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Report

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Report sensory analyses veal

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Summary

On behalf of a client of Animal Sciences Group, different varieties of veal were analyzed by both instrumental and sensory analyses. The sensory evaluation was performed with a sensory analytical panel in the period of 13th of May and 31st of May, 2005. The three varieties of veal were: young bull, pink veal and white veal. The sensory descriptive analyses show that the three groups Young bulls, pink veal and white veal, differ significantly in red colour for the raw meat as well as the baked meat.

The taste of the white veal group is of lower intensity for the attributes 'blood' and 'watery' than for the young bull and the pink veal.

The young bull baked meat is juicier at the end of chewing compared with white veal. For the other texture attributes there are no significant differences between the three product groups. A possible explanation of low texture differences between groups can be that the individual samples show much variation on these attributes.

1. Introduction

On behalf of a client of Animal sciences group, different varieties of veal were analyzed by both instrumental and sensory analyses. The sensory evaluation was performed with a sensory analytical panel of which the results are subject of this report. This sensory analysis was performed in the period of 13th of May and 31st of May, 2005.

The three varieties of veal were: young bull, pink veal and white veal.

2. Materials and methods

Panel

The analytical sensory panel consisted of six persons, selected and trained for sensory analytical analyses and experienced in QDA (Quantitative Descriptive Analysis).

Training

For the sensory assessment of veal the panel was trained in four one hour during sessions. For the training the attribute list for veal was used. The list was adapted for this veal research; the appearance of the raw veal meat has been included. During the training similar products are introduced in order to establish a framework for comparison. In this case market samples were used, obtained from different butchers in Heiloo and IJmuiden, the Netherlands.

Meat

The meat was delivered for sensory analyses on the 13th of May. Every sample was individually packed in vacuum bags. All bags were controlled for vacuum/seal, in case of leakage the bags were vacuumed again and resealed. At the 16th of May all samples were placed in the fast freezer until they reached a temperature of -25°C. After fast freezing the samples were stored in a freezer at -25°C until the day of analysis. The total sample material consisted of three groups: young bull, pink veal and white veal. There were ten samples in each group and there were five slices of each sample (coded A-E).

Analyses

For sensory analyses of food products the Quantitative Descriptive Analysis (QDA, also known as profile method) is common for characterization of the differences between products and to be able to provide sensory data for the interpretation of instrumental data. The method consists of procedures for describing and assessing the flavour of a product in a reproducible way. The separate attributes contributing to the formation of the overall impression given by the product are identified and their intensity assessed in order to build up a description of the flavour of the product. The QDA-analyses were carried out according to ISO standard 6564 (1985, Sensory analysis, Methodology flavour profile methods). The panel has identified and defined 30 character notes (attributes) of the samples to be studied (veal in this case) during the training. The list with attributes and its definition is shown in annex 1. With the help of FIZZ® for window 2.10a (Biosystems), the panelists scored on a line scale from 0-100, with anchors on 0, 50 and 100%. For the test artificial daylight (T>5000K) was used.

Preparation

One hour before starting the test the veal was taken from the freezer and thawed under cold running tap water. The slices were baked in a contact grill. The plates were spread with a little groundnut oil and set up at 180°C. The slices were baked for one and a half minute. The slices were tried to be baked medium raw. The outside of the slice was taken away, whereupon the center of the slice was cut in three pieces, for three panelists.

Design

The samples were presented 'at random' according to an 'incomplete block design' (see table 2). In total 18 samples were judged in duplicate (within and between sessions) and twelve samples were judged solo. Per three panelists a different sample presentation order was provided.

Table 2. Incomplete block design sample presentation.

