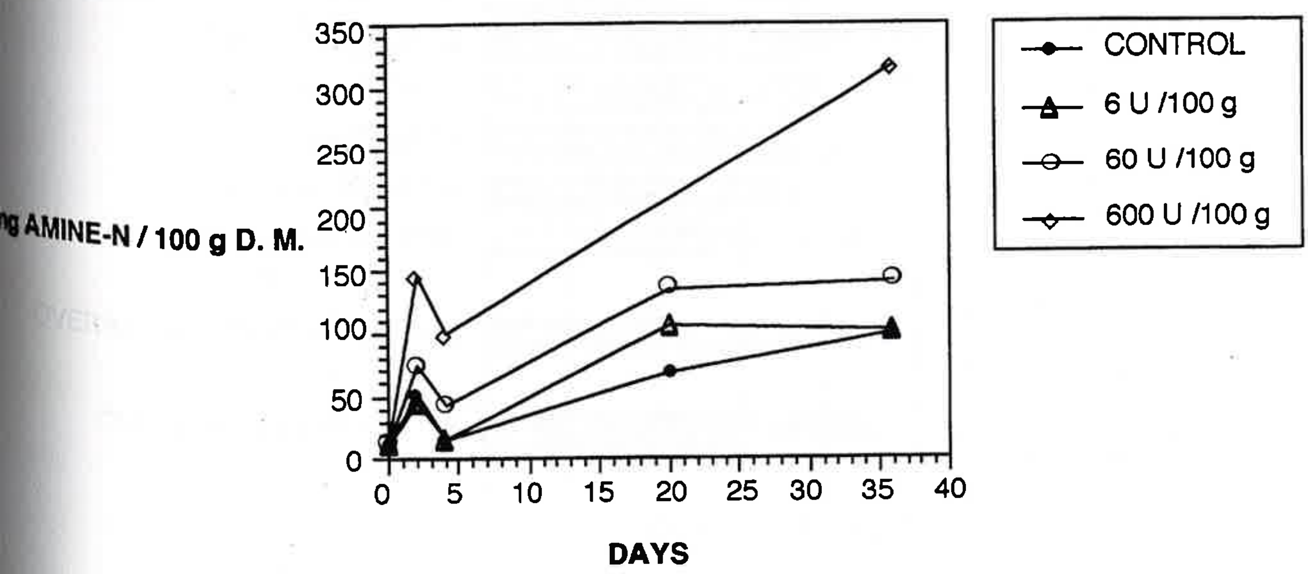


Figure 3 .-

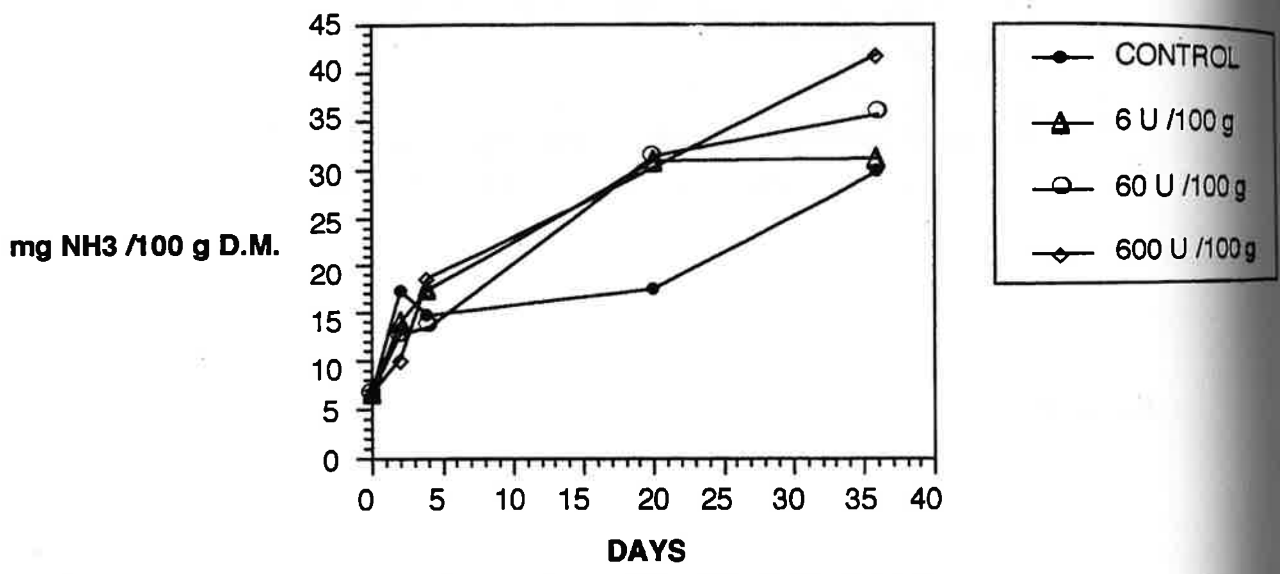
