

## SENSORY PROPERTIES AND CONSUMER ACCEPTABILITY OF TRADITIONAL CAPRETTO AND CHEVON

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**Abstract – Consumer acceptability of chevon types, different from the traditional milk capretto and available outside the Easter period, was evaluated with relationship to their intrinsic sensory properties and consumer familiarity with goat meat. Five meat types, from 38 ram kids, were evaluated: milk capretto (MC, suckling, 1-1.5 months old, m.o., kids), heavy summer kid (HSK, 3-4 m.o. kids), summering chevon (SCh, mountain-pasture grazing, 4-5 m.o. kids), fall chevon (FCh, 5-5.5 m.o. kids) and late fall chevon (LFCh, 5.5-6 m.o. kids). HSK was the most tender meat, having less cooking losses than both MC and the most matured, redder chevon types ( $P \leq 0.05$ ). The instrumental parameters corresponded with the appearance and texture attributes perceived by panelists. In going from the young to the old ram kids, the meat lost its delicate aroma of milk (MC) and sweet taste (HSK) and acquired an increasing intensity of goat odour and flavour, together with livery notes. Consumers ( $n=104$ ) evaluated the sensory differences between meats, and their liking scores were significantly affected by familiarity. The target consumers for obtaining maximal value from chevon are those having familiarity with goat meat, because their acceptability drops only for meat from the oldest ram kids, i.e. those close to sexual maturity.**

**Keywords: goat meat, consumer familiarity, liking.**

### I. INTRODUCTION

Goat husbandry in Italy is aimed at milk and cheese production. The “capretto”, i.e. four to seven-week old kid fed on milk [1,2], is the traditional, and still the main meat product. It is a major component of farm income during the Easter period [3]. In Italy, capretto meat is considered a delicacy, like in France and Latin America [4], whereas fresh meat from later matured goats is not generally consumed. The purpose of the research was to evaluate the sensory properties and consumer acceptability of goat meat from older animals unsold at Easter or born too late to be finished for the Easter period as capretto.

### II. MATERIALS AND METHODS

#### *Experimental design, instrumental analysis*

The experiment was carried out on 38 buck kids of Alpine breed belonging to five groups: milk capretto (MC), heavy summer kid (HSK), summering chevon (SCh), fall chevon (FCh) and late fall chevon (LFCh) (Table 1). The kids were suckled by dams in the farms of origin up to weaning at 1-1.5 months, when the MC group was slaughtered in April. After weaning, the kids of SCh group were moved to a mountain farm and reared at pasture until slaughter, which occurred in late July (4-5 months of age). The remaining kids were brought into the experimental farm of the University of Udine and fed with an experimental diet in multiple boxes on straw until slaughter, which occurred at the beginning of July for the HSK group (3-4 months of age), at the beginning of October for FCh group (5-5.5 months of age) and in late November for LFCh group (5.5-6 months of age; born later at the end-season). Twenty four hours after slaughtering at an EU-licensed abattoir and dressing using standard commercial techniques, the carcasses were weighed (Table 1) and divided into thighs, shoulders and trunk [5]. All procedures meet the requirements of the European Commission Directive, 86-609-EC for Scientific Procedure Establishments.

Table 1. Age, live weight (LW), cold carcass weight (CCW) and number of ram kids per goat meat type

		Goat meat type					SEM
		MC	HSK	SCh	FCh	LFCh	
Kids	no.	10	7	7	7	7	
Age	Mth	1-1.5	3-4	4-5	5-5.5	5.5-6	
LW	kg	11.3 <sup>a</sup>	19.1 <sup>b</sup>	23.3 <sup>c</sup>	24.8 <sup>c</sup>	26.4 <sup>c</sup>	0.34
CCW	kg	5.34 <sup>a</sup>	7.91 <sup>b</sup>	10.61 <sup>c</sup>	11.06 <sup>c</sup>	11.49 <sup>c</sup>	0.170

<sup>a,b,c</sup>: Means with unlike superscripts differ ( $P \leq 0.05$ )

From the trunk were obtained m. *Lungissimus dorsi* (LD) left and right. Instrumental analyses were made on samples of right LD [6], after seven days of ageing; whereas the sensory

profile was performed on the left LD and the consumer test on slices of thigh [7], both of them stored at -20°C after seven days of ageing.

