**Supplemental Table 1.** Correlations between mulch mass remaining in soil (%) and soil chemical, physical, and biological properties for each mulch type (PLA = prototype polylactic acid wood particle mulch; BLK = Bio360® black bioplastic film), and mulch recovery period at the Scottsbluff (SBF) site. For each soil property, the Pearson’s correlation coefficient (r) is reported above the p-value and degrees of freedom (in parentheses). Any significant correlations (*p*<0.05) are denoted with an asterisk (\*).

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  | |  | |  |  |  |  |  |  |  |
| **SCOTTSBLUFF** | Correlation with mulch mass remaining (%) | | | | | | | | | | | | |
|  | PLA | | | | | | |  | BLK | | | | |
|  | 2018 | |  | | 2019 | | |  | 2018 | |  | 2019 | |
| Soil property | Spring | Fall | |  | | Spring | Fall |  | Spring | Fall |  | Spring | Fall |
| Nitrate | 0.12 | 0.16 |  | | -0.17 | | 0.32 |  | 0.18 | 0.34 |  | 0.01 | 0.37 |
|  | (0.64, 16) | (0.53, 16) |  | | (0.50, 16) | | (0.20, 15) |  | (0.48. 16) | (0.17, 16) |  | (0.98, 14) | (0.18, 13) |
| Organic matter | -0.20 | 0.28 |  | | 0.23 | | 0.08 |  | 0.21 | 0.20 |  | 0.30 | 0.02 |
|  | (0.44, 16) | (0.26, 16) |  | | (0.35, 16) | | (0.76, 15) |  | (0.40, 16) | (0.43, 16) |  | (0.27, 14) | (0.93, 13) |
| pH | 0.15 | -0.05 |  | | 0.04 | | -0.41 |  | -0.21 | 0.10 |  | 0.41 | -0.20 |
|  | (0.54, 16) | (0.85, 16) |  | | (0.89, 16) | | (0.10. 15) |  | (0.41, 16) | (0.70, 16) |  | (0.12, 14) | (0.48, 13) |
| Temperature | 0.71\* | 0.19 |  | | 0.30 | | -0.18 |  | -0.19 | -0.22 |  | -0.10 | -0.34 |
|  | (0.001, 16) | (0.45, 16) |  | | (0.25, 15) | | (0.51, 14) |  | (0.46, 16) | (0.38, 16) |  | (0.74, 13) | (0.25, 11) |
| SWCgz | 0.46 | 0.02 |  | | -0.74 | | -0.50 |  | 0.05 | -0.40 |  | -0.60 | - y |
|  | (0.36, 4) | (0.97, 4) |  | | (0.09, 4) | | (0.31, 4) |  | (0.93, 4) | (0.43, 4) |  | (0.21, 4) | - |
| Penetration resistance | 0.31 | 0.16 |  | | -0.19 | | -0.07 |  | -0.20 | -0.02 |  | -0.11 | -0.15 |
|  | (0.21, 16) | (0.53, 16) |  | | (0.46, 16) | | (0.79, 15) |  | (0.42, 16) | (0.93, 16) |  | (0.68, 14) | (0.61, 13) |
| Tensile strength | -0.18 | 0.10 |  | | -0.31 | | -0.18 |  | 0.36 | -0.10 |  | 0.27 | 0.38 |
|  | (0.47, 16) | (0.68, 16) |  | | (0.21, 16) | | (0.49, 15) |  | (0.16, 15) | (0.71, 15) |  | (0.32, 14) | (0.16, 13) |
| Soil bacteria | -0.22 | 0.49 |  | | 0.87\* | | -0.07 |  | -0.38 | 0.25 |  | 0.33 | 0.95\* |
|  | (0.68, 4) | (0.32, 4) |  | | (0.03, 4) | | (0.90, 4) |  | (0.46, 4) | (0.63, 4) |  | (0.52, 4) | (0.05, 2) |
| Soil fungi | 0.21 | -0.04 |  | | 0.74 | | 0.01 |  | -0.14 | 0.23 |  | 0.13 | -0.34 |
|  | (0.70, 4) | (0.94, 4) |  | | (0.09, 4) | | (0.99, 4) |  | (0.79, 4) | (0.66, 4) |  | (0.81, 4) | (0.66, 2) |

z SWCg = Gravimetric soil water content; data collected from within mesh bags of only the NA and SNK plots.

ySoil water data only available for four of six plots, so correlation was not tested.