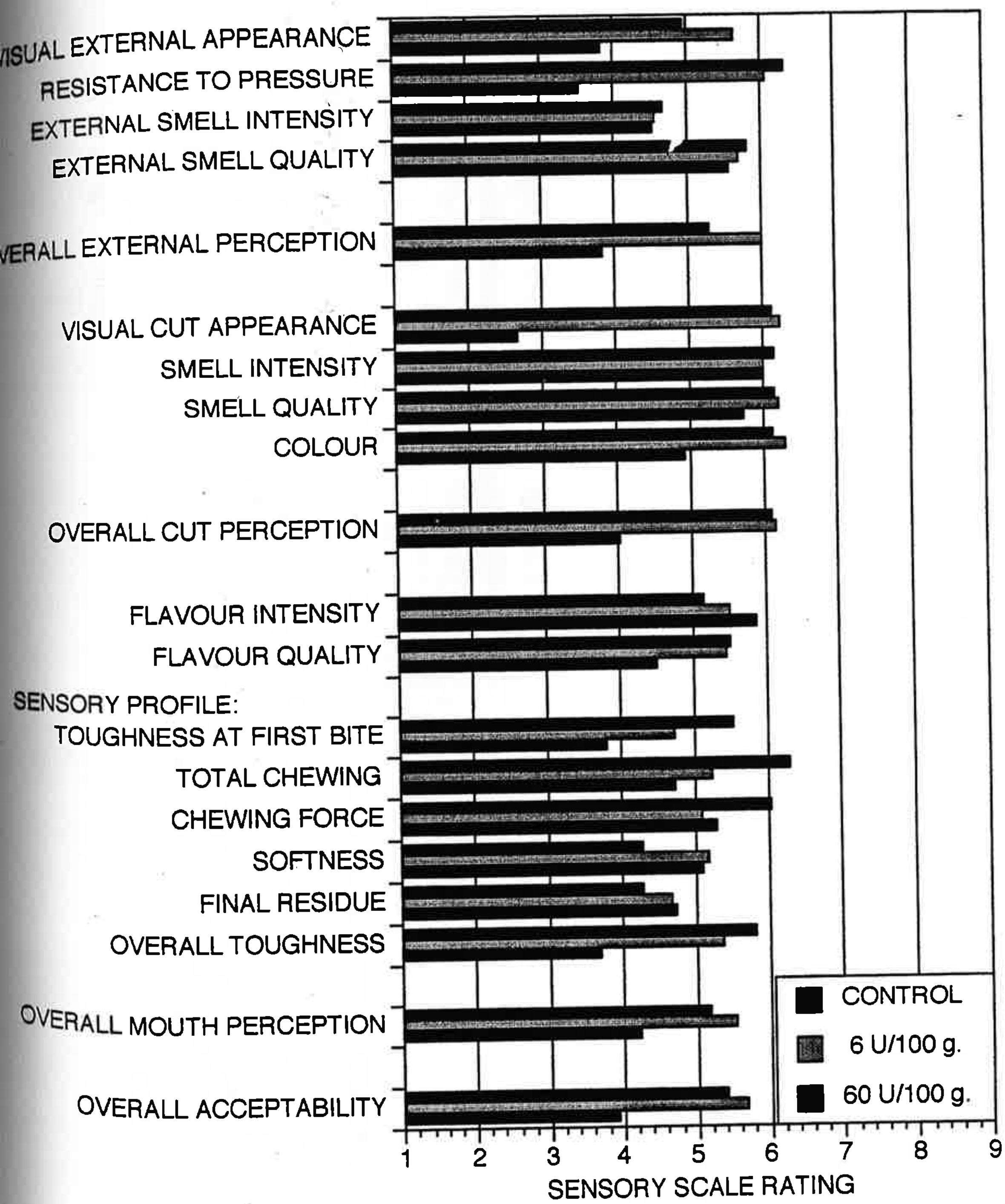
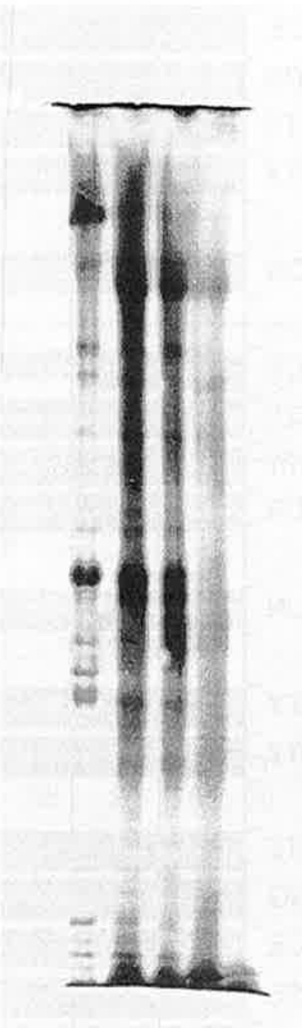

