

USE OF VARIOUS SOAKER-PADS IN RETAIL PACKAGING OF BEEF STEAKS

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Summary

Two anatomically adjacent steaks were assigned to each of seven groups — a control group with no soaker-pad and six treatment groups that involved soaker-pads designated as taped Company A – Absorbency 40, taped Company A – Absorbency 50, regular Company A – Absorbency 40, regular Company A – Absorbency 50, Company B – Absorbency 40 or Company B – Absorbency 50 – to evaluate steak weight loss, total purge, change in soaker-pad weight, loose purge remaining in the retail tray and color attributes after 24 and 48 h of simulated retail display. Use of regular Company A – Absorbency 40 and regular Company A – Absorbency 50 soaker-pads caused additional beef steak weight loss, total purge and gain in soaker-pad weight during simulated retail display in comparison to the use of taped soaker-pads with the same absorbency factors (40 or 50). No differences were observed in steak weight loss, total purge (bloody liquid) or gain in soaker-pad weight between use of taped Company A versus Company B soaker-pads.

Key Words: Soaker-pad, Purge, Color Attributes, Absorbency Factor

Introduction

Purge weight loss for red meats increases as storage or retail display time increases (Hippe, et al. 1991). To offset this development with storage time, soaker-pads are commonly used in retail packaging to enhance the appearance of packages of red meat to the consumer. There are several different types of soaker-pads which result in different effects on the product in the retail package because of the differences in design of the soaker-pad. The objective of this study was to quantify and compare differences in retail beef weight loss, weight of total purge, weight of purge remaining in the retail tray, change in the soaker-pad weight and color of beef cuts associated with the use of different types of soaker-pads. Effects of different soaker-pads on color attributes were determined using the HunterLab MiniScan XE to obtain CIE values for L^* , a^* and b^* .

Materials and Methods

In a split-plot design, seven vacuum-packaged USDA Select strip loin subprimals were purchased and each subprimal was divided into fourteen .75-inch thick steaks. Each steak was trimmed in a manner to obtain steaks of approximately equal size dimensions and weight for each treatment group. Two anatomically adjacent steaks from each strip loin were assigned to each of six soaker-pad treatment groups or to a control group (without a soaker-pad; Table 1). Soaker-pads from Company A were taped on the top side to resemble the design of the soaker-pads of Company B in order to compare results between the regular soaker-pad Company A, the taped Company A soaker-pad and a soaker-pad from Company B. The first of the two anatomically adjacent steaks was used to evaluate steak water loss, total purge, change in soaker-pad weight, loose purge remaining in the retail tray and change in color attributes after 24 h of simulated retail display and the second steak was used to evaluate the same measures after 48 h of simulated retail display.

Table 1. Study Design

Group	Treatment
1	Control – no soaker-pad
2	taped Company A – Absorbency 40
3	taped Company A – Absorbency 50
4	regular Company A – Absorbency 40
5	regular Company A – Absorbency 50
6	Company B – Absorbency 40
7	Company B – Absorbency 50

Each steak was weighed and placed in a single, pre-weighed styrofoam retail display tray with the appropriate pre-weighed soaker-pad for the specified treatment group and overwrapped with polyvinylchloride (PVC) film. The package, following wrapping, was weighed to obtain a total unit weight (of the retail packaging materials plus the steak). After weights were obtained, packages were placed in a lighted cooler (32° F) to simulate retail display. Light was placed in the cooler, over the displayed steaks, in the manner suggested by the American Meat Science Association (1991).



Following the appropriate (24 or 48 h) simulated retail display time, steaks were removed and weighed in order to compute a steak weight loss during display. Additionally, the tray, soaker-pad, PVC film and loose purge contained in the tray were weighed in order to compute the total amount of purge in the retail package. Each soaker-pad also was weighed to determine the change in soaker-pad weight from the time of placement of the cut in the retail display cooler until the time it was removed from the retail display cooler.

