

## SUPPLEMENTARY DATA

FIG. S1. Phylogeny of 21 hummingbird-pollinated plant species, with response variables and plant trait values.

	Response variables				Plant traits			
	Fruit set	Seed set	Seed weight	Seed germination	Index of Self incompatibility	Index of Autogamy	Plant density	Specialization level
<i>Sinningia cooperi</i>	1.04	0.40	4.54	5.21	1.03	0.14	0.81	0.008
<i>Sinningia gigantifolia</i>	3.28	1.23	-4.51	0.78	1.17	0.26	6.49	0.097
<i>Nematanthus crassifolius</i>	0.31	-0.60	2.54	2.32	0.58	0	41.38	0.153
<i>Nematanthus lanceolatus</i>	0.14	0.30	0.26	0.29	1.10	0	6.49	0.282
<i>Salvia sellowiana</i>	0.23	-0.04	0.20	ne	1.16	0	12.17	0.151
<i>Staurogyne itatiaiae</i>	-0.37	0.33	-3.93	-1.19	1.49	0.17	8.11	0.167
<i>Odontonema barbelerioides</i>	0.72	ne	0.67	ne	0.41	0	6.49	0.211
<i>Justicia sebastianopolitanae</i>	-0.19	-0.96	-0.03	ne	0.70	0.1	104.67	0.232
<i>Manettia mitis</i>	0.17	-0.03	0.85	0.47	0.51	0.24	7.3	0.222
<i>Abutilon bedfordianum</i>	1.01	0.99	1.12	1.93	0.19	0	21.1	0.289
<i>Tillandsia geminiflora</i>	1.93	0.82	0.92	-0.08	0	0	15.42	0.087
<i>Vriesea carinata</i>	0.90	0.82	-1.38	0.27	0.95	0.53	4.06	0.151
<i>Vriesea gradata</i>	0.85	0.89	1.08	4.00	1.78	0.74	21.91	0.195
<i>Vriesea longicaulis</i>	-0.21	0.08	-0.51	0.54	1.4	0.36	9.74	0.098
<i>Pitcairnia flammea</i>	0.46	1.15	-0.69	1.48	0.98	0.58	18.66	0.037
<i>Nidularium itatiaiae</i>	0.26	0.28	0.80	1.19	0.16	0.04	33.27	0.169
<i>Aechmea nudicaulis</i>	0.95	0.51	2.56	1.98	0.03	0.03	1.62	0.156
<i>Aechmea vanhoutteana</i>	-0.12	0.28	-4.01	0.00	0.23	0	2.43	0.187
<i>Billbergia distachia</i>	0.65	0.35	0.12	-1.67	0.25	0	8.93	0.050
<i>Quesnelia augusto-coburgii</i>	0.07	0.46	-2.13	-2.10	0.07	0.06	3.25	0.292
<i>Elleanthus brasiliensis</i>	0.60	ne	ne	ne	0.71	0	4.06	0.450

TABLE S1. Raw data (mean, standard deviation, and sample size) used to calculate effect size and variance per treatment (manual cross-pollination [Cp] and natural pollination [Np]) for 21 hummingbird-pollinated plant species for each response variable (fruit set, fruits/seed, seed weight, and seed germination). ne = not evaluated.

Fruit set	manual cross-pollination (Cp)			natural pollination (Np)			effect size	variance	
	Species	mean	standard deviation	sample size	mean	standard deviation			sample size
	<i>Justicia sebastianopolitanae</i>	31.21	39.13	22	38.54	37.07	22	-0.19	0.09
	<i>Odontonema barbelerioides</i>	30.95	38.81	7	8.33	14.62	7	0.72	0.31
	<i>Staurogyne itatiaiae</i>	26.63	33.84	15	37.81	25.18	15	-0.37	0.14
	<i>Aechmea nudicaulis</i>	60.21	27.03	8	30.19	32.21	8	0.95	0.29
	<i>Aechmea vanhoutteana</i>	93.71	8.32	7	94.61	5.07	7	-0.12	0.29
	<i>Billbergia distachia</i>	85.12	29.27	14	60.12	43.56	14	0.65	0.15
	<i>Nidularium itatiaiae</i>	76.02	32.86	19	67.09	33.98	19	0.26	0.11
	<i>Pitcairnia flammea</i>	88.81	17.03	14	78.33	26.37	14	0.46	0.15
	<i>Quesnelia augusto-coburgii</i>	87.63	23.35	21	86.12	20.41	21	0.07	0.1
	<i>Tillandsia geminiflora</i>	95.83	8.33	4	32.5	39.48	4	1.93	0.93
	<i>Vriesea carinata</i>	75	50	4	33.33	27.22	4	0.9	0.59
	<i>Vriesea gradata</i>	42.11	50.73	19	9.73	14.67	19	0.85	0.12
	<i>Vriesea longicaulis</i>	44.44	52.7	9	54.81	39.79	9	-0.21	0.22
	<i>Nematanthus crassifolius</i>	71.67	34.47	15	59.56	41.56	15	0.31	0.14
	<i>Nematanthus lanceolatus</i>	48.96	41.41	8	42.98	41.7	8	0.14	0.25

