Preventing *Escherichia coli* for Deer Hunters

C. Bivins, M. Brummett, C. Castor, C. Clarkston, O. Cotroneo, K. Engle, B. Ewing, T. Flowers
Kansas State University

Introduction

Escherichia coli is a common issue in red meat. However, little research has been done on the prevalence of *E. coli* in red game meat, specifically venison. Hunters have limited resources in the wilderness to prevent contamination, and any effort to change that could be impactful.

Spices are an inexpensive and convenient way to aid in the preservation of meats. Research has been done with the use spices to help control bacterial growth in beef for food safety. Most of this related research used cinnamon and coffee to reduce the bacterial count on whole muscle beef. This is why these two common ingredients were used to test it in venison.

Objectives

1) Evaluate the effects of ground cinnamon and coffee on *E. coli* K12 in venison for hunters to have a simple, yet effective way to prevent the growth of *E. coli.*

2) Evaluate the effect of time, in days, on *E.coli* levels.

Materials and Methods

Sample Location
Locally sourced, non-commercial venison tenderloin was divided into four treatments of 10 grams per dilution series.

Inoculation
The venison tenderloin was inoculated with 100 microliters of concentration 10^7 CFU/mL *Escherichia coli.*

Treatment
Cinnamon (treatment 1) and coffee (treatment 2) were applied as 0.5 grams of spice to 10g of venison. The treated venison was allowed to sit for 48 hours at 35°C. The incubation period allowed the *E. coli* K12 to grow and for the treatments to inhibit the growth.

On day 0, venison was inoculated with *E. coli*, creating positive and negative control samples using plates for yeast and mold, total bacterial count, and *E. coli* growth. Three repetitions were created for each dilution of 10^{-1}, 10^{-2}, and 10^{-3} for yeast & mold and total bacterial count; whereas general *E. coli* was diluted to 10^{-2}, 10^{-3}, and 10^{-4}.

On day 2, the venison inoculated with *E. coli* was used to create additional positive samples similar to day 0's operation, except the dilutions for general *E. coli* were reduced to 10^{-1}, 10^{-2}, and 10^{-3}; the same as yeast & mold and total bacterial count. Both treatments for cinnamon and coffee were added to inoculated meat samples and plated in the same way for negative and positive controls for day 2.

On day 7, the overall growth was observed and replicate procedures were created in the same way as day 2's samples for negative and positive controls as well as both treatments.

Quantification
On day 10 the plates were counted. Colony forming units were put into SAS data management software.

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Results

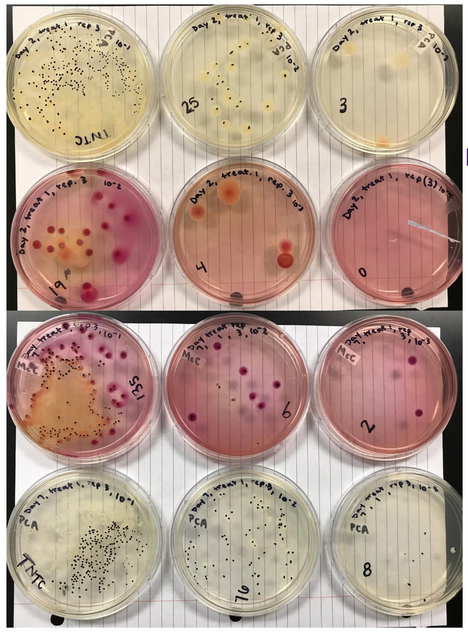


Figure 1. PCA and MacConkey plates, day 2, cinnamon treatment

Figure 2. PCA and MacConkey plates, day 7 cinnamon treatment

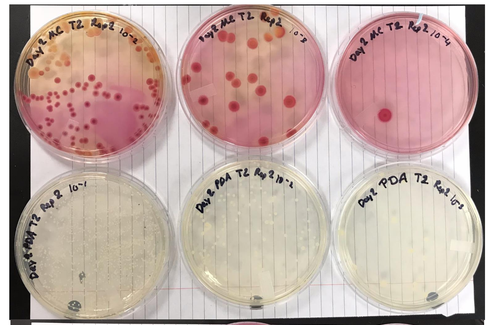


Figure 3. PDA and MacConkey plates, day 2, coffee treatment

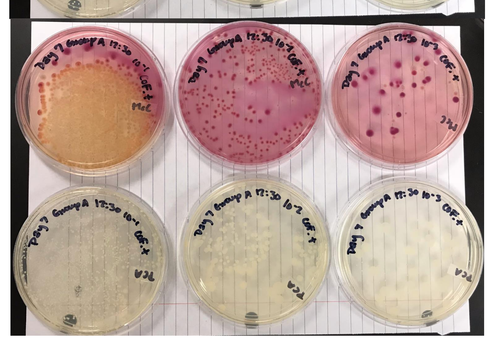


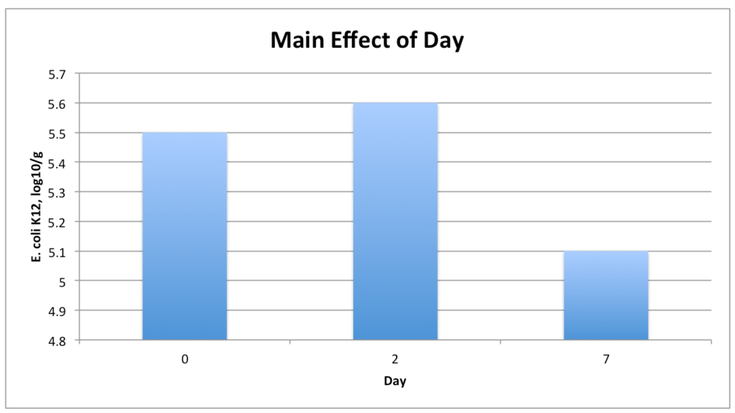
Figure 4. PCA and MacConkey plates, day 7, coffee treatment

Impact of cinnamon or coffee on E.coli K12 in venison, reported in $\log_{10}$/g.

	Treatment					Day				*P* =		
Item;	Negative Control	Positive Control	Cinnamon	Coffee	Pooled SEM	0	2	7	Pooled SEM	Treatment	Day	Treatment × Day
E. coli	5.4	5.6	5.1	5.4	0.15	5.5[ab]	5.6[a]	5.1[b]	0.13	0.235	0.020	0.646
Total Colony	5.1	5.2	4.8	5.1	0.15	4.9	5.0	5.2	0.13	0.421	0.229	0.986
Yeast and mold	4.9	5.0	4.6	5.0	0.14	4.8	4.9	5.0	0.13	0.282	0.531	0.241

[ab]Means within a row that do not share a common superscript differ $P < 0.05$.

Table 1. Impact of Cinnamon or Coffee on *E.coli* K12 in Venison



Results

A P-value of .235 for treatments indicates no conclusive impact of cinnamon and coffee on venison.

A statistical difference in overall bacterial load between Day 2 and Day 7 can be observed.
A P-value of .02 indicates the possibility of *E. coli* K-12 reduction over time, yet alpha values exceeding .05 prevent rejection of the null hypothesis.

Conclusion and Future Research

The results of the study helped demonstrate the prevalence of *E. coli* K12 on whole muscle venison cuts. Further experiments and more data are needed to support the theory that spices affect microbial growth on game meats. More research with more aggressive species can determine the most effective interventions possible to reduce pathogenic microorganisms in venison muscle cuts for deer hunters around the country.

References

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