Supplementary Material

**Assessment of Dicamba and 2,4-D Residues in Palmer amaranth and Soybean**

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**Table S1.** Average herbicide residue detected in Palmer amaranth as a function of time after application in 2019, and the number of samples with a non-detect result in parentheses (n = 9 observations), where 1X equaled 560 g ha-1 of dicamba or 1065 g ha-1 of 2,4-D.

**Table S2.** Average herbicide residue detected in Palmer amaranth as a function of time after application in 2020, and the number of samples with a non-detect result in parentheses (n = 9 observations), where 1X equaled 560 g ha-1 of dicamba or 1065 g ha-1 of 2,4-D.

**Table S3.** Average dicamba residue detected in Enlist or Xtend soybean as a function of time after application in 2020, and the number of samples with a non-detect result in parentheses (n = 4 observations), where 1X equaled 560 g ha-1 of dicamba.

**Table S4.** Average dicamba residue detected in Enlist or Xtend soybean as a function of time after application in 2021, and the number of samples with a non-detect result in parentheses (n = 4 observations), where 1X equaled 560 g ha-1 of dicamba.

**Table S5.** Average 2,4-D residue detected in Enlist or Xtend soybean as a function of time after application in 2020, and the number of samples with a non-detect result in parentheses (n = 4 observations), where 1X equaled 1065 g ha-1 of 2,4-D.

**Table S6.** Average 2,4-D residue detected in Enlist or Xtend soybean as a function of time after application in 2021, and the number of samples with a non-detect result in parentheses (n = 4 observations), where 1X equaled 1065 g ha-1 of 2,4-D.

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| **Table S1.** Average herbicide residue detected in Palmer amaranth as a function of time after application in 2019, and the number of samples with a non-detect result in parentheses (n = 9 observations), where 1X equaled 560 g ha-1 of dicamba or 1065 g ha-1 of 2,4-D. a | | | | | | | | | |
| Time after | Dicamba | | | |  | 2,4-D | | | |
| application | 1X | 0.1X | 0.01X | 0.001X |  | 1X | 0.1X | 0.01X | 0.001X |
| d | ------------------------------------------------------ µg g-1 ------------------------------------------------------ | | | | | | | | |
| 0 | 46.356 (0) | 5.347 (0) | 0.433 (0) | 0.051 (6) |  | 95.926 (0) | 6.343 (0) | 0.575 (0) | 0.039 (0) |
| 3 | 11.609 (0) | 2.286 (0) | 0.292 (0) | 0.096 (6) |  | 5.694 (0) | 0.219 (0) | 0.007 (4) | ND b (9) |
| 7 | 1.049 (1) | 0.264 (1) | 0.044 (8) | ND (9) |  | 0.904 (0) | 0.109 (1) | 0.005 (8) | ND (9) |
| 10 | 0.717 (1) | 0.203 (1) | ND (9) | ND (9) |  | 0.351 (0) | 0.005 (8) | ND (9) | ND (9) |
| 18 | 0.161 (5) | ND (9) | ND (9) | ND (9) |  | 0.091 (0) | ND (9) | ND (9) | ND (9) |
| 21 | 0.116 (7) | 0.049 (8) | ND (9) | ND (9) |  | 0.022 (6) | ND (9) | ND (9) | ND (9) |
| 25 | 0.282 (3) | 0.065 (6) | ND (9) | ND (9) |  | 0.078 (5) | ND (9) | ND (9) | ND (9) |
| 28 | 0.073 (6) | 0.052 (7) | ND (9) | ND (9) |  | 0.053 (6) | ND (9) | ND (9) | ND (9) |
| a Analytical method for extraction and quantification of herbicides in Palmer amaranth vegetative tissue with a detection limit of 0.04 µg g-1 for dicamba and 0.004 µg g-1 for 2,4-D. | | | | | | | | | |
| b Abbreviation; ND, not detected. | | | | | | | | | |