mg NH3 /100 g D.M.
45
40
35
30
25
20
15
10
5
0
0
5
10
15
20
25
30
35
40
DAYS
CONTROL
6 U /100 g
60 U /100 g
600 U /100 g

Figure 4 .-


VISUAL EXTERNAL APPEARANCE
RESISTANCE TO PRESSURE
EXTERNAL SMELL INTENSITY
EXTERNAL SMELL QUALITY
OVERALL EXTERNAL PERCEPTION
VISUAL CUT APPEARANCE
SMELL INTENSITY
SMELL QUALITY
COLOUR
OVERALL CUT PERCEPTION
FLAVOUR INTENSITY
FLAVOUR QUALITY
SENSORY PROFILE:
TOUGHNESS AT FIRST BITE
TOTAL CHEWING
CHEWING FORCE
SOFTNESS
FINAL RESIDUE
OVERALL TOUGHNESS
OVERALL MOUTH PERCEPTION
OVERALL ACCEPTABILITY
CONTROL
6 U/100 g.
60 U/100 g.
1
2
3
4
5
6
7
8
9
SENSORY SCALE RATING



1 2 3 4 5

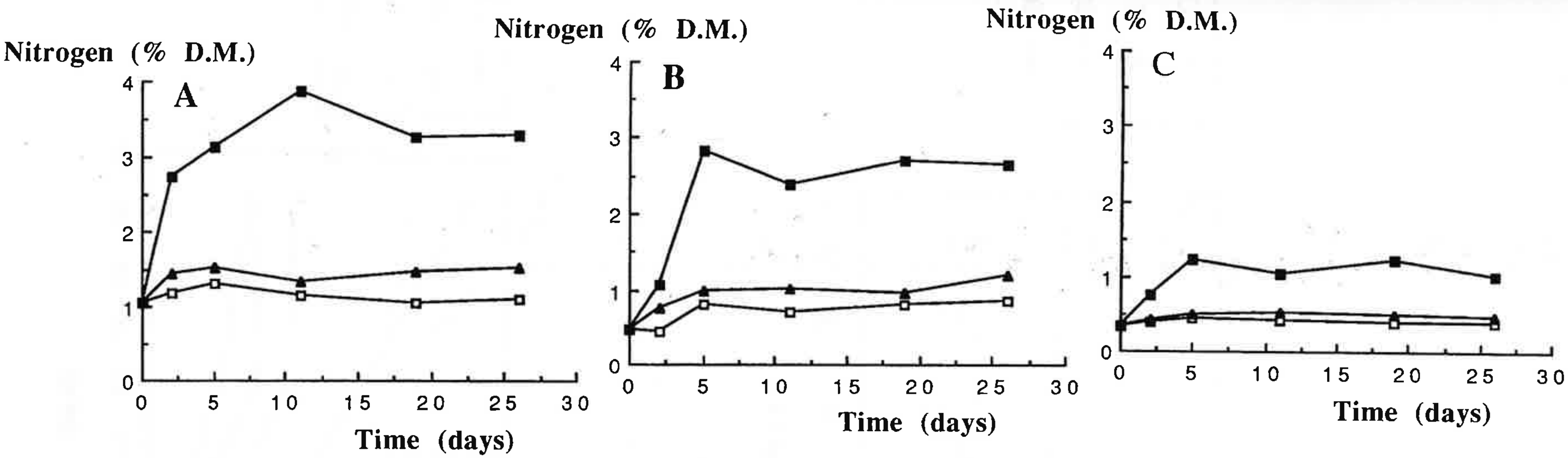


Figure 1. Effect of the addition of papaine (□, control; ▲, 800 units; ■, 4500 units) on the changes in (A) water soluble (WSN), (B) non protein (NPN) and (C) 5 % phosphotungstic acid soluble (PTN) nitrogens during the ripening of experimental dry fermented sausages.

Figure 1.-

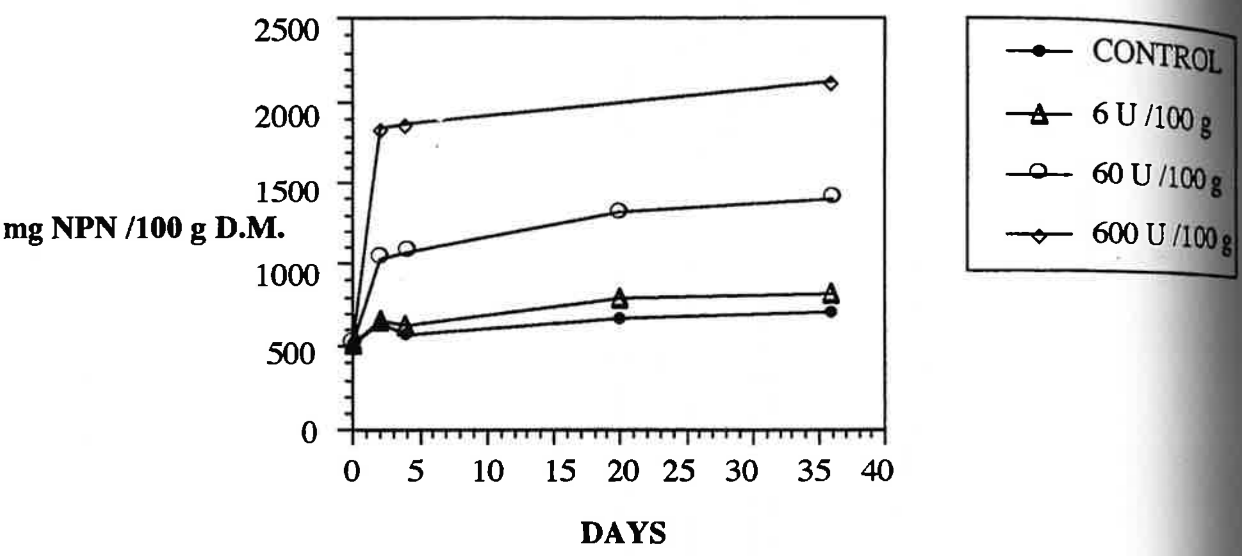
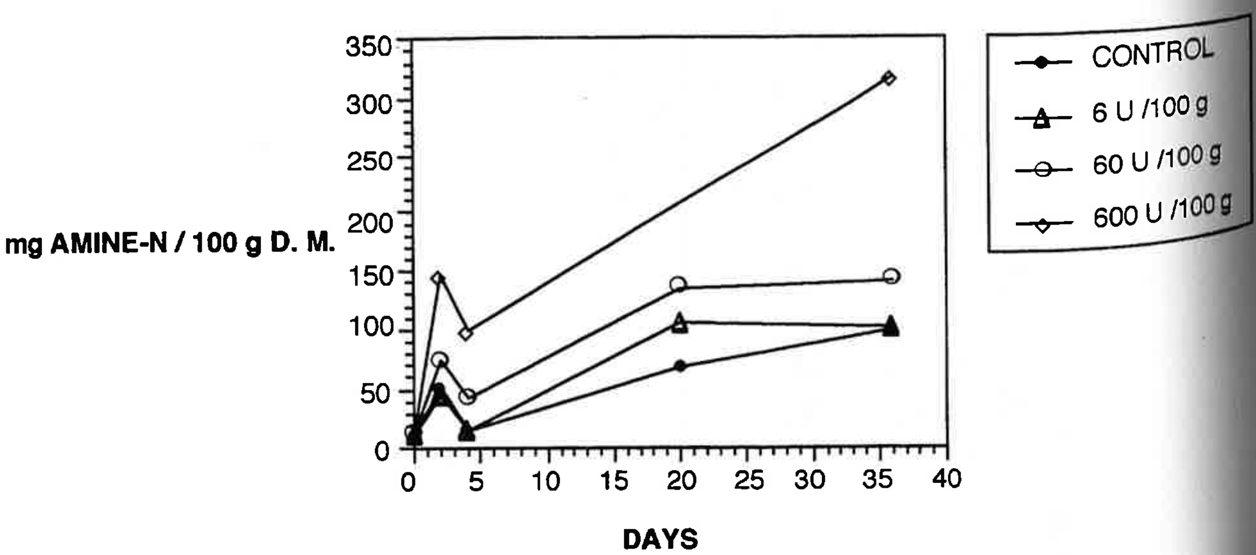


