**Soybean density and Palmer amaranth(*Amaranthus palmeri*) establishment time: Effects on weed biology, crop yield and economic returns.**

Nicholas E. Korres1, Jason K. Norsworthy2, Andy Mauromoustakos3, Martin M. Williams II4

1ORISE Research Scientist, Global Change and Photosynthesis Research, USDA-ARS, 1102 S. Goodwin Ave., Urbana, IL, USA,  2Distinguished Professor, Department of Crop, Soil and Environmental Sciences, University of Arkansas, Fayetteville, AR, USA, 3Professor, Department of Crop, Soil and Environmental Sciences, Agricultural Statistics Annex, Fayetteville, AR, USA; 4Ecologist, Global Change and Photosynthesis Research, USDA-ARS, 1102 S. Goodwin Ave., Urbana, IL, USA.

**Supplemental Table 1**. Parameter estimates of the linear regression model for the effects of crop density on *A. palmeri* height (at harvest) in weeks after (crop) emergence (WAE) of the weed relative to soybean emergence

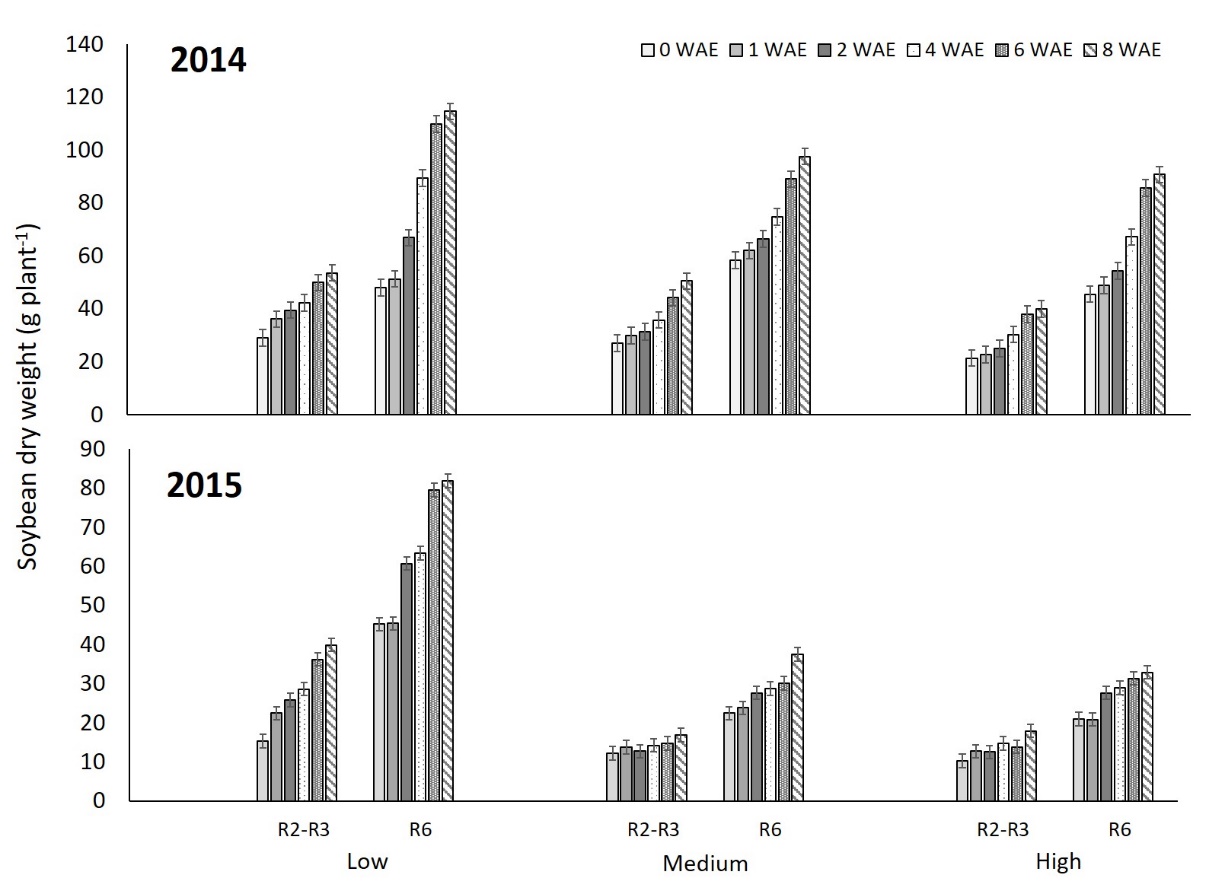
|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| WAE | Intercept | Slope | Intercept Std Error | Slope Std Error | Intercept t Ratio | Slope t Ratio |
| 0 | 142.9 | -6.1E-05 | 4.542 | 2.03E-05 | 31.456 | -2.986 |
| 1 | 125.5 | -9.8E-05 | 4.231 | 1.92E-05 | 29.664 | -5.068 |
| 2 | 103.3 | -0.00016 | 4.272 | 2E-05 | 24.184 | -7.901 |
| 4 | 55.1 | -0.0001 | 4.228 | 1.96E-05 | 13.013 | -5.223 |
| 6 | 48.0 | -9.4E-06 | 4.243 | 1.94E-05 | 11.323 | -0.484 |
| 8 | 51.1 | -3.4E-05 | 4.253 | 1.96E-05 | 12.005 | -1.742 |

