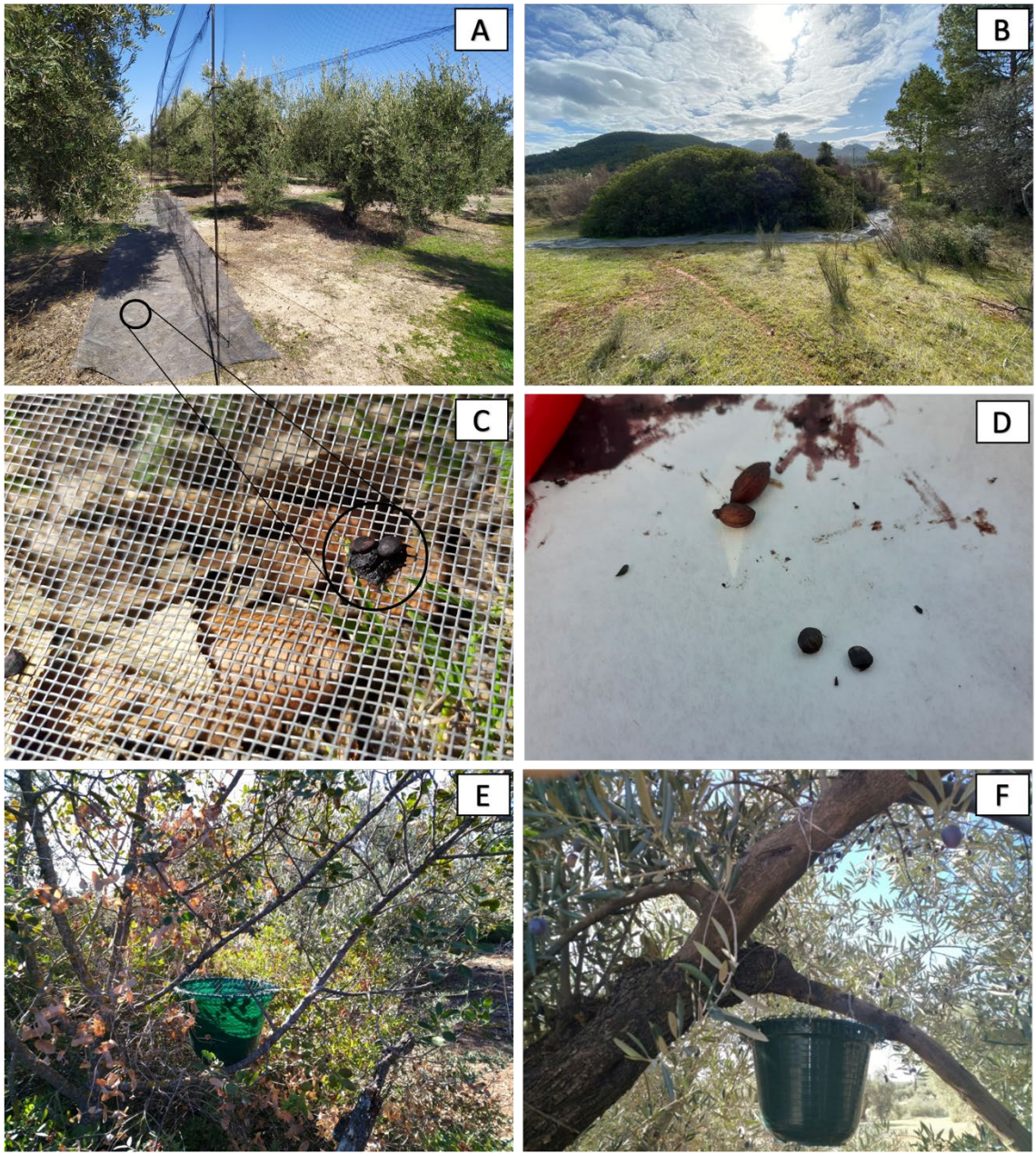
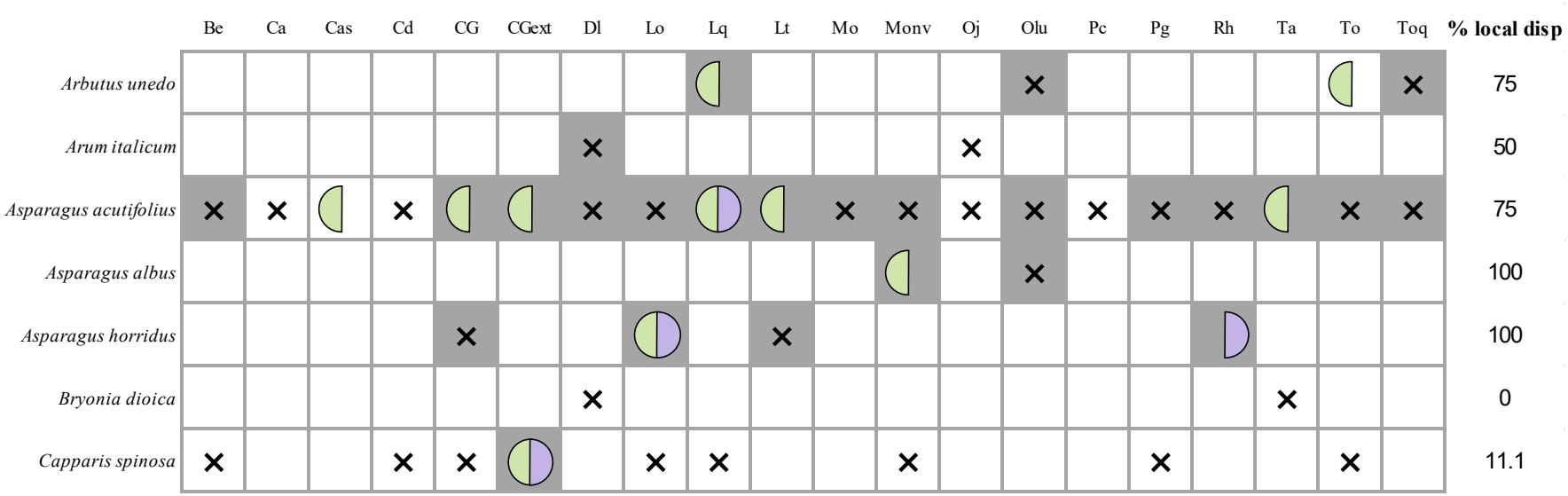
frontiers

Supplementary Material



Supplementary Figure 1. Photographs showing: A) and B) mist nets installed in olive fields and in seminatural woodland habitat patches, respectively, where it can be identified the plastic mesh beneath the mist nets for collecting bird droppings; C) details of *Pistacia lentiscus* seeds dropped in the mesh by trapped birds; D) seeds collected within the paper cone situated inside of the bag collector for bird defecation; E and F) seed fall traps for seed deposition placed in seminatural woodland habitat patches and olive trees, respectively.


Be
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CGext
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Lo
Lq
Lt
Mo
Monv
Oj
Olu
Pc
Pg
Rh
Ta
To
Toq
% local disp
Arbutus unedo
75
Arum italicum
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75
Asparagus albus
100
Asparagus horridus
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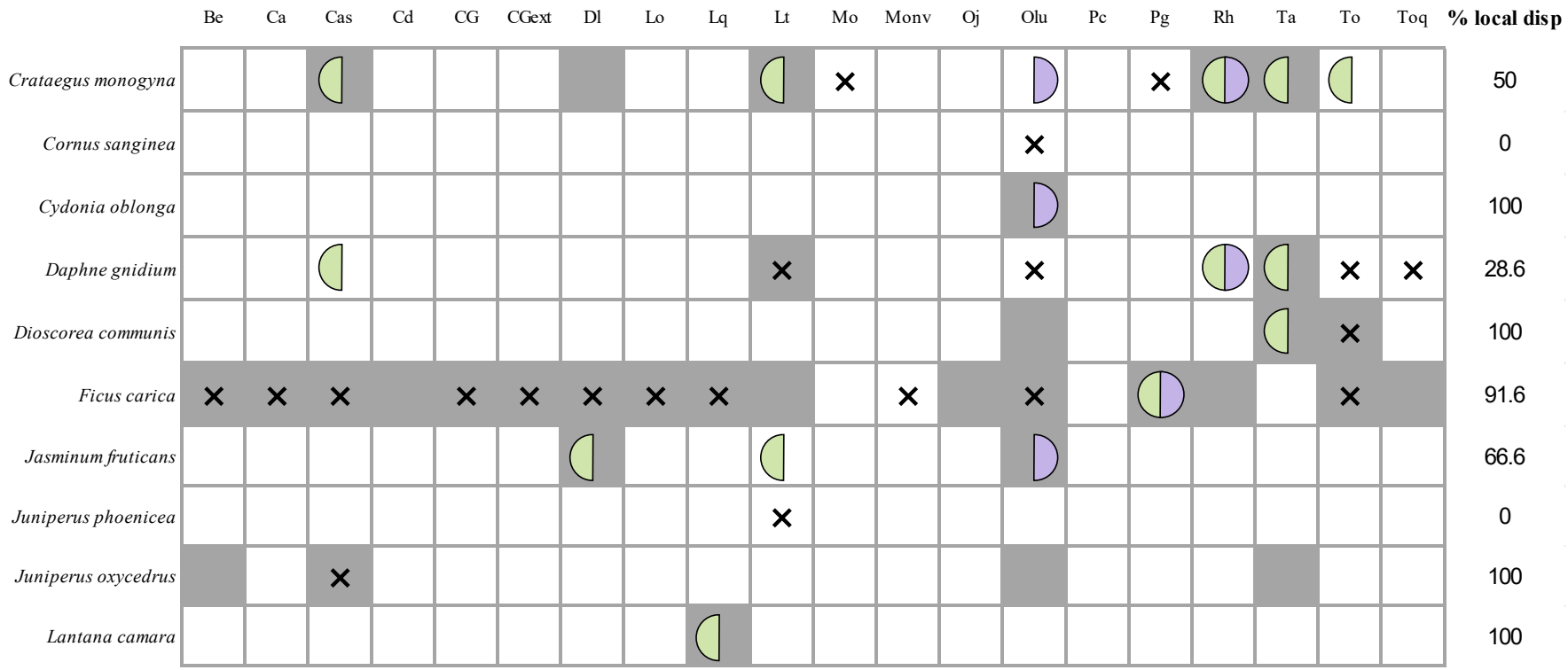
Bryonia dioica
0
Capparis spinosa
11.1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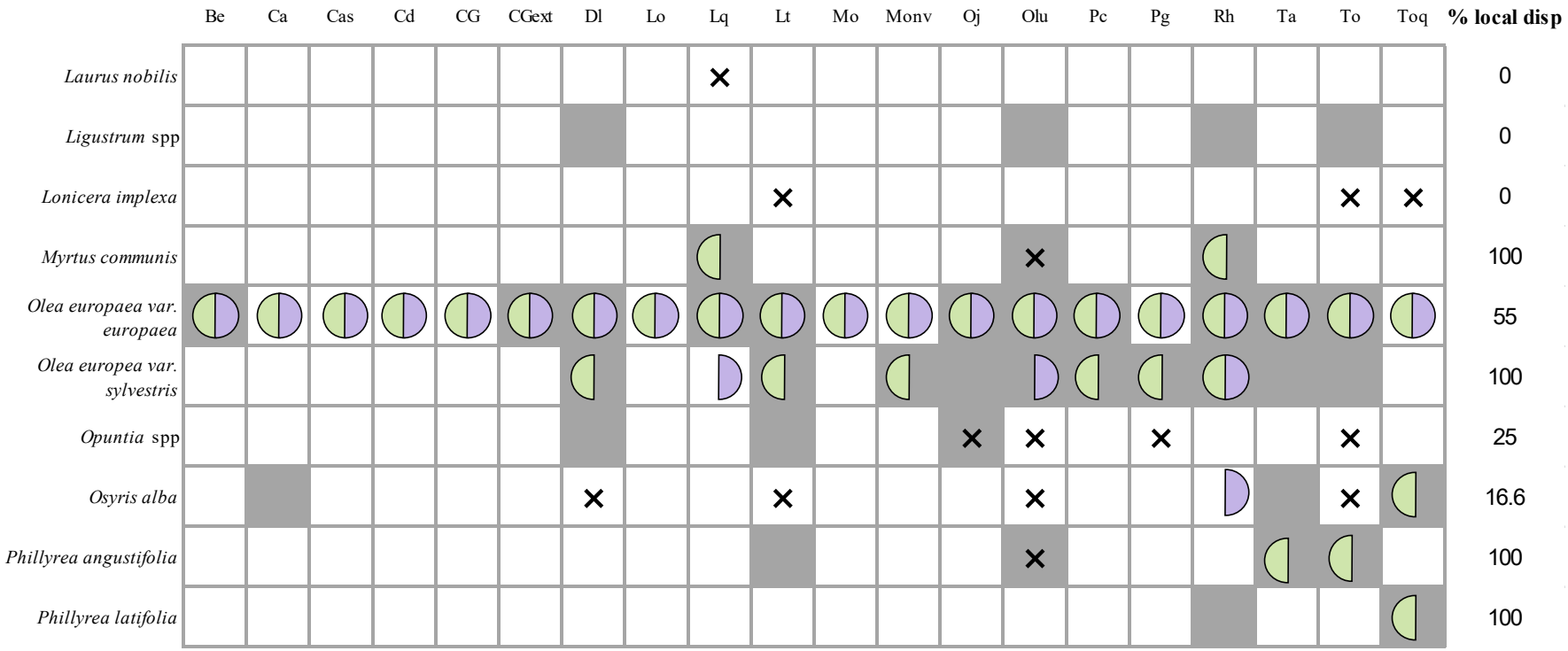
% local disp
Crataegus monogyna
50
