

SUPPLEMENTARY MATERIALS OF THE MANUSCRIPT

Estimates of nectar productivity through a simulation approach differ from the nectar produced in 24 h

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TABLES

Tab. S1 – Studied sites information (see also Fig. S1). “P” corresponds to “nectar productivity over a different time period”, “24h” corresponds to the “measured 24h volume of nectar”, and “S” corresponds to the “Standing nectar volume”.

Field	Crops	Sample method	GPS coordinates	Location in Alpes-de-Hautes-Provence	Elevation (m.a.s.l)
field 1	fennel	P	43°47'23.50"N 6°08'22.10"E	Montagnac (Montagnac-Montpezat)	654
field 1	lavender	P	43°47'20.50"N 6°08'28.00"E	Montagnac (Montagnac-Montpezat)	654
field 2	fennel	P	43°47'43.40"N 6°07'43.40"E	Riez	650
field 2	lavender	P	43°47'41.00"N 6°07'35.06"E	Riez	650
field 3	fennel	P + 24h	43°48'13.70"N 6°02'48.80"E	Allemagne-en-Provence	471
field 4	fennel	24h	43°54'46.90"N 6°05'09.80"E	Saint-Julien d'Asse	450
field 5	fennel	P	43°55'03.00"N 6°06'33.50"E	Bras d'Asse	462
field 6	fennel	P	43°46'57.10"N 6°04'21.80"E	Montagnac (Montagnac-Montpezat)	604
field 6	lavender	P	43°46'57.80"N 6°04'19.10"E	Montagnac (Montagnac-Montpezat)	604
field 7	fennel	P	43°46'00.80"N 6°04'45.20"E	Montagnac (Montagnac-Montpezat)	605

field 7	lavender	P	43°45'54.60"N 6°04'46.20"E	Montagnac (Montagnac-Montpezat)	605
field 8	fennel	P	43°55'00.50"N 6°06'41.50"E	Bras d'Asse	460
field 9	fennel	S + P	43°47'26.90"N 6°06'51.30"E	Montagnac (Montagnac-Montpezat)	640
field 9	lavender	S + P	43°47'28.70"N 6°06'46.60"E	Montagnac (Montagnac-Montpezat)	640
field 10	fennel	24h	43°53'15.90"N 6°07'44.30"E	Puimoisson	690
field 10	lavender	24h	43°53'26.80"N 6°07'49.80"E	Puimoisson	726
field 11	fennel	P	43°52'21.60"N 6°07'34.30"E	Puimoisson	704
field 11	lavender	P	43°52'22.50"N 6°07'33.10"E	Puimoisson	704
field 12	fennel	P + 24h	43°46'58.20"N 6°04'41.80"E	Montagnac (Montagnac-Montpezat)	611
field 12	lavender	P	43°46'57.50"N 6°04'52.60"E	Montagnac (Montagnac-Montpezat)	611
field 13	fennel	24h	43°48'07.30"N 6°07'56.70"E	Riez	657
field 14	fennel	24h	43°48'08.40"N 6°06'06.80"E	Riez	636
field 14	lavender	24h	43°48'00.70"N 6°06'07.50"E	Riez	636

Tab. S2 – Number of replicates per each variable divided by field and crop species.

field	Field standing nectar volume		Produced nectar volume		Sugar concentration of the produced nectar volume		Measured 24 h volume and its sugar concentration		Nectar removal rate	
	fennel	lavender	fennel	lavender	fennel	lavender	fennel	lavender	fennel	lavender
field 1			18	18					19	
field 2			18	18						
field 3			15				12		33	9
field 4							13		11	10
field 5			19				12			
field 6			21	21					22	
field 7			18	15					21	
field 8			38		35				32	11
field 9	81	48	57	64	13	56			32	11
field 10							12	11		
field 11			21	19						
field 12			24	21			16		11	7
field 13							12		33	11
field 14							12	10		

Tab. S3 - Mean error (ME) between the simulated standing nectar and field standing nectar.

Plant species	Simulation scenario			ME
	Sel. Strategy	Nect. Removal		
lavander	average	random		-0.022
		rewarding		-0.038
	max	random		-0.040
		rewarding		-0.044
fennel	average	random		-0.028
		rewarding		-0.021
	max	random		-0.015
		rewarding		-0.013

Tab. S4 – Mean, number of observation, standard deviation and 95% confidence interval for the variables estimated 24 h volume, estimated volume of nectar collected by insects and the time between consecutive nectar removals. All these variable are produced by the simulation model.

