

Additional Materials

Additional Tables

Table S1. The factors that are used for orthogonal design

Level Factors	1	2	3
A <i>S. krylovii</i> (g)	20	40	60
B <i>L. chinensis</i> (g)	20	40	60
C <i>A. frigida</i> (g)	20	40	60

The three factors refer to the three plants. A: *Stipa krylovii*. B: *Leymus chinensis*. C: *Artemisia frigida*. The three levels (1, 2, 3) of fresh plant biomass are 20, 40, and 60 g.

Table S2. Orthogonal design and their factors

Factors EXPNO	A	B	C	Block
1	1	1	1	1
2	1	2	2	2
3	1	3	3	3
4	2	1	2	3
5	2	2	3	1
6	2	3	1	2
7	3	1	3	2
8	3	2	1	3
9	3	3	2	1

L₉ (3⁴) orthogonal table. A, B, and C refer to the three plant factors. A: *Stipa krylovii*. B: *Leymus chinensis*. C: *Artemisia frigida*. The numbers in the columns indicate the factor levels, 1 mean low level, 2 mean intermediate level, and 3 mean high level.

Table S3. Variance analysis of the orthogonal test for mortalities of *O. asiaticus* from third instar to adults within manipulated plant community compositions

Source	df	ANOVA SS	Mean square	F value	Pr > F
Block	1	0.0613	0.0613	5.13	0.0470
<i>S. krylovii</i>	2	0.0211	0.01056	0.88	0.4432
<i>L. chinensis</i>	2	0.0119	0.0060	0.50	0.6209
<i>A. frigida</i>	2	0.0486	0.0243	2.03	0.1814
Model	7	0.1429	0.0204	1.71	0.2131
Error	10	0.1194	0.0119		
Corrected total	17	0.2624			

Table S4. Partial least-square path modelling of the effects (coefficient) of plant biomass, food availability and quality, and grasshopper population density on grasshopper body size

Relationships	direct	indirect	total	P value
Plant biomass -> Food availability and quality	-0.0496	0	-0.0496	0.907
Plant biomass -> Density	-0.8107	0.027	-0.7837	0.00179
Plant biomass -> Grasshopper body size	0.979	-0.351	0.6282	0.1487
Food availability and quality -> Density	-0.5447	0	-0.5447	0.00974
Food availability and quality -> Grasshopper body size	0.8829	-0.213	0.6695	0.0887
Density -> Grasshopper body size	0.3918	0	0.3918	0.5701

Additional Figures

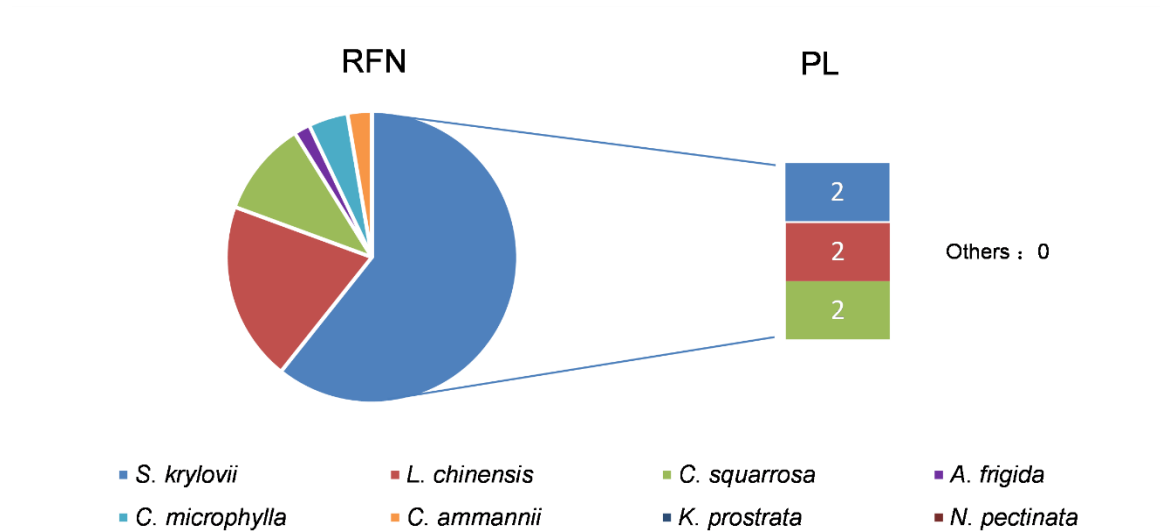


Figure S1 Feeding frequency and preference level of eight plants *PLs* for *S. krylovii*, *L. chinensis*, *C. squarrosa* are 2 Other plants are defined as 0 *PL*: preference level; 0: not consumed (<0.5% of the plant eaten); 1: limited consumption with 0.5–30% of the plant eaten; 2: high consumption with > 30% of the plant eaten Sample size $N = 50$

