Supplementary information

Induced phenological avoidance: a neglected defense mechanism against seed predation in plants.

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SI 1 Occurrence of predation

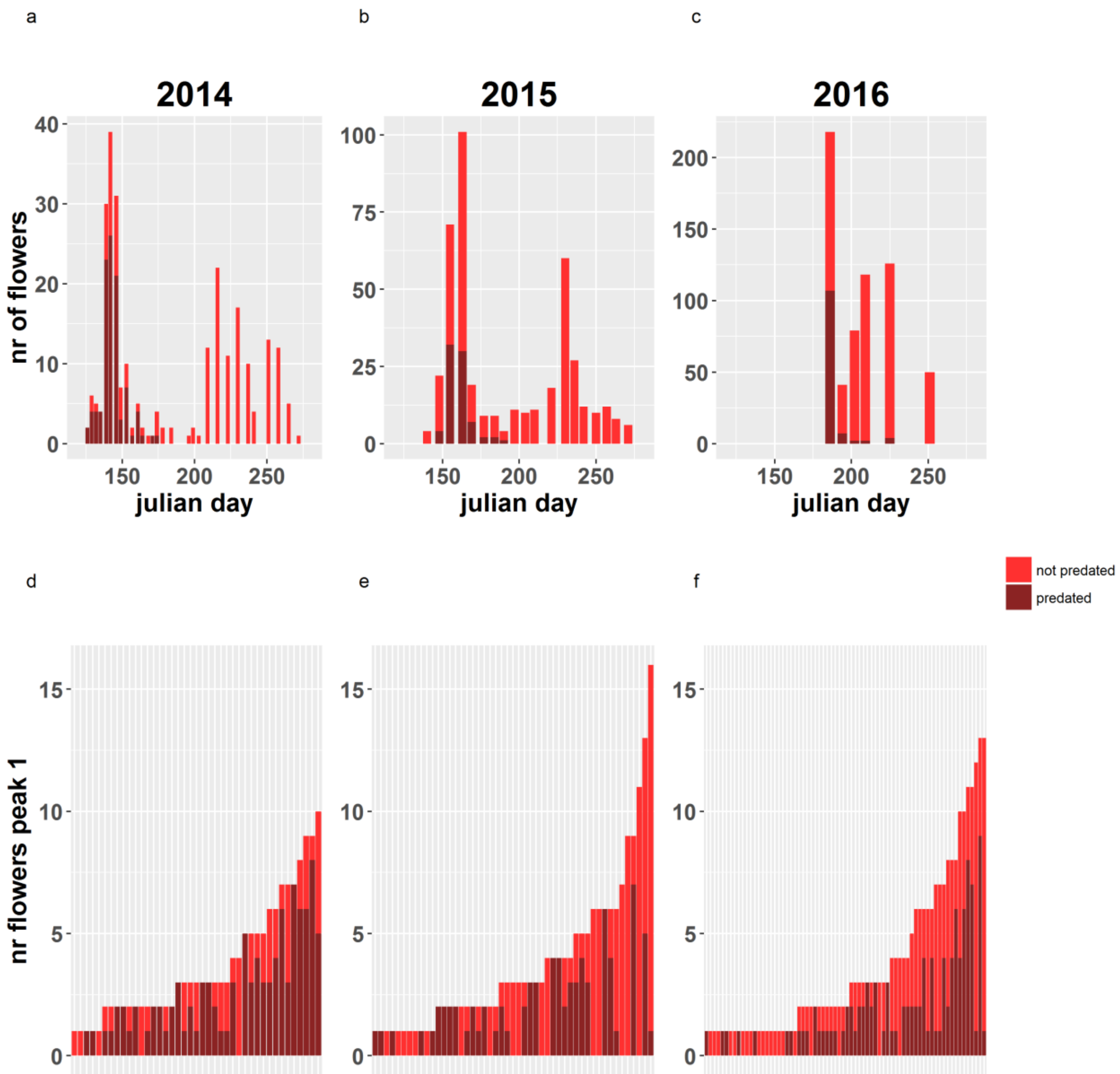

Fig S1: number of flowers per collection moment in (a) 2014 , (b) 2015 and (c) 2016 . Number of flowers that were predated are marked in dark red. Total number of flowers per plant for (d) 2014 , (e) 2015 and (f) 2016, ordered from low to high number of flowers. Flowers that experienced predation are indicated in dark red. Every bar represents a plant.

