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Analysis of Veal Shoulder Muscles for Chemical Attributes

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Summary

The value of wholesale veal cuts varies; the rack, loin, and leg demand a premium price, while the shoulder brings little more per pound than the live animal. This study characterized the chemical properties of muscles from the veal shoulder for the potential to upgrade their value. The m. infraspinatus *and* m. rhomboideus *fell in the intermediate or desirable groups for all traits. All nine muscles show promise in the ability to increase value.*

Introduction

Veal muscles from the loin, rack and leg are being fully utilized using conventional culinary applications and therefore sell for a premium; conversely, few applications are commonly applied to shoulder muscles thus causing a lower-value primal. The objective of this study was to characterize the shoulder muscles, using their chemical properties, for the potential to upgrade their value.

Procedure

Eighteen veal shoulders from separate animals were purchased from two veal packers and shipped to the University of Florida Meat Processing facility for muscle fabrication and isolation of the *m. complexus*, *m. pectoralis profundus*, *m. infraspinatus*, *m. rhomboideus*, *m. serratus ventralis*, *m. splenius* , *m. supraspinatus*, *m. teres major,* and *m. triceps brachii*. Muscles were denuded and a 4 g sample was taken from each muscle to evaluate expressible moisture. Vacuum packaged samples were shipped to the University of Nebraska–Lincoln Loeffel Meats Laboratory and aged 13 days from slaughter. The muscles were evaluated for color and ground to obtain a representative sample. This ground sample was then frozen and powdered using liquid nitrogen and a Waring Blender.

Expressible moisture/water holding capacity (WHC) was measured 4 days postmortem by placing a 2 g lean sample in a paper thimble, centrifuging, and weighing to determine moisture loss.

Color values were measured using a Hunter Lab® Mini Scan XE with a 1 in port using a series of three measurements to measure L*, a*, and b* using illuminant A and a 10° standard observer on samples that were allowed to bloom for 30 minutes.

Proximate composition for moisture and ash was determined using a LECO Thermogravimetric Analyzer-601. Fat content was determined using the Soxhlet ether extraction AOAC procedures.

Muscle pH was measured by preparing slurry of 10 g of sample and 90 mL of water using a combination bulb pH probe and temperature probe.

Means and separations were completed using PROC MEANS, LSMEANS and DIFF processes of PROC GLIMMIX functions of SAS.

Results

All chemical traits measured showed a significant muscle effect ($P < 0.008$). The *m. teres major* was numerically highest in expressible moisture (lowest WHC) at 39.53% and was significantly different than all but two muscles ($P < 0.044$). Most of the veal muscles were quite lean. The *m. serratus ventralis* had the highest fat content at 5.04% ($P = 0.043$) followed by the *m. complexus* at 4.41% ($P = 0.003$) with the remaining muscles ranging from 2.28-3.26%. Higher fat samples tended to have lower moisture values. The *m. serratus ventralis* had the lowest moisture content (75.58%) and was significantly lower than all but *m. complexus* ($P > 0.05$).

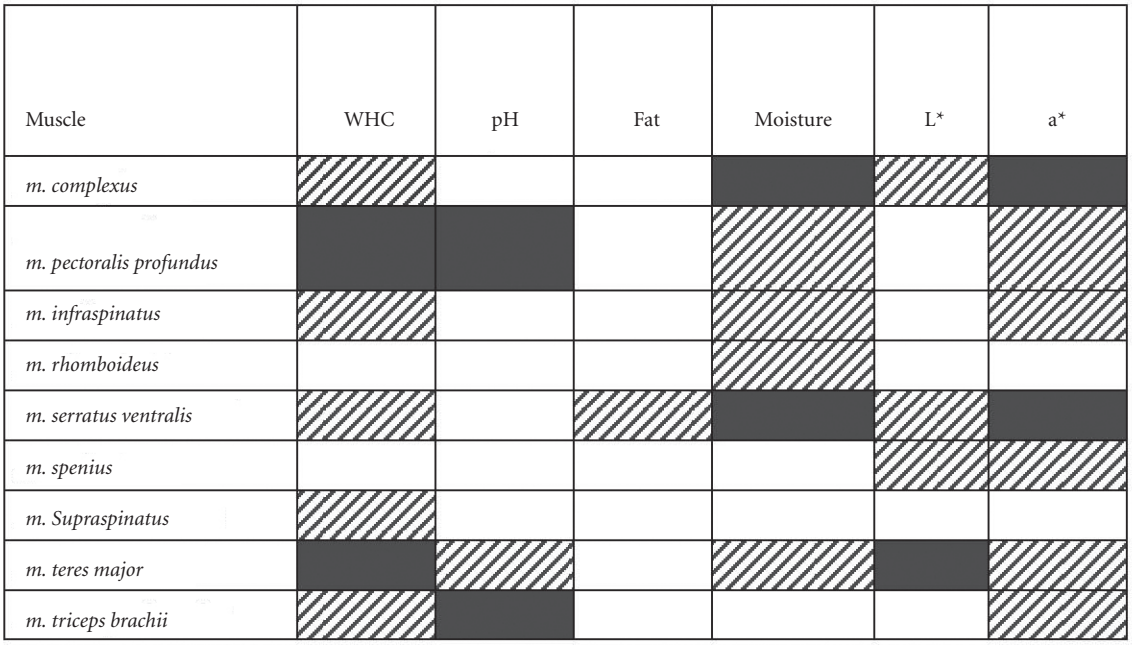
When measured for color, the *m. supraspinatus* was the lightest (highest L*) muscle ($P = 0.023$). The *m. serratus ventralis* was considered the least desirable for redness and was significantly redder than all but one muscle ($P > 0.05$). Of the nine muscles, only two, the *m. pectoralis profundus* and *m. triceps brachii*, were least desirable for pH at 5.67 and 5.69 respectively while *m. infraspinatus* was most desirable with a pH of 5.99 ($P > 0.05$). Muscles with higher pH have better WHC.