<i>Sinningia cooperi</i>	85.63	18.07	4	46.25	43.08	4	1.04	0.62
<i>Sinningia gigantifolia</i>	51.75	14.6	6	4.76	11.66	6	3.28	0.98
<i>Salvia sellowiana</i>	57.88	40.92	11	48.23	39.94	11	0.23	0.18
<i>Abutilon bedfordianum</i>	70.31	29.01	19	40.41	28.99	19	1.01	0.12
<i>Elleanthus brasiliensis</i>	52.5	5	4	29.29	47.33	4	0.6	0.54
<i>Manettia mitis</i>	67.62	20.74	10	63.13	29.25	10	0.17	0.2

Seeds/fruit	Manual cross-pollination (Cp)			Natural pollination (Np)			effect size	variance	
	Species	mean	standard deviation	sample size	mean	standard deviation			sample size
<i>Justicia sebastianopolitanae</i>		1.90	0.99	10	2.90	0.99	10	-0.96	0.23
<i>Odontonema barbelerioides</i>					ne				
<i>Staurogyne itatiaiae</i>		40.00	1.73	3	39.00	3.00	3	0.33	0.69
<i>Aechmea nudicaulis</i>		41.48	31.13	21	22.50	42.40	16	0.51	0.11
<i>Aechmea vanhoutteana</i>		131.65	41.56	81	118.82	48.48	122	0.28	0.02
<i>Billbergia distachia</i>		178.36	63.89	25	148.61	99.77	23	0.35	0.08
<i>Nidularium itatiaiae</i>		474.48	172.76	46	418.37	208.05	92	0.28	0.03
<i>Pitcairnia flammea</i>		569.91	149.92	11	291.42	290.41	12	1.15	0.21
<i>Quesnelia augusto-coburgii</i>		154.62	57.55	34	119.07	85.46	55	0.46	0.05

<i>Tillandsia geminiflora</i>	65.57	11.77	7	49.80	24.16	5	0.82	0.38
<i>Vriesea carinata</i>	591.67	231.19	3	421.75	122.66	4	0.82	0.68
<i>Vriesea gradata</i>	826.67	304.07	3	409.00	446.67	4	0.89	0.70
<i>Vriesea longicaulis</i>	1218.00	637.97	6	1178.60	123.98	5	0.08	0.37
<i>Nematanthus crassifolius</i>	276.71	95.22	7	355.78	144.42	9	-0.60	0.27
<i>Nematanthus lanceolatus</i>	351.67	223.92	6	282.13	217.92	8	0.30	0.30
<i>Sinningia cooperi</i>	2045.11	932.96	9	1663.13	861.30	8	0.40	0.24
<i>Sinningia gigantifolia</i>	1029.33	241.75	3	413.50	525.38	2	1.23	1.38
<i>Salvia sellowiana</i>	2.36	1.08	14	2.40	1.10	20	-0.04	0.12
<i>Abutilon bedfordianum</i>	61.86	14.11	29	45.13	20.59	15	0.99	0.11
<i>Elleanthus brasiliensis</i>					ne			
<i>Manettia mitis</i>	30.18	13.51	22	30.82	23.89	22	-0.03	0.09

Seed weight	Manual cross-pollination (Cp)			Natural pollination (Np)			effect size	variance
	Species	mean	standard deviation	sample size	mean	standard deviation		
<i>Justicia sebastianopolitanae</i>	364.55	154.84	33.00	369.12	131.69	68.00	-0.03	0.05
<i>Odontonema barbelerioides</i>	1723.13	2077.15	16.00	1016.33	251.13	49.00	0.67	0.09
<i>Staurogyne itatiaiae</i>	29.57	1.06	7.00	35.21	1.58	7.00	-3.93	1.04