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| **Table S2.** Average herbicide residue detected in Palmer amaranth as a function of time after application in 2020, and the number of samples with a non-detect result in parentheses (n = 9 observations), where 1X equaled 560 g ha-1 of dicamba or 1065 g ha-1 of 2,4-D. a | | | | | | | | | |
| Time after | Dicamba | | | |  | 2,4-D | | | |
| application | 1X | 0.1X | 0.01X | 0.001X |  | 1X | 0.1X | 0.01X | 0.001X |
| d | ------------------------------------------------------ µg g-1 ------------------------------------------------------ | | | | | | | | |
| 0 | 71.246 (0) | 18.269 (0) | 0.441 (0) | 0.326 (3) |  | 104.565 (0) | 4.538 (0) | 0.578 (0) | 0.036 (0) |
| 2 | 5.562 (0) | 0.699 (0) | 0.094 (4) | 0.046 (8) |  | 8.498 (0) | 0.904 (0) | 0.092 (0) | 0.022 (0) |
| 5 | 1.843 (0) | 0.603 (1) | ND b (9) | ND (9) |  | 3.547 (0) | 0.329 (0) | 0.016 (7) | ND (9) |
| 8 | 2.030 (0) | 0.347 (2) | ND (9) | ND (9) |  | 0.939 (0) | 0.144 (0) | ND (9) | ND (9) |
| 12 | 1.743 (1) | 0.691 (3) | ND (9) | ND (9) |  | 0.995 (0) | 0.159 (5) | ND (9) | ND (9) |
| 15 | 0.855 (1) | 0.284 (1) | ND (9) | ND (9) |  | 0.213 (0) | 0.005 (7) | ND (9) | ND (9) |
| 19 | 0.503 (1) | 0.076 (3) | ND (9) | ND (9) |  | 0.375 (1) | 0.004 (3) | ND (9) | ND (9) |
| 22 | 0.654 (0) | 0.094 (1) | ND (9) | ND (9) |  | 0.304 (3) | 0.004 (6) | ND (9) | ND (9) |
| 26 | 0.348 (2) | 0.123 (0) | ND (9) | ND (9) |  | 0.244 (2) | 0.004 (7) | ND (9) | ND (9) |
| 29 | 0.109 (6) | 0.149 (2) | ND (9) | ND (9) |  | 0.263 (3) | ND (9) | ND (9) | ND (9) |
| a Analytical method for extraction and quantification of herbicides in Palmer amaranth vegetative tissue with a detection limit of 0.04 µg g-1 for dicamba and 0.004 µg g-1 for 2,4-D. | | | | | | | | | |
| b Abbreviation; ND, not detected. | | | | | | | | | |

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| **Table S3.** Average dicamba residue detected in Enlist or Xtend soybean as a function of time after application in 2020, and the number of samples with a non-detect result in parentheses (n = 4 observations), where 1X equaled 560 g ha-1 of dicamba. a | | | | | | | | | |
| Time after | Enlist | | | |  | Xtend | | | |
| application | 1X | 0.1X | 0.01X | 0.001X |  | 1X | 0.1X | 0.01X | 0.001X |
| d | ------------------------------------------------------ µg g-1 ------------------------------------------------------ | | | | | | | | |
| 0 | 40.77 (0) | 3.98 (0) | 0.10 (1) | 0.04 (2) |  | 31.10 (0) | 2.58 (0) | 0.04 (3) | ND b (4) |
| 2 | 3.16 (0) | ND (4) | ND (4) | ND (4) |  | 0.06 (1) | ND (4) | ND (4) | ND (4) |
| 5 | 1.73 (0) | ND (4) | ND (4) | ND (4) |  | ND (4) | ND (4) | ND (4) | ND (4) |
| 8 | 1.75 (1) | ND (4) | ND (4) | ND (4) |  | ND (4) | ND (4) | ND (4) | ND (4) |
| 12 | ND (4) | ND (4) | ND (4) | ND (4) |  | ND (4) | ND (4) | ND (4) | ND (4) |
| 15 | ND (4) | ND (4) | ND (4) | ND (4) |  | ND (4) | ND (4) | ND (4) | ND (4) |
| 22 | ND (4) | ND (4) | ND (4) | ND (4) |  | ND (4) | ND (4) | ND (4) | ND (4) |
| 26 | ND (4) | ND (4) | ND (4) | ND (4) |  | ND (4) | ND (4) | ND (4) | ND (4) |
| 29 | ND (4) | ND (4) | ND (4) | ND (4) |  | ND (4) | ND (4) | ND (4) | ND (4) |
| a Analytical method for extraction and quantification of herbicides in soybean plant tissue with a detection limit of 0.04 µg g-1 for dicamba. | | | | | | | | | |
| b Abbreviation; ND, not detected. | | | | | | | | | |