**Supplemental Table 2.** Correlations between mulch mass remaining in soil (%) and soil chemical, physical, and biological properties for each mulch type (PLA = prototype polylactic acid wood particle mulch; BLK = Bio360® black bioplastic film), and mulch recovery period at the Lincoln (LNK) site. For each soil property, the Pearson’s correlation coefficient (r) is reported above the p-value and degrees of freedom (in parentheses). Any significant correlations (*p*<0.05) are denoted with an asterisk (\*). Correlation coefficients could not be calculated in 2019 for the BLK mulch type because there was 0% mulch mass remaining.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |  |  |  |
| **LINCOLN** | Correlation with biomulch remaining (%) | | | | | | | | | | |
|  | PLA | | | | |  | BLK | | | | |
|  | 2018 | |  | 2019 | |  | 2018 | |  | 2019 | |
| Soil property | Spring | Fall |  | Spring | Fall |  | Spring | Fall |  | Spring | Fall |
| Nitrate | 0.31 | 0.37 |  | -0.03 | 0.07 |  | -0.04 | -0.10 |  | - | - |
|  | (0.21, 16) | (0.14, 16) |  | (0.89, 16) | (0.80, 14) |  | (0.87, 16) | (0.70, 16) |  |  |  |
| Organic Matter | 0.43 | 0.01 |  | 0.33 | -0.27 |  | 0.01 | -0.31 |  | - | - |
|  | (0.08, 16) | (0.99, 16) |  | (0.18, 16) | (0.31, 14) |  | (0.96, 16) | (0.21, 16) |  |  |  |
| pH | -0.47\* | -0.20 |  | -0.05 | 0.46 |  | -0.31 | 0.09 |  | - | - |
|  | (0.04, 16) | (0.43, 16) |  | (0.86, 16) | (0.08, 14) |  | (0.21, 16) | (0.71, 16) |  |  |  |
| Temperature | 0.32 | 0.03 |  | -0.41 | -0.04 |  | -0.20 | 0.27 |  | - | - |
|  | (0.19, 16) | (0.89, 16) |  | (0.09, 16) | (0.87, 14) |  | (0.42, 16) | (0.27, 16) |  |  |  |
| SWCgz | -0.57 | -0.34 |  | -0.20 | 0.20 |  | -0.20 | -0.90\* |  | - | - |
|  | (0.23, 4) | (0.50, 4) |  | (0.71, 4) | (0.75, 3) |  | (0.42, 16) | (0.02, 4) |  |  |  |
| Penetration resistance | 0.40 | 0.14 |  | -0.17 | 0.02 |  | -0.12 | 0.35 |  | - | - |
|  | (0.10, 16) | (0.57, 16) |  | (0.50, 16) | (0.93, 14) |  | (0.62, 16) | (0.16, 16) |  |  |  |
| Tensile strength | 0.43 | 0.28 |  | -0.34 | 0.29 |  | -0.15 | 0.24 |  | - | - |
|  | (0.08, 16) | (0.27, 16) |  | (0.17, 16) | (0.27, 14) |  | (0.56, 16) | (0.34, 16) |  |  |  |
| Soil bacteria | -0.06 | -0.07 |  | 0.14 | 0.40 |  | 0.79 | - |  | - | - |
|  | (0.91, 4) | (0.89, 4) |  | (0.80, 4) | (0.51, 3) |  | (0.06, 4) |  |  |  |  |
| Soil fungi | -0.51 | 0.64 |  | 0.57 | 0.05 |  | -0.09 | - |  | - | - |
|  | (0.30, 4) | (0.17, 4) |  | (0.24, 4) | (0.94, 3) |  | (0.87, 4) |  |  |  |  |

zSWCg = Gravimetric soil water content; data collected from within mesh bags of only the NA and SNK plots