Table S1: Correlation between flower number in the first peak and proportion of flowers of the first peak that experienced predation. There is no correlation between flower number and proportion of predation.

	Correlation coefficient
2014	0.017
2015	-0.278
2016	0.100

SI 2 third analysis with inclusion of predation occurrence as categorical variable

In the main text we split the third analysis in separate analyses for predated and unpredated plants since we believe this makes the interpretation of the quadratic vs linear effects easier. However to support this split we created a model for all plants together including predation occurrence as a categorical fixed effect and the interaction with the first (and second in the quadratic selection gradient) polynomials of the proportion of flowers in the second peak

The quadratic model had the lowest AIC value (quadratic model AIC: 352, linear model AIC 359) therefore the parameter estimates of the quadratic model are represented in the table and the figure below.

Table S2. Parameter estimates of the model testing the effect of 'total number of flowers', 'predation occurrence' as a categorical fixed effect and the interaction with the first (and second in the quadratic selection gradient) polynomials of the proportion of flowers in the second peak on total seed mass per plant. Both interaction effects were significant

Intercept	**Scaled total number of flowers**	**Proportion flowers in peak 2**	**Second polynomial of proportion flowers in peak 2**	**Predation occurence**	**Interaction predation occurrence – proportion flowers in peak 2**	**Interaction predation occurrence – second polynomial of proportion flowers in peak 2**
-1.36 (±0.36) **	0.86 (±0.87) ***	-0.25 (±1.26) .	0.53 (±1.29)	-0.51 (±0.38)	3.66 (±1.72) *	-3.89 (±1.89) *