**Supplemental Table 2**. Parameter estimates of the two-parameter exponential decay model for the effects of crop density on *A. palmeri* dry weight (at harvest) in weeks after emergence (WAE) of the weed relative to soybean emergence

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| WAE | Upper value | Slope | Upper value Std Error | Slope Std Error | Upper value t Ratio | Slope t Ratio |
| 0 | 175.3 | -4.2E-06 | 9.718 | 4.92E-07 | 18.042 | -8.620 |
| 1 | 135.4 | -9.7E-06 | 9.305 | 1.54E-06 | 14.555 | -6.277 |
| 2 | 94.6 | -1.6E-05 | 9.361 | 5.06E-06 | 10.106 | -3.184 |
| 4 | 12.3 | -1.4E-05 | 9.353 | 3.15E-05 | 1.312 | -0.458 |
| 6 | 1.2 | -1.5E-06 | 8.196 | 4.04E-05 | 0.142 | -0.037 |
| 8 | 0.610934 | -1.2E-06 | 8.098 | 7.32E-05 | 0.075 | -0.016 |

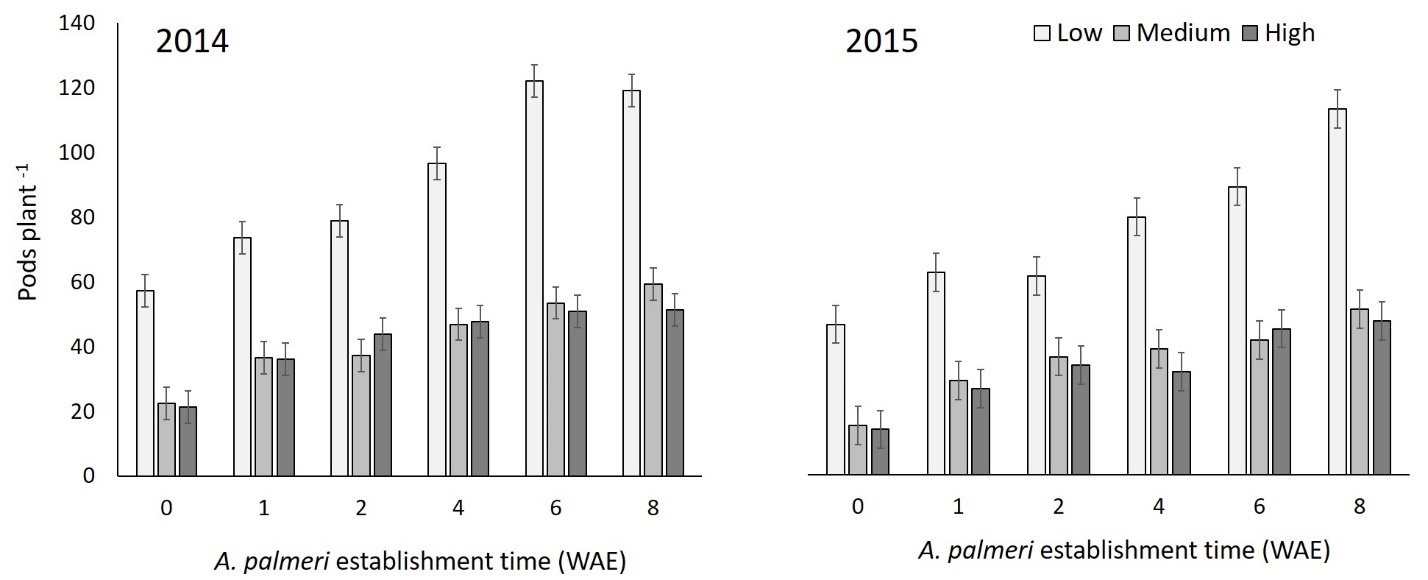
**Supplemental Table 3**. Parameter estimates of the two-parameter exponential decay model for the effects of crop density on *A. palmeri* seed production (at harvest) in weeks after emergence (WAE) of the weed relative to soybean emergence

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| WAE | Upper value | Slope | Upper value Std Error | Slope Std Error | Upper value t Ratio | Slope t Ratio |
| 0 | 352817.5 | -5.5042E-06 | 11688.823 | 3.87343E-07 | 30.184 | -14.210 |
| 1 | 248035.2 | -9.8853E-06 | 12855.638 | 1.13049E-06 | 19.294 | -8.744 |
| 2 | 236084.7 | -1.7437E-05 | 17110.988 | 3.10137E-06 | 13.798 | -5.622 |
| 4 | 1830.093 | 1.30592E-06 | 13293.131 | 2.58329E-05 | 0.138 | 0.050 |
| 6 | 543.0582 | -2.4689E-06 | 26062.138 | 0.00023618 | 0.021 | -0.010 |
