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Supplementary Material

Title: Sending private messages: Floral ultraviolet signals are associated with pollination syndromes in *Erica*

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Table S1 *Erica* species sampled with contribution of UV reflectance to total brightness (> 10 % in bold), visible colour according to human vision, pollination syndrome and collection site. LPF = Long-proboscid fly. Location abbreviations match those in Table S2.

<i>Erica</i> species	Contribution of UV to total brightness	Visible colour	Pollinator	Location
<i>abietina abietina</i>	0.15	red	bird	KP
<i>abietina atrorosea</i>	0.11	pink	bird	CP
<i>abietina aurantiaca</i>	0.09	red	bird	SG
<i>abietina perfoliosa</i>	0.10	yellow	bird	SG
<i>amoena</i>	0.02	pink	insect	AB
<i>ampullacea</i>	0.17	light pink	LPF	GR
<i>aneimena</i>	0.05	pink	insect	KB
<i>aristata</i>	0.25	light pink	LPF	VG
<i>articularis</i>	0.03	pink	insect	VG
<i>axillaris</i>	0.01	green	wind	AB
<i>azaleifolia</i>	0.01	white	insect	AB
<i>baccans</i>	0.04	pink	insect	KB
<i>barbigeroides</i>	0.06	pink	insect	GR
<i>baueri</i>	0.06	white	bird	KB
<i>baueri</i>	0.02	pink	bird	KB
<i>bergiana</i>	0.04	pink	insect	BK
<i>blandfordii</i>	0.05	yellow	insect	KB
<i>blenna</i>	0.11	orange	bird	KB
<i>brachialis</i>	0.08	green	bird	KB
<i>brevifolia</i>	0.04	pink	insect	AB
<i>bruniades</i>	0.01	pink	insect	BB
<i>caffra</i>	0.04	white	insect	SM
<i>calycina</i>	0.05	pink	insect	KB
<i>capensis</i>	0.04	white	insect	KB
<i>caterviflora</i>	0.04	pink	insect	AB
<i>ceraria</i>	0.08	green	bird	KB
<i>coccinea</i>	0.02	yellow	bird	VG
<i>coccinea</i>	0.02	red	bird	CP
<i>collina</i>	0.01	pink	insect	HA
<i>copiosa</i>	0.08	light pink	wind	KB
<i>corifolia</i>	0.07	pink	insect	SB
<i>cristata</i>	0.11	pink	LPF	VG
<i>croceovirens</i>	0.02	orange	bird	KB
<i>croceovirens</i>	0.07	green	bird	KB
<i>cruenta</i>	0.11	red	bird	KB
<i>cumuliflora</i>	0.02	white	insect	JH
<i>curviflora</i>	0.04	pink	bird	SM
<i>curviflora</i>	0.04	orange	bird	GB
<i>curviflora</i>	0.02	yellow	bird	GB
<i>curvirostris</i>	0.07	white	insect	KP
<i>curvistyla</i>	0.07	white	insect	CB
<i>denticulata</i>	0.12	pink	insect	BK

Table S1 continued *Erica* species sampled with contribution of UV reflectance to total brightness (> 10 % in bold), visible colour according to human vision, pollination syndrome and collection site. LPF = Long-proboscid fly. Location abbreviations match those in Table S2.

