USE OF VIDEO IMAGE ANALYSIS, RIBEYE GRIDS, AND LINEAR RIBEYE MEASUREMENTS TO PREDICT AND COMPARE RIBEYE AREAS FROM CARCASS LEFT AND RIGHT SIDES

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Summary

Ribeye tracings from 265 beef carcasses were used to compare ribeye areas from right and left sides. When video image analysis (VIA) was used to determine ribeye area, no difference (P=.48) was observed between right and left sides. However, when ribeye area was determined by using USDA grids, those on the left side were slightly larger (P<.01) than those on right side. This difference is negligible considering the wide range in variation (SD=.68 in^2) between right and left side ribeye areas. Ribeye area correlations between VIA and grid results were high for both right (.96) and left (.95) sides. Linear measures (length, mid-width, and widest width) of ribeyes predicted ribeye area with reasonable accuracy (R^2=.90 and .91). These methods provide several options to determine ribeye area. However, data collectors need to realize that the difference between right and left side ribeye areas may be a greater variable than the sensitivity of the method used.

Introduction

Ribeye area is the muscling factor used in calculating yield grade. However, ribeye areas from the left and right sides of a carcass may differ. This study evaluated the difference in size of ribeyes between the left and right sides. Ribeye measurements are traditionally performed by using a USDA ribeye grid. However, at current chain speeds in most packing plants, the time needed to accurately "grid" a ribeye is too long. Many techniques have been used to accelerate collection of carcass data. Systems that measure images using current computer and video technology (video image analysis, VIA) offer faster and more accurate ribeye area measurements. In addition, simple linear measures of ribeye dimensions potentially could predict ribeye area very rapidly if less accuracy is acceptable. Therefore, our objective was to compare USDA ribeye grids, linear measures, and VIA for determining ribeye area.

Experimental Procedures

Ribeyes from the right and left sides of 265 beef carcasses were traced onto acetate tracing paper at a commercial packing facility. Members of the KSU Meats Judging Team measured the ribeye tracings using USDA grids. Two individuals measured each ribeye twice and averaged their two measurements. The measurements from the two individuals were averaged to determine the final ribeye area. If the difference between the two individuals' results was greater than 0.5 in^2, a third person measured the ribeye and the measurement furthest from the mean was deleted. In addition, ribeye length, center mid-width, and widest width were measured using a ruler calibrated to the nearest .05 in. Ribeye tracings also were measured by VIA. Correlations, paired t-tests, and regression analysis were conducted on data.

Results and Discussion

A plot of right vs. left side ribeye areas using VIA is displayed in Figure 1. The ribeye areas ranged from 7.6 to 19.9 in^2. When rounded to the nearest .1 in^2, right side ribeyes were larger in 124 carcasses (46.8%) and left side ribeyes were larger in 129 carcasses (48.7%). The mean difference (right-left) was –.04 ± .68 in^2. When the right side was larger, the mean difference (right-left) was .69 ± .40 in^2 (range .1 to 2.7 in^2) vs. .74 ± .42 in^2 (range .1 to 3.4 in^2) when the left side was larger. A paired t-test revealed no difference (P=.48) between right (12.92 in^2) and left (12.95 in^2) sides when measured by VIA. However, when USDA grids were used, ribeyes from the left sides (13.05 in^2) were slightly larger (P<.01) than ribeyes from the right sides (12.86 in^2).

Selected correlations of right and left side ribeye areas and measurements using USDA grids, a ruler, and VIA are presented in Table 1. Correlations between grid and VIA ribeye areas and between ruler and VIA-measured ribeye lengths were high for both the right (.96 and .97, respectively) and left (.95 and .97, respectively) carcass sides. For both right and left carcass sides, linear measures (length, mid-width, widest width, and VIA length) had moderately high correlations (.73 to .80) with ribeye area measures (Grid and VIA). However, length measures (Ruler and VIA) had lower correlations (.37 to .49) with width measures (mid-width and widest width).

For carcass right sides and pooled right and left sides (Table 2), ribeye areas measured with a grid or VIA were similar (P=.33). For the left sides, ribeyes measured with a USDA grid were slightly larger (P<.01) than VIA-measured ribeyes. However, the .1 in^2 difference is negligible when calculating yield grade. Measurement of ribeyes by either VIA or USDA grids can accurately determine ribeye area. Length of ribeyes measured by a ruler and VIA were similar (P=.51) for carcass left sides. For carcass right sides and combined right and left sides, ribeye lengths measured by VIA were slightly greater (P<.05) than those measured by ruler. Again the .05 and .02 in. differences are minimal and have little consequence compared to the wide range in ribeye lengths.