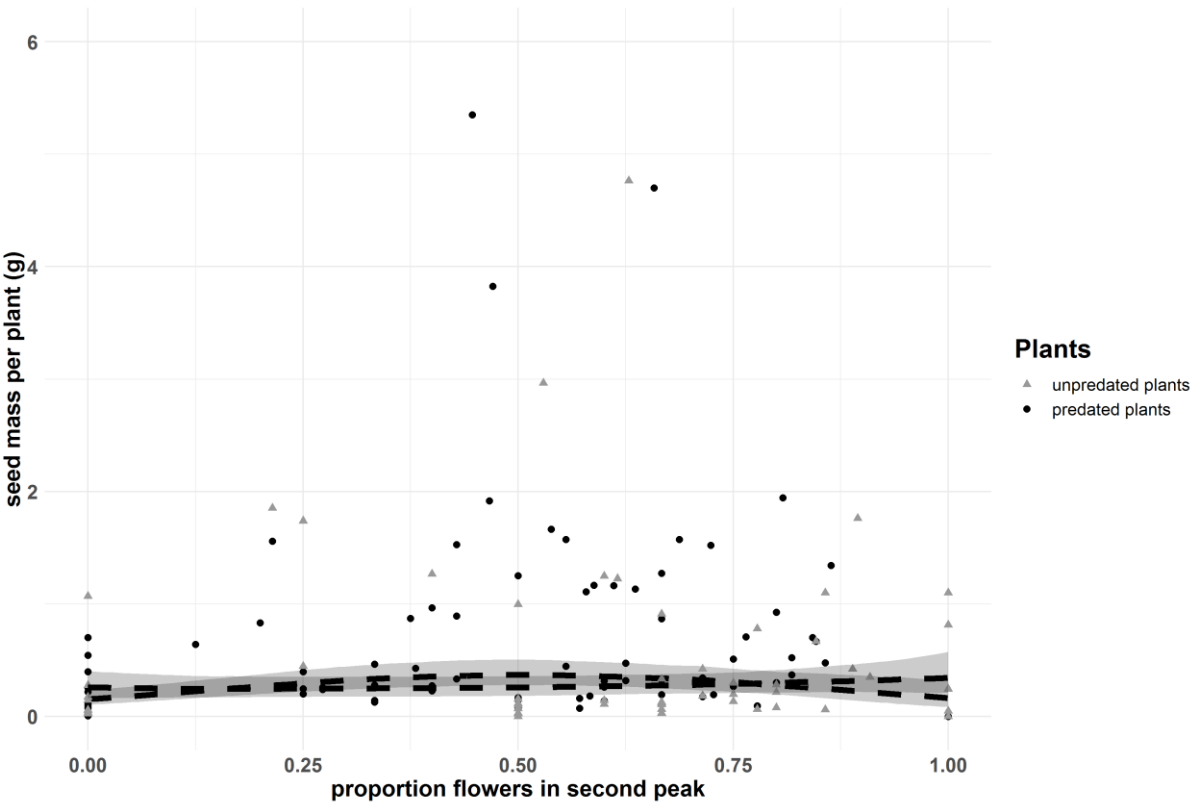

Fig S2: Selection gradients for total seed mass per plant (reproductive output) against the proportion of flowers in the second peak. Points represent data of unpredated and predated plants. The lines (+/- 95% credible interval) show the fitted relationships for predated an unpredated plants seperately, which were derived for plants with an average number of flowers.

SI 3 model summary of plant-level selection gradients

For unpredated plants AIC of the linear model was 156.1 and of the quadratic model was 154.7. Since the difference between the two AIC values is smaller than 2, we consider the most simple model, i.e. the linear model, to represent the data best.

For predated plants AIC of the linear model was 201.0 and of the quadratic model was 194.9. The quadratic model is thus considered to represent the data best.

Table S3: Estimate, standard error and significance code of each model parameter from the best model (i.e. the models with the lowest AIC values) to estimate the logarithm of the total seed weight for predated and unpredated plants in 2015 and 2016. The significance codes indicate between which values the p-value was located: 0< *** < 0.001 < ** < 0.01 < * < 0.05 < . < 0.1.

	Intercept	**Scaled total number of flowers**	**Proportion flowers in peak 2**	**Second polynomial of proportion flowers in peak 2**
unpredated	-1.17 (±0.40) *	1.16 (±0.19) ***	0.001 (±0.50)	/
predated	-1.83 (±0.24) ***	0.79 (±0.09) ***	3.17 (±1.02) **.	-3.10 (±1.21) *

SI 4 model summary of compensatory flowering analysis with number of flowers as response variable

According to the fourth hypothesis, we expected plants to use tolerance as a defense mechanism and show compensatory flowering, that is, plants that experienced predation early in the growing season compensated the loss in reproductive output by increasing the number of flowers later in the growing season in the same year. To test this expectation, we regressed the proportion of flowers per plant in the second peak against the percentage of flowers per plant in the first peak that experienced predation. Year and plot identity were included as a random effects. See main text for the results of this analysis.

An alternative analysis to test for compensatory flowering would be to use the number of flowers or the number of inflorescences as a response variable. Using the number of inflorescences as in other studies is not relevant for G. urbanum, because only in very few plants new inflorescences (i.e. a branch originating from the roset) grow later in the season. For most plants, flowers in the second peak simply grow on new ramifications within existing inflorescences. The only clear unit on these ramification is the single flowers.

We thus regress the total number of flowers per plant against the percentage of flowers per plant in the first peak that experienced predation, controlling for plant size by adding the total inflorescence length as a covariate. Year and plot identity were included as a random effects. This analysis was done for the data of 2015 and 2016; predation was not recorded in 2017. We used a Bayesian approach and fitted the models with the package ‘brms’ (Bürkner, 2016). The results are represented below.