Lean color was evaluated for each steak before simulated retail display but after retail packaging and before removal of the steak from the package after reaching the designated display time. Lean color data were obtained using the HunterLab MiniScan portable spectrophotometer and quantified in CIE L* (lightness: where 100 represents white and zero represents black), a* (redness-greenness) and b* (yellowness-blueness) reflectance values. Color was measured in three separate and standardized locations on each steak and then averaged to obtain a mean value for L*, a* and b* for the steak.

Analysis

Main effects for soaker-pad treatment were analyzed according to the split-plot design using analysis of variance principles to evaluate for fixed effects of soaker-pad treatment on resulting retail steak weight loss (g), retail steak weight loss (%), purge formation, gain in the weight of soaker-pads, loose purge remaining in the retail package and color traits, using the mixed models analysis of variance procedures of SAS (1996).

Results

Steak weight loss was determined by computing the difference between the weight of the steak before simulated retail display and the weight of the steak after simulated retail display. Use of the regular Company A – Absorbency 40 and the regular Company A – Absorbency 50 soaker-pads, after 48 h of simulated retail display, resulted in significantly more ($P < .05$) steak weight loss than was experienced by steaks in the control and all other treatment groups (Table 2). Additionally, it was

evident that when comparing soaker-pads within each series, use of the Company A soaker-pad resulted in additional steak weight loss. Weight losses for steaks in trays with taped Company A versus Company B soaker-pads were not statistically different ($P > .1$).

Table 2. Mean values for steak weight loss (in grams and percentages) during simulated retail display by soaker-pad treatment group and time of display (n = 98) ^a

Group	Mean Steak Weight Loss, g			Mean Steak Weight Loss, %		
	24 h	48 h	Difference	24 h	48 h	Difference
Co. A – 50	4.2 ^c	6.5 ^b	2.3	2.3 ^c	3.1 ^b	1.1
Taped Co. A - 50	1.5 ^f	2.3 ^{bc}	.8	.7 ^f	1.1 ^{de}	.4
Co. B – 50	1.5 ^f	1.8 ^{ef}	.3	.7 ^f	.9 ^{def}	.2
Co. A – 40	5.3 ^c	6.6 ^b	1.3	2.6 ^c	3.2 ^b	.5
Taped Co. A - 40	1.8 ^{ef}	2.6 ^d	.8	.9 ^{ef}	1.3 ^d	.3
Co. B - 40	1.8 ^{ef}	2.6 ^d	.8	.9 ^{def}	1.2 ^{de}	.3
Control	1.4 ^f	1.8 ^f	.4	.6 ^f	.8 ^{ef}	.1

^a Standard error of the mean is equal to .2 g and .2 %, respectively.

^{b,c,d,e,f} Means bearing different superscript letters, within a series of comparisons, (weight in grams and percent weight loss) differ ($P < .05$).

Total purge accumulation in the retail package was determined by computing the difference between the weight of the packaging material plus the weight of the soaker-pad before vs. after simulated retail display. Use of the regular Company A soaker-pads resulted in the greatest amount of total purge accumulation in the package. Use of the Company A soaker-pads resulted in accumulation of greater purge losses than did use of taped Company A or Company B soaker-pads, in both the 50 series and 40 series comparisons (Table 3). Use of the taped Company A versus the Company B soaker-pads, in the same series, did not result in differences in steak weight loss.

Table 3. Mean values for total purge accumulation (in grams) during simulated retail display by soaker-pad treatment group and time of display (n = 98) ^a

Group	Mean Total Purge, g		
	24 h	48 h	Difference
Company A – 50	4.4 ^c	6.2 ^b	1.8
taped Company A - 50	1.0 ^f	1.8 ^{de}	.8
Company B – 50	1.3 ^{ef}	1.5 ^{ef}	.2
Company A – 40	4.9 ^c	6.3 ^b	1.4
taped Company A - 40	1.4 ^{ef}	2.4 ^d	1.0
Company B - 40	1.4 ^{ef}	2.2 ^d	.8
Control	.9 ^f	1.4 ^{ef}	.5

^a Standard error of the mean is equal to .2 g.