The *m. infraspinatus* and *m. rhomboideus* were statistically superior ($P < 0.05$) in chemical traits compared to muscles with the least desirable values. Conversely, the *m. pectoralis profundus* was statistically similar to the least desirable value ($P > 0.05$) for three of the traits. Figure 1 graphically displays the data and is broken into desirable, intermediate and undesirable, white, striped

Table 1. Mean values for chemical traits of veal muscles.

Muscle	WHC %	Moisture %	Fat %	Ash %	pH	L*	a*	b*
m. complexus	37.47^{bcd}	75.82^{de}	4.41^{d}	1.04^{ab}	5.86^{bc}	48.81^{cd}	27.88^{cd}	22.79^{ab}
m. pectoralis profundus	38.56^{cd}	76.34^{cd}	2.73^{abc}	1.16^{de}	5.67^{e}	49.22^{bc}	26.16^{ab}	19.50^{e}
m. infraspinatus	36.25^{ab}	76.86^{bc}	3.26^{c}	1.00^{a}	5.99^{a}	50.00^{b}	26.20^{ab}	21.17^{cd}
m. rhomboideus	35.20^{a}	76.88^{b}	2.54^{ab}	1.12^{cd}	5.80^{cd}	49.76^{bc}	25.82^{ab}	20.10^{de}
m. serratus ventralis	36.65^{abc}	75.58^{e}	5.04^{e}	1.03^{ab}	5.89^{b}	48.69^{cd}	28.05^{d}	23.46^{a}
m. splenius	35.89^{ab}	77.47^{a}	2.39^{a}	1.07^{bc}	5.86^{bc}	48.80^{bcd}	26.65^{b}	20.70^{cde}
m. supraspinatus	37.23^{abc}	77.33^{ab}	2.76^{abc}	1.16^{de}	5.85^{bc}	51.37^{a}	25.32^{a}	20.11^{de}
m. teres major	39.53^{d}	76.21^{d}	3.06^{bc}	1.16^{de}	5.75^{d}	47.83^{d}	26.49^{b}	20.31^{de}
m. triceps brachii	37.19^{abc}	77.16^{ab}	2.28^{a}	1.21^{e}	5.69^{e}	49.61^{bc}	26.77^{bc}	21.77^{bc}

[a-e]Means within a given column with common superscripts do not differ significantly ($P > 0.05$).



WHC	pH	Fat %	Moisture %	l*	a*
W = < 36%	W = > 5.8	W = < 5%	W = > 77%	W = > 49	W = < 26
S = 36-38%	W = 5.7-5.8	S = 5-7%	S = 76-77%	S = 48-49	S = 26-27
G = > 38%	G = < 5.7	G = > 7%	G = < 76%	G = < 48	G = > 27

Figure 1. Graphic representation of the traits of veal muscles where white (W) is desirable, striped (S) is intermediate, and dark gray (G) is undesirable.

and gray, respectively, for each trait. Muscles that are desirable or intermediate for all traits are *m. infraspinatus*, *m. rhomboideus*, *m. splenius* , and *m. supraspinatus* and consequently show much promise to be upgraded. The *m. triceps brachii* had an undesirable grouping for only pH while *m. complexus*, *m. pectoralis profundus*, *m. serratus ventralis*, *m. teres major* had two traits each that were classified as undesirable. Yet from a chemical profile perspective, all of the muscles possessed some favorable characteristics and in the proper culinary application still could be utilized as a value-added muscle.

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