

More than the usual suspect: diversity of pollinators of Chayote (*Sechium edule*) in high elevations in Chiapas, Mexico. **Apidologie**

Angélica Elizabeth Martínez-Bauer^{1*}, Rémy Vandame¹ and Gerardo Cerón-Martínez²

1. El Colegio de la Frontera Sur, Departamento de Agricultura, Sociedad y Ambiente, San Cristóbal de Las Casas, Chiapas, Mexico. *corresponding autor: angelica.e.mtz.bauer@gmail.com
AEMB_ORCID number: 0000-0001-6989-8427
2. Department of Zoology, University of Oxford, OX1 3SZ, Oxford, UK.
GCM_ORCID number: 0000-0002-6352-0658

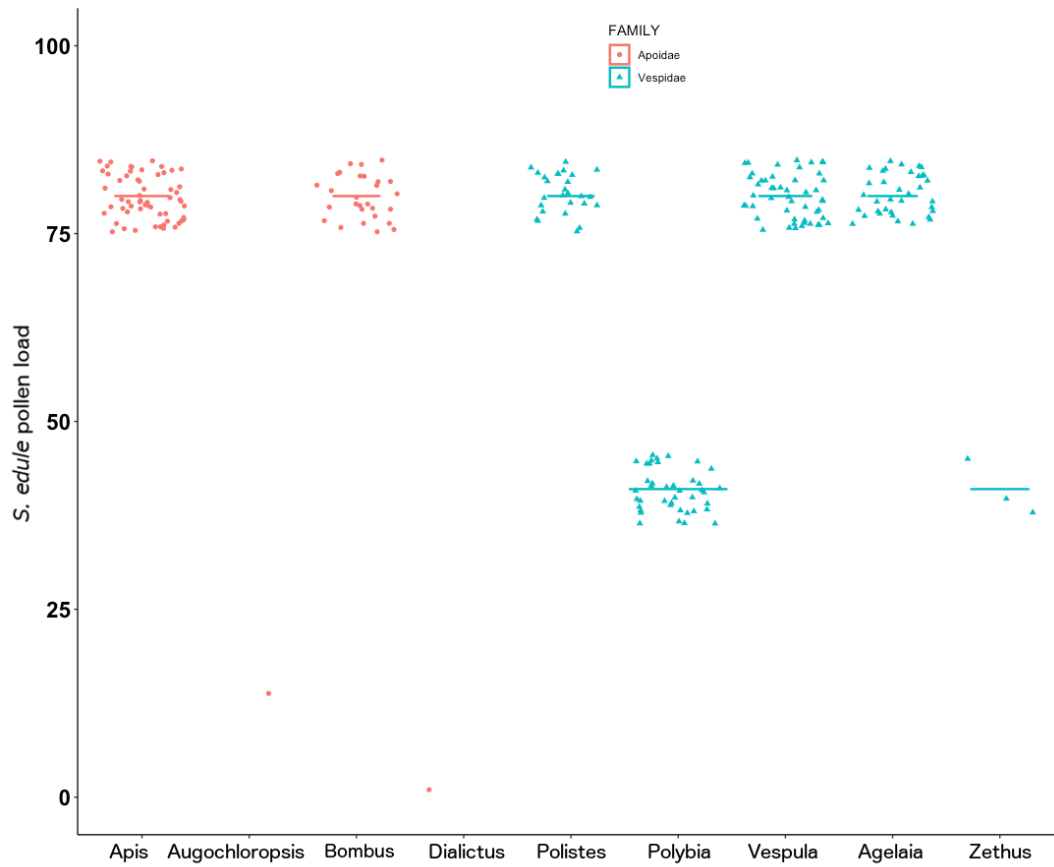
Online Resource 1

Figures

Online Resource 1 Figure 1. Flower visitors collected directly on *Sechium edule* flowers. A) *Hylaeus sp1* (bee) with 4 visible chayote pollen grains, probably due to jar contamination; B) *Agelaia sp1*. (wasp) with more than 20 chayote pollen grains covering the entire body.



Online Resource 1 Figure 2. *Sechium edule* pollen loads for 4 genera of bees and 5 genera of wasps, based on a DAFOR scale (Dominant ≥ 50 grains, Abundant 20 to 50, Frequent 10 to 20, Occasional 3 to 10 and Rare 1 to 3 grains) as a proxy to determine pollen transport efficiency. We used median value of pollen abundances: D = 80, A = 41, F = 13, O = 6 and R = 1.