^{b,c,d,e,f} Means bearing different superscript letters, within a series of comparisons, differ ($P < .05$).

Gain in soaker-pad weight was determined by computing the difference in weight of the soaker-pad before and following simulated retail display. As was the case for steak weight loss and total purge accumulation, the gain in soaker-pad weight was significantly greater ($P < .05$) for Company A soaker-pads than for either the taped Company A or Company B soaker-pads (Table 4). As time in the simulated retail display increased from 24 h to 48 h, there was additional gain in soaker-pad weights and, again, Company A soaker-pads had higher gains than either of the other two types of soaker-pads, while taped Company A and Company B soaker-pads had statistically equivalent weight gains (in both the 40 and 50 series comparisons).

Differences were computed between the weight of total purge and the gain in weight of the soaker-pad to quantify and compare differences in the weight of purge remaining in the bottom of retail trays associated with the use of different types of soaker-pads during simulated retail display. Significant differences ($P < .05$) in the mean weight of purge remaining in the tray following display occurred when comparing the control at 48 h to the other soaker-pad treatments (Table 5). However, results indicated that there was no difference among performance of the soaker-pads (excluding the control treatments) used in simulated retail display.

Table 4. Mean values for gain in soaker-pad weight (in grams) during simulated retail display by soaker-pad treatment group and time of display (n = 98) ^a

Group	Mean Gain in Soaker-Pad Weight, g		
	24 h	48 h	Difference
Company A – 50	4.0 ^c	5.5 ^b	1.5
taped Company A - 50	.4 ^g	1.2 ^{def}	.8
Company B – 50	.7 ^{fg}	1.0 ^{efg}	.3
Company A – 40	4.3 ^c	5.7 ^b	1.4
taped Company A - 40	.8 ^{fg}	1.4 ^{de}	.6
Company B - 40	.9 ^{efg}	1.9 ^d	1.0

^a Standard error of the mean is equal to .3 g.

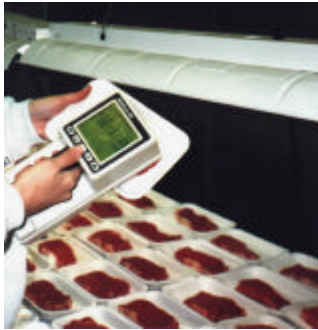
^{b,c,d,e,f,g} Means bearing different superscript letters, within a series of comparisons, differ ($P < .05$).

Table 5. Mean values for weight of purge remaining in retail tray following simulated retail display by soaker-pad treatment group and time of display (n = 98) ^a

Group	Mean Loose Purge Weight, g		
	24 h	48 h	Difference
Company A – 50	.4 ^{cd}	.7 ^{cd}	.3
Taped Company A - 50	.6 ^{cd}	.7 ^{cd}	.1
Company B – 50	.5 ^{cd}	.4 ^{cd}	.1
Company A – 40	.6 ^{cd}	.6 ^{cd}	0
Taped Company A - 40	.6 ^{cd}	.8 ^{cd}	.2
Company B - 40	.5 ^{cd}	.3 ^d	.2
Control	.9 ^c	1.4 ^b	.5

^a Standard error of the mean is equal to .2 g.

^{b,c,d} Means bearing different superscript letters, within a mode of measurement, differ ($P < .05$).



Lean color was monitored during simulated retail display using the changes in L*, a* and b* of the steaks from the initial time of packaging to the end of the display time. There were differences (P < .05) in the change of L*, a* and b* due to the soaker-pad used (Table 5). Values for L*, a* and b* were usually lower after simulated retail display than after packaging but before display. A decrease in L* means the steak became darker in appearance during simulated retail display, a decrease in a* indicated that lean color became less red and more green and a decrease in b* indicated that the lean color became less yellow and more blue during simulated retail display. Although statistical differences in color parameters occurred due to

the type of soaker-pad used, these differences suggested no consistent pattern in color deterioration and were not useful for examining differences in appearance that might be related to differences in types of soaker-pads used in packaging of the steaks. Lean beef color changed, in each soaker-pad treatment group, with increasing amounts of display time, but no changes indicated that a single soaker-pad resulted in more or less color deterioration than any other soaker-pad to which it was compared.

