|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Spraying |  | Tillage |  | DAA |  | *b* |  | *d* (g) |  | ED50 (g a.i) |
| 1st |  | Ploughing |  | 1 |  | 3.37 (2.13) |  | 0.63 (0.02) |  | 338 (0.11) |
|  |  |  |  | 7 |  | 1.87 (0.44) |  | 0.53 (0.02) |  | 349 (0.11) |
|  |  |  |  | 15 |  | 1.70 (0.20) |  | 0.50 (0.02) |  | 1130 (0.13) |
|  |  |  |  | 30 |  | 1.50 (0.19) |  | 0.55 (0.02) |  | 2050 (0.24) |
|  |  |  |  | 60 |  | 1.33 (0.21) |  | 0.51 (0.02) |  | 3480 (0.47) |
|  |  | Cultivated |  | 1 |  | 3.33 (2.63) |  | 0.58 (0.02) |  | 320 (0.15) |
|  |  |  |  | 7 |  | 2.35 (0.56) |  | 0.51 (0.02) |  | 427 (0.05) |
|  |  |  |  | 15 |  | 1.37 (0.16) |  | 0.51 (0.03) |  | 1070 (0.14) |
|  |  |  |  | 30 |  | 1.25 (0.17) |  | 0.59 (0.02) |  | 2220 (0.32) |
|  |  |  |  | 60 |  | 1.04 (0.14) |  | 0.52 (0.02) |  | 2920 (0.46) |
|  |  | Direct-drilling |  | 1 |  | 1.15 (0.40) |  | 0.53 (0.01) |  | 166 (0.10) |
|  |  |  |  | 7 |  | 1.83 (0.38) |  | 0.48 (0.02) |  | 476 (0.06) |
|  |  |  |  | 15 |  | 1.28 (0.15) |  | 0.69 (0.02) |  | 976 (0.14) |
|  |  |  |  | 30 |  | 1.18 (0.13) |  | 0.55 (0.02) |  | 1780 (0.24) |
|  |  |  |  | 60 |  | 1.11 (0.14) |  | 0.53 (0.02) |  | 3230 (0.47) |
| 2nd |  | Ploughing |  | 1 |  | 2.92 (1.97) |  | 0.42 (0.02) |  | 312 (0.12) |
|  |  |  |  | 7 |  | 2.41 (1.91) |  | 0.59 (0.02) |  | 331 (0.09) |
|  |  |  |  | 15 |  | 1.51 (0.42) |  | 0.51 (0.02) |  | 436 (0.08) |
|  |  |  |  | 30 |  | 1.34 (0.13) |  | 0.62 (0.02) |  | 1333 (0.19) |
|  |  |  |  | 60 |  | 1.19 (0.09) |  | 0.65 (0.02) |  | 2680 (0.39) |
|  |  | Cultivated |  | 1 |  | 2.66 (1.86) |  | 0.57 (0.02) |  | 307 (0.15) |
|  |  |  |  | 7 |  | 2.49 (1.21) |  | 0.63 (0.03) |  | 281 (0.08) |
|  |  |  |  | 15 |  | 1.46 (0.31) |  | 0.62 (0.02) |  | 368 (0.07) |
|  |  |  |  | 30 |  | 0.92 (0.14) |  | 0.47 (0.02) |  | 1870 (0.26) |
|  |  |  |  | 60 |  | 1.10 (0.10) |  | 0.56 (0.01) |  | 2820 (0.34) |
|  |  | Direct-drilling |  | 1 |  | 2.48 (1.34) |  | 0.65 (0.02) |  | 270 (0.11) |
|  |  |  |  | 7 |  | 2.06 (0.99) |  | 0.49 (0.01) |  | 379 (0.06) |
|  |  |  |  | 15 |  | 1.30 (0.29) |  | 0.56 (0.02) |  | 569 (0.08) |
|  |  |  |  | 30 |  | 1.08 (0.15) |  | 0.58(0.03) |  | 1460 (0.18) |
|  |  |  |  | 60 |  | 1.16 (0.09) |  | 0.61 (0.02) |  | 2640 (0.41) |

**Table S1.**Estimated parameter values, slope (*b*), upper limit (*d*) and dose to reduce by 50 % (ED50) *Apera spica-venti* biomass as a function of tillage systems and spraying times. Parameter were estimated based on curve fittings to the observed values from the bioassay in 2014 using Eq.(1).Standard errors for each parameter are shown in parentheses.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Spraying |  | Tillage |  | DAA |  | *b* |  | *d* (g) |  | ED50 (g a.i) |
| 1st |  | Ploughing |  | 1 |  | 1.83 (2.43) |  | 0.98 (0.02) |  | 114 (0.27) |