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| **Table S4.** Average dicamba residue detected in Enlist or Xtend soybean as a function of time after application in 2021, and the number of samples with a non-detect result in parentheses (n = 4 observations), where 1X equaled 560 g ha-1 of dicamba. a | | | | | | | | | |
| Time after | Enlist | | | |  | Xtend | | | |
| application | 1X | 0.1X | 0.01X | 0.001X |  | 1X | 0.1X | 0.01X | 0.001X |
| d | ------------------------------------------------------ µg g-1 ------------------------------------------------------ | | | | | | | | |
| 0 | 17.52 (0) | 0.86 (0) | 0.10 (1) | ND b (4) |  | 7.65 (0) | 0.20 (0) | ND (4) | ND (4) |
| 4 | 1.42 (0) | 0.04 (3) | ND (4) | ND (4) |  | 0.53 (1) | ND (4) | ND (4) | ND (4) |
| 8 | 0.76 (0) | 0.04 (3) | ND (4) | ND (4) |  | ND (4) | ND (4) | ND (4) | ND (4) |
| 10 | 1.18 (2) | 0.04 (3) | ND (4) | ND (4) |  | ND (4) | ND (4) | ND (4) | ND (4) |
| 14 | 1.12 (1) | ND (4) | ND (4) | ND (4) |  | ND (4) | ND (4) | ND (4) | ND (4) |
| 17 | 1.27 (2) | ND (4) | ND (4) | ND (4) |  | ND (4) | ND (4) | ND (4) | ND (4) |
| 21 | 1.13 (1) | ND (4) | ND (4) | ND (4) |  | ND (4) | ND (4) | ND (4) | ND (4) |
| 24 | 0.65 (2) | 0.04 (3) | ND (4) | ND (4) |  | ND (4) | ND (4) | ND (4) | ND (4) |
| 28 | 0.10 (2) | 0.04 (3) | ND (4) | ND (4) |  | ND (4) | ND (4) | ND (4) | ND (4) |
| 31 | ND (4) | ND (4) | ND (4) | ND (4) |  | ND (4) | ND (4) | ND (4) | ND (4) |
| a Analytical method for extraction and quantification of herbicides in soybean plant tissue with a detection limit of 0.04 µg g-1 of dicamba. | | | | | | | | | |
| b Abbreviation; ND, not detected. | | | | | | | | | |