Figure 2.-



Batch	P added (units)*	Colour and appearance	Texture	Flavour	Overall quality**
Control	0	7.7a	7.1a	7.1a	7.1a
800P	800	7.2a	6.2b	7.1a	6.9a
4500P	4500	3.5b	2.5c	3.2b	3.0b

Different letters in each column means significative difference at $p < 0.01$
*For unit definition see text
** Overall quality = Colour and appearance x 0.1 + Texture x 0.25 + Flavour x 0.65

Table 1. Effect of papaine (P) on selected sensorial characteristics of experimental dry fermented sausages after 26 days of ripening (0-10 scale)

Fig.1.

Biogenic amine production by *Lactobacillus jensenii* in MRS broth supplemented with 0,1 % lysine

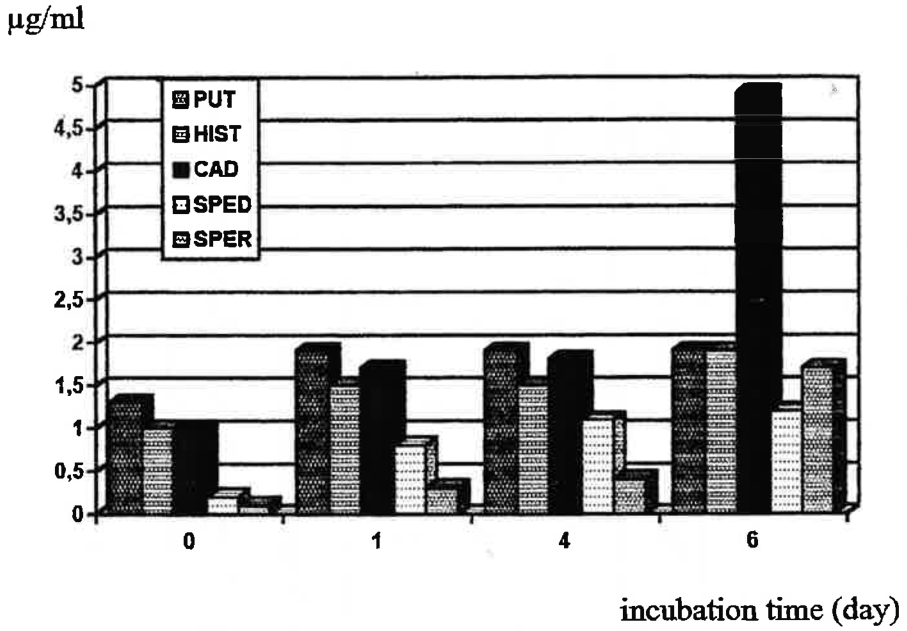


Fig. 2.