Regression equations (Table 3) were developed to predict VIA ribeye area from linear ruler measurements of ribeye length, mid-width, and widest width. Equations utilizing ribeye length and either mid-width or widest width had R^2 between .84 and .87 for right, left, and combined right and left side ribeyes. Equations combining ribeye length, mid-width, and widest width improved the R^2 to .90 and .91. Potentially, linear measurements could be collected at chain speeds of commercial plants by a data collection team. By incorporating these measures into regression equations, ribeye areas could be predicted with reasonable accuracy. This is especially true considering the differences that may exist between right and left side ribeyes.

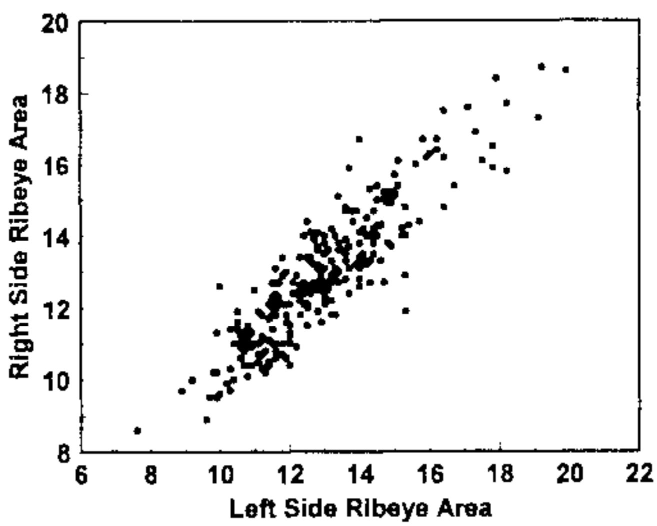

Figure 1. Plot of Right Side vs. Left Side Carcass Ribeye Areas Using Video Image Analysis.

Table 1. Selected Correlations of Right and Left Side Ribeye Areas and Measurements Using USDA Grids, a Calibrated Ruler, and Video Image Analysis (VIA)

	Right Side						Left Side					
		Ruler			VIA			Ruler			VIA	
Item	Grid Area	Length	Mid-Width	Widest Width	Area	Length	Grid Area	Length	Mid-Width	Widest Width	Area	Length
Right side												
Grid area	1											
Length	.75	1										
Mid-width	.78	.44	1									
Widest width	.73	.37	.72	1								
VIA area	.96	.77	.73	.77	1							
VIA length	.77	.97	.47	.41	.80	1						
Left side												
Grid area	.93	.74	.75	.73	.93	.77	1					
Length	.74	.79	.46	.46	.73	.80	.78	1				
Mid-width	.78	.48	.80	.66	.76	.52	.78	.44	1			
Widest width	.76	.47	.68	.68	.73	.49	.78	.46	.75	1		
VIA area	.93	.71	.73	.71	.90	.73	.95	.78	.79	.81	1	
VIA length	.76	.80	.48	.48	.75	.81	.80	.97	.48	.49	.82	1

Table 2. Means for Ribeye Area and Length Measured by a USDA Grid and Calibrated Ruler or Video Image Analysis (VIA)

Trait	Grid/Ruler	VIA	P value
Right side, n=265			
Ribeye area, in. ^{2}	12.86	12.95	.33
Length, in.	5.59	5.64	< .01
Left side, n=265			
Ribeye area, in ^{2}	13.05	12.95	< .01
Length, in.	5.63	5.63	.51
Combined, n=530			
Ribeye area, in ^{2}	12.96	12.93	.33
Length, in.	5.61	5.63	< .01

Table 3. Regression Equations for Predicting Ribeye Area (VIA) from Linear Ribeye Measurements

	Parameter Estimates				
Equation for:	Intercept	Length	Mid-Width	Widest Width	R^2
Right side (n=265)					
Ribeye area, in^2	-8.912	2.341	3.204		.84
Ribeye area, in^2	-10.776	2.500		3.206	.86
Ribeye area, in^2	-10.666	2.225	1.727	2.121	.90
Left Side (n=265)					
Ribeye area, in^2	-10.338	2.470	3.439		.86
Ribeye area, in^2	-11.083	2.380		3.510	.87
Ribeye area, in^2	-11.396	2.211	1.955	2.167	.91
Combined (n=530)					
Ribeye area, in^2	-9.604	2.404	3.317		.85
Ribeye area, in^2	-10.911	2.443		3.347	.86
Ribeye area, in^2	-11.011	2.216	1.837	2.145	.91