variable	plant species	selection	removal	mean	n	sd	conf.in up	conf. Int up
estimated 24h volume	fennel	rewarding	average	0.091	32430	0.017	0.092	0.091
	fennel	random	average	0.073	31996	0.025	0.074	0.073
	fennel	random	max	0.111	32430	0.007	0.111	0.111
	fennel	rewarding	max	0.112	32430	0.004	0.112	0.112
	lavender	rewarding	average	0.260	27480	0.026	0.260	0.259
	lavender	random	average	0.234	27403	0.048	0.234	0.233
	lavender	random	max	0.244	27480	0.018	0.244	0.244
	lavender	rewarding	max	0.233	27480	0.006	0.234	0.233
volume of nectar collected by insects	fennel	rewarding	average	0.022	32430	0.003	0.022	0.022
	fennel	random	average	0.019	31996	0.005	0.019	0.019
	fennel	random	max	0.004	32430	0.001	0.004	0.004
	fennel	rewarding	max	0.004	32430	0.001	0.004	0.004
	lavender	rewarding	average	0.046	27480	0.012	0.046	0.045
	lavender	random	average	0.045	27403	0.019	0.045	0.045
	lavender	random	max	0.015	27480	0.004	0.015	0.015
	lavender	rewarding	max	0.014	27480	0.002	0.014	0.014
time bwtween removals	fennel	rewarding	average	2.991	32430	0.676	2.999	2.984
	fennel	random	average	3.123	31996	1.820	3.143	3.103
	fennel	random	max	0.578	32430	0.090	0.579	0.577
	fennel	rewarding	max	0.588	32430	0.050	0.589	0.588
	lavender	rewarding	average	2.262	27480	0.433	2.267	2.257
	lavender	random	average	2.381	27403	1.217	2.396	2.367
	lavender	random	max	0.910	27480	0.209	0.912	0.907
	lavender	rewarding	max	0.909	27480	0.104	0.910	0.908

FIGURES

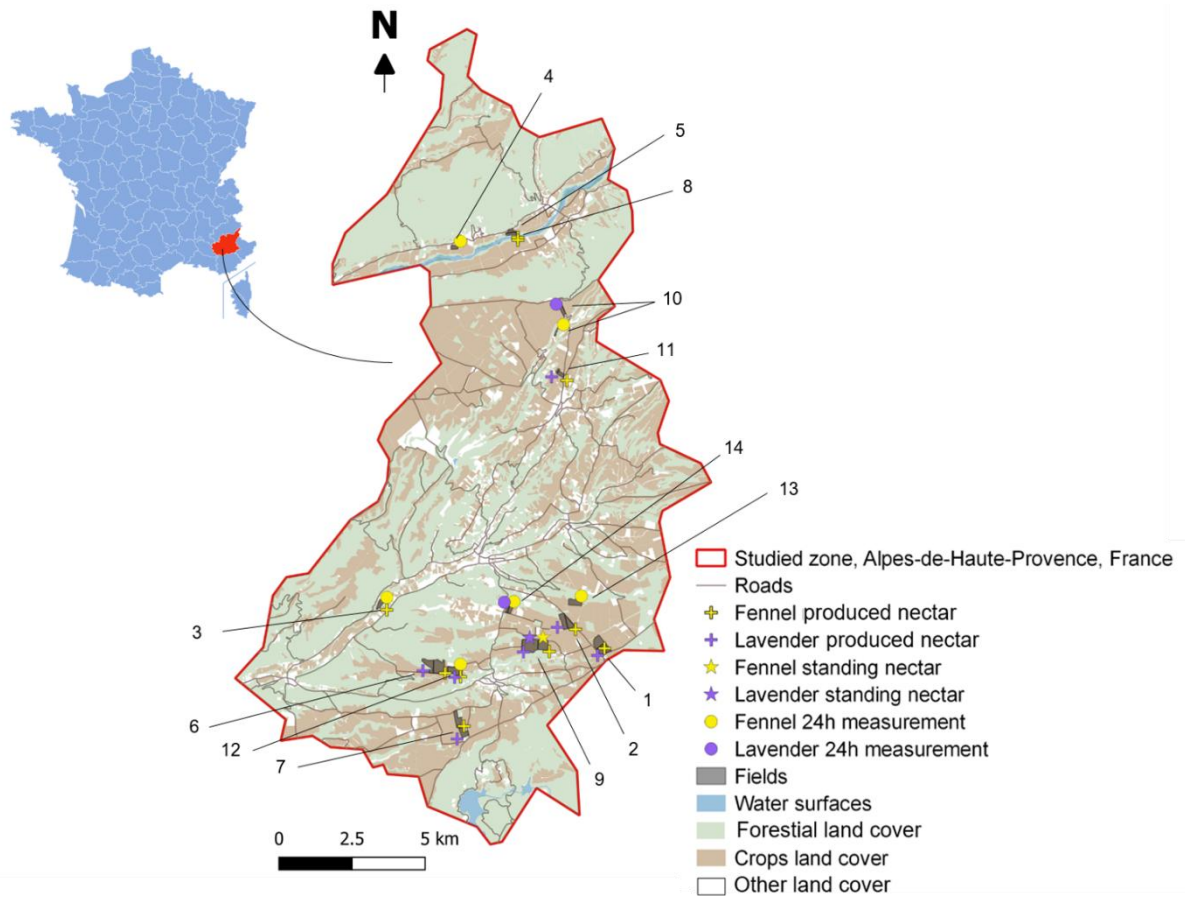


Fig. S1 Map of the study area.