Cornus sanginea
0
Cydonia oblonga
100
Daphne gnidium
28.6
Dioscorea communis
100
Ficus carica
91.6
Jasminum fruticans
66.6
Juniperus phoenicea
0
Juniperus oxycedrus
100
Lantana camara
100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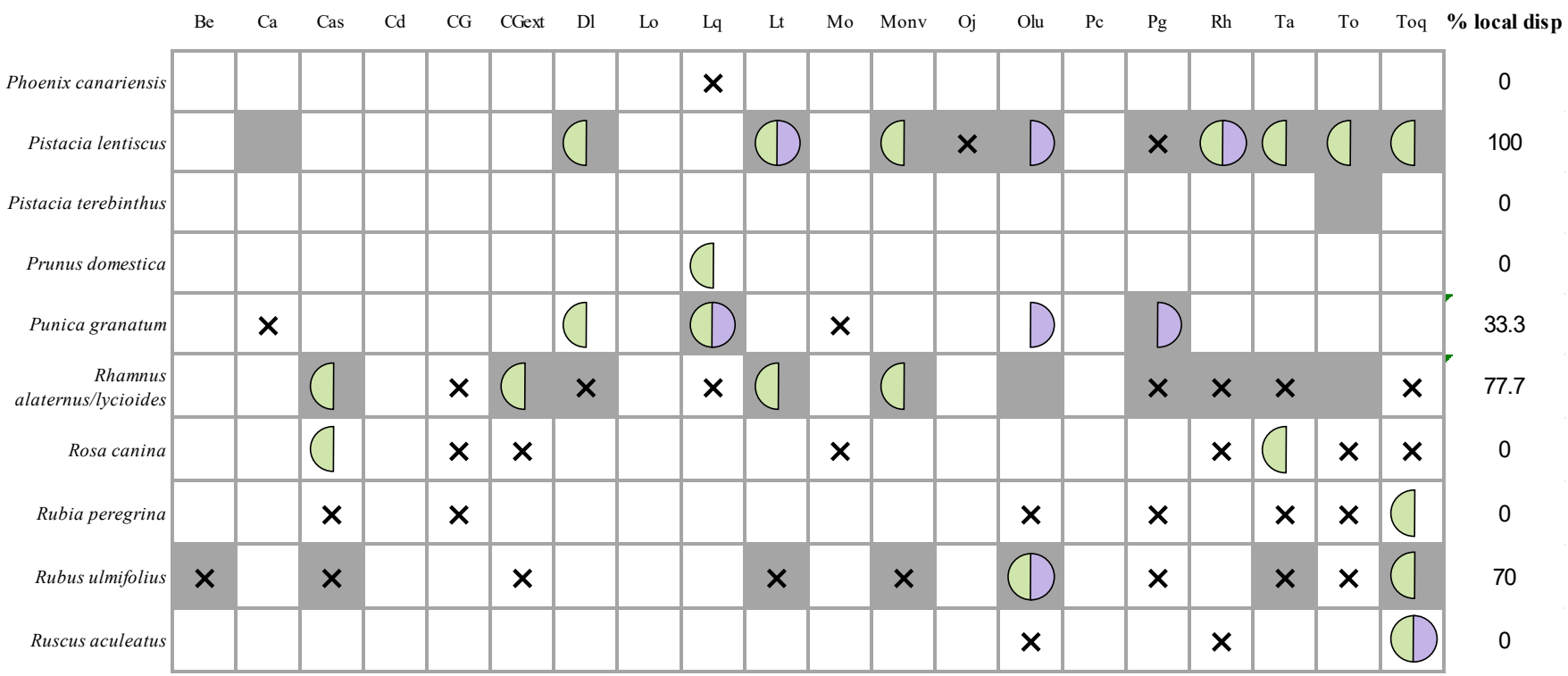
% local disp
Laurus nobilis
0
Ligustrum spp
0
Lonicera implexa
0
Myrtus communis
100
Olea europaea var. europaea
55
Olea europea var. sylvestris
100
Opuntia spp
25
Osyris alba
16.6
Phillyrea angustifolia
100
Phillyrea latifolia
100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Ta
To
Toq
% local disp
Phoenix canariensis
0
Pistacia lentiscus
100
Pistacia terebinthus
0
Prunus domestica
0
Punica granatum
33.3
Rhamnus alaternus/lycioides
77.7
Rosa canina
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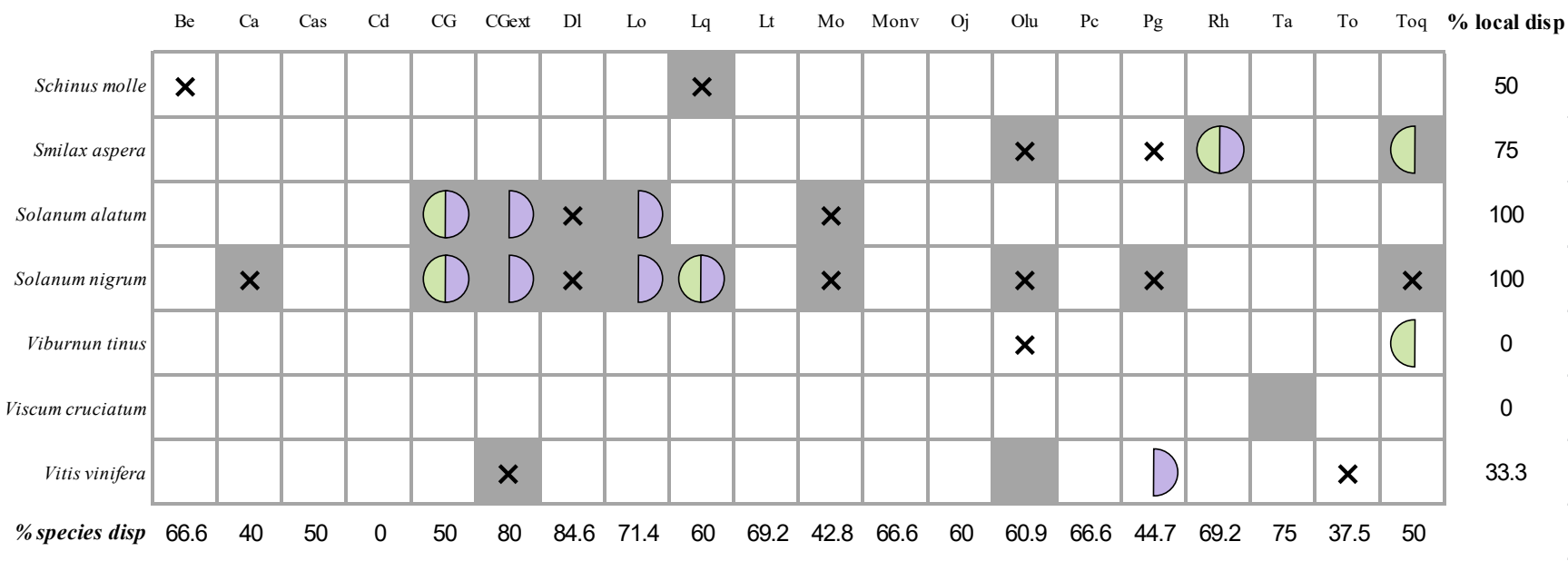
Rubia peregrina
0
Rubus ulmifolius
70
Ruscus aculeatus
0



Supplementary Fig 2. Fleshy-fruited seeds dispersed by birds in relation to its fruit availability (present or absent) within farm (each column) and across localities (rows). Fleshy-fruited plant species that were found dispersed by birds (either in droppings of trapped birds or in seed fall traps) are represented as grey cells, while white