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Amaranthus palmeri

- Reports of herbicide-resistant
- Reports of herbicide-resistant; Auxin Mimics

AMARANTHUS PALMERI

Dioecious

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↑↑ Competitive

Rapid growth rate

↑↑ Seed production

Figure 1 is a semi-logarithmic plot showing the survival percentage of four grasshopper species (S, R-1, R-2, R-3) in response to Dicamba rates (g a.e. ha⁻¹). The x-axis is logarithmic, ranging from 1 to 1000. The y-axis is linear, ranging from 0 to 100%. Species S (green crosses) shows the most rapid decline in survival, reaching near 0% at 1000 g a.e. ha⁻¹. Species R-1 (orange triangles), R-2 (purple circles), and R-3 (brown squares) show a more gradual decline, with R-3 maintaining the highest survival at high Dicamba rates. Vertical dashed lines are present at 100 and 300 g a.e. ha⁻¹.

Dicamba rates (g a.e. ha ⁻¹)	S (%)	R-1 (%)	R-2 (%)	R-3 (%)
1	100	100	100	100
10	90	100	100	100
20	80	100	100	100
50	60	90	95	100
100	20	80	85	95
200	10	40	55	80
300	10	20	30	35
1000	10	10	20	30

Figure 1 is a semi-logarithmic plot showing the reduction in fresh weight (%) compared to non-treatment (Y-axis) versus Dicamba rates (g a.e. ha⁻¹) (X-axis, logarithmic scale). The plot displays four data series: S (green), R-1 (orange), R-2 (purple), and R-3 (brown). All series show a sigmoidal dose-response curve, indicating that the reduction in fresh weight increases with Dicamba rate, eventually reaching a plateau. Treatment S shows the highest reduction across the range of rates, while R-2 shows the lowest reduction.

Dicamba rates (g a.e. ha ⁻¹)	S (%)	R-1 (%)	R-2 (%)	R-3 (%)
1	0	0	0	0
10	75	0	0	0
20	60	0	0	0
50	85	25	20	0
100	100	70	50	10
200	100	45	35	25
500	100	100	90	90

The diagram illustrates the experimental workflow for herbicide application and data collection. It begins with a central orange oval labeled "Non-linear log-logistic regression model". To the left, a yellow oval labeled "Herbicide application" contains an icon of a sprayer. Below this, a sequence of images shows a plant in a pot, a plant in a tray, and a plant in a pot. A calendar icon indicates "50 D.A.T." (Days After Treatment). Below the plant images, text states "Survival & fresh weight was measured". To the right, a graph shows "Plant response" vs "Herbicide dose" with two curves: a blue curve for "Resistant population" and a red curve for "Sensitive population". The graph highlights the $GR_{50/90}$ and $LD_{50/90}$ points on the curves.

The R3 population showed the highest LD₅₀ value compared to R1, R2, and the S population. However, the GR₅₀ value was highest in R2. Overall, the values among the Spanish populations were closer to each other but clearly higher compared to the S American population.

POP	LD ₅₀ ±SE	SLOPE	P-VALUE	LD ₉₀ ±SE
S	78.1 ± 12.7	0.03	< 0.001	153.1 ± 29.4
R-1	245.5 ± 45.3	0.01	< 0.001	525.5 ± 122.7
R-2	272.2 ± 59.5	0.01	< 0.001	564.6 ± 257.1
R-3	461.1 ± 59.5	0.01	< 0.001	778.4 ± 127.5

POP	GR ₅₀ ±SE	SLOPE	P-VALUE	GR ₉₀ ±SE
S	10.3 ± 3.4	- 0.09	< 0.005	34.9 ± 15.8
R-1	100.7 ± 34.7	- 0.01	< 0.005	434.4 ± 145.1
R-2	221.1 ± 45.0	-0.01	< 0.001	616.3 ± 137.2
R-3	138.0 ± 47.7	- 0.001	< 0.005	652.7 ± 203.3

CONCLUSION: This research **confirmed** that three *A. palmeri* Spanish populations have developed **resistance to dicamba**, which is the first documented case of dicamba resistance in Europe. However, further investigations are needed to describe the resistance mechanisms of these populations. Moreover, R1, R2 and R3 have been reported to be resistance to ALS-inhibitors. The presence of multiple herbicide-resistant populations of *A. palmeri* from Europe highlights the need for integrated weed management approaches and preserve the efficacy of chemical control.