Table 6. Change in mean color values during simulated retail display by soaker-pad treatment group and time of display (n = 98) ^a

Group	Change in L*		Change in a*		Change in b*	
	0 – 24 h	0 – 48 h	0 – 24 h	0 – 48 h	0 – 24 h	0 – 48 h
Co. A – 50	-1.66 ^d	-2.24 ^{bc}	-.94 ^{cde}	-1.27 ^{bcde}	-.76 ^d	-.79 ^d
Taped Co. A – 50	-1.91 ^{cd}	-1.67 ^d	-.30 ^{def}	-.70 ^{cdef}	-.50 ^{de}	-.91 ^b
Co. B – 50	-3.61 ^b	-.94 ^{de}	-1.31 ^{bcd}	-2.08 ^b	-1.61 ^b	-1.24 ^b
Co. A – 40	-.87 ^{de}	.19 ^e	-1.57 ^{bc}	-1.06 ^{bcde}	-1.16 ^b	-.61 ^d
Taped Co. A – 40	-1.31 ^{de}	-1.86 ^{cd}	-.17 ^{ef}	-.54 ^{cdef}	.11 ^{de}	-.47 ^{de}
Co. B – 40	-1.76 ^d	-1.00 ^{de}	-1.20 ^{bcde}	-1.00 ^{bcde}	-1.66 ^b	-.57 ^{de}
Control	-1.76 ^d	-1.44 ^{de}	-.63 ^{cdef}	.21 ^f	.39 ^e	-.90 ^c

^a Standard error of the mean is equal to .6, .4 and .3 for the change in L*, change in a* and the change in b*, respectively.

^{b,c,d,e,f} Means bearing different superscript letters, within a series of comparisons, differ (P < .05).

Conclusion

Steaks displayed on the regular Company A soaker-pads sustained greater weight loss, more purge formation during display and increased soaker-pad weight than steaks displayed on the other soaker-pads evaluated in this study (taped Company A and Company B soaker-pads). Specifically, use of regular Company A soaker-pads in the 40 and 50 series, during 24 h or 48 h simulated retail display, resulted in higher (P < .05) weight loss, purge accumulation and soaker-pad weight gain than did the use of other soaker-pads. Results indicate that use of the taped Company A soaker-pads created equivalent results to the use of Company B soaker-pads of the same series in steak weight loss, total purge accumulation and gain in soaker-pad weight.

While steaks in all treatment groups and the control group had reduced L*, a* and b* values after simulated retail display, the steaks in the control group and taped Company A – 40 group sustained the least change in a* and b* values when comparing the values before vs. after simulated retail display.

Based on these results, it is apparent that water is drawn out of product and this results in excess steak weight loss when product is placed on the regular Company A soaker-pads in the 40 and

50 series. Company A soaker-pads should be redesigned or reconfigured to reduce the amount of steak weight loss in the products merchandised for retail sale.

Implications

This study was not designed to determine the percentage of water lost from steaks or the impact of that water loss on product quality. Most meat products contain, on average, 78 percent water. If the steaks used in this study contained 78% water, the impact on steak weight loss, of using the Company A soaker-pads, would have been equivalent to losing approximately 10% of the total water contained in the steak.

Retail supermarket meat merchandisers (via personal communications with personnel representing two different major chain-store retail companies) indicated that, for their business, maintaining a positive retail package image, relative to consumer esthetic value, in the meat case is much more important than the amount of water drawn from the product as a result of the soaker-pad used in the package. They also indicated that a weight loss of 6.6 grams in a product is not significant enough to be of concern.

Literature Cited

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