

Ecography

**E6923**

Manzaneda, A. J. and Rey, P. J. 2011. Geographical and interspecific variation in the nutrient-enrichment hypothesis as an adaptive advantage of myrmecochory. – *Ecography* 34: xxx–xxx.

**Supplementary material**

**Appendix 1.** Mean values ( $\pm$  1SE) of seedling emergence, survival and establishment in 23 nests of different ant functional groups that disperse *H. foetidus* seeds.

Functional group	Emergence	Survival	Establishment
Major dispersers	$0.25 \pm 0.07$	$0.1 \pm 0.06$	$0.044 \pm 0.03$
Occasional	$0.3 \pm 0.05$	$0.09 \pm 0.05$	$0.042 \pm 0.03$
LD	$0.28 \pm 0.05$	$0.09 \pm 0.04$	$0.04 \pm 0.02$
FD	$0.31 \pm 0.1$	$0.12 \pm 0.1$	$0.05 \pm 0.048$

**Appendix 2.** Averages observed ( $\pm 1$  S.D.) values for soil variables obtained from 76 sowing points in two seed destinations (ant nests and maternal plant) in three distant regions in the Iberian Peninsula.

Region	Cazorla		Peña Negra		Caurel	
	Nest	Maternal Plant	Nests	Maternal Plant	Nests	Maternal Plant
Soil Parameter						
Clay	32.16 $\pm$ 6.7	26.38 $\pm$ 4.5	15.45 $\pm$ 2.5	15.2 $\pm$ 2.5	16.5 $\pm$ 1.5	15.25 $\pm$ 4.4
Sand	10.47 $\pm$ 5.0	13.38 $\pm$ 5.9	6.3 $\pm$ 1.2	7.45 $\pm$ 0.35	9.86 $\pm$ 3.9	6.7 $\pm$ 0.28
Gravel	19.37 $\pm$ 12.5	21.11 $\pm$ 7.7	55.41 $\pm$ 5.8	56.65 $\pm$ 2.9	26.4 $\pm$ 16.14	32.9 $\pm$ 20.1
Silt	37.96 $\pm$ 7.8	39.08 $\pm$ 0.07	22.8 $\pm$ 3.4	20.65 $\pm$ 0.07	47.18 $\pm$ 13.8	45.1 $\pm$ 15.3
CaCO <sub>3</sub>	18.0 $\pm$ 18.2	17.78 $\pm$ 15.7	<0.5	<0.5	<0.5	<0.5
Organic C	3.79 $\pm$ 1.8	6.17 $\pm$ 1.3	4.3 $\pm$ 0.75	3.0 $\pm$ 1.8	8.1 $\pm$ 2.84	3.77 $\pm$ 4.09
pH	7.89 $\pm$ 0.3	7.77 $\pm$ 0.2	5.79 $\pm$ 0.59	6.3 $\pm$ 0.7	6.11 $\pm$ 0.55	6.95 $\pm$ 0.21
P	8.28 $\pm$ 10.15	6.3 $\pm$ 3.74	27.96 $\pm$ 16.5	23.2 $\pm$ 12.02	28.4 $\pm$ 27.2	5.45 $\pm$ 4.5
N	0.28 $\pm$ 0.15	0.36 $\pm$ 0.08	0.304 $\pm$ 0.07	0.204 $\pm$ 0.07	0.67 $\pm$ 0.23	0.37 $\pm$ 0.43

K	210.78 ± 97.8	240.83 ± 76.2	392 ± 201.2	469.0 ± 26.9	138.25 ± 109.7	72.5 ± 44.5
C/N	11.36 ± 0.26	11.58 ± 0.04	11.5 ± 0.05	11.3 ± 0.28	11.6 ± 0.04	11.0 ± 0.84
Organic N	0.33 ± 0.15	0.36 ± 0.08	0.37 ± 0.06	0.26 ± 0.15	0.69 ± 0.24	0.32 ± 0.34
Organic matter	6.54 ± 3.12	10.64 ± 2.36	7.42 ± 1.3	5.18 ± 3.1	13.97 ± 4.9	6.5 ± 7.04

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**Appendix 3.** Principal components analysis conducted on soil parameters for 76 seed sowing points in three different regions and two potential seed destinations for *H. foetidus* seeds. Values highlighted in bold type are those parameters that weight in a significant proportion (> 0.6) on each factor.

Soil parameter	Correlation to principal factors (PC)	
	PC1	PC2
Clay	-0.316	<b>0.661</b>
Sand	0.039	0.505
Gravel	-0.013	<b>-0.964</b>
Silt	0.261	<b>0.782</b>
CaCO <sub>3</sub>	-0.544	0.298
Organic C	<b>0.977</b>	-0.017
pH	-0.487	<b>0.686</b>
P	0.553	-0.593
N	<b>0.920</b>	-0.077
K	0.057	-0.489
C/N	<b>0.802</b>	0.047
Organic N	<b>0.977</b>	-0.017
Organic matter	<b>0.977</b>	-0.018
Fraction of Variance (%)	41.31	26.12

**Appendix 4.** Principal components analysis conducted on soil parameters for 23 ant nests of 5 different ant species in the southern region of Cazorla. Values highlighted in bold type are those parameters that weighted in a significant proportion (> 0.6) on each factor.