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| **Table S5.** Average 2,4-D residue detected in Enlist or Xtend soybean as a function of time after application in 2020, and the number of samples with a non-detect result in parentheses (n = 4 observations), where 1X equaled 1065 g ha-1 of 2,4-D. a | | | | | | | | | |
| Time after | Enlist | | | |  | Xtend | | | |
| application | 1X | 0.1X | 0.01X | 0.001X |  | 1X | 0.1X | 0.01X | 0.001X |
| d | ------------------------------------------------------ µg g-1 ------------------------------------------------------ | | | | | | | | |
| 0 | 75.352 (0) | 2.285 (1) | 0.269 (0) | 0.03 (0) |  | 74.88 (0) | 5.35 (0) | 0.28 (0) | 0.02 (0) |
| 2 | 1.015 (0) | 0.019 (2) | 0.079 (2) | ND (4) |  | 6.87 (0) | 0.07 (0) | 0.01 (0) | ND b (4) |
| 5 | 0.284 (0) | ND (4) | ND (4) | ND (4) |  | 1.73 (0) | 0.01 (0) | ND (4) | ND (4) |
| 8 | 0.065 (0) | 0.007 (0) | ND (4) | ND (4) |  | 5.13 (0) | 0.01 (3) | ND (4) | ND (4) |
| 12 | 0.013 (2) | ND (4) | ND (4) | ND (4) |  | 0.38 (2) | ND (4) | ND (4) | ND (4) |
| 15 | 0.012 (2) | ND (4) | ND (4) | ND (4) |  | 0.05 (2) | ND (4) | ND (4) | ND (4) |
| 19 | 0.020 (2) | ND (4) | ND (4) | ND (4) |  | 0.01 (1) | ND (4) | ND (4) | ND (4) |
| 22 | ND (4) | ND (4) | ND (4) | ND (4) |  | 0.02 (2) | ND (4) | ND (4) | ND (4) |
| 26 | ND (4) | ND (4) | ND (4) | ND (4) |  | 0.01 (3) | ND (4) | ND (4) | ND (4) |
| 29 | ND (4) | ND (4) | ND (4) | ND (4) |  | 0.07 (1) | ND (4) | ND (4) | ND (4) |
| a Analytical method for extraction and quantification of herbicides in soybean plant tissue with a detection limit of 0.004 µg g-1 of 2,4-D. | | | | | | | | | |
| b Abbreviation; ND, not detected. | | | | | | | | | |

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| **Table S6.** Average 2,4-D residue detected in Enlist or Xtend soybean as a function of time after application in 2021, and the number of samples with a non-detect result in parentheses (n = 4 observations), where 1X equaled 1065 g ha-1 of 2,4-D. a | | | | | | | | | |
| Time after | Enlist | | | |  | Xtend | | | |
| application | 1X | 0.1X | 0.01X | 0.001X |  | 1X | 0.1X | 0.01X | 0.001X |
| d | ------------------------------------------------------ µg g-1 ------------------------------------------------------ | | | | | | | | |
| 0 | 43.99 (0) | 3.79 (0) | 0.11 (0) | 0.03 (0) |  | 125.69 (0) | 10.69 (0) | 0.85 (0) | 0.23 (0) |
| 4 | 8.58 (0) | 0.02 (0) | ND b (4) | ND (4) |  | 24.74 (0) | 0.27 (0) | 0.01 (1) | ND (4) |
| 8 | 0.10 (0) | 0.01 (3) | ND (4) | ND (4) |  | 7.17 (0) | 0.07 (0) | ND (4) | ND (4) |
| 10 | 0.02 (1) | ND (4) | ND (4) | ND (4) |  | 3.63 (0) | 0.01 (0) | ND (4) | ND (4) |
| 14 | 0.11 (2) | ND (4) | ND (4) | ND (4) |  | 2.94 (0) | 0.01 (2) | ND (4) | ND (4) |
| 17 | ND (4) | ND (4) | ND (4) | ND (4) |  | 1.20 (0) | 0.01 (3) | ND (4) | ND (4) |
| 21 | ND (4) | ND (4) | ND (4) | ND (4) |  | 0.36 (1) | 0.01 (3) | ND (4) | ND (4) |
| 24 | ND (4) | ND (4) | ND (4) | ND (4) |  | 0.03 (2) | ND (4) | ND (4) | ND (4) |
| 28 | ND (4) | ND (4) | ND (4) | ND (4) |  | 0.01 (3) | ND (4) | ND (4) | ND (4) |
| 31 | ND (4) | ND (4) | ND (4) | ND (4) |  | 0.01 (2) | ND (4) | ND (4) | ND (4) |
| a Analytical method for extraction and quantification of herbicides in soybean plant tissue with a detection limit of 0.004 µg g-1 of 2,4-D. | | | | | | | | | |
| b Abbreviation; ND, not detected. | | | | | | | | | |