| 8 | 108.5907 | 4.35036E-06 | 7952.0331 | 0.00022556 | 0.014 | 0.019 |



**Supplemental Figure 1**. Effects of *A. palmeri* establishment time × soybean density on soybean dry weight at R2-R3 and R6 reproductive crop growth stages. Vertical bars indicate the LSD value for mean separation between soybean densities and each reproductive stage only at P<0.05.

Average low density achieved for 2014 was 121302 plants ha-1 (120311, 122292) and for 2015 was 98437 plants ha-1 (96117, 100758); average medium achieved for 2014 was 242604 plants ha-1 (241302, 243906) and for 2015 was 198229 plants ha-1 (193724, 202735) and finally average high density achieved for 2014 was 389333 plants ha-1 (386401, 392266) and for 2015 was 323167 plants ha-1 (314202, 332132). Numbers in the parentheses indicated the lower and upper 95 % mean respectively.



**Supplemental Figure 2**. Effects of *A. palmeri* establishment time × crop density on pod production plant-1 in weeks after emergence (WAE) of the weed relative to soybean emergence. Vertical bars represent LSD values for mean separation at P<0.05.

Average low density achieved for 2014 was 121302 plants ha-1 (120311, 122292) and for 2015 was 98437 plants ha-1 (96117, 100758); average medium achieved for 2014 was 242604 plants ha-1 (241302, 243906) and for 2015 was 198229 plants ha-1 (193724, 202735) and finally average high density achieved for 2014 was 389333 plants ha-1 (386401, 392266) and for 2015 was 323167 plants ha-1 (314202, 332132). Numbers in the parentheses indicated the lower and upper 95 % mean respectively.