#### *Sensory analysis*

The samples of the five goat meat types were presented monadically, randomized between subjects and sessions. Trained panellist and consumers performed their evaluations in individual booths in a sensory laboratory. The appearance evaluation was carried out on raw meat samples under white light. The taste of meat samples was evaluated after portioning and cooking. The firing was done in a convection oven with humidity control, until reaching 70°C at the heart of the product, monitored by an internal thermocouple. The samples were labelled with numeric codes and their taste assessed under red light. Between samples the assessor was asked to rinse his mouth, eating a piece of carrot and drinking a sip of water.

#### *Descriptive profile*

The loins were thawed at 4°C overnight for 24 h before the test and cut into pieces of equal size before cooking. Sensory profiling was carried out by a panel of eight trained assessors experienced in meat evaluation. During a preliminary phase, discussions were held that aimed at developing a common sensory vocabulary and to avoid doubt about the meaning of attributes. The panel developed a profile protocol for a quantitative descriptive method containing 24 validated attributes relating to: fresh meat appearance (colour, *ca*, and watering, *wa*); meat odour (goat intensity, *go*, metallic, *mo*, liver, *lo*, toasted, *to*, herbaceous, *ho*, milk, *do*); meat taste (sweet, *st*, umami, *ut*, salt, *sat*, acid, *at*, bitter, *bt*); meat flavour (goat intensity, *gf*, metallic, *mf*, liver, *lf*, toasted, *tf*, herbaceous, *hf*, milk, *df*); meat texture (fibrousness, *f*, chewiness, *c*, juiciness, *j*, tenderness, *t*, adhesiveness, *a*). The sensory evaluation was replicated seven times. In each session, every judge assessed five meat samples, from five different kids, one for every goat meat type. The panel rated the intensity of each sensory attribute on an unstructured linear scale from 0 to 10 (0 = no intensity, 10 = extreme intensity).

#### *Consumer test*

One hundred and four consumers were recruited to participate in the hedonistic test on goat meat at the University of Udine. Divided into groups

of eight, consumers were asked to rate their liking/disliking for the taste of the five cooked goat meat types, using the Labelled Affective Magnitude (LAM) scale [8]. The frozen thighs, sliced into thick slices (approx. 2.5 cm), were thawed at 4°C overnight 24 h before the test, trimmed, cut into 2.5 cm<sup>3</sup> samples and then cooked for tasting. Finally, consumers completed a questionnaire concerning socio-demographic data, buying behavior and consumption of meat products, and their familiarity with goat meat [9].

#### *Statistical analysis*

Live weight, carcass weight and meat instrumental characteristics were subjected to one-way analysis of variance with 'goat meat type' as fixed effect (SPSS vers. 17 software; SPSS Inc., Illinois). Every sensory attribute was initially analysed following a two way factorial design in which the goat meat type and panellist were treated as fixed effect and random variable respectively. Significant attributes were then processed by Principal Component Analysis (PCA) carried out using PanelCheck vers.1.4.0 software (<http://www.matforsk.no/panelcheck>), in order to geometrically represent and explain the actual dimensionality of the meat goat sensory space. The liking data were analysed by a repeated measures model, with 'goat meat type' as a within-subject factor and 'familiarity with goat meat' as a between-subject factor.

### III. RESULTS AND DISCUSSION

#### *Intrinsic sensory characteristic*

The redness value varied in meat types (Table 2), increasing in intensity ( $P \leq 0.05$ ) with kid age, according to the observed and parallel rise of the muscle myoglobin content [10].

