COUNTRY OF ORIGIN AND COOKING ENDPOINT TEMPERATURE EFFECT ON THE FLAVOUR PROFILE OF BEEF

O.P. Soladoye[1], N.J. Gaudette[2], Z. Pietrasik[2], J.L. Aalhus[1], and N. Prieto[1*]
[1]Lacombe Research and Development Centre, Agriculture and Agri-Food Canada, Lacombe, AB, Canada. [2]Food Processing Development Centre, Ministry of Agriculture and Forestry, Leduc, AB, Canada.
*E-mail: nuria.prietobenavides@agr.gc.ca

Introduction

Recently, flavour is becoming the most important contributor to beef eating satisfaction and overall consumer acceptability compared to tenderness or juiciness, and consumers are willing to pay premium for this attribute (Felderhoff et al., 2020; Garmyn, 2020; Miller, 2020). Being a complex attribute, beef flavour results from the interaction of tastes, aromas and tactile senses via the tongue, nasal, sinus and oral cavities (Kerth & Miller, 2015). Flavour complexity in beef arises from the impact of both pre-mortem (e.g. animal age, animal breed, and feeding regimen) and post-mortem (e.g. cooking and storage conditions) factors in the development of different flavour precursors and compounds (Adhikari et al., 2011; Kerth, 2016; López-Pedrouso et al., 2020). As such, flavour profile can be used to differentiate beef from different regions and increase competitiveness and uniqueness in the marketplace. Hence, the present study aims to evaluate the effect of country of origin and cooking endpoint temperature on the flavour profile of beef.

Material and Methods

Full ribeye primals (*Longissimus thoracis*) were purchased from Australia (n=18), Canada (n=16) and the US (n=20) to represent Meat Standards Australia Grade 4 star mixed grain, Canadian AAA barley or USDA Choice corn finished beef steers, respectively. Upon arrival at the Lacombe Research and Development Centre (Agriculture and Agri-Food Canada, Canada), all ribeyes were aged at 2 ºC until 45 d to equal the ageing time incurred during shipping of the Australian product, and subsequently frozen at -35 ºC until analyses. Two 2.5-cm steaks from each loin were cut, thawed overnight under refrigeration, and randomly grilled to an internal endpoint temperature of either 63 ºC (rare) or 71 ºC (medium-well). Steaks were presented in a balanced design to a 9-member trained sensory panel to rate the intensity of aromas (n=19), tastes (n=5), and flavours (n=19) using a 15-cm line scale. Flavour profile data were analysed using the MIXED model procedure of SAS v. 9.4 (SAS Institute Inc., 2014), with the main effects of country of origin and endpoint cooking temperature and their interaction in the model, and panel session and assessor and their interactions included as random effects.

Results

As shown in Figure 1a and b, beef identity and buttery flavours were rated higher (P<0.05) in Canadian and USA compared to Australian steaks, whereas bitter taste, and barnyard, liver-like and rancid flavours were higher (P<0.05) in Australian than in both Canadian and USA steaks. Canadian steaks presented higher (P<0.05) fat-like flavour than Australian and USA steaks, whereas brown roasted flavour was higher in USA, lower in Australian, and intermediate in Canadian steaks (P<0.05). Regarding the effect of cooking endpoint temperature on the flavour

profile of beef (Figure 2), steaks cooked to a 63 ºC endpoint presented higher (P<0.05) cruciferous aroma, sour taste, and bloody/serumy and sour/dairy flavours, and tended (P<0.1) to have higher metallic flavour than the 71 ºC steaks. Steaks cooked at 71 ºC had higher (P<0.05) sweet taste and beef identity flavour and tended (P<0.1) to have higher buttery flavour and brown roasted aroma and flavour than the 63 ºC steaks. There was only one significant interaction between endpoint cooking temperature and country of origin (Figure 3); the 71 ºC treatment significantly (P<0.05) increased the beef identity flavour compared to the 63 ºC in Canadian steaks, but no cooking endpoint temperature effect was observed for this flavour attribute in either USA or Australian steaks.

