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in

Audiot A. (ed.), Casabianca F. (ed.), Monin G. (ed.).
5. International Symposium on the Mediterranean Pig

Zaragoza : CIHEAM
Options Méditerranéennes : Série A. Séminaires Méditerranéens; n. 76

2007
pages 287-289

Use of low intensity ultrasound in fat back from pigs with different genetic background

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SUMMARY – In this work, the use of low-intensity ultrasound on back fat as an objective and non-destructive analytical technique to differentiate between back fats from Iberian pigs (Ib) and from Iberian x Duroc (IbxD) crossbreed pigs, was studied. The ultrasonic velocity decreased as the temperature during the assay increased (from 0 to 25℃) in all the batches. This fact is caused by the melting of the fat with increasing temperatures resulting in an increase in the liquid content of the system. It is generally recognised that the ultrasonic velocity is lower in liquid than in solid fat. Measurements of ultrasonic velocity were significantly lower in back fat from the Ib batch (1594 m/s) than in the IbxD batch counterpart (1600 m/s). These results are probably due to the differences in fatty acid composition between the batches. Back fat from the Ib batch shows significantly higher percentages of oleic acid and monounsaturated fatty acids than that from the IbxD batches. Therefore, back fat from Ib was more fluid than IbxD back fat, which involves a decrease in ultrasonic velocity in the former. In conclusion, these results show that the measurement of ultrasonic velocity in fat back could be used to differentiate between pure Iberian pigs and Iberian x Duroc crossbreed pigs.

Keywords: Iberian, Iberian x Duroc, back fat, ultrasonic velocity, fatty and composition, fenidity, temperature.

RESUME – *"Utilisation d'ultrasons à faible intensité sur le gras dorsal de porcs de différent type génétique". Dans cette étude a été examinée l'utilisation d'ultrasons à faible intensité sur le gras dorsal comme technique d'analyse objective et non destructive pour différencier le gras dorsal de porcs Ibériques (Ib) et celui de porcs croisés Ibérique x Duroc (IbxD). La vitesse des ultrasons a diminué à mesure que la température augmentait pendant l'essai (de 0 à 25℃) dans tous les lots. Ceci est causé par la fonte du gras à températures croissantes, résultant en une augmentation de la teneur en liquide du système. Il est généralement admis que la vitesse des ultrasons est inférieure dans le gras liquide par rapport au gras solide. Les mesures de vitesse des ultrasons ont été significativement plus faibles dans le gras dorsal du lot Ib (1594 m/s) par rapport au lot IbxD (1600 m/s). Ces résultats sont probablement dus aux différences de composition en acides gras entre les lots. Le gras dorsal du lot Ib montre un pourcentage significativement supérieur d'acide oléique et d'acides gras monoinsaturés par rapport aux lots IbxD. Par conséquent, le gras dorsal des animaux Ib était plus fluide que celui des animaux IbxD, ce qui implique une baisse de la vitesse des ultrasons chez le premier. En conclusion, ces résultats montrent que la mesure de la vitesse des ultrasons dans le gras dorsal pourrait être utilisée pour différencier les porcs Ibériques purs et les porcs croisés Ibérique x Duroc.*

Mots-clés : *Ibérique, Ibérique x Duroc, gras dorsal, vitesse des ultrasous, composition en acides gras, fluidité, temperature.*

Introduction and aim

Low-intensity ultrasound can be used to provide information about the quality properties of foods. It is a useful, rapid and non-destructive technique of analysis. In this work, the use of low-intensity ultrasound on back fat as an objective and non-destructive analytical technique to differentiate between raw meat from pure Iberian pigs (Ib) and from Iberian x Duroc (IbxD) crossbreed pigs, was studied.

Materials and methods

Fat content determination (Bligh and Dyer,1959) and measurements of ultrasonic velocity (m/s) at different temperatures (from 0℃ to 20℃) (Simal *et al.*, 2003) were carried out in back fat samples from different Iberian pig crossbreeds (pure Iberian-Ib-, Iberian sow x Duroc boar-IbxD- and Duroc sow x Iberian board -DxIb-). Fatty acid methyl esters (López-Bote *et al*., 1997) (FAME) were analysed by gas chromatography (GC)-flame ionisation detector (FID).

Results and discussion

Ultrasonic velocity decreased with the temperature (Fig. 1) due to two effects, the negative temperature coefficient of UV in fat and the increase in the liquid content due to fat melting, which has a lower velocity than solid fat (McClements, 1997). This effect have been observed in previous works (Benedito *et al*., 2001; Anand Pal Singh *et al.*, 2004). Measurements of ultrasonic velocity (Fig. 2) were significantly lower in back fat from Ib batch than in the IbxD batch counterpart. These results are probably due to the differences in fatty acid composition between the batches (Fig. 3). Back fat from the Ib batch shows significantly higher percentages of monounsaturated fatty acids than that from the IbxD batches. Therefore, back fat from Ib was more fluid than IbxD back fat, which involves a decrease in ultrasonic velocity in the former.