<i>Erica</i> species	Contribution of UV to total brightness	Visible colour	Pollinator	Location
<i>diaphana</i>	0.07	purple	bird	KB
<i>discolor</i>	0.03	red	bird	SM
<i>discolor</i>	0.05	green	bird	SM
<i>distorta</i>	0.06	pink	insect	BK
<i>elimensis</i>	0.07	pink	insect	HA
<i>ericoides</i>	0.03	pink	insect	CP
<i>exleena</i>	0.02	white	wind	AB
<i>fascicularis</i>	0.07	pink	bird	PB
<i>fascicularis</i>	0.06	green	bird	PB
<i>fastigiata coventryi</i>	0.16	light pink	LPF	VG
<i>fastigiata fastigiata</i>	0.15	light pink	LPF	JH
<i>fontana</i>	0.06	pink	bird	VG
<i>formosa</i>	0.06	white	insect	KB
<i>fuscescens</i>	0.02	white	insect	KB
<i>gibbosa</i>	0.06	light pink	insect	KB
<i>glabella laevis</i>	0.02	pink	insect	VG
<i>glandulosa glandulosa</i>	0.15	pink	bird	SM
<i>glandulosa fourcadei</i>	0.09	red	bird	KB
<i>glauca</i>	0.09	red	bird	KB
<i>glomiflora</i>	0.06	white	insect	KB
<i>glomiflora</i>	0.07	pink	insect	KB
<i>grandiflora</i>	0.07	yellow	bird	JH
<i>grandiflora</i>	0.11	orange	bird	PM
<i>haematocodon</i>	0.12	red	insect	KB
<i>halicacaba</i>	0.07	green	bird	KB
<i>heleophila</i>	0.02	white	insect	KB
<i>hirtiflora</i>	0.07	pink	insect	SM
<i>hispidula</i>	0.06	light pink	wind	GB
<i>holoserica</i>	0.03	pink	insect	VG
<i>imbricata</i>	0.03	white	insect	CP
<i>intermedia</i>	0.03	yellow	insect	KB
<i>intervallaris</i>	0.03	pink	insect	JH
<i>irbyana</i>	0.13	pink	LPF	GR
<i>irregularis</i>	0.06	pink	insect	GR
<i>jasminiflora</i>	0.12	light pink	LPF	HA
<i>laeta</i>	0.02	pink	insect	SB
<i>lanuginosa</i>	0.02	red	rodent	VG
<i>lanuginosa</i>	0.03	white	rodent	VG
<i>lateralis</i>	0.05	pink	insect	BK
<i>leptopus</i>	0.05	white	insect	KB
<i>leucotrachela</i>	0.12	white	bird	KB

Table S1 continued *Erica* species sampled with contribution of UV reflectance to total brightness (> 10 % in bold), visible colour according to human vision, pollination syndrome and collection site. LPF = Long-proboscid fly. Location abbreviations match those in Table S2.

<i>Erica</i> species	Contribution of UV to total brightness	Visible colour	Pollinator	Location
<i>leucotrachela</i>	0.06	red	bird	KB
<i>limosa</i>	0.05	red	insect	CB
<i>lutea</i>	0.05	white	insect	KB
<i>macowanii lanceolata</i>	0.07	white	bird	VG
<i>macowanii lanceolata</i>	0.01	purple	bird	VG
<i>mammosa</i>	0.03	white	bird	SB
<i>mammosa</i>	0.03	pink	bird	KB
<i>mammosa</i>	0.02	light pink	bird	SB
<i>margaritacea</i>	0.03	white	insect	KB
<i>mauritanica</i>	0.04	pink	insect	KB
<i>melanthera</i>	0.06	pink	insect	KB
<i>melastoma minor</i>	0.01	green	bird	VG
<i>melastoma minor</i>	0.04	black	bird	VG
<i>mollis</i>	0.06	pink	insect	CB
<i>monsoniana</i>	0.03	white	insect	KB
<i>multumbellifera</i>	0.07	purple	insect	SB
<i>muscosa</i>	0.06	white	wind	KP
<i>nana</i>	0.09	yellow	bird	KB
<i>nudiflora</i>	0.06	pink	insect	KP
<i>obliqua</i>	0.03	pink	insect	FK
<i>obtusata</i>	0.06	pink	insect	AB
<i>palliiflora</i>	0.02	pink	insect	CB
<i>parviflora</i>	0.03	pink	insect	VG
<i>patersonii</i>	0.10	yellow	bird	BB
<i>pauciovulata</i>	0.06	pink	insect	AB
<i>penicilliformis</i>	0.05	white	insect	KB
<i>perspicua</i>	0.04	white	bird	HH
<i>perspicua</i>	0.03	purple	bird	HH
<i>physodes</i>	0.07	white	insect	KB
<i>pinea</i>	0.11	yellow	bird	BK
<i>placentiflora</i>	0.02	purple	insect	VG
<i>plena</i>	0.04	white	insect	AB
<i>plukenetii lineata</i>	0.02	red	bird	PO
<i>plukenetii plukenetii</i>	0.07	pink	bird	PO
<i>plukenetii plukenetii</i>	0.02	red	bird	BK
<i>pulchella</i>	0.07	pink	insect	SB
<i>recurvata</i>	0.04	white	bird	KB
<i>regia mariae</i>	0.09	red	bird	PO
<i>salax</i>	0.06	white	wind	JH
<i>sessiliflora</i>	0.06	green	bird	VG
<i>shannonea</i>	0.12	light pink	LPF	AB
<i>sitiens</i>	0.05	pink	insect	KB