Conclusion

Even after 45 d of ageing, trained panellists were able to discern variations in beef taste/flavour intensities arising from production differences in country of origin. Cooking beef steaks to a low endpoint temperature of 63 ºC resulted in a combination of aromas, tastes and flavours that may be attributed to limited formation of Maillard reaction products. Increasing endpoint temperature to 71 ºC lengthened the cooking time and contributed to additional flavour development. Nevertheless, the endpoint temperature increasing from 63 to 71 ºC did not enhance umami taste regardless of country of origin, which suggests that higher temperatures/longer cooking times may be required to promote the formation of umami compounds.

References

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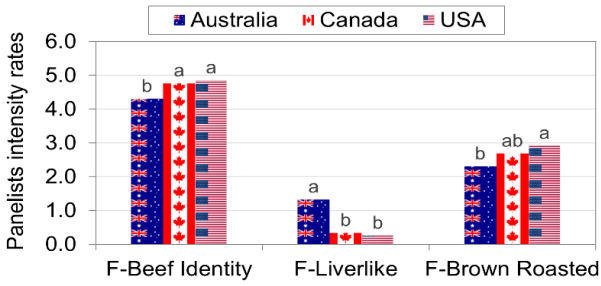
Figure 1a,b. Effect of country of origin on the flavour profile of beef.

a)



b)

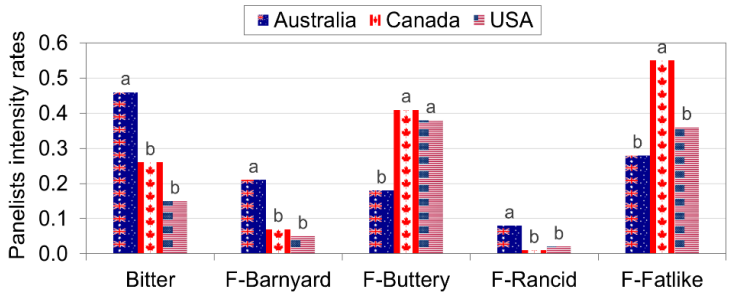


Figure 2. Effect of cooking endpoint temperature on the flavour profile of beef.

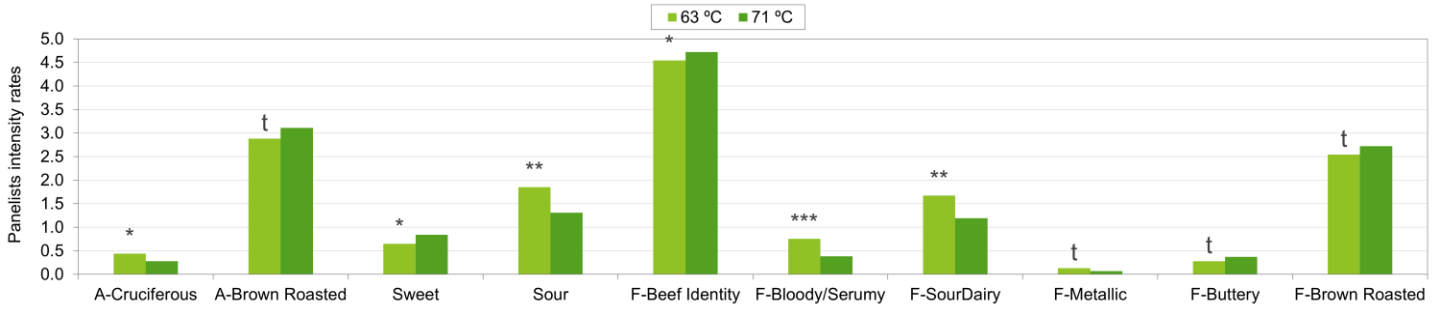


Figure 3. Effect of country of origin and cooking endpoint temperature on the flavour profile of beef.