cells denote that the plant species was not detected as dispersed. The fruits species available at the surroundings of the mist-nets in the olive field (purple semi-circle) and in seminatural woodland habitat patches (green semi-circle) are also shown. Furthermore, those fruits that were available in the bird census stations but not detected in the plots of mist-netting, hence available at the scale of the whole farm, are identified with X within the cells. Empty grey cells represent seed species that were found dispersed in the farm but not available at the farm scale, and illustrate probable events of long-distance dispersal. The last column (% local disp) shows the percentage of the localities where a given available species was dispersed. The last row (*% species disp)* shows the percentage of the available fleshy-fruited species that were dispersed within a farm/locality. Column codes as in Supplementary Table 1. Note that bird mist-netting was conducted only in one farm per locality and that seed fall traps were set only in 9 localities (a pair of farms per locality).

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Supplementary Material

Supplementary Table 1. Geographic location (UTM, ellipsoid WGS84 zone 30N), farm size, ground cover management and seminatural woodland habitat cover (SNWH) of the study localities.

Locality	Coordinates UTM (X)	Coordinates UTM (Y)	Orchard code	Ground management	Seminatural woodland cover in the landscape	Farm size
Cañada del Duz	408804	4188673	Be 1	Intensive	Low SNWH	Small
			Be 2	Low-intensity	Low SNWH	Small
Casilla Aranda	366104	4165850	Ca 1	Low-intensity	Low SNWH	Small
			Ca 2	Intensive	Low SNWH	Small
El Puerto	445150	4178468	Cas 1	Low-intensity	High SNWH	Large
			Cas 2	Intensive	High SNWH	Large
Espejo	365995	4174106	Cd 1	Intensive	Low SNWH	Large
			Cd 2	Low-intensity	Low SNWH	Large
Guadiana intensivo	475229	4194518	CG 1	Low-intensity	Intermediate SNWH	Large
			CG 2	Intensive	Intermediate SNWH	Large
Guadiana extensivo	480296	4195993	CGext 1	Low-intensity	Intermediate SNWH	Large
			CGext 2	Intensive	Intermediate SNWH	Large
Lantejuela	296996	4136843	Dl 1	Low-intensity	Low SNWH	Small
			Dl 2	Intensive	Low SNWH	Small
El Cortijuelo	487191	4181959	Lo 1	Low-intensity	Intermediate SNWH	Small
			Lo 2	Intensive	Intermediate SNWH	Small
Linares	442815	4218204	Ql 1	Low-intensity	Low SNWH	Small
			Ql 2	Intensive	Low SNWH	Small
Bobadilla	348848	4098288	Lt 1	Low-intensity	High SNWH	Large