<i>Aechmea nudicaulis</i>	33.47	1.45	10.00	28.87	1.95	10.00	2.56	0.40
<i>Aechmea vanhoutteana</i>	53.15	1.56	10.00	62.10	2.59	10.00	-4.01	0.69
<i>Billbergia distachia</i>	97.70	1.84	10.00	97.38	3.12	10.00	0.12	0.20
<i>Nidularium itatiaiae</i>	26.30	0.80	10.00	25.58	0.93	10.00	0.80	0.22
<i>Pitcairnia flammea</i>	9.18	0.38	10.00	9.62	0.77	10.00	-0.69	0.22
<i>Quesnelia augusto-coburgii</i>	46.25	1.32	10.00	52.65	3.85	10.00	-2.13	0.34
<i>Tillandsia geminiflora</i>	38.90	4.47	10.00	34.63	4.46	10.00	0.92	0.23
<i>Vriesea carinata</i>	34.00	1.08	10.00	36.35	2.05	10.00	-1.38	0.26
<i>Vriesea gradata</i>	19.48	2.00	10.00	17.30	1.87	10.00	1.08	0.24
<i>Vriesea longicaulis</i>	22.34	6.95	10.00	24.98	1.07	10.00	-0.51	0.21
<i>Nematanthus crassifolius</i>	17.82	0.57	10.00	16.16	0.68	10.00	2.54	0.40
<i>Nematanthus lanceolatus</i>	13.44	1.08	10.00	13.22	0.38	10.00	0.26	0.20
<i>Sinningia cooperi</i>	2.42	0.13	5.00	1.86	0.09	5.00	4.54	2.04
<i>Sinningia gigantifolia</i>	2.20	0.14	5.00	2.78	0.08	5.00	-4.51	2.02
<i>Salvia sellowiana</i>	748.95	164.58	19.00	709.36	218.77	31.00	0.20	0.09
<i>Abutilon bedfordianum</i>	435.40	41.13	10.00	399.00	15.24	10.00	1.12	0.24
<i>Elleanthus brasiliensis</i>					ne			
<i>Manettia mitis</i>	11.05	1.29	10.00	10.08	0.87	10.00	0.85	0.22

---

Seed germination	Manual cross-pollination (Cp)			Natural pollination (Np)			effect size	variance
	Species	mean	standard deviation	sample size	mean	standard deviation		
<i>Justicia sebastianopolitanae</i>					ne			
<i>Odontonema barbelerioides</i>					ne			
<i>Staurogyne itatiaiae</i>	60.42	5.59	6.00	69.58	8.37	6.00	-1.19	0.42
<i>Aechmea nudicaulis</i>	72.75	12.71	10.00	51.00	7.75	10.00	1.98	0.32
<i>Aechmea vanhoutteana</i>	95.42	3.95	6.00	95.42	3.54	6.00	0.00	0.33
<i>Billbergia distachia</i>	89.75	5.37	10.00	96.75	1.82	10.00	-1.67	0.29
<i>Nidularium itatiaiae</i>	97.08	4.18	6.00	91.25	4.81	6.00	1.19	0.42
<i>Pitcairnia flammea</i>	95.42	4.68	6.00	88.75	3.54	6.00	1.48	0.47
<i>Quesnelia augusto-coburgii</i>	88.75	4.51	10.00	96.75	2.53	10.00	-2.10	0.33
<i>Tillandsia geminiflora</i>	89.58	5.70	6.00	90.00	4.54	6.00	-0.08	0.33
<i>Vriesea carinata</i>	96.00	2.80	10.00	95.00	4.10	10.00	0.27	0.20
<i>Vriesea gradata</i>	96.00	3.77	10.00	78.25	4.68	10.00	4.00	0.69
<i>Vriesea longicaulis</i>	94.75	3.25	10.00	92.50	4.68	10.00	0.54	0.21
<i>Nematanthus crassifolius</i>	40.75	13.35	10.00	14.50	7.51	10.00	2.32	0.37
<i>Nematanthus lanceolatus</i>	42.92	8.55	6.00	38.33	18.66	6.00	0.29	0.34
<i>Sinningia cooperi</i>	87.20	7.97	10.00	34.20	11.24	10.00	5.21	1.03
<i>Sinningia gigantifolia</i>	60.42	14.96	6.00	46.25	18.51	6.00	0.78	0.37

<i>Salvia sellowiana</i>					ne				
<i>Abutilon bedfordianum</i>	9.00	5.86	10.00	0.50		1.10	10.00	1.93	0.31
<i>Elleanthus brasiliensis</i>					ne				
<i>Manettia mitis</i>	51.50	14.29	10.00	45.75		8.73	10.00	0.47	0.21