

VIRULENCE FACTORS AND PROBIOTIC INHIBITION OF *ESCHERICHIA COLI* STRAINS ISOLATED FROM COMMERCIAL BROILER PRODUCTION IN BRAZIL

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CONCLUSIONS

- 46% of *E. coli* recovered from commercial broiler production in Brazil was potentially pathogenic, although levels of the most virulent isolates were low.
- Inhibition and delay of *E. coli* growth *in vitro* by probiotic *Bacillus* strains was variable compared to previous reports.
- These results emphasize the need to understand regional APEC virulence profiles in a flock, in order to allow the use of targeted prevention and treatment measures, reducing the underlying risk these *E. coli* populations pose to poultry health and welfare.

INTRODUCTION

This study aimed to investigate the prevalence of virulence associated genes of *E. coli* isolates from commercial Brazilian broiler production and to determine the efficacy of the cell free supernatants (CFS) of 11 *Bacillus* strains to inhibit the growth of a subset of the isolated potential avian pathogenic *E. coli* (APEC) *in vitro*.

METHODS

- Whole intestinal tracts were excised from 4 commercial broiler farms in 2 regions of Brazil and used to isolate and characterize *E. coli*
- A previously defined pentaplex PCR protocol was used to test for the presence of 5 virulence associated genes (*cvaC*, *iss*, *iucC*, *tsh*, *irp2*); isolates harbouring ≥ 2 genes were identified as APEC
- Probiotic inhibition assays monitored OD at 595 nm of *E. coli* cultures with or without *Bacillus* CFS. % inhibition was calculated by comparing the OD of the treated well at the point at which the OD of the control well was 0.4
- Delay in growth was measured by comparing the time taken to reach OD 0.4 by the control and treated wells

RESULTS

Virulence

- 45.83% of all isolates contained ≥ 2 virulence genes, and so were considered potentially pathogenic
- Prevalence of high virulence isolates was low; only 0.67% contained all 5 genes
- There were geographical differences between sampled farms (58.7% APEC Paran vs 33.0% APEC Minas Gerais, $P < 0.0001$, Figure 1), emphasizing the need to understand microbial populations at a regional level

RESULTS (cont)

Growth inhibition by *Bacillus* probiotic strains

- Compared to previous reports of *E. coli* inhibition by *Bacillus* CFS (Wealleans et al., 2016), inhibition and delay of the growth of Brazilian *E. coli* was highly variable.
- Inhibition was highly variable, both between *E. coli* and *Bacillus* strains
 - Maximum growth inhibition was 97%; average positive inhibition was 37.64%
 - 47% of tested *Bacillus* CFS/*E. coli* combinations increased *E. coli* growth, by a maximum of 20% above control
- Delay in *E. coli* growth averaged 25 minutes (Figure 2), though maximum delay was 500 minutes – longer than the average gut transit times of a chicken – meaning the *Bacillus* CFS completely inhibited *E. coli* growth
- 35% of tested *Bacillus* CFS/*E. coli* combinations increased rate of *E. coli* growth, by a maximum of 60 minutes earlier than control

Figure 1. Prevalence of virulence associated genes in *E. coli* isolated from commercial Brazilian broiler production