			Lt 2	Intensive	High SNWH	Large
Moraleda	413236	4115857	Mo 1	Low-intensity	Low SNWH	Small
			Mo 2	Intensive	Low SNWH	Small
Mancha Real	446896	4190963	Mon 1	Low-intensity	Intermediate SNWH	Large
			Mon 2	Intensive	Intermediate SNWH	Large
Marchena	298144	4134306	Oj 1	Intensive	Low SNWH	Large
			Oj 2	Low-intensity	Low SNWH	Large
Obejo	346633	4226751	Olu 1	Low-intensity	Intermediate SNWH	Large

			Olu 2	Intensive	Intermediate SNWH	Large
Torredonjimeno	403367	4180658	Pc 1	Intensive	Low SNWH	Large
			Pc 2	Low-intensity	Low SNWH	Large
Puerto Serrano	279698	4096919	Pg 1	Low-intensity	Intermediate SNWH	Small
			Pg 2	Intensive	Intermediate SNWH	Small
Prado del Rey	274783	4074784	Rh 1	Low-intensity	High SNWH	Small
			Rh 2	Intensive	High SNWH	Small
Alcaudete	409113	4156903	To 1	Low-intensity	Intermediate SNWH	Large
			To 2	Intensive	Intermediate SNWH	Large
Siles	530340	4250159	Ta 1	Low-intensity	High SNWH	Large
			Ta 2	Intensive	High SNWH	Large
Nueva Carteya	374630	4158136	Toq 1	Low-intensity	Intermediate SNWH	Large
			Toq 2	Intensive	Intermediate SNWH	Large