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<i>Erica</i> species	Contribution of UV to total brightness	Visible colour	Pollinator	Location
<i>sparmannii</i>	0.08	green	bird	KB
<i>sparsa</i>	0.06	pink	insect	KB
<i>spumosa</i>	0.03	pink	insect	AB
<i>tenella</i>	0.03	white	insect	AB
<i>tenella</i>	0.08	pink	insect	AB
<i>totta</i>	0.07	white	insect	KB
<i>triflora</i>	0.04	white	insect	JH
<i>triste</i>	0.00	white	wind	SB
<i>umbrosa</i>	0.05	pink	insect	JH
<i>unicolor</i>	0.02	green	bird	KB
<i>verecunda</i>	0.02	light pink	insect	GB
<i>verticillata</i>	0.06	pink	bird	KB
<i>vestita</i>	0.13	pink	bird	GR
<i>vestita</i>	0.13	red	bird	GR
<i>villosa</i>	0.03	white	insect	VG
<i>viridiflora</i>	0.02	green	bird	KB
<i>viscaria longiflora</i>	0.13	orange	bird	JH
<i>viscaria longiflora</i>	0.11	red	bird	JH
<i>viscaria longiflora</i>	0.09	purple	bird	JH
<i>viscaria longiflora</i>	0.05	pink	bird	JH
<i>viscaria macrosepala</i>	0.05	green	bird	VG
<i>viscaria pendula</i>	0.02	white	bird	HH

Table S2 Locations and GPS coordinates at which *Erica* species were sampled

Location	Abbreviation	Coordinates
Akkedisberg	AB	34.417°S, 19.668°E
Bainskloof Pass	BK	33.580°S, 19.135°E
Betty's Bay	BB	34.354°S, 18.920°E
Cape Point	CP	34.266°S, 18.463°E
Cedarberg	CB	32.350°S, 19.150°E
Fernkloof Nature Reserve	FK	34.394°S, 19.265°E
Gifberg	GB	30.890°S, 18.676°E
Grootbos Private Nature Reserve	GR	34.545°S, 19.425°E
Hemel and Aarde Valley	HA	34.363°S, 19.351°E
Hottentots-Holland Mountain Catchment Area	HH	33.971°S, 18.899°E
Jonkershoek Nature Reserve	JH	33.971°S, 18.997°E
Kasteelspoort Hiking Trail	KP	33.965°S, 18.389°E
Kirstenbosch National Botanical Garden	KB	33.990°S, 18.428°E
Paarl Mountain Nature Reserve	PM	33.737°S, 18.936°E
Perdeberg	PB	34.307°S, 18.990°E
Potberg	PO	34.372°S, 20.564°E
Scarborough	SB	34.179°S, 18.390°E
Silvermine	SM	34.074°S, 18.398°E
Stellenbosch University Botanical Garden	SG	33.936°S, 18.866°E
Vogelgat Private Nature Reserve	VG	34.391°S, 19.315°E

Table S3 Contribution of UV to total brightness in 125 *Erica* species in relation to pollination syndrome. Output from generalised linear model; significant results in bold.

Variable	Estimate	SE	χ^2	P-value
Intercept	-2.73	0.06	-	-
Pollinator (LPF)[‡]	0.82	0.13	68.02	< 0.001

[‡]Long-proboscid fly (LPF) pollination was used as a reference category.

Table S4 Contribution of UV to total brightness in 125 *Erica* species in relation to pollination syndrome. LPF = Long-proboscid fly. Output from Tukey post-hoc test; significant results in bold.

Contrast	Estimate	SE	Z-ratio	P-value
bird-insect	0.34	0.09	3.55	0.004
bird-LPF	-0.83	0.13	-6.21	< 0.001
bird-rodent	1.03	0.59	1.73	0.414
bird-wind	0.46	0.25	1.86	0.341
insect-LPF	-1.17	0.14	-8.53	< 0.001
insect-rodent	0.69	0.59	1.16	0.776
insect-wind	0.12	0.25	0.47	0.990
LPF-rodent	1.85	0.60	3.09	0.017
LPF-wind	1.28	0.26	4.86	< 0.001
rodent-wind	-0.57	0.63	-0.90	0.897

Table S5 Average number of seeds per treatment (UV, non-UV, and scent control). Output from generalised linear model; significant results in bold.