Session day	Sample	Slice	Sample	Slice	Sample	Slice	Sample	Slice	Sample	Slice	Sample	Slice
Day 1	9	A-C	59	A-E	70	B-C	7	C-D	46	A-C	46_2 ^A	B-E
Day 2	55	C-E	7_2 ^B	B-E	33	A-B	64	B-E	10	A-E	33_2 ^A	C_D
Day 3	65	A-C	38_2 ^B	A-C	53	B-E	6	B-D	10_2 ^B	B-D	53_2 ^A	C-D
Day 4	12	B-D	72	B-D	8	A-D	36	B-D	38	D-E	8_2 ^A	B-C
Day 5	42	A-D	41	B-C	23	A-E	44	A-D	22	A-D	41_2 ^A	A-D
Day 6	58	A-B	44_2 ^B	C-E	54	D-E	6_2 ^B	A-E	45	A-B	58_2 ^A	C-E
Day 7	68	A-E	23_2 ^B	B-D	64_2 ^B	C-D	30	A-D	26	B-D	30_2 ^A	B-E
Day 8	19	B-C	55_2 ^B	A-B	65_2 ^B	D-E	42_2 ^B	C-E	24	A-E	19_2 ^A	D-E

^A duplo judgement within session ^B duplo judgement between sessions

Statistical analyses

The statistical analyses were performed in SPSS version 10.1. The means per sample group and per attribute were calculated. Analyses of Variance (ANOVA) were used to judge the significant differences ($P < 0,05$) between the different groups and samples. A post hoc-test (LSD) was used to sort out the significant differences. Pearson correlation tests (2-tailed) were performed to find correlations between attributes ($P < 0,05$).

3. Results

The main interest in this study was to analyze whether there are differences between the three product groups: Young bull, Pink Veal and White veal. For the raw meat three attributes were assessed: raw appearance fresh, raw appearance red and raw appearance brown. The graphical presentation of the average results is presented in annex 2. The average results for the raw meat are presented in table 3.

Table 3. Results for raw meat (average score 0-100).

Product group	Young bull	Pink veal	White veal
raw appearance fresh	64	66	68
raw appearance red	82 ^a	61 ^b	16 ^c
raw appearance brown	24 ^a	19 ^b	12 ^c

Superscripts lacking a common letter indicate significant differences ($p < 0,05$)

There were significant differences between the three product groups for the attributes 'raw appearance red' and 'raw appearance brown'. The three groups differed from each other. The young bull meat was more red and more brown (although low level of brownness), followed by the pink veal meat and finally the white veal that had the least red and brown colour.

The baked samples were analyzed for 30 attributes, divided in five categories: baked appearance, texture at the beginning of chewing, texture at the end of chewing, taste and aftertaste. The average results per group are presented in table 4. Analyses of variance show significant differences for the all four 'baked appearance' attributes, one texture attribute and two taste attributes.

Table 4. Results for baked meat (average scores 0-100).

Product group	Young bull	Pink veal	White veal
baked appearance			
rawness	34 ^a	24 ^b	18 ^b
baked appearance red	31 ^a	18 ^b	10 ^c
baked appearance beige	42 ^a	60 ^b	60 ^b
baked appearance grey	12 ^{ab}	15 ^a	8 ^b
texture begin tender	48	42	48
texture begin juicy	49	42	45
texture begin dry	41	46	47
texture begin tough	39	45	40
texture end tender	45	40	43
texture end juicy	43 ^a	37 ^{ab}	36 ^b
texture end dry	49	50	55
texture end chewiness	53	47	50
texture end tough	38	46	43
texture end structure	35	38	32
taste metallic	29	29	26
taste blood	27 ^a	25 ^a	18 ^b
taste sweet	14	12	13
taste watery	17 ^a	17 ^a	22 ^b
taste liver	23	23	20
taste sour	14	13	11
taste rancid	1	1	1
taste fresh	38	33	34
taste bitter	3	4	4
aftertaste metallic	22	22	21
aftertaste blood	7	9	9
aftertaste sweet	9	8	9
aftertaste liver	14	15	14
aftertaste sprinkling	13	13	14
aftertaste watery	18	17	19
aftertaste sour	9	9	9

Superscripts lacking a common letter indicate significant differences ($p < 0,05$)