Supplementary Table 2. Results of generalized linear mixed-models (GLMMs) for frugivore abundance (encoded as FA1) and richness (alternative models encoded as FR1 and FR2) in response to olive farm habitats (H), seminatural woodland habitat cover (SNWH), the percentage of olive cover in the landscape (OGC) and ground cover management (M). We included locality as a random factor. Results include $R^2_{GLMM\,(m)}$ and $R^2_{GLMM\,(c)}$ of the best fit-models. We present only models that are better than the null model based on AIC values and show ΔAIC for alternative competing models. Effects retained in each model are illustrated with a green square.

Model code	Predictors included in the models						Model fit					
	H	M	SNWH	OGC	H x OGC	H x SNWH	df	logLink	AIC	ΔAIC	$R^2_{GLMM(m)}$	$R^2_{GLMM(c)}$
A) *Frugivore abundance*												
FA1	■	–	■	■	■	–	9	-813.3	1644.7	0	0.409	0.617
B) *Frugivore richness*	–	–	–	–	–	–						
FR1	■	■	■	–	–	■	10	-341.1	702.2	0	0.499	0.671
FR2	■	–	■	–	–	■	9	-342.6	703.2	1.0	0.496	0.668

Supplementary Table 3. Results of generalized linear mixed-models (GLMMs) for variation in frugivory descriptors: A) proportion of mist-netted frugivore species with seeds in their droppings (alternative models encoded as PFS1 to PFS5); B) the abundance of seeds per dropping of fruit-eating birds (encoded as SAD1, SAD2, SAD3 and SAD4); and C) seed richness in droppings (encoded as SRD1, SRD2, SRD3 and SRD4) in response to olive farm habitats (H), seminatural woodland cover (SNWH), percentage of olive cover (OGC) in the landscape and ground cover management (M). We included monthly sessions nested within locality as random factor in GLMMs to take into account the repeated measure scheme in each of the unique tramping station of each habitat. Results include $R^2_{GLMM\ (m)}$ and $R^2_{GLMM\ (c)}$ of the best fit-models. We present only the most parsimonious models that are better than the null model based on AIC values and show ΔAIC for alternative competing models. Effects retained in each model are illustrated with a green square. In the first case, the selected model was PSF3, which was substantially similar to model PFS1 (with lower AIC, Table S3) but preferred since the latter incorporated a non-statistically significant effect of habitat. In second case, the preferred model was SAD2 because was more parsimonious and their residuals behave much better than SAD1. It was preferred to SAD3 because lower AIC and the incorporation of a marginally significant effect of OGC, which consistently appeared in 4 out of 5 significant models. In the last case, the selected model was SRD1.

