6:5

Influence of boar taint in organoleptic characteristics of spanish cured ham.

ARNAU J., DIAZ I., GARCIA-REGUEIRO, J.A., HORTOS M. and CASADEMONT G.
Institut Català de la Carn (IRTA). Generalitat de Catalunya. Granja Camps i Armet. Monells. (Girona) Spain.

INTRODUCTION

In the last years entire male pigs are used in Spain for meat production (1). The utilization of non castrated pigs can be supported by the adventages in lean meat production and feed conversion. 5 -Androst-16-ene-3-one (5α-An) and Skatole (3-methylindole) are the principal responsibles of boar taint. Androstenone was associated with boar taint by Patterson in 1968 (2); the biosynthesis of 5α-An is made basically in the testicles, and it is accumulated in the fat tissue. Skatole is a degradation product of tryptophan (3), produced by the activity of the gut flora. Skatole is present in fat and muscle of pigs (4). The economical advantages obtained rearing boars are limited by the existence of certain number of carcasses with boar taint. The carcasses with strong boar taint can be used comminuted meat products meat products, mixed with meat from gilts. Thus, boar taint can be diluted down to the threshold value. Carcasses with light or moderate boar taint could be used for production of salami and smoked cured ham (6). However in Spain cured ham manufacturers impute several organoleptic failures in cured hams to the use of entire male pigs. The purpose of the present work was to study the influence of boar taint on the reject of cured ham by means of two evaluation systems: objective concentrations of 5α-An, Skatole and indole, and subjective evaluation by panel test. Correlation between panel-test and concentrations of 5α-An and Skatole were studied.

MATERIAL AND METHODS

200 hams from entire male pigs were evaluated for boar taint. Sensorial evaluation was carried out according to the method described by Jarmoluk et al. (1970) (7). Samples were checked by a 4 member panel test. They were sensibles to 5α-An and Skatole. The scale employed to classify the samples was: 0, absent; 1, dubions; 2, weak; 3 present and 4, strong. Each sample was subjected to three olfactory assays by panelist. The final odour note was calculated relecting the mode of 12 judgements obtained. 15 hams were selected and fat samples were analyzed to determine initial concentrations of Skatole and indole. The selected hams were subjected to the following process: curing for 12 days, salt equilibration 30 days at 2-5°C, drying for 4 month with a increasing temperature ranging from 12°C to 30-35°C at the end of the process, HR:75-80%. Cured hams were deboned and vacuum packed. 5α-An, Skatole and indole concentration were determined and cured hams were evaluated by a tasting panel composed by members sensibles to 5α-An (A^+) and members insensibles to 5α-An (A^-). All members can detect Skatole. At each sensory evaluation, three samples were evaluated. The panelists had to distinguish tainted samples (1 or 2) from control samples (triangular test). 5α-An was determined according to the method described by Garcia-Regueiro and Diaz (1985) (8). Skatole and indole were analized by HPLC according to the method developed by Garcia-Regueiro et al. (1986) (9). HPLC conditions were: column olichrosorb RP-18 (25 cm X 4,6 mm) 5 μm; mobile phase: methenol: water (6:4) at 1 ml/min operated at ambient temperature; uv detection: at 225 or 280 nm. HRGC conditions: column FSOT OV-1 (bonded phase) 25 m X 93 mm (SGE, Australia), carrier gas: halium at 30 cm/seg. Temperature program: 80°C-4°C/min-250°C; inyection system: splitless. FiD detection was employed.

RESULTS AND DISCUSSION

The percentage of hams with boar taint, was aprox. 15%, similar to the results expresed by Arpa et al., (1984) (10); they found in 519 samples of back fat : 78,8% of free boar taint carcasses; 15,8% with light levels (0,6-0,8 μg/g); 4,6% with present boar taint and 98 % strong boar taint carcasses. 5α-An levels in back fat are variables, and it is not correlated with several parameters (carcass weight, age,...). Threshold values has not been clearly established, but 1 μg/g can be considered limit value for detection by olfectory evaluation ( ). Maximal concentration of 5α-An found in the samples analyzed was 2,67 ug/g, corresponding to ham N°1; whose sex odour note was 4 (strong boas taint). Concentrations of skatole and indole decreased during the process. These variations can be due to the reactions with peroxides, aldheydes or other electrophykic compounds. Sample n°1 was only classified as tainted by panelists A^+ (sensibles to 5α-An). Panelists A^- had more difficulties to carry out a judgement of the samples; therefore sex odour affects specially to persons sensibles to 5α-An. High correlation was found between olfatory panel test in fresh hams and tasting panel in cured hams $R=0,85$ ($P \leq 0,01$). The correlation between androstenone level and that evaluated by olfatory panel test and tasting panel was 0,53 and 0,64 respectively. Lower correlations were obtained between skatole and subjective evaluations (R=0,30 for olfatory panel test and R=0,22 for tasting panel). It is extremely difficult for boar taint to be detected on the factory floor through smell, owing to the limitations of the human olfactory system, specially as the detection is normally consumed cold, but during mastication fat temperature increases, and boar taint ca be detected. Therefore entire male pig carcasses with high boar taint scores, are not suitable for the production of spanish dry cured hams, as the product may be rejected by the consumer. This , curing and drying process does not eliminate boar taint, but it can be slightly masked by rancidity.

