CORRELATION BETWEEN COLLAGEN TRAITS AND SENSORIAL AND PHYSICAL TRAITS IN *M. LONGISSIMUS DORSI* OF BROWN BULLS

E. ZGUBIČ, S. ČEPIN, S. ŽGUR

44 th International Congress of Meat Science and Technology
University of Maribor, Faculty of Agriculture, Vrbanska 30, 2000 Maribor, SLOVENIA
University of Ljubljana, Biotechnical Faculty, Zootechnical Department, Groblje 3, 1230 Domžale, SLOVENIA

Keywords: beef, meat quality, meat tenderness, sensory traits, collagen

INTRODUCTION

For the consumer, sensory traits are the most important meat traits, which define beef quality. Tenderness is one of the most important sensory traits (Seideman et al., 1989) and depends on many different biological and technological factors (Dransfield, 1992). Among them, myofibrilar fragmentation and content of connective tissue and collagen (Dransfield, 1977) and collagen solubility (Bailey and Light, 1989; Gerrard et al., 1987) are the most important. Collagen concentration does not change significantly during growth until slaughter, but collagen solubility decreases with animal weight and age (Sorensen, 1981; Bailey and Light, 1989). The aim of the work was to analyse the correlation between collagen and sensorial and physical meat traits in Brown bulls.

MATERIALS AND METHODS

49 Brown bulls in 6 groups were offsprings of 6 different sires and in one group they were offsprings of coincidental sires. *M. Longissimus dorsi* samples for sensory and collagen analysis were taken between 8th and 13th rib and frozen at -20 °C and for collagen at -70 °C until analysis. Shaer force values were recorded with Instron. The colorometric analysis for hydroxyproline was used to determine the collagen concentration (Bergman and Loxely, 1963 adopted by Matissek et al. 1992). Collagen solubility was determined after 1h extraction at 77°C in Ringer solution (Hill, 1966).

The statistical analysis was performed by GLM procedure (SAS, 1990). Sires of the analysed bulls and a percentage of American Brown Swiss genotype as fixed effects and body weight at slaughter and collagen concentration or solubility as covariables were included into the statistical model.

RESULTS AND DISCUSSION

Bulls were slaughtered at an interval from 406 to 559 days of age and from 501 to 658 kg live weight, which is common in Slovenia. Mean collagen content was 5.31 mg/g. fresh tissue with 6.28 % of soluble collagen. Table 1 presents the results of the variance analysis. The regression coefficient showed that with an increased collagen content shear force values increased and tenderness decreased. Greater collagen solubility resulted in lower shear force values and increased tenderness. But neither the regression coefficient for collagen content nor for soluble collagen were statistically significant.

Also Harris et al. (1992) did not found any statistical significant correlation between collagen content and solubility and meat tenderness. Sorensen (1981) reported about significant correlation between collagen traits and meat tenderness in muscle *semitendinosus*, but not in *longissimus dorsi*. Dransfield (1977) and Seideman (1986) found significant differences in tenderness between different muscles, that contain different collagen content.

CONCLUSIONS

Collagen traits were not statistically significant correlated with sensory (tenderness, juiciness and flavour) and physical (shear force values) traits of meat from brown bulls.

REFERENCES

Bailey, A.J./ Light, N.D. Connective tissue in meat and meat products. London, Elsevier Applied Science, 1989, 355 s.

Dransfield, E. Intramuscular composition and texture of beef muscles. J. Sci. Fd. Agric., 28(1977), s. 833 - 842

Dransfield, E. Meat tenderness. Meat Focus, 9(1992), s. 237 - 245

Gerrard, D.E./ Jones, S.J./ Aberle, E.D./ Lemenger, R.P./ Diekman, M.A./ Judge, M.D. Collagen stability, testosterone secretion and meat tenderness in growing bulls and steers. J. Anim. Sci., 65(1987), s. 1236 - 1242

Harris, J.J./ Miller, R.K./ Savell, J.W./ Cross, H.R./ Ringer, L.J. Evaluation of tenderness of beef top sirloin steaks. J. Food Sci., 57(1992), s. 6 -15

Hill, F. The solubility of intramuscular collagen in meat animals of various ages. J. Food Sci., 31 (1966), p. 161 - 166

Matissek, R./ Schnepel, F. M./ Steiner, G. Lebensmittelanalytik. Grundzüge - Methoden - Anwendungen, 2. Auflage. Berlin - Heidelberg, Springer - Verlag, 1992, p. 107 - 111

Seideman, S.C. Methods of expressing collagen characteristics and their relationship to meat tenderness and muscle fiber types. J. Food Sci., 51(1986), s. 273-276

Seideman, S.C./ Cross, H.R./ Crouse, J.D. Variations in the sensory properties of beef as affected by sex, condition, muscle and postmortem aging. J. Food Qual., 12(1989), s. 39 - 58

SAS 1989. SAS/ STAT User's, Version 6. Caryn, NC, USA, SAS Institute Inc.

