**Supplementary Tables**

**Table S1.** Combined probability of survivors for each test accession.

| Weed species | Herbicide | ½× rate | 1× rate | Number of  accessions | *p*total |
| --- | --- | --- | --- | --- | --- |
| Palmer amaranth | Glufosinate | 1/10 | 0/10 | 2 | 0.110 |
| 0/10 | 0/10 | 112 | 1.000 |
| 0/9 | 0/9 | 4 | 1.000 |
| 0/8 | 0/8 | 4 | 1.000 |
| 0/7 | 0/7 | 5 | 1.000 |
| 0/6 | 0/6 | 7 | 1.000 |
|  | <6 |  | 11 | -- |
| Dicamba | 3/10 | 0/10 | 1 | 0.016 |
| 1/10 | 1/10 | 1 | 0.041 |
| 2/10 | 0/10 | 5 | 0.091 |
| 0/10 | 1/10 | 1 | 0.110 |
| 1/6 | 0/6 | 2 | 0.253 |
| 1/8 | 0/8 | 1 | 0.319 |
| 1/9 | 0/9 | 1 | 0.349 |
| 1/10 | 0/10 | 10 | 0.377 |
| 0/10 | 0/10 | 76 | 1.000 |
| 0/8 | 0/8 | 8 | 1.000 |
| 0/9 | 0/9 | 3 | 1.000 |
| 0/7 | 0/8 | 1 | 1.000 |
| 0/7 | 0/7 | 1 | 1.000 |
| 0/6 | 0/7 | 1 | 1.000 |
| 0/6 | 0/6 | 3 | 1.000 |
|  | <6 |  | 6 | -- |
| 2,4-D | 6/10 | 1/10 | 1 | 0.038 |
| 5/10 | 1/10 | 1 | 0.097 |
| 1/10 | 2/10 | 1 | 0.126 |
| 4/10 | 1/10 | 2 | 0.193 |
| 5/10 | 0/10 | 6 | 0.217 |
| 3/10 | 1/10 | 2 | 0.305 |
| 4/9 | 0/10 | 1 | 0.345 |
| 2/10 | 1/10 | 1 | 0.394 |
| 4/10 | 0/10 | 1 | 0.430 |
| 1/10 | 1/10 | 1 | 0.438 |
| 0/10 | 1/10 | 1 | 0.449 |
| 3/10 | 0/10 | 6 | 0.678 |
| 2/10 | 0/10 | 13 | 0.877 |
| 1/9 | 0/9 | 1 | 0.966 |
| 1/10 | 0/10 | 32 | 0.976 |
| 0/10 | 0/10 | 89 | 1.000 |
|  |  | <6 |  | 3 | -- |
| Waterhemp | Glufosinate | 5/10 | 0/10 | 1 | **0.000** |
| 4/10 | 0/10 | 1 | **0.000** |
| 2/10 | 0/10 | 6 | 0.011 |
| 1/10 | 1/10 | 1 | 0.012 |
| 1/7 | 0/7 | 1 | 0.080 |
| 1/10 | 0/10 | 14 | 0.110 |
| 0/10 | 0/10 | 102 | 1.000 |
| 0/9 | 0/9 | 1 | 1.000 |
| 0/8 | 0/8 | 2 | 1.000 |
| 0/6 | 0/6 | 1 | 1.000 |
|  | < 6 |  | 2 | -- |
| Dicamba | 7/10 | 3/10 | 1 | **0.000** |
| 9/16 | 3/16 | 1 | **0.000** |
| 8/10 | 1/10 | 1 | **0.000** |
| 6/10 | 2/10 | 1 | **0.000** |
| 5/10 | 1/10 | 1 | **0.000** |
| 6/10 | 0/10 | 2 | **0.000** |
| 3/6 | 1/6 | 1 | **0.000** |
| 4/10 | 1/10 | 1 | **0.001** |
| 5/10 | 0/10 | 3 | **0.001** |
| 4/10 | 0/10 | 5 | **0.006** |
| 3/6 | 0/6 | 3 | **0.008** |
| 3/8 | 0/8 | 1 | 0.019 |
| 3/10 | 0/10 | 4 | 0.035 |
| 1/10 | 1/10 | 1 | 0.046 |
| 0/6 | 1/6 | 1 | 0.057 |
| 2/6 | 0/6 | 2 | 0.066 |
| 0/10 | 1/10 | 1 | 0.092 |
| 2/10 | 0/10 | 9 | 0.158 |
| 1/6 | 0/6 | 10 | 0.346 |
| 1/7 | 0/7 | 2 | 0.389 |
| 1/9 | 0/9 | 1 | 0.466 |
| 1/10 | 0/10 | 17 | 0.500 |
| 0/10 | 0/10 | 23 | 1.000 |
| 0/9 | 0/9 | 1 | 1.000 |
| 0/6 | 0/6 | 13 | 1.000 |
| 0/8 | 0/8 | 1 | 1.000 |
| 0/7 | 0/8 | 1 | 1.000 |
| 0/7 | 0/7 | 1 | 1.000 |
|  | <6 |  | 24 | -- |
| 2,4-D | 5/10 | 2/10 | 1 | **0.000** |
| 5/10 | 0/10 | 1 | **0.001** |
| 2/10 | 2/10 | 1 | **0.001** |
| 3/10 | 1/10 | 2 | **0.003** |
| 4/10 | 0/10 | 3 | **0.004** |
| 2/10 | 1/10 | 2 | 0.014 |
| 3/10 | 0/10 | 1 | 0.027 |
| 2/9 | 0/10 | 1 | 0.108 |
| 0/10 | 1/10 | 2 | 0.110 |
| 2/10 | 0/10 | 6 | 0.129 |
| 1/8 | 0/8 | 1 | 0.383 |
| 1/10 | 0/10 | 13 | 0.449 |
| 0/10 | 0/10 | 92 | 1.000 |
| 0/8 | 0/8 | 1 | 1.000 |
| 0/6 | 0/7 | 1 | 1.000 |
| 0/6 | 0/6 | 1 | 1.000 |
|  |  | < 6 |  | 3 | -- |