Inflorescence length is significantly and positively correlated with the total number of flowers (95% credible interval (CI) of slope: 0.0257 – 0.0416). Larger plants have more flowers, which is to be expected. The percentage predation in the first peak is negatively, but not significantly, related to the total number of flowers (95% credible interval (CI) of slope: -0.0549 – 0.0044). So, if a plant experienced more predation it tends to produce less flowers. This is the opposite of what we would expect in the case of compensatory flowering. These results confirm the results included in the main article that show no evidence for compensatory flowering.

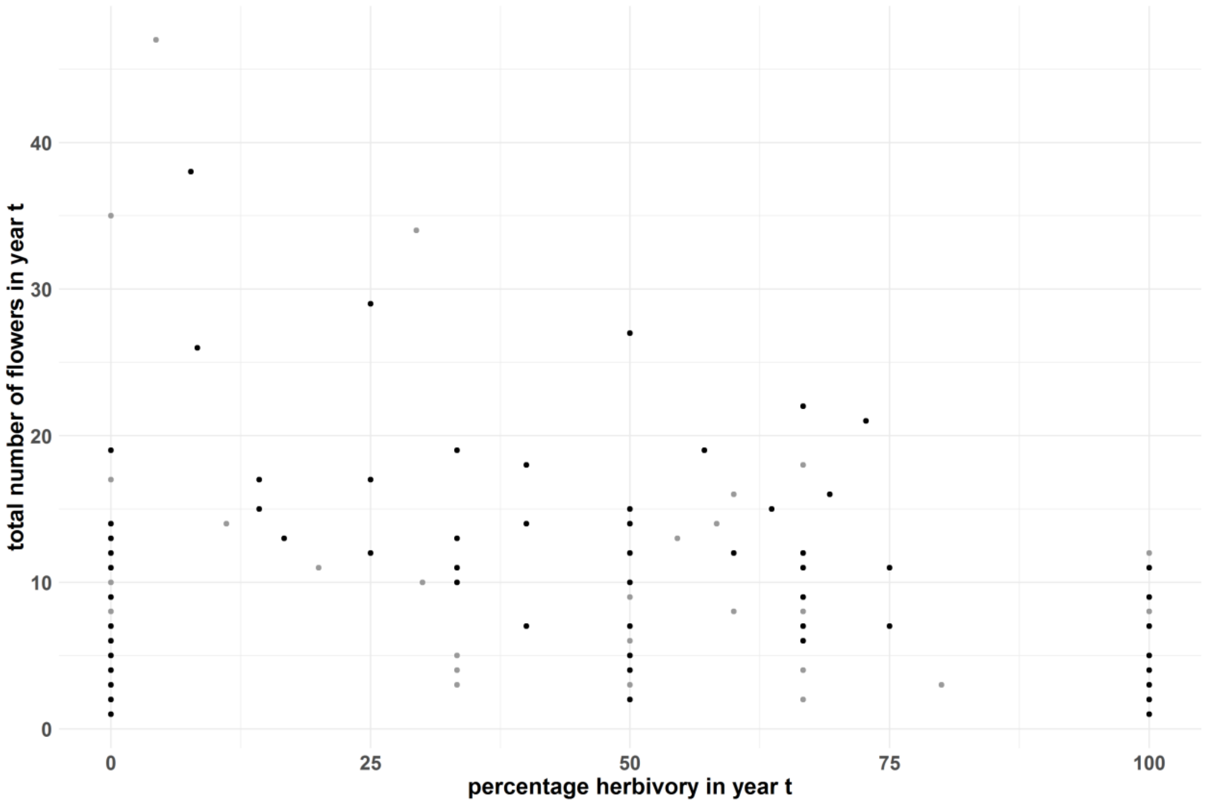

Fig. S4. Tests for evidence of compensatory flowering The relationship between the plant-level proportion of flowers from the first peak that were predated (x-axis) versus the total number of flowers per plant within the same year (y-axis), that is, compensatory flowering. Points represent plant-level observations of 2015 (grey) and 2016 (black). No significant relationship was found for compensatory flowering.