The rawness of the meat was assessed to be able to evaluate the degree of baking. The baking procedure was designed in such a way that the meat would be baked 'medium done'. Due to differences in firmness of the meat (intrinsic structure differences) between the sample groups the thickness of the slices before baking varies (highest sagging in white veal, lowest in young bull meat) and effects the baking. For the group 'young bulls' the rawness was significantly

higher than for the other groups and an average score of 34 can be regarded between medium and well done. The correlation of this attribute in this group was highest for the texture attribute 'juicy' at the beginning and the end of chewing (0,60 and 0,58 respectively). Tenderness had lower correlation with the degree of baking, 0,24. For the pink veal group the average score of 24 for 'baked appearance rawness' can be interpreted as 'almost done'. The correlations were similar for the young bull group (i.e. tenderness 0,34, juiciness begin 0,69 and juiciness end 0,57). Finally, the degree of baking of the white veal only correlated little with the juiciness at both the beginning and the end of chewing (0,31 and 0,37 respectively). The rawness did not differ significantly between white veal and pink veal. The PCA analyses (Principle Component Analyses) score plots for the complete dataset are shown in figure 1. This figure shows previous described correlations between attributes.

The baked appearance redness differs for each product group. After baking the young bull was most red, the pink veal was slightly less red and the white veal was not red at all. Scores are lower than for the raw appearance, meaning the redness has disappeared during baking. Both the white veal and the pink veal were more beige when baked than the young bull. The white veal was hardly gray and the pink veal was slightly gray after baking, low grayness but significant higher than for white veal.

The 'blood taste' and the 'watery taste' differ for the three groups. The white veal has a lower blood taste and a higher watery taste.

The average results do not significantly differ between the three groups for the majority of the texture attributes. Only the juiciness at the end of chewing differs for the young bull meat and the white veal meat: the young bull meat was juicier at the end of chewing. The explanation of these similarities for texture attributes can be that the individual samples within a group vary. This was tested for and the results are presented in table 5, 6 and 7. These results show individual sample differences for all three product groups for almost all texture attributes.

Table 5. Results individual samples for the Young Bull group (average scores 0-100).

Young bull products	6	7	8	9	10	12	19	22	23	24	LSD means
Raw appearance red	91	80	79	90	81	84	79	78	84	76	13
baked appearance rawness	34	38	36	7	12	26	55	15	55	38	27
baked appearance red	33	34	32	7	10	20	53	6	45	44	25
texture begin tender	48	43	46	9	40	27	64	47	64	67	21
texture begin juicy	51	44	50	16	48	37	62	33	63	57	21
texture begin dry	41	38	36	62	45	56	28	61	26	42	22
texture begin tough	41	35	41	75	43	69	31	31	22	21	23
texture end tender	43	45	43	16	42	19	58	44	63	61	23
texture end juicy	44	43	42	21	35	34	54	36	56	46	22
texture end dry	47	40	50	80	52	65	37	61	38	47	23
texture end chewiness	47	53	48	18	47	27	66	61	70	77	22
texture end tough	42	40	46	69	41	66	31	23	21	17	25
texture end structure	33	31	43	36	35	43	43	16	34	29	24
taste metallic	28	22	31	33	21	31	32	24	36	31	17
taste blood	26	28	27	24	18	22	33	21	33	29	18

The bold attributes differ significantly within the group

Table 6. Results individual samples for the Pink veal group (average scores 0-100).

Pink veal products	30	33	36	38	42	44	45	46	68	70	LSD means
Raw appearance red	64	51	64	55	61	67	67	58	76	48	13
baked appearance rawness	24	8	48	33	34	25	16	11	36	3	25
baked appearance red	15	8	42	22	28	18	6	13	34	2	24
texture begin tender	35	23	40	42	73	59	31	22	51	40	23
texture begin juicy	47	20	62	47	57	45	33	24	67	27	20
texture begin dry	40	69	27	45	32	42	60	56	28	53	24
texture begin tough	58	62	50	44	14	30	65	56	45	37	25
texture end tender	33	20	43	41	67	50	23	23	51	47	20
texture end juicy	43	17	50	38	50	37	30	27	54	31	20
texture end dry	52	74	38	51	34	46	65	51	38	55	20
texture end chewiness	32	35	40	48	71	62	31	35	51	64	23
texture end tough	66	62	58	42	16	28	71	55	44	31	24
texture end structure	46	42	36	38	31	38	40	40	38	22	24
taste metallic	29	27	40	32	31	23	25	29	34	18	15
taste blood	25	17	35	29	28	26	13	22	29	18	16

The bold attributes differ significantly within the group

Table 7. Results individual samples for the White veal group (average scores 0-100).