|  |  |  |  | 3 |  | 1.26 (0.56) |  | 0.87 (0.02) |  | 143 (0.10) |
|  |  |  |  | 11 |  | 1.46 (0.15) |  | 0.92 (0.02) |  | 643 (0.06) |
|  |  |  |  | 20 |  | 1.38 (0.14) |  | 0.85 (0.02) |  | 746 (0.07) |
|  |  |  |  | 28 |  | 1.36 (0.11) |  | 1.00 (0.03) |  | 1040 (0.09) |
|  |  | Cultivated |  | 1 |  | 1.07 (0.37) |  | 0.93 (0.02) |  | 137 (0.08) |
|  |  |  |  | 3 |  | 1.28 (0.58) |  | 0.87 (0.02) |  | 147 (0.11) |
|  |  |  |  | 11 |  | 1.41 (0.14) |  | 0.91 (0.02) |  | 663 (0.06) |
|  |  |  |  | 20 |  | 1.52 (0.13) |  | 0.93 (0.02) |  | 856 (0.07) |
|  |  |  |  | 28 |  | 1.35 (0.10) |  | 0.97 (0.01) |  | 1100 (0.09) |
|  |  | Direct-drilling |  | 1 |  | 2.38 (2.29) |  | 1.02 (0.01) |  | 215 (0.23) |
|  |  |  |  | 3 |  | 1.50 (0.60) |  | 0.95 (0.02) |  | 186 (0.10) |
|  |  |  |  | 11 |  | 1.26 (0.14) |  | 0.85 (0.02) |  | 578 (0.06) |
|  |  |  |  | 20 |  | 1.62 (0.15) |  | 0.87 (0.02) |  | 951 (0.08) |
|  |  |  |  | 28 |  | 1.42 (0.12) |  | 0.83 (0.02) |  | 1420 (0.14) |
| 2nd |  | Ploughing |  | 1 |  | 0.72 (0.57) |  | 0.89 (0.02) |  | 116 (1.02) |
|  |  |  |  | 7 |  | 2.61 (1.24) |  | 0.91 (0.02) |  | 236 (0.19) |
|  |  |  |  | 15 |  | 1.21 (0.19) |  | 0.88 (0.02) |  | 228 (0.07) |
|  |  |  |  | 30 |  | 1.15 (0.13) |  | 0.78 (0.04) |  | 555 (0.07) |
|  |  |  |  | 60 |  | 1.18 (0.15) |  | 0.86 (0.02) |  | 1050 (0.14) |
|  |  | Cultitaved |  | 1 |  | 3.17 (2.43) |  | 0.84 (0.02) |  | 292 (0.13) |
|  |  |  |  | 7 |  | 1.62 (0.44) |  | 0.95 (0.01) |  | 312 (0.09) |
|  |  |  |  | 15 |  | 1.21 (0.20) |  | 0.89 (0.02) |  | 295 (0.07) |
|  |  |  |  | 30 |  | 1.38 (0.18) |  | 0.97 (0.01) |  | 592 (0.06) |
|  |  |  |  | 60 |  | 1.31 (0.15) |  | 0.86 (0.01) |  | 1680 (0.13) |
|  |  | Direct-drilling |  | 1 |  | 1.61 (0.68) |  | 0.90 (0.02) |  | 289 (0.12) |
|  |  |  |  | 7 |  | 2.11 (0.60) |  | 0.86 (0.03) |  | 266 (0.07) |
|  |  |  |  | 15 |  | 1.23 (0.16) |  | 0.95 (0.02) |  | 240 (0.07) |
|  |  |  |  | 30 |  | 1.23 (0.12) |  | 0.82 (0.03) |  | 406 (0.07) |
|  |  |  |  | 60 |  | 0.94 (0.11) |  | 0.90 (0.03) |  | 1071 (0.18) |

**Table S2.**Estimated parameter values, slope (*b*), upper limit (*d*) and dose to reduce by 50 % (ED50) *Apera spica-venti* biomass as a function of tillage systems and spraying times. Parameter were estimated based on curve fittings to the observed values from the bioassay in 2015 using Eq.(1). Standard errors for each parameter are shown in parentheses.