Biogenic amine production by *Lactobacillus jensenii* in MRS broth supplemented with 0,1 % histidine

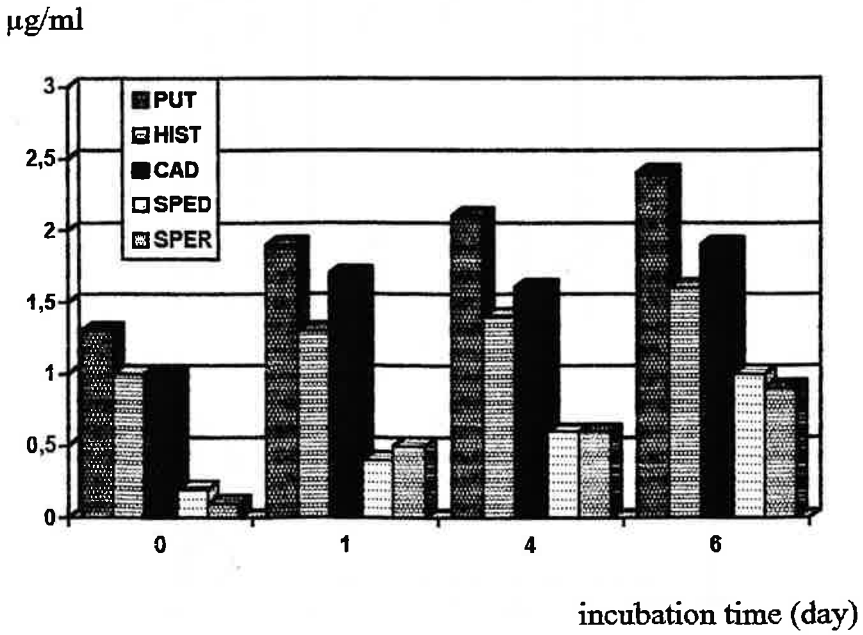


Fig. 3.

Biogenic amine production by *Lactobacillus jensenii* in MRS broth supplemented with 0,1 % ornithine

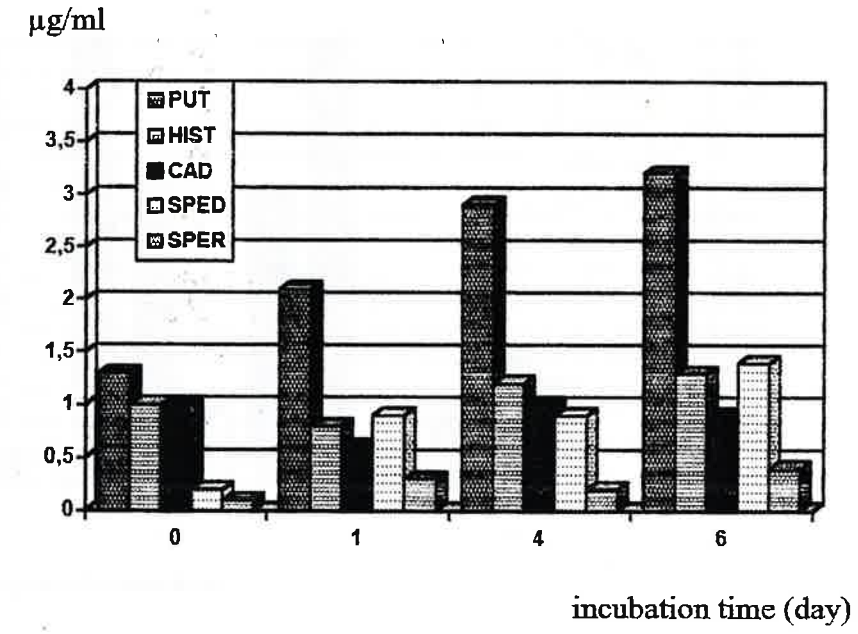


Fig. 4.

