

# Effect of milk feeding system on carcass and meat quality of Frisa Valtellinese kids

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**RIASSUNTO** – Effetto del sistema di allattamento sulla qualità della carcassa e della carne del capretto di razza Frisa Valtellinese - *Sedici capretti di razza Frisa Valtellinese sono stati allattati naturalmente (N) o con sostituto del latte (A) e macellati a circa 17 kg di peso. L'alimentazione artificiale ha prodotto un aumento della resa lorda di macellazione (45,6 vs. 48,6% per N e A), a causa soprattutto del minor contenuto dell'apparato digerente. Il sistema di allattamento ha avuto una scarsa influenza sulla resa in tagli, mentre la carcassa dei capretti A ha mostrato un maggior rivestimento adiposo (stato d'ingrassamento: 3,5 vs. 2,2 punti). I principali parametri di qualità della carne (pH finale, colore, perdite alla cottura, resistenza al taglio, analisi tipo) non sono stati modificati dalla dieta; tuttavia la carne dei capretti allattati naturalmente è risultata più ricca di C18:3 e C20:5, con un più favorevole rapporto n-3/n-6 (0,77 vs. 0,45).*

**Key words:** Frisa Valtellinese, kid, milk feeding system, carcass and meat quality.

**INTRODUCTION** – Frisa goat is an autochthonous breed from high Valtellina (Italian Central Alps), the territory of Sondalo and Grosio villages being regarded as its cradle. Widespread in the Province of Sondrio, it counts about 5.000 heads. Frisa Valtellinese has black coat, apart from the characteristic white stripes of the head (*frisature*) and other specific white regions, and short hair. In comparison with other similar autochthonous Alpine goat breeds it distinguishes thanks to its bigger size (80 cm at withers). The hardy constitution is coupled with some dairy traits such as deep chest, long rump and well developed udder (Corti *et al.*, 1998).

After a century long decline, the Frisa Valtellinese breeding, as well as other autochthonous Alpine goat populations, is now showing remarkable, although contradictory, recovering signals which deserve to be encouraged (Corti and Brambilla, 2003). Product characterisation and valuation is a useful way by which research may efficiently contribute. However, different farming systems have to be considered in order to fulfil this purpose. Natural suckling is the typical rearing system in extensive farming, where meat kids is usually the sole commercial output. This production system lives together with the semi-extensive one, which maintains the Alpine tradition of milking the goats, summered on mountain pastures. In the semi-extensive system, breeders often exploit intensive techniques in the permanent valley farm unit; these techniques include artificial milk feeding as well as machine milking and concentrate supplementation (Corti and Brambilla, 2003). The purpose of the present paper is to study the effects of natural *vs.* artificial milk feeding on carcass and meat quality of young Frisa Valtellinese kids.

**MATERIAL AND METHODS** – Sixteen Frisa Valtellinese kids, reared in a farm in Valchiavenna, were fed either on natural milk (N) suckled from their dams or on a commercial milk replacer (A), based on skimmed dry milk and milk derivatives (73%) and containing 23% powder weight of both protein and fat; the milk replacer was administered in two meals per day in a powder to water ratio variable from 15 to 18%, according to age, and in increasing quantities, up to the final 1l/head/meal. When kids averaged 17.3 (s.d. 2.65) kg live

weight, they were slaughtered according to ASPA (1991) procedures. Carcasses were halved and dissected in neck, ribs (steaks and lumbar region), flank (brisket and abdominal region), thoracic and pelvic limb. Muscle *longissimus thoracis et lumborum* (LT) was dissected from the lumbar region and analysed for Warner-Bratzler shear force (WBSF), water loss, colour, pH, proximate analysis and fatty acid composition (ASPA, 1996). Data were submitted to one-way ANOVA, comparing two milk feeding systems: natural *vs.* artificial.

**RESULTS AND CONCLUSIONS** – Dressing percentages (table 1) were lower than those reported by Corti and Sangiorgio (2000) for Frisa Valtellinese kids and by Manfredini *et al.* (1988) for Alpine kids with similar live weight. The administration of milk replacer allowed an increase in gross dressing percentage, as a consequence of the higher incidence of the gut content in N kids, which would consume some fibrous feed when reared under their dams. The difference in yield between rearing systems further increased considering the gross yield with head and offal, due to a higher incidence of these body parts and, especially, offal in A kids (6.44 *vs.* 8.03% for N and A, respectively): this may be due to a higher develop of liver caused by the artificial diet. The incidence of the cuts showed a significant difference only for neck, heavier in naturally fed kids. Carcass fatness, which is important for commercial evaluation (Colomer-Rocher *et al.*, 1987), was clearly higher in artificially reared kids (3.50 – good to optimum – *vs.* 2.25 – discreet to good, for A and N, respectively).