White veal products	26	41	53	54	55	58	59	64	65	72	LSD means
raw appearance red	15	20	17	18	13	16	15	17	12	14	11
baked appearance rawness	18	19	24	25	26	17	11	11	12	13	22
baked appearance red	7	14	8	10	20	8	11	4	6	8	18
texture begin tender	61	63	38	72	54	51	22	48	26	50	25
texture begin juicy	62	46	39	51	54	52	19	37	45	40	21
texture begin dry	27	44	52	46	34	47	71	49	50	49	23
texture begin tough	27	25	52	16	35	43	50	33	66	31	26
texture end tender	60	53	33	65	50	44	25	43	21	45	26
texture end juicy	50	35	37	45	39	32	21	32	37	33	22
texture end dry	42	57	59	42	49	61	65	48	56	64	22
texture end chewiness	55	63	39	75	64	46	36	52	28	45	26
texture end tough	42	27	49	18	34	45	51	40	72	41	26
texture end structure	31	34	31	24	34	31	36	22	40	33	22
taste metallic	20	22	28	29	30	24	30	23	28	27	14
taste blood	13	15	22	16	21	16	23	17	14	24	13

The bold attributes differ significantly within the group

Another explanation of the similarities between the three product groups for texture attributes can be that the effects of the differences in intrinsic structures (partly) counteract the differences in texture. Apart from differences in firmness of the meat, differences in waterholding capacity and amount of intramuscular fat (see report on the quality of white veal, pink veal and young bull meat by Hillebrand et al., 2005) affect the results for texture attributes.

The duplicates show very little differences: only for the texture attributes tender and juicy at the beginning of chewing. Meaning that the panel performance can be regarded as within the levels of acceptance.

4. Conclusion

The sensory descriptive analyses show that the three groups Young bulls, pink veal and white veal, differ significantly in red colour for the raw meat as well as the baked meat.

The taste of the white veal group was of lower intensity for the attributes 'blood' and 'watery' than for the young bull and the pink veal.

The young bull baked meat was juicier at the end of chewing compared with white veal. For the other texture attributes there are no significant differences between the three product groups.

A possible explanation of low texture differences between groups can be that the individual samples show much variation on these attributes.

Attribute list

Descriptions of the attributes used for sensory evaluation of veal

Subject:	Attribute	Anchor points	Description
Appearance	Raw appearance	little - much	Little raw means well done. Assess the amount of raw appearance.
	Red colour	little - much	Strong red is real dark red, weak red is pink. Assess the middle part of the meat.
	Beige colour	little - much	Assess the amount of beige in the meat between the outside and the raw part of the meat.
	Grey	little - much	How gray is the part of the meat
Texture at first moment of chewing	Tenderness	not - much	Very tender when not much resistance during chewing and smooth
	Juiciness	not - much	The amount of juice released during chewing
	Dryness	not - much	How dry is the meat at the first moment of chewing
	Toughness	not - much	Difficult or easy to reduce, with little or much power.
Texture at the end of chewing	Tenderness	not - much	Very tender when not much resistance during chewing and smooth
	Juicyness	not - much	The amount of juice released at the end of chewing
	Dryness	not - much	How dry is the meat at the first moment of chewing
	Chewiness	not - much	Not chewy when a turd remains
	Toughness	not - much	Difficult or easy to reduce, with little or much power.
	Structure	fine - coarse	The structure of the fibers is fine or coarse
Taste	Metalic	weak - strong	Fresh taste, reminds you of licking a piece of metal when it has been sanded.
	Blood	weak - strong	Fresh blood taste
	Sweet	weak - strong	Sweet taste of meat and juices
	Watery	weak - strong	Neutral taste of released juices
	Liver	weak - strong	Reminds of the taste of liver.
	Sour	weak - strong	Sour like vinegar
	Rancid	weak - strong	Reminds you of oxidated oil
	Fresh	weak - strong	The fresh taste of the

