

Evaluation of a Commercially Available Organic Acid Product During Feed Withdrawal and its Relation to Carcass Shrink in Commercial Turkeys

C. Pixley¹, J. Barton², J.L. Vicente³, A.D. Wolfenden¹, B.M. Hargis¹ and G. Tellez¹

¹Department of Poultry Science, University of Arkansas, Fayetteville AR 72701, USA

²Arkansas Poultry Federation Laboratory, Fayetteville AR 72701, USA

³Sigrah Zellet de Mexico S.A. de C.V., Queretaro, Mexico 76220, USA

Abstract: The transport of live animals has important economic and welfare implications. A commercially-available organic acid product (Optimizer™) was added to the drinking water of commercial hen turkeys during preslaughter Feed Withdrawal (FW) in two trials. In trial 1, a total of 60 trailers from treated (OA) or control non-treated turkey houses were evaluated. Turkey farmers initiated water treatment on the day before pick up (8-12 h treatment according to label directions). Investigators recorded trailer numbers as they were loaded out of each house to confirm which trailers contained treated birds vs. control non-treated birds. Individual trailer weights were recorded upon arrival to the processing plant and again immediately prior to live hang. A significant reduction in rate of weight loss during holding at the processing plant was observed in the treated turkeys (719 g/min per OA treated trailer vs. 845 g/min per control trailer). In trial 2, two commercial market age turkey houses were selected and in each house, 400 birds were weighed and recorded as a representative sampling. The treated house received OA administered according to manufacturer's directions continuously for 19 h. At the end of this time, 400 birds were weighed and recorded as a representative sampling. A significant ($p < 0.05$) improvement of average body weights was observed in treated turkeys during 19 h (125 g treated vs. 35 g control), an average of 90 grams difference. Experiments are ongoing to measure water consumption during the FW that may explain the reduction in carcass shrinkage during transportation to the processing plant and increased body weights at the farm by increasing hydration of turkeys treated with OA.

Key words: Organic acids, Turkeys, carcass shrinkage, transportation

INTRODUCTION

The transport of live animals has important implications in both economic and welfare areas (Grandin, 1993). In poultry and other species, economic losses during transport are due to mortality, carcass shrinkage (carcass dehydration) and carcass condemnation (Veerkamp, 1986). Although pre-transport Feed Withdrawal (FW) contributes to carcass shrinkage, FW prior to processing of poultry is simple and is commonly employed to reduce ingesta contamination during processing (Duke *et al.*, 1997; Sams, 2001; USDA, 1993). However, shrinkage (carcass dehydration) begins immediately after FW (Benibo and Farr, 1985; Denton, 1985; Veerkamp, 1986), resulting in recommendations that slaughter take place within 4-6 h after FW to minimize shrink-associated losses. Thus, processing schedules should consider FW effects on both gut fullness and shrinkage. Previously our laboratory conducted a study in broiler chickens showing a commercially available water treatment product significantly reduced carcass condemnation at the processing plant and mortality during transportation, with consistent improvement of average body weights at

the farm and at the processing plant (Wolfenden *et al.*, 2007a). In the present study, this product was used to evaluate shrinkage during FW as well as during transportation to the processing plant.

MATERIALS AND METHODS

Organic acids: A commercially available water treatment product (Optimizer™)¹ was used in the drinking water according to manufacturer's directions. This commercial product is a proprietary combination of organic acids and flavoring agents. Previous publications have also shown this product, under experimental conditions, to reduce *Salmonella* colonization in crop and cecal tonsils without affecting water consumption in chickens (Jarquin *et al.*, 2007; Wolfenden *et al.*, 2007b).

Trial 1: Trial 1 was conducted with a total of 60 trailers from treated or control non-treated turkey houses. Each trailer carried an average of approximately 2100 market age turkeys from a commercial-cross turkey line. These turkeys were being raised by contract farmers for an integrated turkey company in the state of Arkansas, U.S.A. Water treatment was initiated at 9 PM on the day

before pick up with sufficient OA stock solution to last 8-12 h, during the time of FW (time off feed). Investigators recorded trailer numbers as they were loaded out of each house to confirm which birds received the OA vs controls. Individual trailer weights were recorded upon arrival at the processing plant (Time 1) and immediately prior to live hang (Time 2).