Tables

Online Resource 1 Table I. Results from the linear mixed effects model (negative binomial distribution), with visitation rate/hr as the response variable and insect identity and plant size as explanatory variables and site as random factor.

Fixed effects:

	Estimate	Std. Error	z value	Pr(> z)	
(Intercept)	3.16297	0.12601	25.101	< 2e-16	***
(bee) Augochloropsis	-2.22052	0.80231	-2.768	0.005646	**
(bee) Bombus	-0.67024	0.17127	-3.913	9.10E-05	***
(bee) Dialictus	-1.52692	0.7202	-2.12	0.033995	*
(fly) Diptera msp 2	-1.93284	1.70715	-1.132	0.257549	
(fly) Diptera msp 4	-1.80036	0.31629	-5.692	1.25E-08	***
(fly) Diptera msp 5	-1.91936	0.51295	-3.742	0.000183	***
(fly) Bibionidae	-3.10325	3.53932	-0.877	0.3806	
(fly) Dolichop	-1.71456	0.79829	-2.148	0.031729	*
(fly) Syrphi	-1.73712	0.64439	-2.696	0.007023	**
(wasp) Polistes	-0.69728	0.16839	-4.141	3.46E-05	***
(wasp) Polybia	-1.27849	0.15132	-8.449	< 2e-16	***
(wasp) Vespula	-0.65837	0.14353	-4.587	4.50E-06	***
(wasp) Agelaia	-0.36668	0.16384	-2.238	0.025225	*
(wasp) Zethus	-1.63402	0.54038	-3.024	0.002496	**
Plant Size	0.28088	0.12075	2.326	0.020014	*
Bombus : Plant Size	-0.14983	0.16213	-0.924	0.355425	
Dip 2 : Plant Size	-0.7772	2.87625	-0.27	0.786997	
Dip 4 : Plant Size	-0.25559	0.316	-0.809	0.418616	
Dip 5: Plant Size	-0.20536	0.3782	-0.543	0.587136	
Bibionidae : Plant Size	-1.39251	2.94891	-0.472	0.636776	
Syrphi : Plant Size	-0.32963	0.59382	-0.555	0.578828	
Polistes : Plant Size	0.01519	0.19127	0.079	0.936696	
Polybia 1: Plant Size	-0.52412	0.14621	-3.585	0.000337	***
Vespula : Plant Size	-0.4485	0.14004	-3.203	0.001361	**
Agelaia : Plant Size	-0.39441	0.15706	-2.511	0.012032	*
Zethus : Plant Size	0.22527	0.40706	0.553	0.579986	

Online Resource 1 Table II. Mean visitation rates (visits/hr) of Chayote flower visitors by plant size (measured in square meters of area covered).

	13m ² (PI)	20m ² (FL)	22m ² (AL)	25m ² (PI)	30m ² (SA)	50m ² (VH)	64m ² (SA)
BEES							
<i>Apis mellifera</i>	2.5	2.9	0.9	0.7	1	0.7	2.8
<i>Bombus</i> sp		0.3		0.9	0.3		1
Other native Bees							0.4
WASPS							
<i>Vespula squamosa</i>		0.5	1.8	0.2	1	0.6	0.7
<i>Agelaia</i> sp 1	1	0.3	0.3	0.3	1.9	0.8	0.9
<i>Polybia msp 1</i>		0.6	1	0.4	0.6	0.3	0.3
<i>Polistes instabilis</i>			1.2	0.6	0.6	1	0.9
DIPTERA							
all diptera	1	0.3		0.3	0.3	0.2	0.3
COLEOPTERA							
all coleoptera							0.3

Online Resource 1 Table III. List of plant species identified in pollen load samples.