Model code	Predictors included in the models						Model fit					
	H	M	H x M	OGC	M x OGC	H x OGC	df	logLink	AIC	ΔAIC	$R^2_{GLMM(m)}$	$R^2_{GLMM(c)}$
A) *Proportion of mist-netted frugivores with seeds in their droppings*												
PFS1	■	■	–	■	–	–	6	-227.7	467.4	0	0.135	0.246
PFS2	■	■	–	■	■	–	7	-226.8	467.6	0.2	0.138	0.245
PFS3	–	■	–	■	–	–	5	-229.1	468.1	0.7	0.125	0.224
PFS4	–	■	–	■	■	–	6	-228.2	468.4	1.0	0.136	0.231
PFS5	■	■	–	–	–	–	5	-229.4	468.7	1.3	0.123	0.252
B) *Seed abundance in droppings*												
SAD1	■	■	–	■	■	–	8	-1181.3	2378.6	0	0.548	0.989
SAD2	■	■	–	■	–	–	7	-1182.6	2379.2	0.6	0.490	0.988
SAD3	■	■	–	–	–	–	6	-1183.9	2379.7	1.1	0.480	0.987
SAD4	■	■	–	■	–	■	8	-1182.1	2380.2	1.6	0.495	0.988
C) *Seed diversity in droppings*												
SRD1	■	■	–	–	–	–	5	-751.7	1513.5	0	0.168	0.359
SRD2	■	■	–	■	■	–	7	-750.3	1514.6	1.1	0.198	0.366
SRD3	■	■	–	■	–	–	6	-751.5	1515	1.5	0.164	0.346
SRD4	■	■	■	–	–	–	6	-751.7	1515.5	2	0.169	0.360

Supplementary Table 4. Results of GLMMs for A) probability of seed deposition (alternative models encoded as PSA1, PSA2, PSA3, PSA4 and PSA5), B) seed abundance (SAT1, SAT2, SAT3, SAT4 and SAT5) and C) seed richness in traps (SRT1, SRT2 and SART3) in response to olive farm habitats (H), seminatural woodland cover (SNWH), percentage of olive cover in the landscape (OGC) and ground cover management (M). We included locality as random factor in GLMMs. Results include $R^2_{GLMM\ (m)}$ and $R^2_{GLMM\ (c)}$ of the best fit-models. We present only the most parsimonious models that are better than the null model based on AIC values and show ΔAIC for alternative competing models. Effects retained in each model are illustrated with a green square. Selected models were PSA1 (alternatively PSA5 could be selected by parsimony), SAT4 ´(preferable to SAT1 to SAT3 because the latter incorporate effects clearly non-significant) and SRT1 (substantially equivalent to SRT2).

Model code	Predictors included in the models						Model fit					
	H	M	H x M	SNWH	OGC	H x OGC	df	logLink	AIC	ΔAIC	$R^2_{GLMM(m)}$	$R^2_{GLMM(c)}$
A) *Probability of seed deposition in traps*												
PSA1	■	■	–	■	–	–	7	-194.5	402.9	0	0.199	0.246
PSA2	■	■	–	–	–	–	5	-196.6	403.1	0.2	0.152	0.246
PSA3	■	■	–	–	■	–	6	-195.6	403.2	0.3	0.174	0.223
PSA4	■	–	–	■	–	–	6	-196.0	403.9	1.0	0.187	0.234
PSA5	■	–	–	–	–	–	4	-198.0	404.1	1.2	0.141	0.199
B) *Seed abundance in traps*												
SAT1	■	■	–	–	■	■	9	-556.2	1130.4	0	0.878	0.996
SAT2	■	■	–	–	■	–	7	-558.5	1131.0	0.6	0.860	0.996
SAT3	■	–	–	–	■	■	8	-557.5	1131.1	0.6	0.877	0.996
SAT4	■	–	–	–	■	–	6	-559.9	1131.7	1.3	0.859	0.996
SAT5	■	■	–	■	■	–	9	-556.9	1131.8	1.4	0.939	0.996
C) *Seed richness in traps*												
STR1	■	■	■	■	–	–	9	-363.5	745.0	0	0.322	0.366
STR2	■	■	■	–	■	–	9	-365.2	746.5	1.5	0.282	0.379
STR3	■	■	–	■	–	–	7	-366.4	746.8	1.8	0.293	0.339