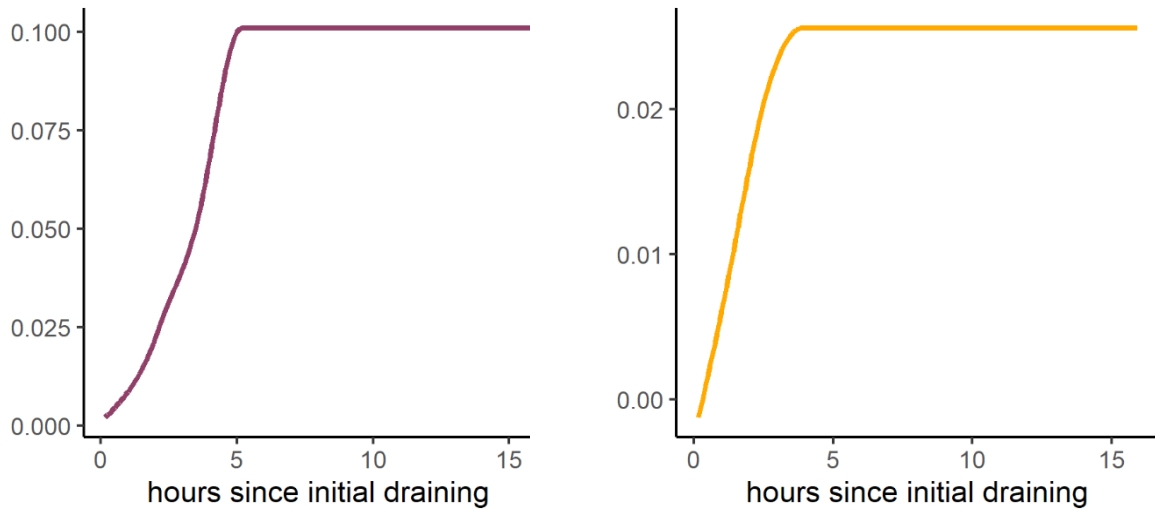


Fig. S2 Simplified nectar production dynamic used as simulation parameter for lavender (purple) and fennel (orange).

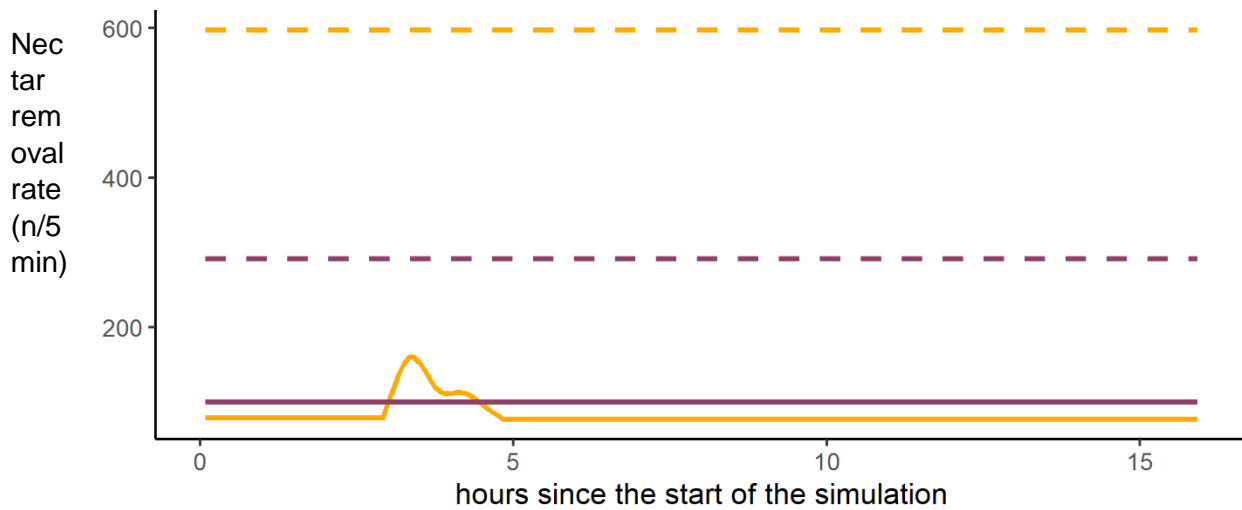


Fig. S3 Nectar removal rate parameters across the time for lavender (purple) and fennel (orange). Solid lines are nectar removal parameters, dashed lines are maximum nectar removal rate parameters.