Table 2. Instrumental sensory parameters of goat meat types: colour (lightness, L\*, redness, a\*, and yellowness, b\*), cooking loss (CL, %) and hardness (Warner Bratzler Shear Force, WBSF, N)

	Goat meat type					SEM
	MC	HSK	SCh	FCh	LFCh	
L*	40.7	38.0	40.3	39.9	38.1	0.413
a*	4.11 <sup>a</sup>	5.72 <sup>b</sup>	5.87 <sup>b</sup>	6.09 <sup>b</sup>	6.37 <sup>b</sup>	0.150
b*	11.5	10.4	11.7	10.9	10.7	0.136
CL	18.4 <sup>ab</sup>	12.6 <sup>c</sup>	13.8 <sup>bc</sup>	21.7 <sup>a</sup>	19.9 <sup>ab</sup>	0.627
WBSF	29.1 <sup>ab</sup>	23.7 <sup>b</sup>	28.2 <sup>ab</sup>	38.4 <sup>a</sup>	37.0 <sup>a</sup>	1.26

<sup>a,b,c</sup>: Means with unlike superscripts differ ( $P \leq 0.05$ )

The HSK was the most tender meat among the goat types examined; moreover, it had lesser cooking losses ( $P \leq 0.05$ ) than both, capretto and the most matured chevon types. The instrumental results agreed with the appearance and texture attributes perceived by panellists, as illustrated in Figure 1.

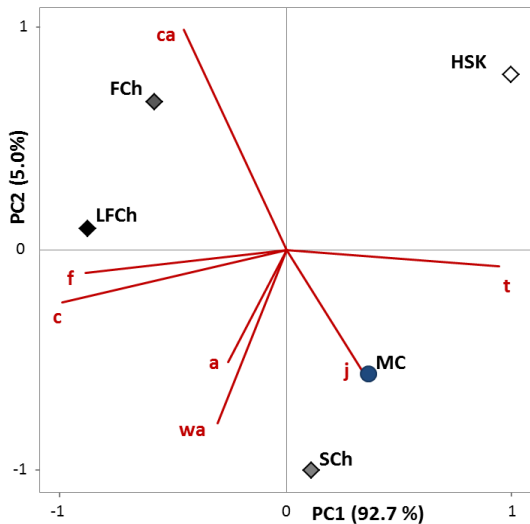


Figure 1. PCA group average configuration of meat goat types on the basis of appearance and texture sensory attributes, whose correlations with the space dimensions are reported as vectors (see Material and methods for attribute description)

PC1 accounted for 92.7% of the original variability in appearance and texture descriptors of goat meat. Its left half was highly correlated with fibrousness and chewiness; the most matured chevon meat types (LFCh and FCh), characterized by the highest WBSF values (Table 2), had negative PC1-scores. Instead, along the right half, that was loaded by tenderness and juiciness, were located the other meat types, and in particular HSK, the PC1-score of which was the highest among meats. The poorest watering appearance of HSK was in line with its low cooking loss (Table 2), as well as the high colour scores of LFCh and FCh with their high instrumental redness.

The clear differentiation in appearance and texture between types of goat meat was confirmed in terms of perceived taste and odour, as highlighted by the PCA bi-plot of Figure 2. Moving from the young to the old ram kids, along the PC1 (73% of the original variance explained), the meat lost its delicate aroma of milk (MC) and sweet taste (HSK) and acquired an increasing intensity of goat odour and flavour. These attributes, together with livery

notes, characterised FCh and much more LFCh meats. The Sch meat had intermediate sensory properties. After the passage from monogastric stage to ruminant, the bacterial flora in the rumen begins to synthesize a series of branched-chain fatty acids, especially in adult animals that are responsible for the evolution of flavour [11].