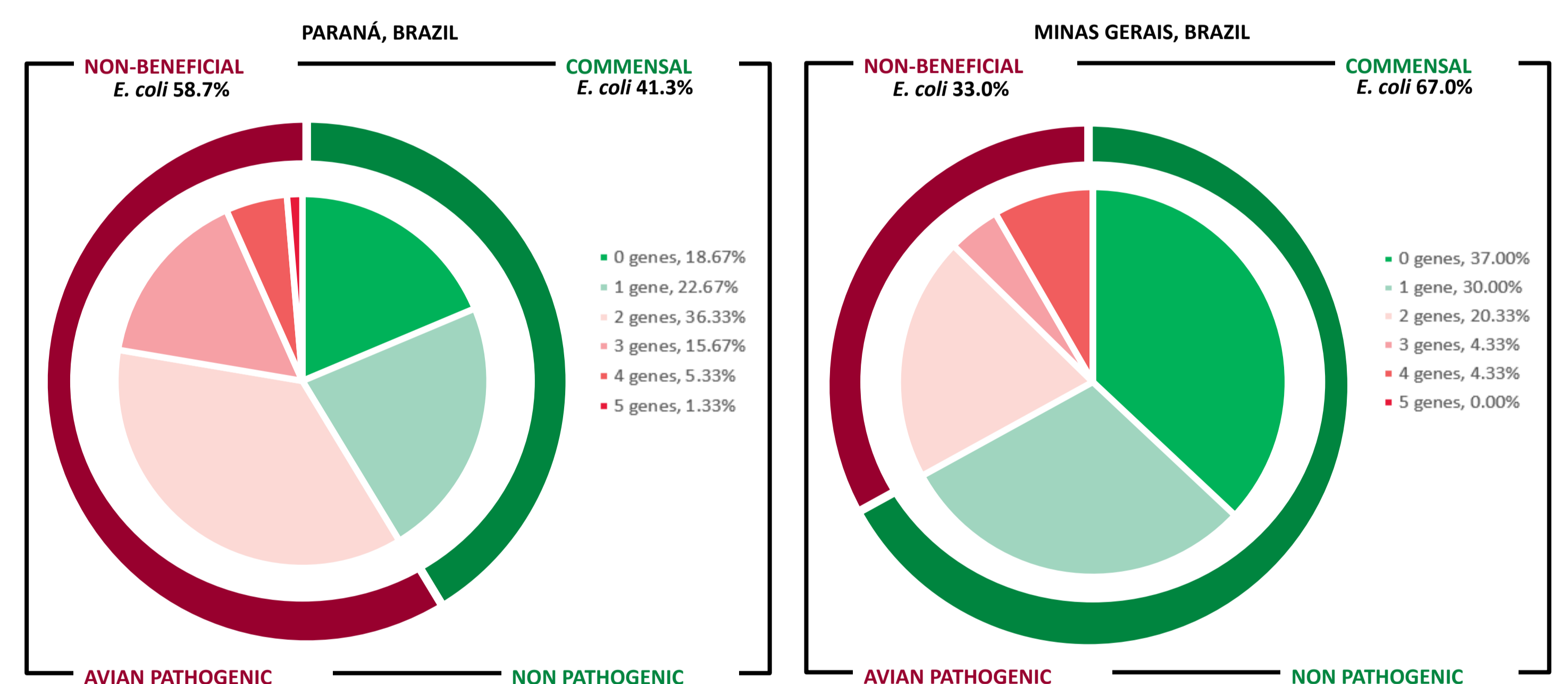
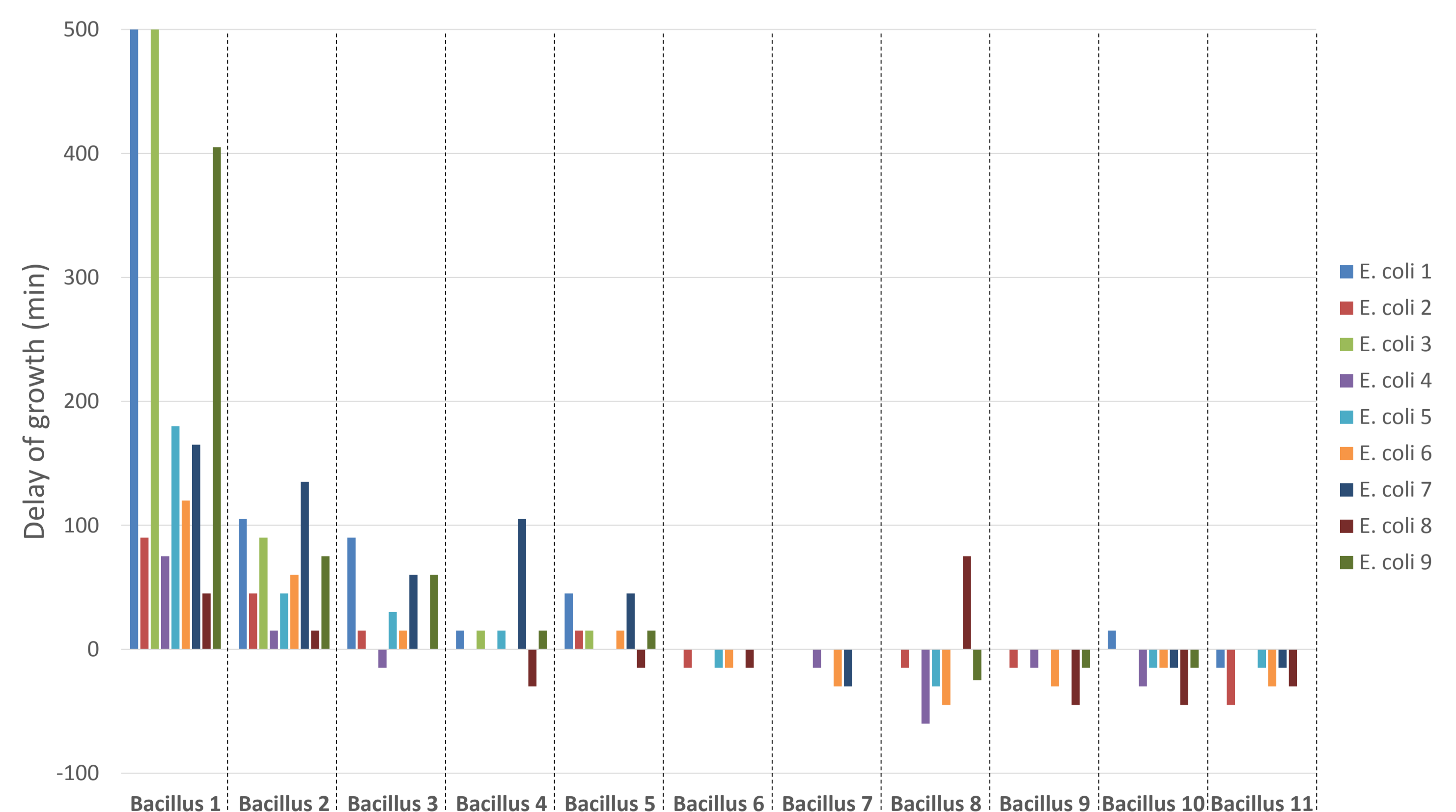


Figure 2. Delay of *E. coli* growth (difference in time wells to reach OD 0.4) when incubated with *Bacillus* CFS



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