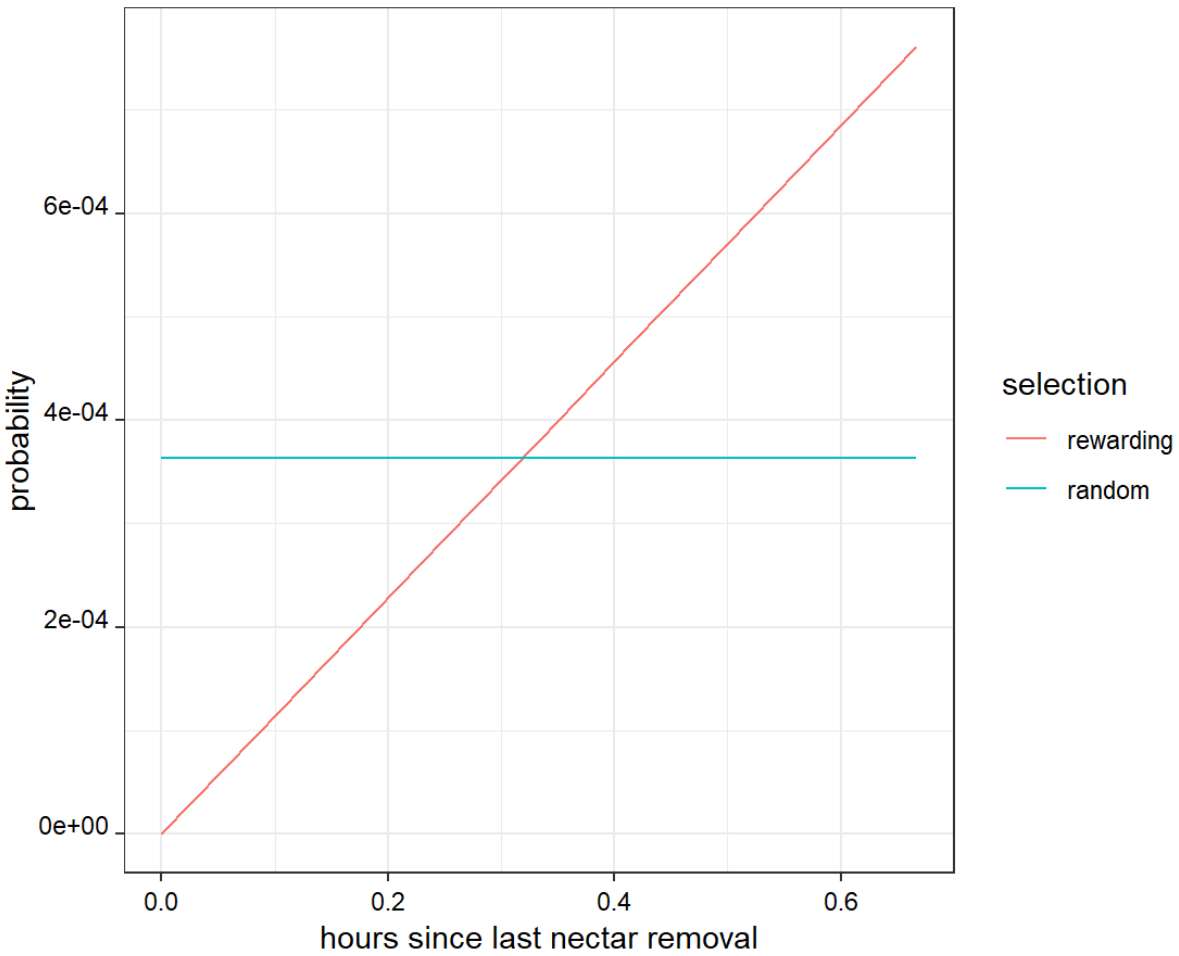


Fig. S4 Example of probability function calculated at each of a flower having its nectar removed in scenarios where insects select flowers randomly (light-blue line) and in scenarios where the probability of a flower having the nectar removed increases proportionally as the time passed since the last nectar removal.

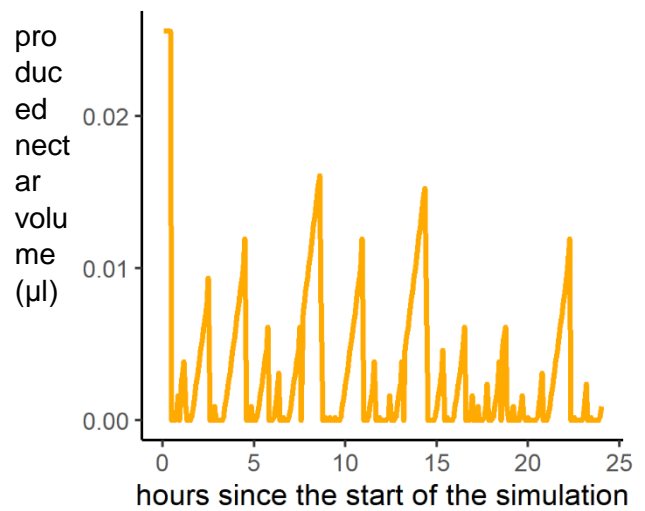
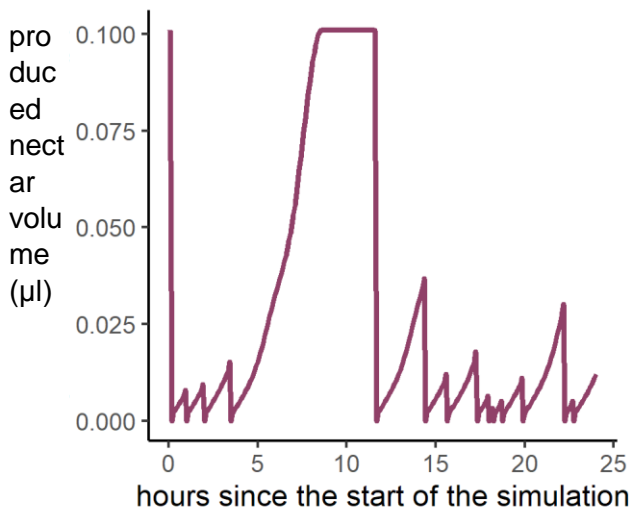


Fig. S5 Examples of single flower nectar remove history for lavender in average and random scenario (purple) and for fennel in maximum random scenario.