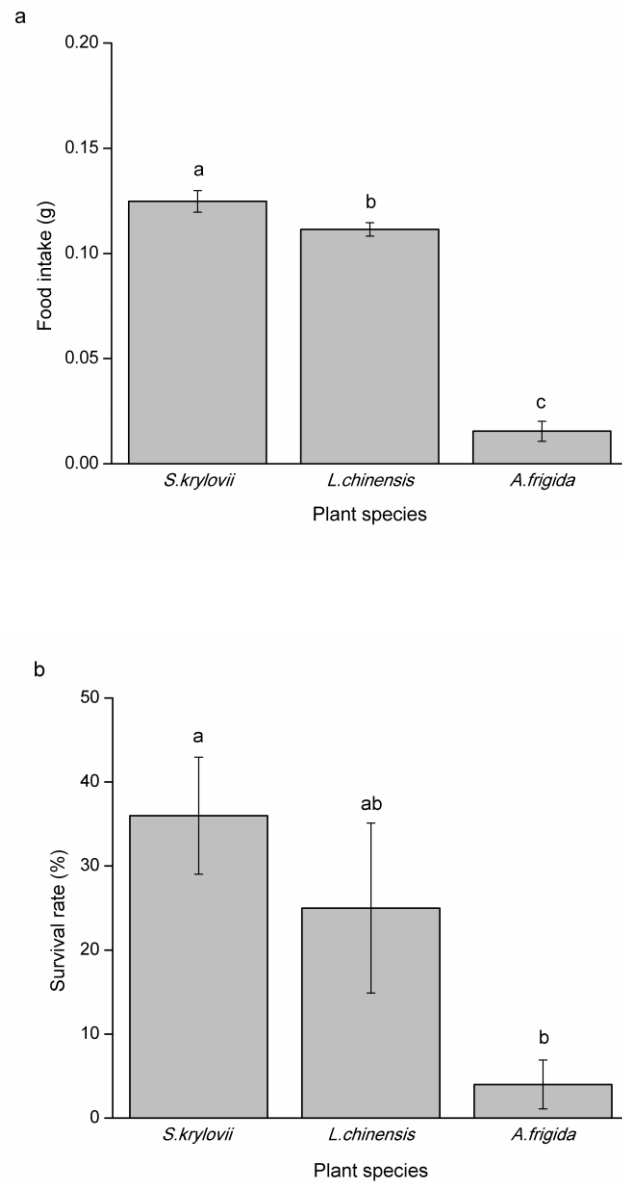


Figure S2 Mean consumption (g/day/individual $\pm$ SEM) (a) and survival rate $\pm$ SEM (b) of *O. asiaticus* feeding on three plant species as measured under laboratory conditions. The horizontal axis indicates the plant species. Sample size, $N=60$. The values of the bar chart are mean $\pm$ SEM. Error bar indicates the standard error. Those marked by different lowercase letters are significantly different based on Tukey's HSD at $P < 0.05$.

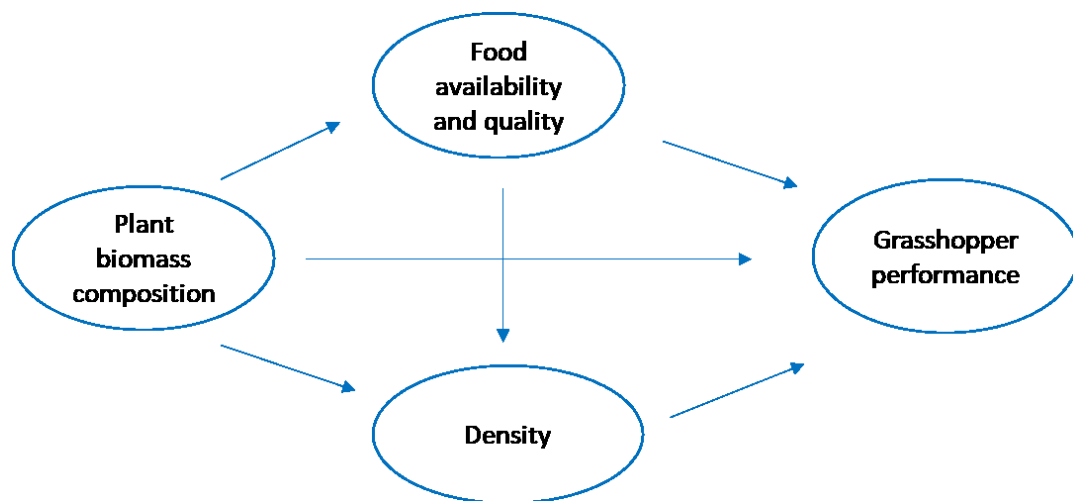


Figure S3. The partial least -square modelling path on grasshopper performance.

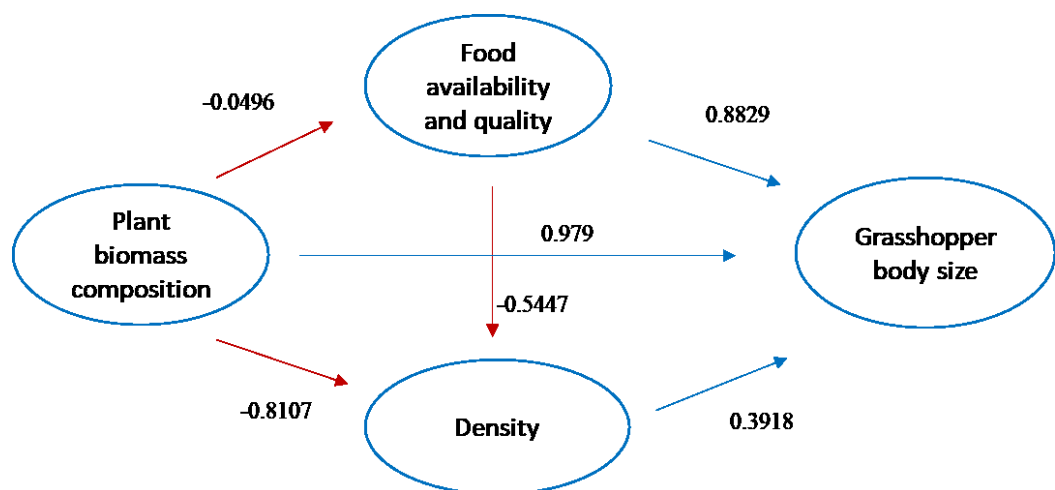


Figure S4. The effect of plant biomass composition on grasshopper body size from partial least - square modelling.