Table 1. Carcass traits.

	Milk feeding		Significance	Pooled s.d.
	Natural	Artificial		
Starved live weight (kg)	17.1	17.5	ns	2.68
Empty body weight (EBW, kg)	14.41	15.69	ns	2.499
Gut content (% EBW)	19.1	11.7	0.000	3.03
Warm carcass weight (kg)	7.81	8.50	ns	1.347
Warm carcass + head and offal (kg)	9.90	10.95	ns	1.671
Warm dressing percentage (%):				
net (on EBW)	54.3	54.2	ns	2.09
gross (on LW)	45.6	48.6	0.01	1.98
gross with head and offal	57.9	62.5	0.001	2.22
Offal (% EBW)	6.44	8.03	0.000	0.665
Empty gut (% EBW)	9.15	8.52	ns	0.984
Jointing (% carcass weight):				
neck	13.4	12.6	0.04	0.68
flank (brisket + abdominal region)	13.8	14.4	ns	0.87
thoracic limb	21.9	21.8	ns	0.73
ribs (steaks + lumbar region)	17.6	17.6	ns	0.91
pelvic limb	33.3	33.6	ns	1.02
1 <sup>st</sup> quality cuts% (1)	72.8	73.0	ns	1.08
Fatness score	2.25	3.50	0.02	0.850

(1) Sum of thoracic limb, ribs and pelvic limb.

The most important quality traits of the meat (final pH, colour, cooking loss, WBSF, chemical composition) were not affected by the two different diets (table 2). It may be noticed from WBSF values that kid meat was tender: Todaro *et al.* (2004) found higher values for meat of Nebrodi kids weighing 11 kg (6.4 kg/cm<sup>2</sup>). Some differences between the two adopted milk feeding systems were observed on meat fatty acid composition: the LT of the naturally fed kids was richer in stearic, linolenic and EPA acid, but no difference could be revealed in the incidence of saturated, mono- and poli-unsaturated fatty acids. The meat of the N kids was higher in n-3 PUFA and in n-3/n-6 ratio (0.77 *vs.* 0.45 for N and A, respectively).

In conclusion, artificial milk feeding, useful for expanding cheese production, increased the gross yield of Frisa Valtellinese kids and enabled the production of better fat covered carcasses. On the other hand, natural rearing combined its higher emotional value with some distinctive intrinsic qualities of Frisa Valtellinese kid meat, mainly linked to a higher level of n-3 PUFA, and consequently to a higher n-3/n-6 ratio, which is favourable for human health.

Table 2 Longissimus thoracis et lumborum traits.

	Milk feeding		Significance	Pooled s.d.
	Natural	Artificial		
pH	5.79	5.81	ns	0.183
Physical characteristics:				
Colour: L*	40.4	40.4	ns	2.13
a*	1.79	1.70	ns	1.112
b*	11.9	11.8	ns	0.88
Croma	12.1	11.9	ns	0.93
Hue angle	81.7	82.0	ns	5.34
Cooking loss (%)	22.8	20.4	ns	2.87
WBSF (N)	36.5	32.5	ns	6.03
Proximate analysis (%):				
Dry matter	24.6	24.8	ns	1.59
Crude fat	3.20	3.50	ns	1.180
Crude protein	19.9	19.8	ns	0.62
Ash	1.42	1.39	ns	0.210
Fatty acids (% total f.a.):				
C 18:0	12.6	10.8	0.05	1.62
C 18:3	3.0	1.6	0.03	1.06
C 20:5	2.4	1.4	0.07	1.03
saturated	38.2	36.8	ns	2.67
mono-unsaturated	35.9	39.1	ns	5.10
poli-unsaturated	25.9	24.1	ns	6.45
n-3 PUFA	10.0	6.8	0.07	3.23
n-6 PUFA	13.9	15.8	ns	4.03
n-3/n-6	0.77	0.45	0.01	0.201

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