Diagnostic model plots

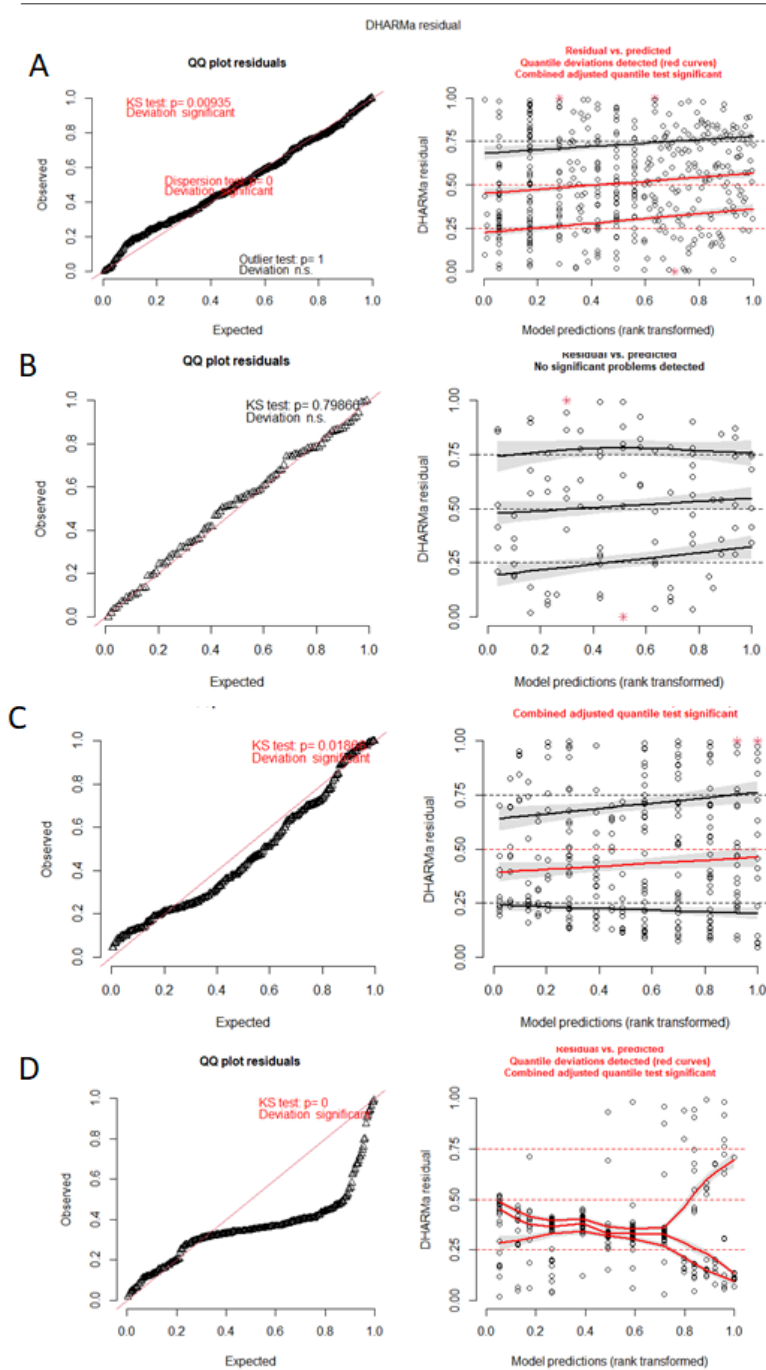


Fig. S6 QQ residual and measured vs. predicted model plots. Plots test model assumptions for the model having a response variable the nectar production (A), measured 24 h volume (B), nectar removal rate (C), and the proportion of honeybee over the other insects. Model structure and estimates can be seen in the Supplementary Table 1. While A, B and C plots indicate normal distribution of residuals and homogeneity of residuals, D does not respect these assumptions. This is probable due to the lack of some important variable in the model. Despite this last model should be taken cautiously, it should be noted

that in the boxplot (Fig S10) the magnitude of the difference in honeybee proportion over other insects is high.