Sorensen, S.E. Relationships between collagen properties and meat tenderness in young bulls of different genotype, weight and feeding intensity. Ph.D.Thesis, Kopenhagen, Royal veterinary and agricultural university, 1981, 138 s.

Table 1: P – value of statistical model and regression coefficients, their values (b_1 for collagen concentration and b_2 for collagen solubility) and standard errors

	COLLAGEN CONCENTRATION				SOLUBLE COLLAGEN			
Traits	p-value model	b_1 collagen conc.	S.E. b_1	p-value b_1	p-value model	b_2 soluble collagen	S.E. b_2	p-value b_2
Shear force – transverse, N	0.05	1.11294	4.17941	0.79	0.03	-3.05294	2.30211	0.19
Shear force – longitudinal, N	0.03	1.18703	1.62008	0.47	0.01	-1.35303	0.89175	0.14
Tenderness*	0.30	-0.12889	0.24377	0.60	0.30	0.06977	0.13718	0.61
Juiciness*	0.97	-0.07088	0.10311	0.50	0.87	-0.08476	0.05676	0.14
Flavour*	0.96	-0.00444	0.08400	0.96	0.96	-0.02400	0.04800	0.61

* - 1 - is the worst and 7 the best note

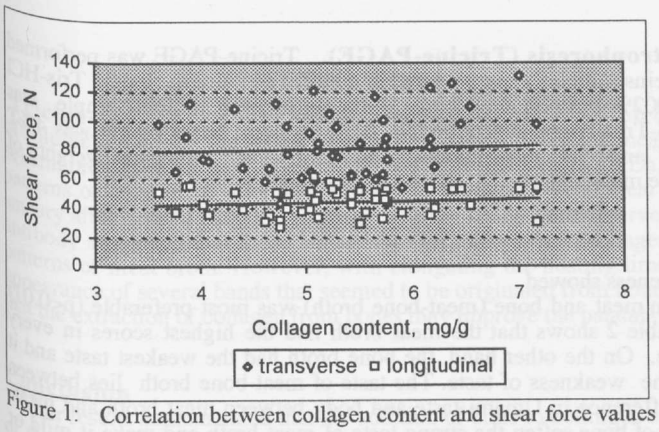

Figure 1: Correlation between collagen content and shear force values

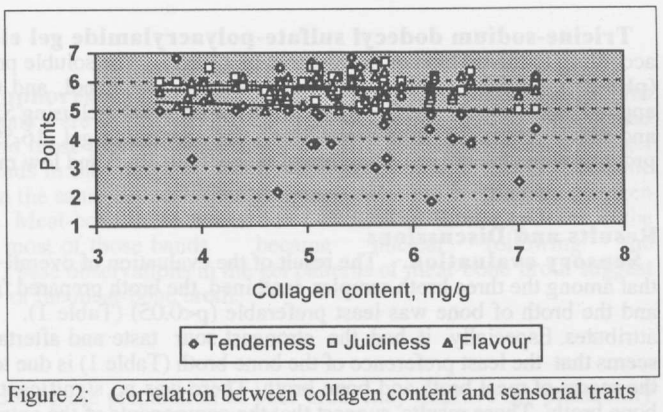

Figure 2: Correlation between collagen content and sensorial traits

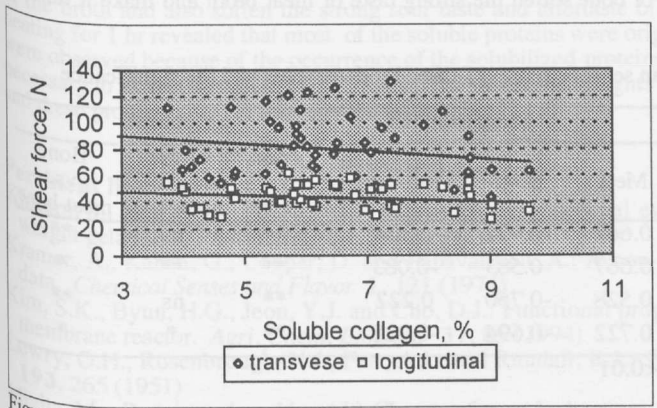

Figure 3: Correlation between collagen solubility and shear force values

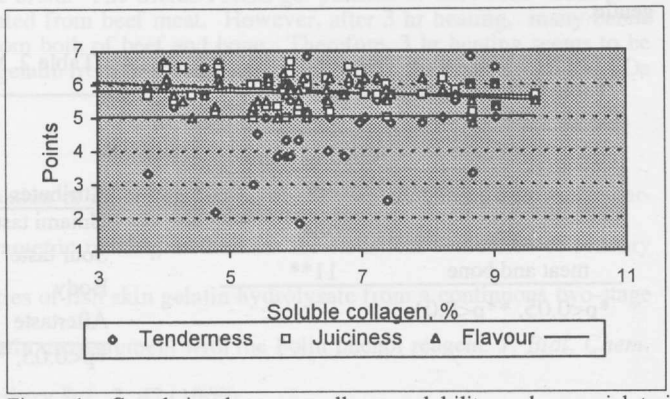

Figure 4: Correlation between collagen solubility and sensorial traits