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BRIEF COMMUNICATION: An evaluation of the sensory traits of venison

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Introduction

New Zealand venison is a well-regarded export product in Europe and quality is a key philosophy of the deer industry. As production targets increase understanding consumer preferences is important to ensure the eating quality of venison is maintained alongside these goals. Using data available from the Deer Progeny Test (Ward et al. 2014) this study aims to assess the quality of data from a sensory evaluation and investigate relationships between sensory traits and the overall acceptability of venison.

Materials and methods

Progeny were generated in two herds (Whiterock Station and Invermay) using nine red deer and five wapiti sires across red deer hinds. The 310 progeny were born in 2011 and slaughtered in October 2012. All male progeny were slaughtered (n=262), but female progeny slaughtered were from the wapiti sires only (n=48).

Carcasses were held at 4°C for at least 24 h prior to carcass dissection. The sample for sensory evaluation was approximately 25 mm thick and from the left striploin between the 12th and 13th ribs. Striploin samples were individually packed, placed in a blast freezer until frozen and stored at ≤ -12°C until evaluation.

Sensory evaluation was by 35 Alliance Group Ltd employees who regularly volunteered on a tasting panel. To initially qualify for the panel as taste evaluators of meat, the volunteers had to score at least 75% correct in a triangle test differentiating between lamb loins which were chilled for six weeks and those which were frozen after one day. Some panellists had not tasted venison prior to this investigation.

Prior to evaluation, the frozen loin samples were thawed overnight at room temperature. Samples were randomly numbered and cooked for approximately 5 minutes on each side until medium rare on a hot plate. Each loin was cut into bite-sized cubes (~2cm^2) and kept in a water bath at ~72°C until evaluation.

Loins were presented randomly four samples at a time on white plates. Each sample was evaluated by seven (47 loins), eight (213 loins) or nine (50 loins) panellists. Panellists sat around a table informally with normal lighting; apple juice was provided to cleanse the palate between samples and panellists were asked not to discuss evaluations. Panellists tasted 14-17 loin samples per 20-30 minute session. There were 19 sessions in total resulting in 2348 venison sample tastings. Samples were scored for aroma, flavour, texture, succulence and overall acceptability on a scale of 1 (unfavourable) to 3 (favourable) with 0.25 increments. Guidelines were given of favourable or unfavourable characteristics for each trait, e.g. stale, bitter, clean, fresh aromas; rancid, tainted, bitter, good, meaty, delicate flavours; tough, excessively chewy, low resistance to bite textures; dry, juicy succulence; and low to high overall acceptability.

Correlations between the sensory traits were examined using Pearson correlation co-efficients. Prediction of overall acceptability from sensory traits was tested using a stepwise regression model. These analyses did not include adjustments for any other effects.

The reproducibility between panellists was examined as the level of agreement between panellists when scoring a trait, as was the individual panellist consistency in scoring over the duration of the sensory evaluation. These analyses used variance components of random effects from a model analysed by residual maximum likelihood (REML; Patterson and Thompson, 1971) using the MIXED procedure in SAS/STAT, in a similar manner to the analysis of Gill et al. (2010) of beef quality traits.

The model included fixed effects of measurement date, progeny sex, hot carcass weight, sire type (wapiti or red), herd (Whiterock Station vs Invermay) and progeny sex/weaning mob(herd) combination (representing contemporary group) and the random effects of sire, animal (within sire), panellist, and panellist/measurement date-interaction.

Reproducibility (panel member agreement; proportion) = (sire variance + animal variance + residual variance) / (sire variance + animal variance + residual variance + panellist variance + panellist x date variance)

Panel member consistency (proportion) = panellist variance / (panellist variance + panellist x date variance)

Standard errors were calculated by a Taylor series approximation. Reproducibility has been defined differently to that used by Gill et al. (2010) in that the same variance component model has been used for both measures in this study, whereas Gill et al. (2010) dropped panellist from their model to calculate reproducibility. However (panellist variance + panellist x date variance) in the full model was within 7% of (panellist x date variance) in the model without panellist for each trait.

Results and discussion

Texture was the trait most strongly associated with overall acceptability, explaining 77.9% of the variation in overall acceptability. This was followed in the stepwise regression by succulence (6.8% additional variation explained) and then flavour (2.6%). These findings are similar to results for beef where juiciness and tenderness (an aspect of texture) were strongly correlated with overall liking (Gill et al. 2010) and in contrast to studies of lamb by McLean et al. (2010) who found flavour to be the strongest indicator of overall liking. The strongest correlations within sensory traits were found between texture and succulence, followed by flavour and aroma, and flavour and succulence (Table 1).

The mean scores for all traits were acceptable and moderately high, aroma had the highest and texture had the lowest mean score (Table 2).

The scoring consistency of individual panellists over the duration of the experiment was examined. Consistency in scoring was moderately high for all sensory traits; flavour being the highest, followed by succulence, texture, aroma, and overall acceptability. In beef sensory evaluations, Gill et al. (2010) found tenderness to be the most consistently scored trait.

Texture was the most reproducible trait between panellists, followed by overall acceptability, succulence, flavour and aroma (Table 2). This was similar to beef results (Gill et al. 2010) in which juiciness and tenderness were found to have the highest levels of agreement.

The panellist consistency and reproducibility statistics, with the exception of the reproducibility of aroma, are comparable to results found in beef giving confidence in the evaluation methods used. Future evaluations would benefit from repeating samples between sessions to assess the repeatability of results for individual samples, i.e. the same panellist and sample on different days. Sensory evaluation of loins which had been aged would be valuable because this would be more typical of exported venison. Further research is planned investigating relationships between animal measurements and sensory traits to improve knowledge supporting the production of venison most preferred by consumers.

Table 1 Pearson's Correlation Coefficients between sensory traits[1], trait means and standard deviations (SD) of sensory data collected during sensory evaluations of venison samples in order to examine relationships between the different sensory traits and with overall acceptability.

	Aroma	Flavour	Texture	Succulence	Overall
Mean (SD)	2.48 (0.42)	2.46 (0.38)	2.31 (0.44)	2.42 (0.39)	2.37 (0.38)
Aroma	1				
Flavour	0.646	1			
Texture	0.473	0.575	1		
Succulence	0.532	0.643	**0.730**	1	
Overall	0.553	**0.714**	**0.883**	**0.822**	1

[1]Correlation coefficients on a scale of -1 to 1, with weak = 0 < |r| < .3; moderate = .3 < |r| < .7; strong = |r| > 0.7 (bold). There were 2482-2483 observations per value; all were significant at P<0.001. Traits were scored on a scale of 1-3 in 0.25 increments.

Table 2 Variance components of random effects, panellist consistency and reproducibility statistics and standard errors (SE)[1] using a mixed modelling procedure on data collected during sensory evaluations of venison samples in order to assess the quality of taste panel assessments.

	Variance Components				Consistency Statistics	
Trait	Sire + Animal	Panellist	Panellist x date	Residual	Panellist Consistency (SE)	Reproducibility (SE)
Aroma	0.001	0.089	0.027	0.044	**0.765 (0.057)**	0.276 (0.035)
Flavour	0.003	0.058	0.010	0.071	**0.854 (0.043)**	0.525 (0.018)
Texture	0.025	0.044	0.012	0.094	**0.783 (0.062)**	0.681 (0.025)
Succulence	0.010	0.046	0.011	0.077	**0.801 (0.058)**	0.603 (0.023)
Overall	0.015	0.033	0.011	0.070	**0.757 (0.066)**	0.657 (0.025)

[1]Panellist consistency and reproducibility on scale of 0-1; values above 0.75 in bold.

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