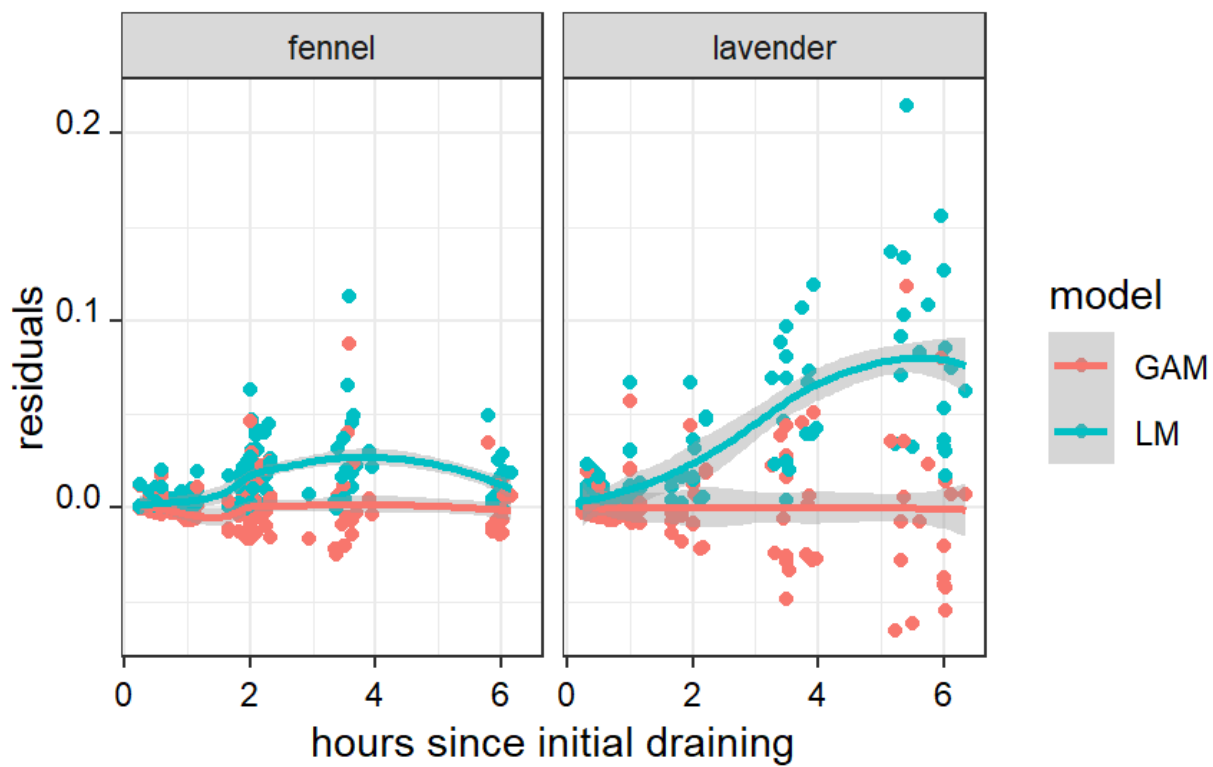


Fig. S7 Residual of the GAMMs (GAM) and linear model (LM) calculated over produced nectar volumes recorded in the field sampling for fennel and lavender.

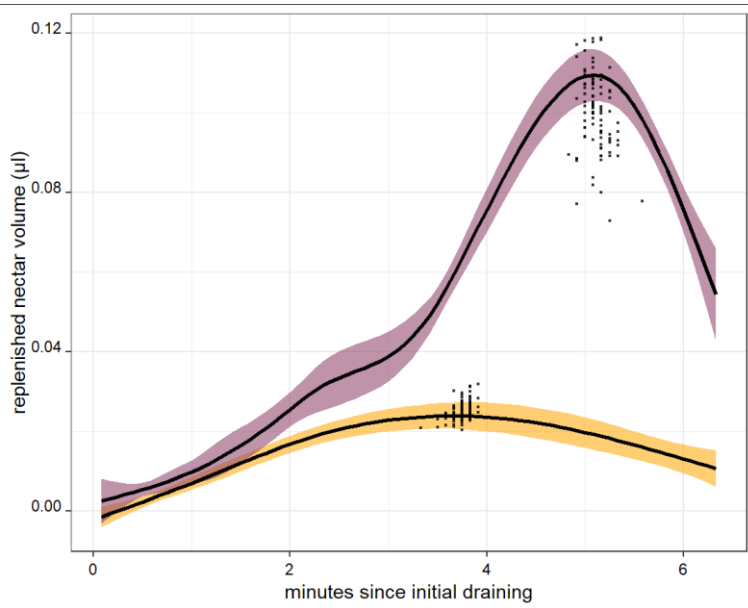


Fig. S8 Peaks validation. Function indicated the dynamic of nectar replenishment estimated using the complete data. Dots indicate estimated peak by a GAMM model on a 80% random subset of the complete data.

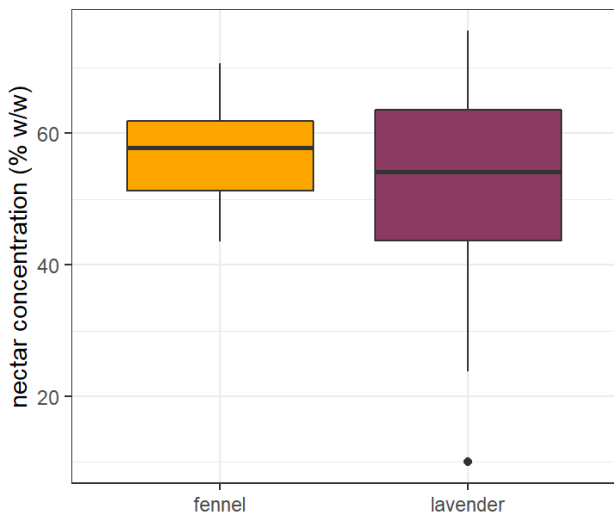


Fig. S9 Nectar concentration of the produced nectar (0-6 hours since draining).

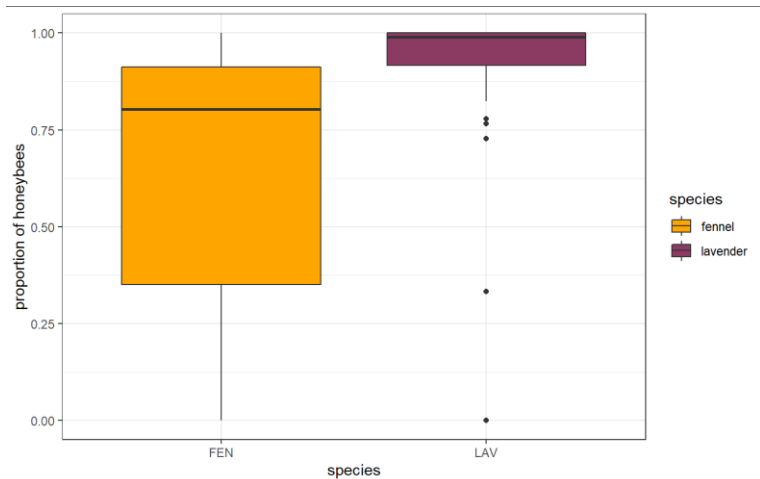


Fig. S10 Proportion of honeybees (*Apis mellifera*) of the insects visiting every five minutes. Orange and purple points, smooth lines and boxplot refer to fennel and lavender, respectively.

