Supplementary Material

Evaluation of Environmental Risk Factors Associated with Survival of generic *E. coli* in Organic Integrated Crop-Livestock Systems in California and Minnesota

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**Supplementary Table 1.** Assessment of the individual top-ranked meteorological explanatory variable from Random Forest analyses. Each variable was added into the final multivariable mixed-effect zero-inflated negative binomial model with row as a random effect for the concentrations of generic *E. coli* (gEc) in soil samples collected from graze CC treatment of the organic crop-livestock integration field trials in CA and MN (2021–2022). Four variables – (A) Maximum air temperature (Air\_temp\_max), (B) Maximum of soil temperature at 10cm depth (soil\_temp10\_max), (C) Minimum air temperature for 30 days before soil sampling day (Air\_temp\_min30), and (D) Maximum wind speed (Wind\_max) showed significant results.

**(A) Air\_temp\_max**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Variable** | **Coefficients** | **Relative Risks (RR)** | **95% CI** | ***P*-value** |
| **Conditional component – Log (count of gEc)** | | | | |
| Intercept | 0.20 |  |  | 0.617 |
| Air\_temp\_max | - 0.07 | 0.93 | 0.90 – 0.96 | <0.001\* |
| State | | | | |
| CA | Reference |  |  |  |
| MN | 0.85 | 2.34 | 1.15 – 4.76 | 0.019\* |
| Sampling day - Day Post-Graze (DPG) | | | | |
| DPG | 0.06 | 1.06 | 1.04 – 1.08 | <0.001\* |
| (DPG – 32) + | - 0.06 | 0.94 | 0.92 – 0.96 | <0.001\* |
| State × DPG | | | | |
| MN × DPG | - 0.02 | 0.98 | 0.95 – 1.01 | 0.216 |
| MN × (DPG – 32) + | -0.003 | 0.997 | 0.96 – 1.04 | 0.870 |
| **Variable** | **Coefficients** | **Odds ratio**  **(OR)** | **95% CI** | ***P*-value** |
| **Zero-inflated component – Logit (probability of zero count in gEc)** | | | | |
| Intercept | 0.89 |  |  | 0.43 |
| Air\_temp\_max | -0.28 | 0.75 | 0.59 – 0.96 | 0.022\* |

\* *P* -value < 0.05

+ DPG was a spline linear variable with a knot at 32 DPG, which was the day most showing the highest concentration of gEc.

**(B) soil\_temp10\_max**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Variable** | **Coefficients** | **Relative Risks (RR)** | **95% CI** | ***P*-value** |
| **Conditional component – Log (count of gEc)** | | | | |
| Intercept | 0.27 |  |  | 0.47 |
| Soil\_temp10\_max | - 0.11 | 0.89 | 0.48 – 0.85 | <0.001\* |
| State | | | | |
| CA | Reference |  |  |  |
| MN | 1.38 | 4.00 | 1.98 – 8.06 | <0.001\* |
| Sampling day - Day Post-Graze (DPG) | | | | |
| DPG | 0.07 | 1.08 | 1.05 – 1.10 | <0.001\* |
| (DPG – 32) + | - 0.07 | 0.93 | 0.91 – 0.95 | <0.001\* |
| State × DPG | | | | |
| MN × DPG | - 0.02 | 0.98 | 0.96 – 1.01 | 0.23 |
| MN × (DPG – 32) + | - 0.009 | 0.99 | 0.96 – 1.03 | 0.61 |
| **Variable** | **Coefficients** | **Odds ratio**  **(OR)** | **95% CI** | ***P*-value** |
| **Zero-inflated component – Logit (probability of zero count in gEc)** | | | | |
| Intercept | 2.57 |  |  | 0.004\* |
| Soil\_temp10\_max | - 0.45 | 0.64 | 0.48 – 0.85 | 0.002\* |

\* *P* -value < 0.05

+ DPG was a spline linear variable with a knot at 32 DPG, which was the day most showing the highest concentration of gEc.

**(C) Air\_temp\_min30**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Variable** | **Coefficients** | **Relative Risks (RR)** | **95% CI** | ***P*-value** |
| **Conditional component – Log (count of gEc)** | | | | |
| Intercept | - 0.89 |  |  | 0.002\* |
| Air\_temp\_min30 | - 0.06 | 0.94 | 0.91 – 0.97 | <0.001\* |
| State | | | | |
| CA | Reference |  |  |  |
| MN | 1.16 | 3.18 | 1.63 – 6.20 | <0.001\* |
| Sampling day - Day Post-Graze (DPG) | | | | |
| DPG | 0.07 | 1.07 | 1.05 – 1.09 | <0.001\* |
| (DPG – 32) + | - 0.08 | 0.92 | 0.90 – 0.95 | <0.001\* |
| State × DPG | | | | |
| MN × DPG | - 0.07 | 0.93 | 0.91 – 0.96 | <0.001\* |
| MN × (DPG – 32) + | 0.08 | 1.08 | 1.05 – 1.12 | <0.001\* |
| **Variable** | **Coefficients** | **Odds ratio**  **(OR)** | **95% CI** | ***P*-value** |
| **Zero-inflated component – Logit (probability of zero count in gEc)** | | | | |
| Intercept | -20.32 |  |  | 0.99 |

\* *P* -value < 0.05

+ DPG was a spline linear variable with a knot at 32 DPG, which was the day most showing the highest concentration of gEc.

**(D) Wind\_max**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Variable** | **Coefficients** | **Relative Risks (RR)** | **95% CI** | | ***P*-value** |
| **Conditional component – Log (count of gEc)** | | | | | |
| Intercept | - 0.74 |  |  | | 0.01\* |
| Wind\_max | - 0.17 | 0.86 | 0.75 – 0.95 | | 0.005\* |
| State | | | | | |
| CA | Reference |  |  | |  |
| MN | 1.67 | 5.29 | 2.66 – 10.51 | | <0.001\* |
| Sampling day - Day Post-Graze (DPG) | | | | | |
| DPG | 0.06 | 1.06 | 1.04 – 1.08 | | <0.001\* |
| (DPG – 32) + | - 0.07 | 0.93 | 0.91 – 0.95 | | <0.001\* |
| State × DPG | | | | | |
| MN × DPG | - 0.04 | 0.96 | 0.94 – 0.99 | | 0.002\* |
| MN × (DPG – 32) + | 0.03 | 1.03 | | 1.00 – 1.06 | 0.03\* |
| **Variable** | **Coefficients** | **Odds ratio**  **(OR)** | | **95% CI** | ***P*-value** |
| **Zero-inflated component – Logit (probability of zero count in gEc)** | | | | | |
| Intercept | - 5.26 |  | |  | 0.02\* |
| Wind\_max | 0.58 | 1.78 | | 0.98 – 3.23 | 0.05 |

\* *P* -value < 0.05

+ DPG was a spline linear variable with a knot at 32 DPG, which was the day most showing the highest concentration of gEc.