Fractions represent the total number of survivors out of the total tested per accession for the indicated weed species, herbicide and rate. Treatment 1× is the label rate and ½× is half-the label rate for each herbicide. *ptotal* is the combined probability of observing the indicated number of survivors in both treatments, if the null hypothesis of identity with sensitive controls is true. Tests for which the null hypothesis was rejected are in bold.

**Table S2.** Combined probability of survivors for each retested accession.

| Species | Accession | Herbicide | Initial test at ½× rate | Initial test at 1× rate | *p*total | Retest at 1× rate | *p*retest |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Palmer amaranth | WR2019-003 | 2,4-D | 6/10 | 1/10 | 0.038 | 0/20 | 1.000 |
| WR2019-033 | 2,4-D | 2/10 | 1/10 | 0.394 | 0/20 | 1.000 |
| WR2019-044 | 2,4-D | 4/10 | 1/10 | 0.193 | 1/20 | 0.677 |
| WR2019-048 | 2,4-D | 5/10 | 1/10 | 0.097 | 8/20 | **0.000** |
| WR2019-136 | 2,4-D | 0/10 | 1/10 | 0.449 | 1/20 | 0.677 |
| WR2019-149 | 2,4-D | 1/10 | 2/10 | 0.126 | 0/20 | 1.000 |
| WR2019-172 | Dicamba | 0/10 | 1/10 | 0.110 | 0/20 | 1.000 |
| WR2019-197 | 2,4-D | 1/10 | 1/10 | 0.438 | 0/20 | 1.000 |
| WR2019-200 | 2,4-D | 4/10 | 1/10 | 0.193 | 1/20 | 0.677 |
| WR2019-203 | 2,4-D | 3/10 | 1/10 | 0.305 | 0/20 | 1.000 |
| WR2019-204 | 2,4-D | 3/10 | 1/10 | 0.305 | 1/20 | 0.677 |
| WR2019-219 | Dicamba | 1/10 | 1/10 | 0.041 | 0/20 | 1.000 |
| Waterhemp | WR2019-006 | Dicamba | 8/10 | 1/10 | **0.000** | 4/20 | **0.001** |
| WR2019-037 | 2,4-D | 0/10 | 1/10 | 0.110 | 1/20 | 0.198 |
| WR2019-056 | Dicamba | 7/10 | 3/10 | **0.000** | 3/20 | **0.004** |
| WR2019-118 | Dicamba | 9/16 | 3/16 | **0.000** | 4/20 | **0.001** |
| WR2019-123 | 2,4-D | 3/10 | 1/10 | **0.003** | 3/20 | **0.007** |
| WR2019-127 | Dicamba | 4/10 | 1/10 | **0.001** | 2/20 | **0.027** |
| WR2019-173 | Dicamba | 6/10 | 2/10 | **0.000** | 1/20 | 0.168 |
| WR2019-174 | 2,4-D | 3/10 | 1/10 | **0.003** | 4/20 | **0.001** |
| WR2019-183 | Dicamba | 1/10 | 1/10 | 0.046 | 0/20 | 1.000 |
| WR2019-223 | Dicamba | 5/10 | 1/10 | **0.000** | 0/20 | 1.000 |
| WR2019-232 | 2,4-D | 0/10 | 1/10 | 0.110 | 1/20 | 0.198 |
| WR2019-249 | 2,4-D | 2/10 | 1/10 | 0.014 | 1/20 | 0.198 |
| WR2019-254 | 2,4-D | 2/10 | 2/10 | **0.001** | 1/20 | 0.198 |
| WR2019-258 | Dicamba | 0/6 | 1/6 | 0.057 | 1/20 | 0.168 |
| WR2019-267 | Dicamba | 0/10 | 1/10 | 0.092 | 0/20 | 1.000 |
| WR2019-300 | 2,4-D | 2/10 | 1/10 | 0.014 | 1/20 | 0.198 |
| WR2019-304 | Dicamba | 3/6 | 1/6 | **0.000** | 1/20 | 0.168 |

Fractions represent the total number of survivors out of the total tested per accession for the indicated weed species, herbicide and rate (initial or retest). Treatment 1× is the label rate and ½× is half-the label rate for each herbicide. *p*totalis the combined probability of observing the indicated number of survivors in both treatments, if the null hypothesis of identity with susceptible controls is true. *p*retestis the probability of observing the indicated number of survivors in the retest, if the null hypothesis of identity with susceptible controls is true. Tests for which the null hypothesis was rejected are in bold.