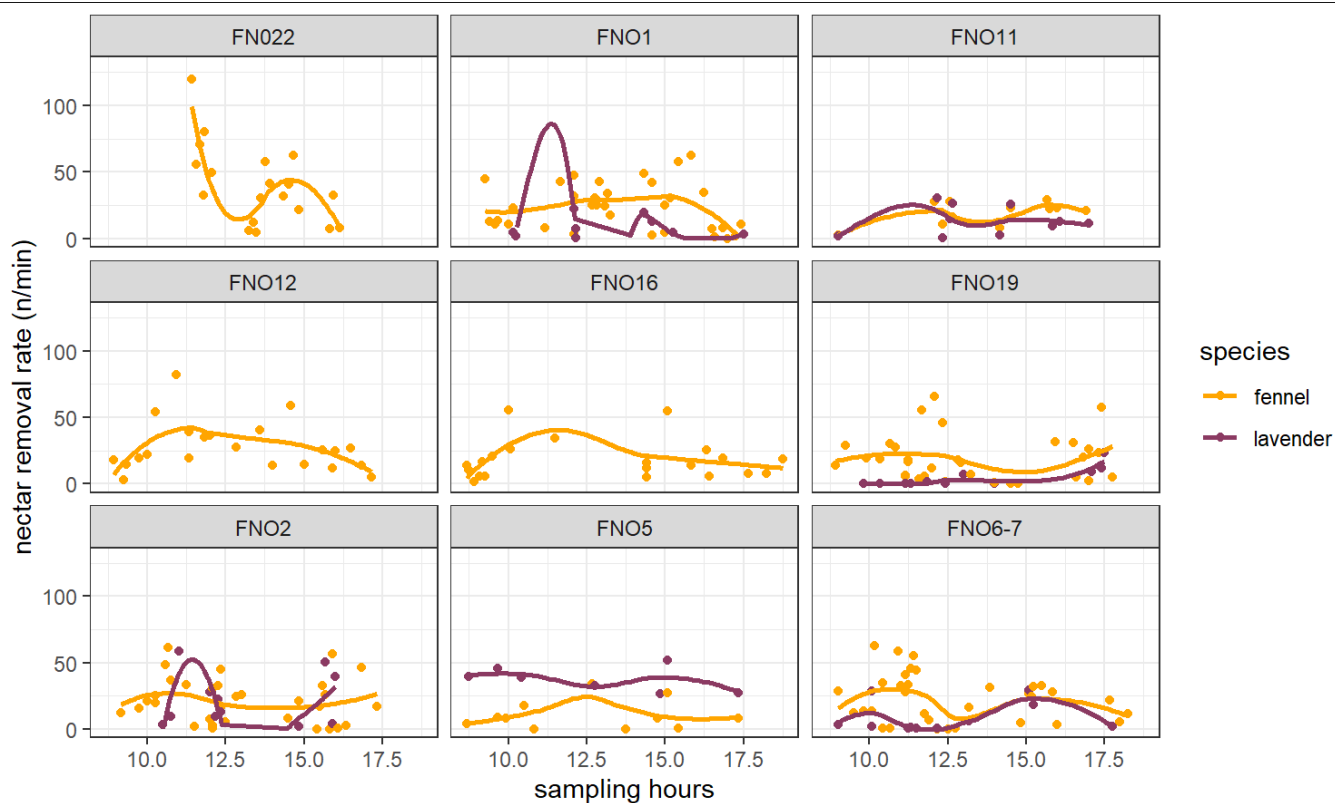


Fig. S11 nectar removal rates per each field across hours since flower-visiting insects start to forage. An average visitation rate per plant species was added through the `geom_smooth` function of `ggplot2`.

