

FACTORS AFFECTING EATING QUALITY OF NORTHERN IRELAND BEEF

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Abstract – This study evaluated factors affecting the eating quality of beef produced in Northern Ireland. Expert sensory panels, production and instrumental measurements were conducted on eleven groups of cattle. Principal Component Analysis was used to relate these parameters. Results highlight that eating quality attributes are associated with meat quality measurements as well as pre- and post-slaughter treatments. However there is extensive variation between animals within treatments that is unexplained. Individual cattle show a wide variation of eating quality with beef from some cows having similar eating qualities to continental and Aberdeen Angus cattle.

Key Words – Beef, Eating Quality, Principal Component Analysis.

I. INTRODUCTION

Tenderness and flavour are two of the most important beef eating quality attributes [1]. However, consistent eating quality continues to challenge the beef industry worldwide. Delivering beef of consistent quality to the consumer is vital for consumer satisfaction and helps to ensure demand and profitability within the industry [2]. The cattle supplied to the Northern Ireland beef industry vary greatly with respect to breed, sex and age, all of which, in addition to post-slaughter processing, contribute to the variation in eating quality. Thus, understanding the factors affecting eating quality both pre- and post-slaughter is vital to ensuring consistent beef quality. The aim was to relate sensory profiling results to both production factors and instrumental measurements of aspects of eating quality, for a range of cattle produced for the Northern Ireland beef industry.

II. MATERIALS AND METHODS

Beef (*Longissimus lumborum*) was sampled from 144 cattle killed between September and November 2015. Cattle were selected from 11 different treatments (Table 1) in order to deliver a range of perceived eating qualities. Each group contained different animals and the carcass was not split between hanging methods. Ultimate pH was measured at two days post slaughter. Slices (5 x 25mm) were cut from the right side of each carcass for Warner Bratzler Shear Force (WBSF) measurement and sensory profiling. These slices were vacuum-packed and aged a further 12 days (14 days in total) at 5°C. Each steak was then blast frozen and stored at -20°C until required for either WBSF measurement or sensory profiling evaluation. Drip loss on thawing and cooking loss was recorded. Sensory profiling was conducted using eight experienced panellists. Steak slices were grilled to an internal temperature of 70°C using a Rational oven. Panels were managed using Fizz Sensory software (Fizz acquisition 2.5). Statistics was conducted by Principal Component Analyses and using restricted maximum likelihood (REML) estimation.

Table 1- Table of cattle groups and identifiers used in PCA Figure 1.

Cattle Group	Identifier	Cattle Group	Identifier
Continental Heifer Tender stretch	Con-H-Ts	Dairy Bull Achilles hung	Bull-At
Continental Heifer Achilles hung	Con-H-At	Continental Heifer Heat Shortened Tender stretch	Con-H-HS-Ts
Continental Steer Tender stretch	Con-S-Ts	Continental Heifer Heat Shortened Achilles hung	Con-H-HS-At
Continental Steer Achilles hung	Con-S-At	Cow Tender stretch	Cow-Ts
Aberdeen Angus Tender stretch	AA- Ts	Cow Achilles hung	Cow-At
Dairy Bull Tender stretch	Bull-Ts		

III. RESULTS AND DISCUSSION

Significant differences were identified for 18 sensory attributes and 7 instrumental measurements (not detailed). Figure 1 shows the Principal Component Analysis (PC1 Vs PC2) for all sensory variables, together with instrumental

variables and cattle groups. Previous research [3] shows that consumer liking would be expected to be associated with tenderness and roast beef flavour. Tenderstretched continental heifers were associated with tender, juicy and roast beef flavour and received low scores for bloody aroma. Unsurprisingly, both cows groups, were associated with tough, stringy attributes and also with charred aromas and flavours. Age, cook loss and WBSF also correlated strongly with this region of Figure 1. The heat shortened, Achilles hung continental group (Con-H-Hs-At) is located to the left side of Figure 1, indicating that its eating quality was unexpectedly high, especially regarding tenderness.

The PCA of individual animals (not shown) shows considerable variation between animals for all cattle groups, especially cows and the heat shortened group previously mentioned. In some instances, individual cows were associated with attributes related to good eating quality, similar to tenderstretched heifers from the continental and Aberdeen Angus groups.

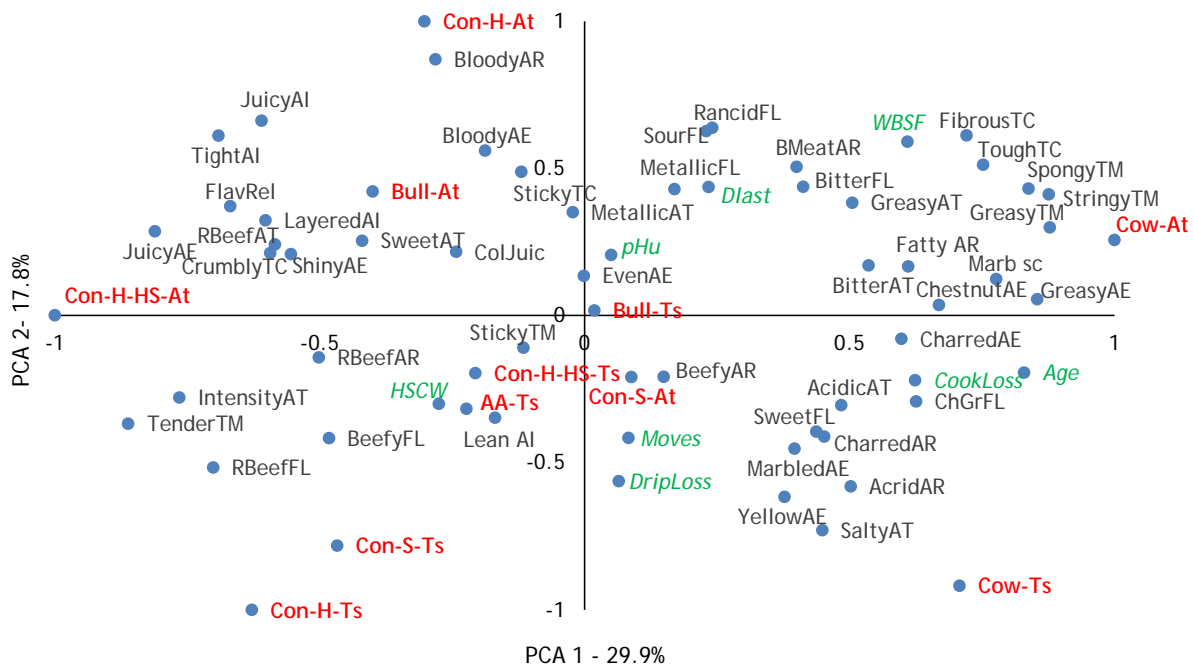


Figure 1. PCA 1 Vs PCA 2 for all sensory and instrumental variables

Abbreviations: AE, AI = external/internal appearance, AR = aroma, AT = aftertaste, FL = flavour, TC, TM = texture on cutting or in the mouth, R=roast, ChGr = chargrilled, ColJuic = cloudiness of juices, Age = animal age, HSCW- Hot Carcass Weight, Moves - # of farm moves, Dlast – Days on last farm, pHu – Ultimate pH, WBSF – Warner Bratzler Shear Force, Marb sc – Marbling score.

IV. CONCLUSION

The results presented show that eating quality attributes are associated with meat quality measurements as well as pre- and post-slaughter treatments. However there is extensive variation between animals within treatments that is unexplained and the meat from some cows is as good as that obtained from continental and Angus animals.

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