

# Effect of age on meat quality attributes in wild red (*Cervus elaphus*) and fallow deer (*Dama dama*)

Munkhnasan Enkhbold, Attila Lőrincz, Márk Hajnal István, Majd Elayan, László Friedrich, Adrienn Varga-Tóth

Department of Livestock and Food Preservation Technology, Hungarian University of Agriculture and Life Sciences, Menei st 44, H-1118 Budapest, Hungary

## Introduction

**Game meat** is gaining popularity among consumers for its unique flavor and strong nutritional profile. It is rich in protein, essential vitamins, and low in fat, making it a healthy choice [1]. Meat quality in wild deer is influenced by various factors [2], including age, which affects tenderness, water-holding capacity, and color. **This study aimed to investigate how age impacts meat quality traits in wild red and fallow deer, and to estimate the age of an unknown sample using instrumental measurements.**

## Methodology

Wild red deer (*Cervus elaphus*) and fallow deer (*Dama dama*) meat samples were collected from local hunters in Western Hungary. *Semimembranosus* muscle samples were taken from deer aged **7-48 months**, along with one sample of unknown age. Instrumental analyses were conducted to evaluate the effect of age on meat quality. The following parameters were assessed:

- ✓ **Water Holding Capacity (WHC)**
- ✓ **pH**
- ✓ **Instrumental Color Measurement**
- ✓ **Instrumental Texture Measurement**

## Results

**1. WHC:** Significantly differed among age groups, ranging from 0.00039 g/mm<sup>2</sup> in younger deer to 0.00082 g/mm<sup>2</sup> in older animals. The unknown sample showed low WHC, similar to younger deer.

**Table 1.** Physicochemical Properties of Deer Meat Samples of Different Ages (Mean±SD)

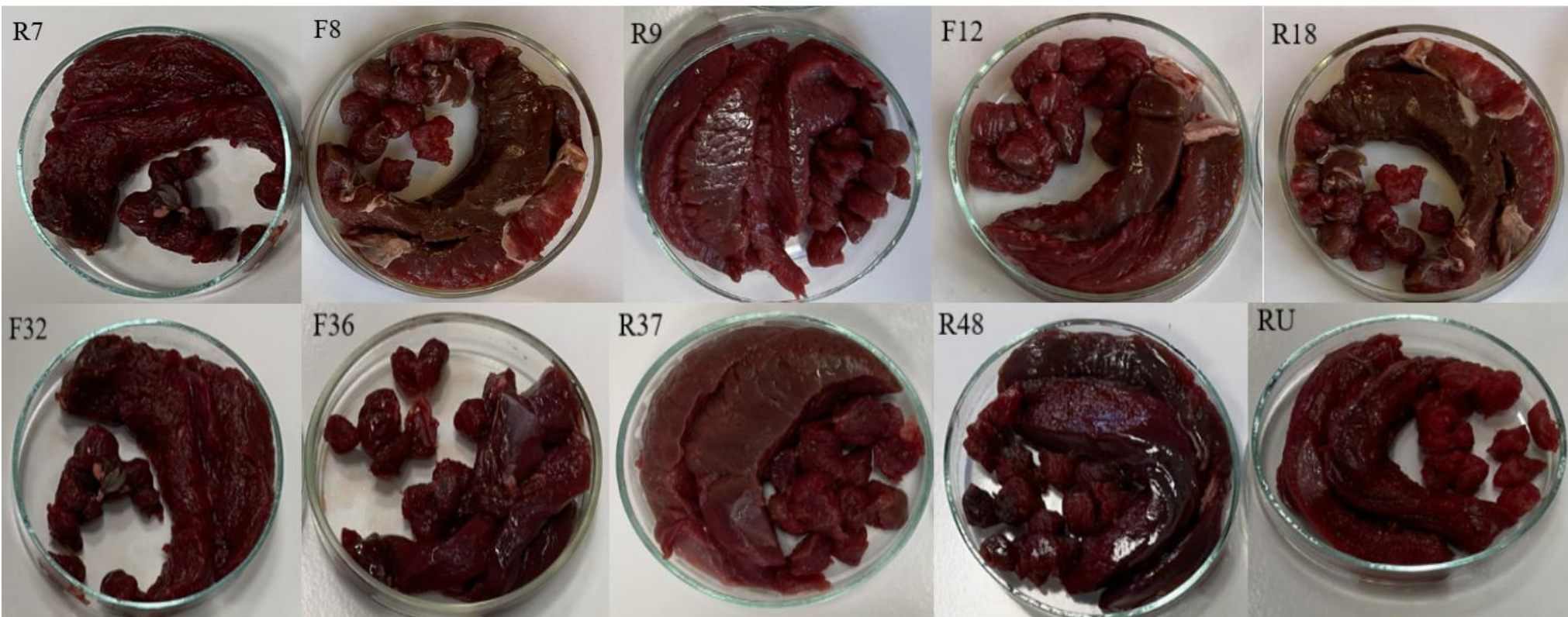
Sample	pH	L*	a*	b*	Shear Force (N)
R7	5.63±0.01 <sup>a</sup>	35.1±4.59 <sup>a</sup>	11.2±2.54 <sup>a</sup>	4.0±0.80 <sup>ab</sup>	32.38±11.23 <sup>a</sup>
F8	5.79±0.19 <sup>ab</sup>	37.2±1.34 <sup>a</sup>	10.2±1.00 <sup>a</sup>	2.6±0.37 <sup>a</sup>	39.99±9.66 <sup>a</sup>
R9	5.57±0.01 <sup>a</sup>	41.6±4.59 <sup>b</sup>	14.6±1.54 <sup>a</sup>	3.5±0.50 <sup>a</sup>	37.57±2.96 <sup>a</sup>
F12	6.09±0.03 <sup>c</sup>	35.8±4.59 <sup>a</sup>	10.4±1.30 <sup>a</sup>	4.6±0.31 <sup>b</sup>	39.83±6.76 <sup>a</sup>
R18	5.64±0.03 <sup>a</sup>	33.2±1.20 <sup>a</sup>	9.9±1.00 <sup>a</sup>	5.0±0.17 <sup>b</sup>	48.89±3.33 <sup>b</sup>
F32	5.83±0.01 <sup>b</sup>	35.3±4.59 <sup>a</sup>	10.6±2.54 <sup>a</sup>	3.3±0.47 <sup>a</sup>	42.43±3.65 <sup>b</sup>
F36	5.84±0.14 <sup>b</sup>	37.0±2.34 <sup>a</sup>	9.3±1.00 <sup>a</sup>	3.7±0.22 <sup>a</sup>	49.53±3.39 <sup>b</sup>
R37	5.61±0.11 <sup>a</sup>	41.8±4.59 <sup>b</sup>	11.4±2.54 <sup>a</sup>	4.9±0.60 <sup>b</sup>	56.70±11.02 <sup>c</sup>
R48	5.52±0.01 <sup>a</sup>	36.0±3.67 <sup>a</sup>	12.0±3.08 <sup>a</sup>	4.6±0.40 <sup>b</sup>	60.80±8.18 <sup>c</sup>
RU	5.87±0.01 <sup>b</sup>	37.0±2.46 <sup>a</sup>	13.4±1.00 <sup>a</sup>	2.8±0.17 <sup>a</sup>	53.75±10.83 <sup>c</sup>