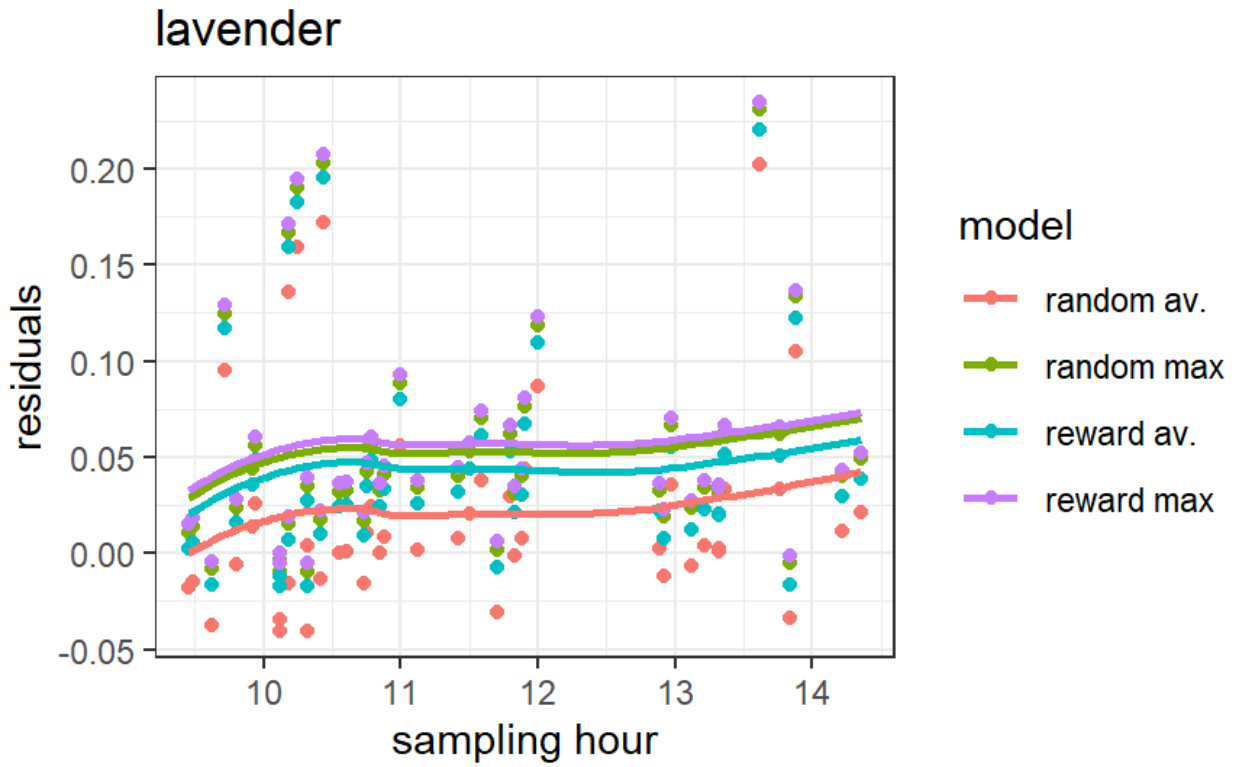


Fig. S12 Residuals of simulated standing nectar volume and field standing nectar volume across the time for lavender.

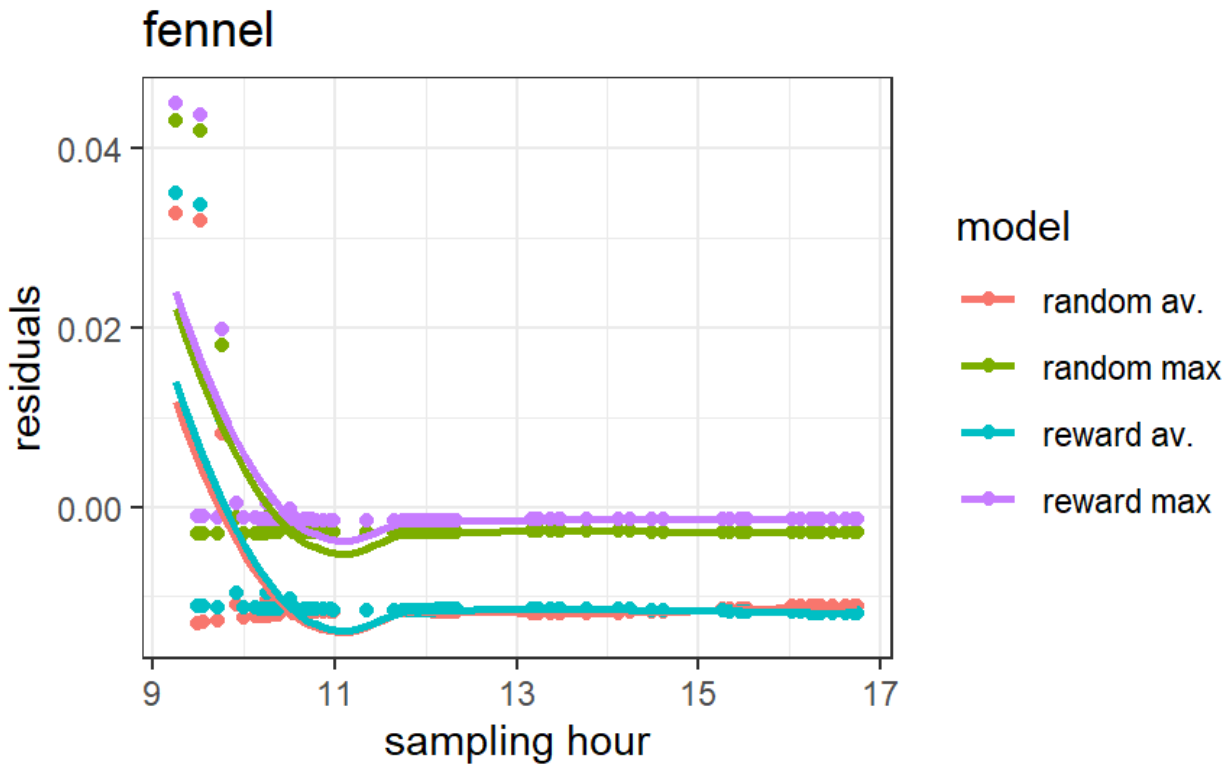


Fig. S13 Residuals of simulated standing nectar volume and field standing nectar volume across the time for fennel.