Changes in biogenic amine level of pork meat inoculated with *Lactobacillus jensenii* at 5 °C

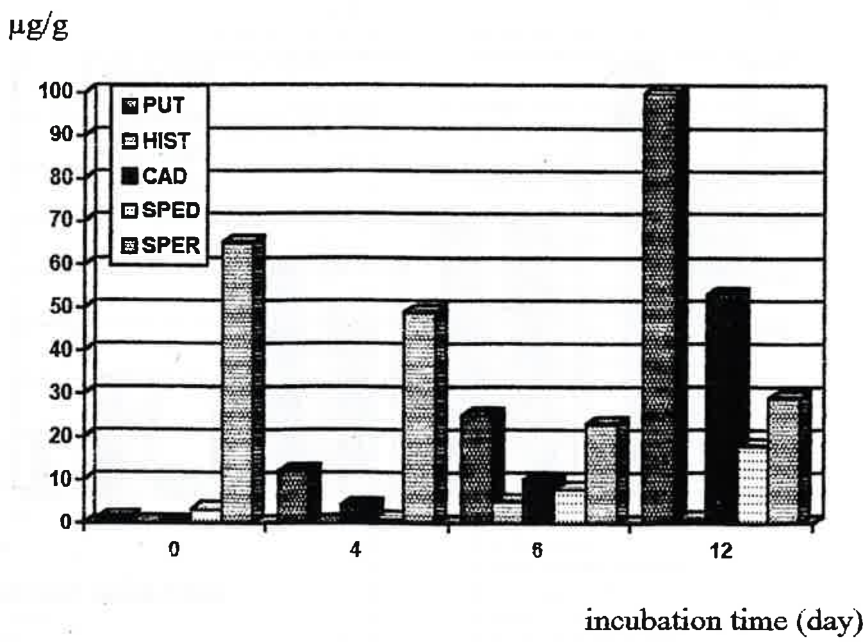


Fig. 5.

Changes in biogenic amine level of pork meat inoculated with *Lactobacillus jensenii* at 15 °C

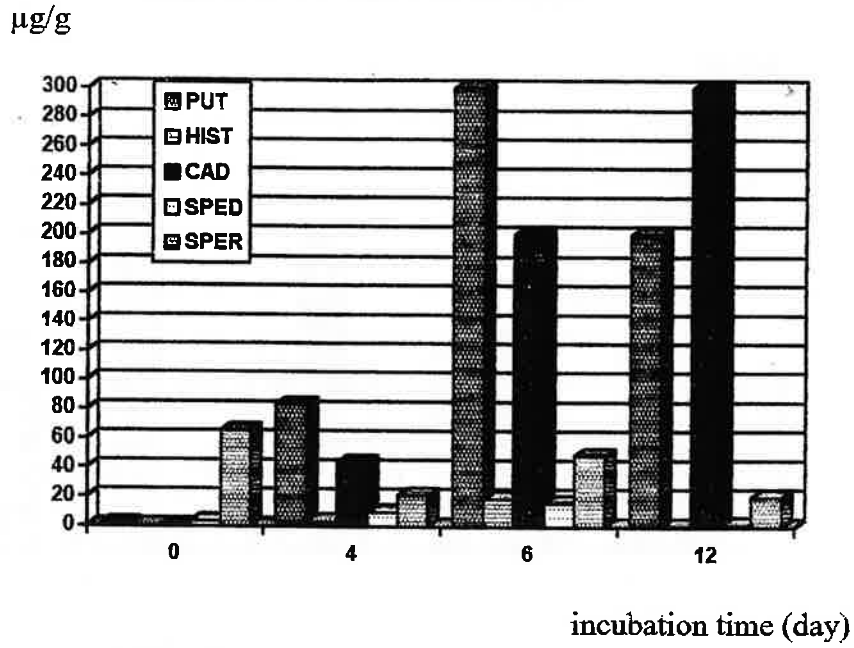


Fig. 6.

Changes in free precursor amino acids of pork meat inoculated with *Lactobacillus jensenii*