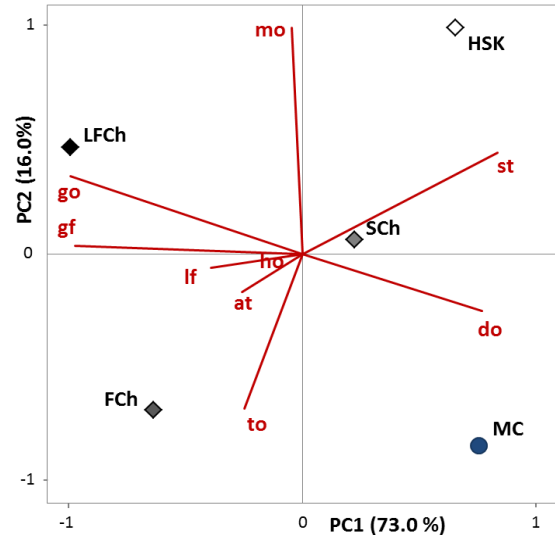


Figure 2. PCA group average configuration of meat goat types on the basis of significant flavour sensory attributes, whose correlations with the space dimensions are reported as vectors (see Material and methods for attribute description)

### Consumer acceptability

The respondents who took part in the hedonic evaluation were Friuli Venezia Giulia Region residents, relatively well balanced by gender and comprised in a range of age from 21 to 75 years, with the majority (72%) aged between 25 and 64 years old. They had a good level of education (82% with diplomas and degrees) and were half employed, 31% students and the remainder (19%) unemployed, retirees or housewives. The large majority of them (90%) claimed they eat fresh meat at least 2 or 3 times a month and 41% at least 2 or 3 times a week, purchasing it most commonly from supermarkets (48%) or butchers (37%), with a significant 15% of them buying meat directly from producers or being meat producers. The meat types consumed with greater frequency were: pork (67% of respondents consumed it at least once per week), poultry (64%) and beef (61%). Goat meat, as expected, was consumed rarely and only 8% of applicants declared they eat it at least 2 or 3 times a month. However, when asked for familiarity with meat goat, half of respondents

revealed that they were familiar with this meat. Indeed, while half of them chose in the familiarity scale [9] the options: 'I recognize the meat, but I have not tasted it' (5%) or 'I have tasted, but I do not use the meat' (45%) (Unfamiliar group); another half of participants selected the choices 'I occasionally eat the meat' (44%) or 'I regularly eat the meat' (6%) (Familiar group).

The consumers clearly perceived the sensory differences between goat meat types as reflected in the liking ratings (Table 3). In general terms, the most appreciated meats were capretto and heavy capretto, the scores of which were close to the 'like moderately' level. The less pleasant meat was chevon of FCh and LFCh type that received scores only marginally higher than 'like slightly' [8]. However, the acceptability of the less tender and more mature flavoured chevon was influenced by the level of familiarity with goat meat. Indeed, while the unfamiliar consumers showed a significant decrease in pleasantness when tasting chevon instead of capretto, the more familiar ones, reduced their level of likeness only when tasting the much more matured chevon type.

Table 3. LAM liking scores of consumers for the different goat meat types. Mean values and effect of consumer familiarity with goat meat

	Goat meat type					SEM
	MC	HSK	SCh	FCh	LFCh	
Mean	30 <sup>a</sup>	28 <sup>ab</sup>	24 <sup>ab</sup>	20 <sup>bc</sup>	15 <sup>c</sup>	1.74
Unfamiliar	28 <sup>a</sup>	25 <sup>ab</sup>	16 <sup>bc</sup>	7 <sup>c</sup>	10 <sup>c</sup>	2.45
Familiar	32 <sup>a</sup>	32 <sup>a</sup>	31 <sup>a</sup>	33 <sup>a</sup>	20 <sup>b</sup>	2.48
Difference	5	7	15*	26*	10	3.49

<sup>a,b,c</sup> Means in the same row with unlike superscripts differ ( $P \leq 0.05$ ); \*: difference differs from 0 ( $P \leq 0.05$ )

#### IV. CONCLUSION

Increasing the age of kids, considered as by-product with a low commercial value except during the Easter period, led to types of goat meat with peculiar sensory attributes, different from those of traditional milk-fed capretto. Whereas heavy summer kid, 3 to 4-month old, maintained delicate properties, like tenderness, juiciness and sweetness, chevon became progressively redder, goaty in flavour and tougher with increasing ram kid age. The target consumers to obtain the best value from chevon are those having familiarity with goat meat; indeed their acceptability drops only

with meat from the oldest ram kids, i.e. those close to their sexual maturity.

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