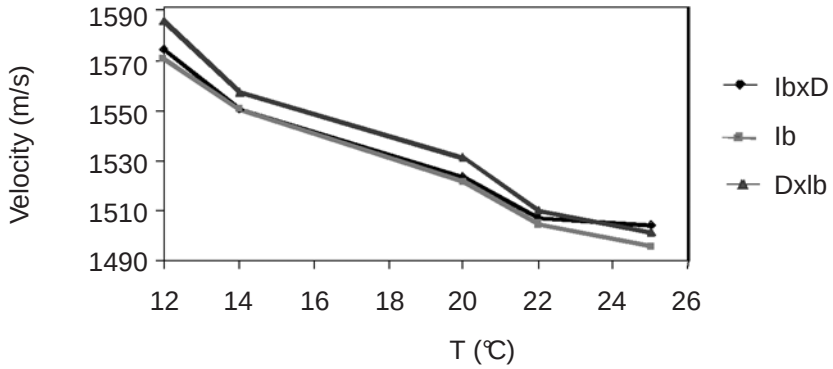

Fig. 1. Influence of sample tempertature on ultrasound velocity.

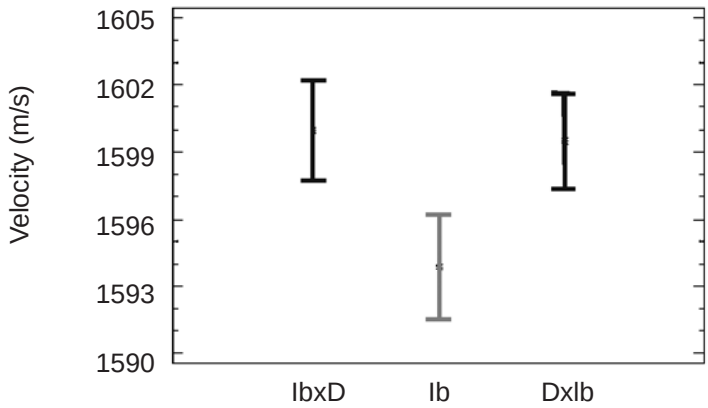

Fig. 2. Means values of ultrasonic velocity (m/s) on back fat from pigs with differnt genetic background.

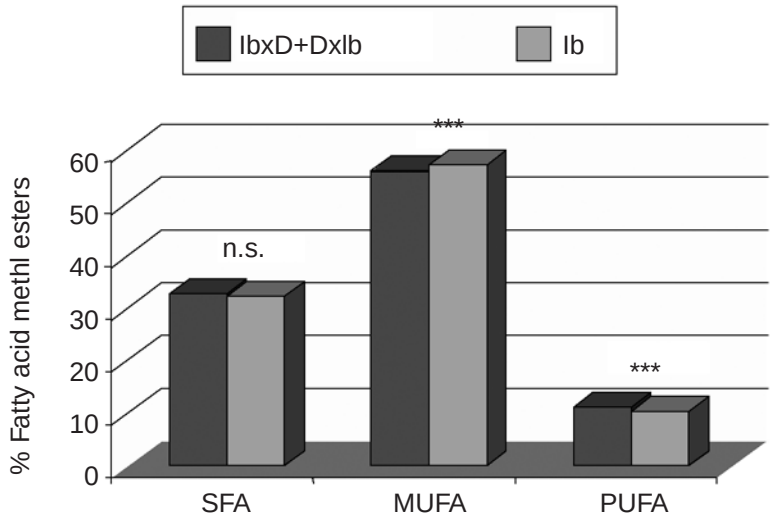

Fig. 3. SFA: saturated fatty acids. MUFA: monounsaturated fatty acids. PUFA: poliunsaturated fatty acids. ***: significant differences ($p<0.005$); n.s.: non significant differences.

Conclusions

Measurement of the ultrasonic velocity in back fat could be used to differentiate between pure Iberian pigs and Iberian x Duroc crossbreed pigs.

Acknowledgements

Sonia Ventanas thanks the "Ministerio de Educación" for the grant "FPU" and support during the development of this work. The authors also thank the "Ministerio de Ciencia y Tecnología" for the support of the project entitled: "Hacia el establecimiento de predictores de calidad en la materia prima y en productos del cerdo ibérico mediante parámetros fisico-químicos (ULTRAFAT)" (Project AGL 2001-6932-01).

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