Formulas used:

- Yard Time = Time 2 - Time 1
- Shrink = Trailer weight at Time 1 - Trailer weight at Time 2
- Shrink/minute = Shrink/Yard Time
- % Shrink/minute = ((Shrink/Trailer weight at Time 1)/Yard Time in minutes)100
- Time off feed = Time 2 - Time when feed access was removed
- Value of treatment = (Control Shrink-Treatment Shrink) (Value of the carcass per Kg)
- Benefit to Cost Ratio = Value of treatment/OA product cost

Trial 2: In trial 2, two commercial market age turkey houses were selected and a representative sample (n = 400) was weighed and recorded. Portable fencing was used to corral approximately 20 turkeys at approximately 20 sites for weighing. The treated house received the mix of OA continuously for 19 h. At the end of this time, a representative sample (n = 400) was weighed and recorded.

Data analysis: In trial 1, data collected were subjected to one-way analysis of variance for carcass shrinkage during holding at the processing plant yard prior to live

hang and significant differences between means were further separated using Duncan's multiple range test. (SAS Institute, 1988). In trial 2, a two by two factorial analysis was performed to evaluate body weights before and after treatment in the OA treated vs. control non-treated turkeys. Statistical significance was designated at $p < 0.05$ in both trials.

RESULTS AND DISCUSSION

Economic losses during transport are due to mortality, particularly of pigs and poultry, carcass bruising and shrinkage (loss of weight) and reductions in meat quality (Warriss, 1996). Table 1 shows the effect of this OA product administered during turkey FW on carcass shrinkage during holding at the processing plant in trial 1. A significant reduction in carcass shrinkage in the turkeys that received the mix of OA was observed when compared with the control non-treated birds. There were no significant differences in the time off feed in the FW period or the transit time of the trailers from the farms to the processing plant between the treated and the control non-treated birds.

Table 2 summarizes the effect of OA during feed withdrawal on body weights of commercial turkeys before and after the treatment in trial 2. A significant increase in the body weight of the treated turkeys that received OA was observed when compared with the non-treated turkeys, with 90 grams gained in only 19 h of treatment with OA.

Economic estimates in commercial broiler chickens that received a similar treatment of OA during FW suggested a ten-fold return on investment after deducting the cost of the OA product (Wolfenden *et al.*, 2007a). In the present study, the benefit to cost ratio was estimated at greater than 6.5:1. Note that weight loss during transportation from farm to the processing plant were

Table 1: Evaluation of the effect of organic acids during feed withdrawal on carcass shrink during holding of commercial turkeys at the processing plant in trial 1

	Control	Treated
Yard shrink per trailer per minute (grams)	845±27.1a	719±22.6b
Shrink per minute (%)	2.8±0.045a	2.4±0.044b
Transit time (min)	71.20±5.96a	68.93±6.08a
Time off feed (min)	809.14±40.10a	726.33±30.90a
Difference of shrink per minute between groups	126 grams	

Values are presented as mean ± SE. Different letters within rows of experimental columns indicate significant differences between treatments ($p < 0.05$)

Table 2: Evaluation of organic acids during feed withdrawal on body weights on commercial turkeys before and after the treatment in trial 2

	Body weights before treatment (0 h)	Body weights after treatment (19 h)	Difference in body weights
Control	6359±40b,x	6394±35b,y	35 grams
Treated	6456±36b,x	6581±33a,x	125 grams
Difference in body weights	97 grams		90 grams

Values are presented as mean ± SE. Different letters within rows of experimental columns indicate significant differences between treatments ($p < 0.05$). Different letters within rows (a,b) or within columns (x,y) indicate significant differences

not measured. The losses were only quantified during the time the trailers spent in queue at the processing plant.

In areas where there are regulatory and consumer issues with *Salmonella* contamination of carcasses, there may be an additional advantage to some OA products. This product has shown to decrease *Salmonella* in market age broilers when administered during the pre-slaughter FW period (Jarquin *et al.*, 2007). Previous research has suggested that administration of lactic acid during the pre-slaughter FW, effective for reducing crop contamination with *Salmonella* at relatively high concentrations, could discourage water consumption and lead to excessive carcass shrinkage (Byrd *et al.*, 2001). While this evidence was shown when using lactic acid alone, the product evaluated in the present study is reported to contain a proprietary combination of organic acids and flavorants where water consumption is not discouraged. Flavoring agents claimed by the manufacturer have not been released or evaluated. Organic acids are a readily available energy source for both the birds and gut microflora; therefore, it is important that the organic acids be administered in sufficient concentrations to be bactericidal, but low enough concentrations to be voluntarily consumed by the birds.

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¹Manufactured by Pacific Vet Group-USA, Fayetteville, Arkansas