Family	Genus or species	Pollen Code	Occurrence in pollen loads
Amaranthaceae		Amara_01	39
Apiaceae	<i>Coriandrum sp.</i>	Apiac_01	9
Apiaceae	<i>Foeniculum vulgare</i>	Apiac_02	2
Brassicaceae	<i>Brassica sp.</i>	Brassi_01	13
Brassicaceae	<i>Raphanus sp.</i>	Brassi_03	4
Campanulaceae	<i>Lobelia laxiflora</i>	Campa_01	2
Commelinaceae	<i>Tinantia sp.</i>	Comme_01	9
Compositae		Compo_01	3
Compositae		Compo_03	3
Compositae		Compo_05	3
Compositae		Compo_06	2
Compositae		Compo_07	2
Compositae		Compo_08	4
Compositae		Compo_09	4
Compositae		Compo_11	46
Compositae		Compo_12	47
Compositae		Compo_13	1
Compositae		Compo_14	2
Compositae		Compo_15	27
Compositae		Compo_16	3
Compositae		Compo_18	1
Compositae		Compo_19	1
Compositae		Compo_20	78
Compositae		Compo_22	12
Compositae		Compo_23	1
Compositae		Compo_24	14
Compositae	<i>Taraxacum sp.</i>	Compo_25	35
Compositae	<i>Taraxacum sp.</i>	Compo_27	1
Compositae	<i>Conyza bonariensis</i>	Compo_28	1
Convolvulaceae	<i>Ipomoea</i>	Convo_01	2
Cucurbitaceae	<i>Cucurbita sp.</i>	Cucur_01	26
Cucurbitaceae	<i>Sechium edule</i>	Cucur_Cha	113
Cucurbitaceae	<i>Cyclanthera sp.</i>	Cucur_02	72
Iridiaceae	<i>Crocasmia sp.</i>	Iridi_01	1
Lamiaceae	<i>Prunella sp.</i>	Laima_01	2
Leguminosae	<i>Phaseolus coccineus</i>	Legumi_01	19
Leguminosae	<i>Medicago sp.</i>	Legumi_03	2
Malvaceae		Malvac_01	3
Malvaceae		Malvac_02	1
Onagraceae	<i>Lopezia racemosa</i>	Onagra_01	20
Onagraceae	<i>Oenothera sp.</i>	Onagra_02	3
Oxaliaceae	<i>Oxalis sp.</i>	Oxali_01	2

Pinaceae	<i>Pinus</i>	Pinac_01	34
Poligonaceae	<i>Rumex sp.</i>	Poligo_01	2
Solanaceae	<i>Brugmansia sp.</i>	Solan_01	5
Solanaceae	<i>Solanum americanum</i>	Solan_03	64
Solanaceae	<i>Solanum</i>	Solan_04	35
Solanaceae	<i>Physalis sp.</i>	Solan_Tom	25
Undetermined	NA_ID	SinID_04	1
Undetermined	NA_ID	SinID_05	98
Undetermined	NA_ID	SinID_06	2
Undetermined	NA_ID	SinID_08	1
Undetermined	NA_ID	SinID_09	16
Undetermined	NA_ID	SinID_10	12
Undetermined	NA_ID	SinID_11	2
Undetermined	NA_ID	SinID_13	3
Undetermined	NA_ID	SinID_15	2
Undetermined	NA_ID	SinID_16	1
Undetermined	NA_ID	SinID_18	8
Undetermined	NA_ID	SinID_24	3
Undetermined	NA_ID	SinID_26	14
Undetermined	NA_ID	SinID_29	1
Undetermined	NA_ID	SinID_31	1
Undetermined	NA_ID	SinID_33	3
Undetermined	NA_ID	SinID_34	2
Undetermined	NA_ID	SinID_36	2
Undetermined	NA_ID	SinID_38	1
Undetermined	NA_ID	SinID_40	3
Undetermined	NA_ID	SinID_42	1
Undetermined	NA_ID	SinID_47	1
Undetermined	NA_ID	SinID_48	2

Online Resource 1 Table IV. Results from the generalized linear model with fruit set as the response variable and visitation rate and insect identity as explanatory variables.

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)	
(Intercept)	0.1328278	0.0154529	8.596	1.29E-15	***
Visit_Rate/hr	-0.0003793	0.000472	-0.804	0.4224	
Bombus	-0.0104846	0.0301589	-0.348	0.7284	
Polistes	-0.0030119	0.0279985	-0.108	0.9144	
Polybia 1	0.0054864	0.0236442	0.232	0.8167	
Vespula	-0.0421964	0.0221307	-1.907	0.0578	.
Agelaia	-0.0235096	0.0269937	-0.871	0.3847	
Visit_Rate/hr : Bombus	0.0048345	0.0020272	2.385	0.0179	*
Visit_Rate/hr : Polistes	-0.0008551	0.0015919	-0.537	0.5917	
Visit_Rate/hr : Polybia 1	0.0023279	0.00172	1.353	0.1772	
Visit_Rate/hr : Vespula	0.0025149	0.0009757	2.577	0.0106	*
Visit_Rate/hr : Agelaia	-0.0003788	0.0012741	-0.297	0.7665	

Online Resource 2. DAFOR, pollen load data: scale Dominant ≥ 50 grains, Abundant 20 to 50, Frequent 10 to 20, Occasional 3 to 10 and Rare 1 to 3 grains.

Available as Microsoft Excel spreadsheet (xlsx extension).