**Note:** R = Red deer, F = Fallow deer, RU = Red deer of unknown age. The number following the letter indicates the animal's age in months. Different superscript letters within a column indicate statistically significant differences ( $p < 0.05$ ).

## Results

**2. pH:** Significant differences observed among samples ( $p < 0.05$ ). The highest pH was found in F12, while the unknown sample showed a mid-range pH, similar to F32 and F36.

**3. Surface color:**  $L^*$ ,  $a^*$ , and  $b^*$  values varied among samples, with R9 and R37 showing significantly higher  $L^*$ , and F12, R18, R37, and R48 displaying higher  $b^*$  values ( $p < 0.05$ ). No significant differences were observed in  $a^*$  values across age groups.



**Figure 1.** Visual Appearance of Deer Meat Samples of Different Ages

**4. Texture analysis:** Parameters varied significantly with age. Older deer (e.g., R37, R48) exhibited higher shear force, hardness, and chewiness, while younger animals showed more tender meat with lower resistance and structural firmness ( $p < 0.05$ ). Texture analysis suggests RU likely came from a mid-range deer.

## Conclusion

Age had a clear impact on deer meat quality, particularly affecting texture, pH, and WHC. Instrumental measurements suggest the unknown sample likely originated from a mid-age animal. Future studies should include larger sample sizes, different muscles, and seasonal effects to refine age prediction models.

## References

- [1] Demartini, E. et al. (2018) Consumer preferences for red deer meat: a discrete choice analysis considering attitudes towards wild game meat and hunting, *Meat Science*, 146, pp. 168–179.
- [2] Lorenzo, J.M. et al. (2019) Effect of age on nutritional properties of Iberian wild red deer meat, *Journal of the Science of Food and Agriculture*, 99(4), pp. 1561–1567.

## Acknowledgements

We are grateful for the support of the Doctoral School of Food Science, Hungarian University of Agriculture and Life Sciences.