			meat
	Bitter	weak - strong	Reminds you of the bitterness of coffee
Aftertaste	Metallic	weak - strong	Fresh taste, reminds you of licking a piece of metal when it has been sanded.
	Astringent/bitter	weak - strong	Rough in the mouth
	Sweet	weak - strong	Sweet taste of meat and juices
	Liver	weak - strong	Reminds of the taste of liver.
	Tickling	weak - strong	Tickling sensation in the mouth
	Watery	weak - strong	Neutral taste of released juices
	Sour	weak - strong	Sour like vinegar

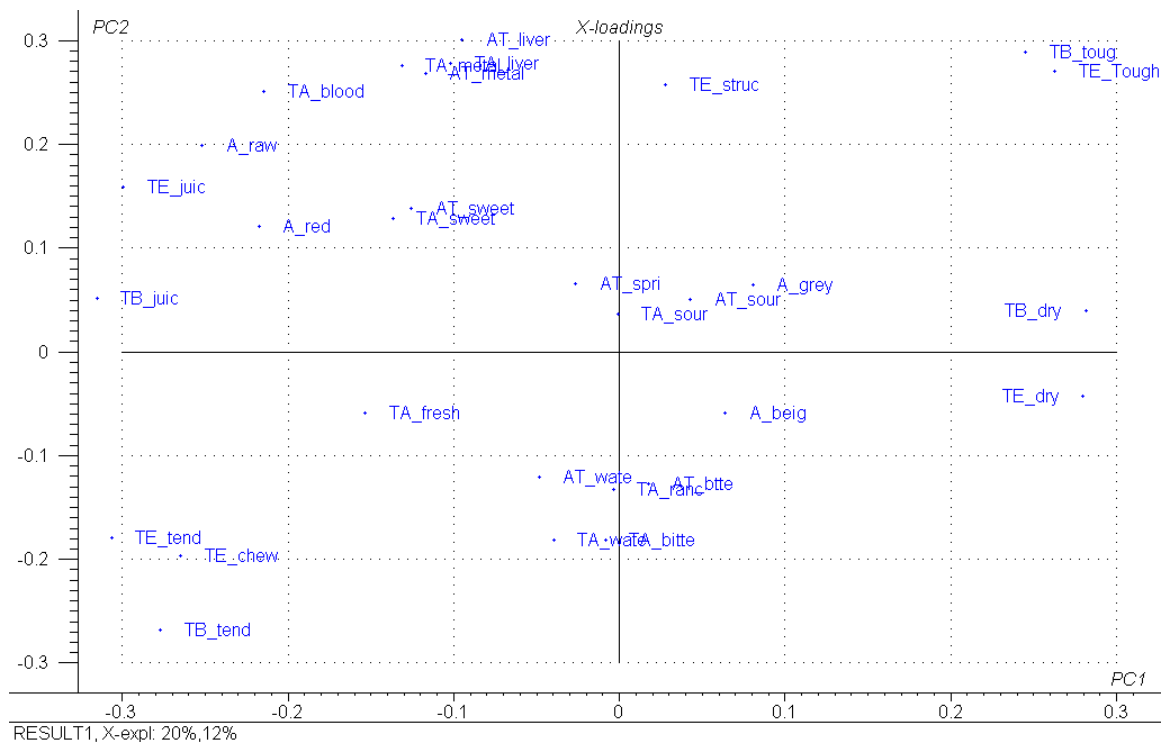


Figure 1. PCA score plot of all attributes analyzed in this experiments.