REFERENCES

1) Diestre A., Calsina D., Casademont G. & Monfort J.Mª. "A note on the incidence of boar taint in the carcasses of non castrated pigs slaughtered in Catalunya". 28th European Meeting of Meat Research Workers 9.26:464-466.
2) PATTERSON R.L.S. 5α-androst-16-ene-3 one. Compound responsible for taint in boar fat. J. Sci. Fd. Agric. 19, 31-38 (1968).
3) HANSON K.E., LUNDSTROM K., FJELKNER-MODIG S. & PERSSON J. "The importance of androstenone and skatole for boar taint". Swedish J. Agric. Res. 10, 167-173 (1980).
4) Mortensen A.B. & Sørensen S.E. Relationship between boar taint and skatole determined with a new analysis method. Proc. 30th European Meeting of Meat Research Workers, Bristol. (1984).
5) MALMFORS B. & LUNDSTROM K. "Consumer reactions to boar Meat" A Review Livest. Pro. Sci. 10 187-196 (1983).
6) PEARSON A.M., NGODDY S., PRICE J.F. & LARZELERE H.E. "Panel acceptability of products containing boar meat" J. Anim. Sci. 33 26-29 (1971).
7) JARMOLUK L., MARTIN A.H. & FREEDEN H.T., 1970. Detection of boar taint in pork. Can. J. Anim. Sci., 50: 750-752 (1970).
8) GARCIA REGUEIRO J.A. & DIAZ I. "Determination of 5α-Androst-16-en-3-one in Back Fat of Pigs by CGC and ECD. HRCC of CC 8 (1985) 698-699.
9) GARCIA REGUEIRO J.A., HORTOS M., ARNAU C. & MONFORT J.M. "Determination of skatole and indole in back fat of pigs by HPLC". J. of HRC & CC. (in press).
10) ARPA I., DIESTRE A. & MONFORT J.Mª. "Incidencia del olor sexual en canales porcinas de machos sin castrar según panel de olfación y su relación con la androstenona" (in press).

TABLA I 5α-Androstenone, skatole and indole concentrations in fresh and cured hams.

ham no.	olfatory panel test	5α-Androstenone (ppm)	Indole (ppm)		skatole (ppm)	
		c.h.	f.h.	c.h.	f.h.	c.h.
1	4	2,67	0,01	0,01	0,01	0,01
2	3	1,29	0,14	ND	0,25	0,24
3	3	1,06	0,04	0,09	0,16	0,09
4	3	1,02	0,01	0,01	ND	0,17
5	2	ND	0,01	ND	0,12	ND
6	2	0,39	0,02	0,01	0,13	0,01
7	2	ND	0,03	ND	0,29	0,083
8	2	1,1	0,07	0,01	0,15	0,01
9	2	0,01	0,05	0,03	0,19	0,16
10	1	0,99	0,01	0,01	0,01	0,01
11	1	2	0,03	0,01	0,28	0,01
12	1	1,10	0,03	0,01	0,101	0,01
13	0	0.16	0,03	0,01	0,08	0,01
14	0	0,78	0,01	0,01	0,01	0,01
15	0	0,27	0,01	0,01	0,02	0,01

c.h. cured ham
f.h. fresh ham

TABLE II Percentage of responses in tasting panel.

ham no			1	2	3	6	7	8	11	12	13	14
sex odour note			4	3	3	2	2	2	1	1	0	0
(Androst.) µg/g			2,67	1,29	1,06	0,39	ND	1,1	2	1,1	0.16	0,78
(skatole) µg/g			0,01	0,25	0,16	0,13	0,29	0,15	0,28	0,10	0,08	0,01
(indole)µg/g			0,01	0,14	0,04	0,02	0,03	0,07	0,03	0,03	0,03	0,01
Members	A^+		10	8	8	8	8	8	8	10	8	10
	A^-		2	4	4	2	2	4	4	2	4	2
Percentage of responses in tasting panel	A^+	+	100	90	50	25	50	37	37	0	25	0
		D	0	0	13	12	0	13	0	30	0	0
		-	0	10	37	63	50	50	63	70	75	100
	A^-	+	0	25	25	50	0	25	25	0	25	0
		D	0	0	0	50	0	0	25	50	0	0
		-	100	75	75	0	100	75	50	50	75	100

+: Boar taint present
D: Boar taint dubious
-: Boar taint is not present

TABLE III Variable correlations

	1	2	3	4
1	-	0,85***	0,53	0,30
2		-	0,64*	0,22
3			-	0,09
4				-

1: olfatory panel test
2: % of positive responses of A^+ members in tasting panel
3: Androstenone
4: skatole

*** $P < 0,01$
* $P < 0,1$