Soil parameter	Correlation to principal factors (PC)	
	PC1	PC2
Clay	-0.133	<b>0.781</b>
Sand	0.023	0.032
Gravel	-0.049	<b>-0.956</b>
Silt	0.178	<b>0.844</b>
CaCO <sub>3</sub>	<b>-0.780</b>	-0.116
Organic C	<b>0.971</b>	0.057
pH	<b>-0.733</b>	0.139
P	0.519	-0.026
N	<b>0.971</b>	0.060
K	<b>0.859</b>	-0.299
C/N	<b>0.970</b>	0.058
Organic N	<b>0.705</b>	0.311
Organic matter	<b>0.884</b>	0.096
Fraction of Variance (%)	63.14	24.78

**Appendix 5.** Average observed ( $\pm 1$  S.D.) values of soil parameters for 23 nests of 5 different ant species in the region of Cazorla. Underlined values are the highest value observed. Statistic and its significance come from univariate tests (ANOVA) conducted for each soil parameter separately. Significant differences ( $P > 0.05$ ) are bold-typed.

Soil Parameters	Ant species					F	p
	<i>A. iberica</i>	<i>C. cruentatus</i>	<i>P. pallidula</i>	<i>C. velox</i>	<i>C. vagus</i>		
<b>Soil texture</b>							
Clay (%)	<u>35.0 <math>\pm</math> 12.51</u>	32.94 $\pm$ 5.87	32.5 $\pm$ 4.82	32.74 $\pm$ 1.06	27.2 $\pm$ 7.12	0.71	0.593
Sand (%)	11.55 $\pm$ 6.13	10.9 $\pm$ 6.48	<u>12.16 <math>\pm</math> 4.63</u>	8.04 $\pm$ 4.00	9.8 $\pm$ 4.99	0.45	0.767
Gravel (%)	16.7 $\pm$ 13.53	19.4 $\pm$ 8.49	18.06 $\pm$ 5.41	17.14 $\pm$ 7.02	<u>26.45 <math>\pm</math> 26.14</u>	0.36	0.827
Silt (%)	36.72 $\pm$ 9.13	36.78 $\pm$ 8.14	37.2 $\pm$ 1.75	<u>42.04 <math>\pm</math> 3.56</u>	36.55 $\pm$ 14.84	0.38	0.813
<b>Soil chemistry</b>							
CaCO <sub>3</sub> (%)	14.25 $\pm$ 15.97	24.56 $\pm$ 22.5	18.38 $\pm$ 20.1	<u>27.76 <math>\pm</math> 18.1</u>	0.175 $\pm$ 0.05	1.68	0.196
Organic Carbon (%)	3.98 $\pm$ 1.98	3.02 $\pm$ 1.78	3.76 $\pm$ 1.18	2.49 $\pm$ 1.0	<u>6.22 <math>\pm</math> 1.10</u>	4.24	<b>0.013</b>
pH	7.88 $\pm$ 0.35	7.99 $\pm$ 0.34	7.90 $\pm$ 0.14	<u>8.11 <math>\pm</math> 0.21</u>	7.48 $\pm$ 0.44	2.58	0.072
P (mg/kg)	3.72 $\pm$ 2.73	4.02 $\pm$ 3.39	9.88 $\pm$ 7.83	5.36 $\pm$ 4.65	<u>20.0 <math>\pm</math> 18.93</u>	2.38	0.091
Organic matter (%)	6.87 $\pm$ 3.42	5.21 $\pm$ 3.08	6.49 $\pm$ 2.03	4.30 $\pm$ 1.72	<u>10.72 <math>\pm</math> 19.91</u>	4.23	<b>0.013</b>

N (%)	$0.28 \pm 0.13$	$0.27 \pm 0.15$	$0.27 \pm 0.10$	$0.21 \pm 0.08$	<u><math>0.48 \pm 0.22</math></u>	2.59	0.071
Organic N (%)	$0.37 \pm 0.17$	$0.26 \pm 0.15$	$0.33 \pm 0.09$	$0.22 \pm 0.08$	<u><math>0.53 \pm 0.09</math></u>	4.23	<b>0.013</b>
K (mg/kg)	$226.25 \pm 147.7$	$185.8 \pm 31.79$	$220.2 \pm 34.5$	$156.2 \pm 48.9$	<u><math>283.0 \pm 170.8</math></u>	1.06	0.402
C/N	$11.37 \pm 0.33$	$11.24 \pm 0.38$	$11.42 \pm 0.15$	$11.24 \pm 0.26$	<u><math>11.57 \pm 0.05</math></u>	1.26	0.323

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**Appendix 6.** Variation in the percentage (%) of openness of the canopy cover above nests of 9 ant dispersers of *H. foetidus* in the Iberian Peninsula. (Aibe = *A. iberica*, Ccru = *C. cruentatus*, Cvag = *C. vagus*, Cvel = *C. velox*, Ppal = *P. pallidula*, Lema = *L. emarginatus*, Fsan = *F. sanguinea*, Flug = *F. lugubris*, Lful = *L. fuliginosus*).