Variable	Estimate	SE	χ^2	<i>P</i> -value
Intercept	-16.30	3042.30	-	-
Treatment (UV)[‡]	18.68	3042.30	8.79	0.012

[‡]The treatment with UV reflection was used as a reference category.

Table S6 Average number of seeds per treatment (UV, non-UV, and scent control). Output from Kruskal-Wallis post-hoc test; significant results in bold.

Contrast	χ^2	Z-ratio	P-value
non-UV – scent control	11.43	-2.83	0.002
non-UV – UV	11.43	-3.02	0.001
scent control – UV	11.43	-0.19	0.423

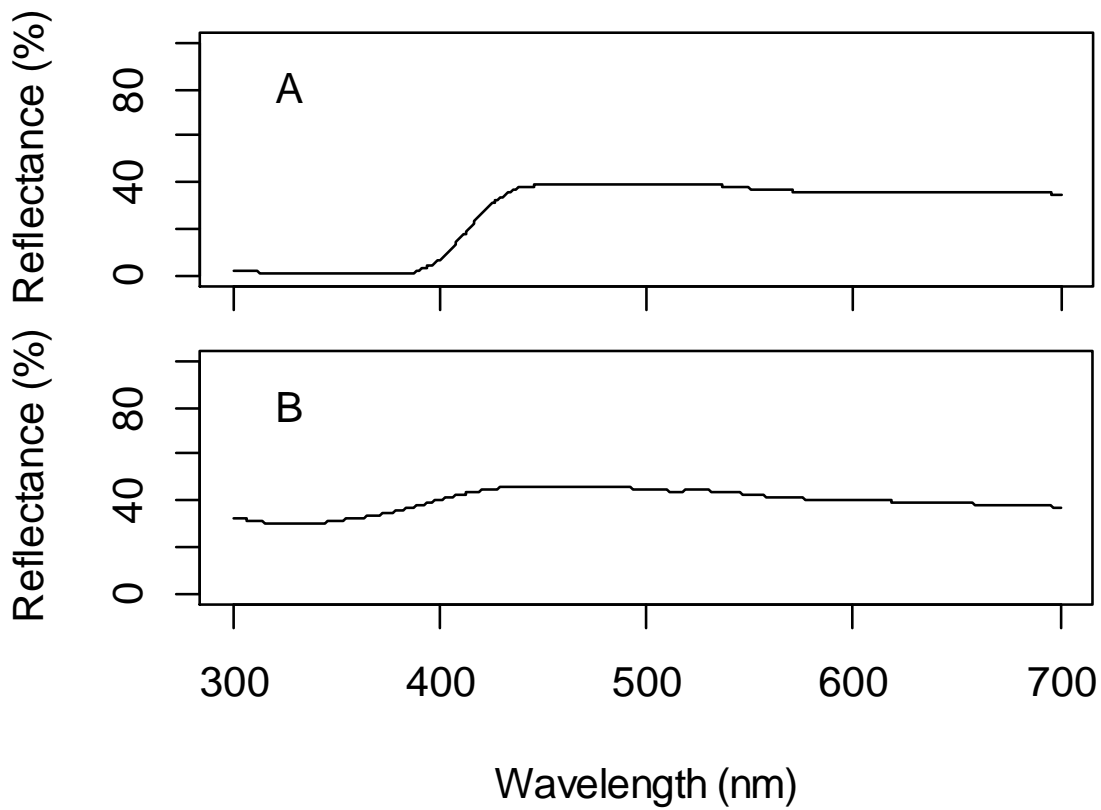


Figure S1 Spectral reflectance of A) White non-UV model flower (contribution of UV to total brightness: 9 %) and B) White UV model flower (contribution of UV to total brightness: 23 %). Bird vision was modelled in the R package pavo using the average avian ultra-violet-sensitive visual system, a D65 illuminant and a green foliage background. A receptor-noise limited model, with a Weber fraction of 0.1 for the long-wavelength sensitive photoreceptor type, indicated a chromatic contrast of 6.79 Just Noticeable Differences (JND)

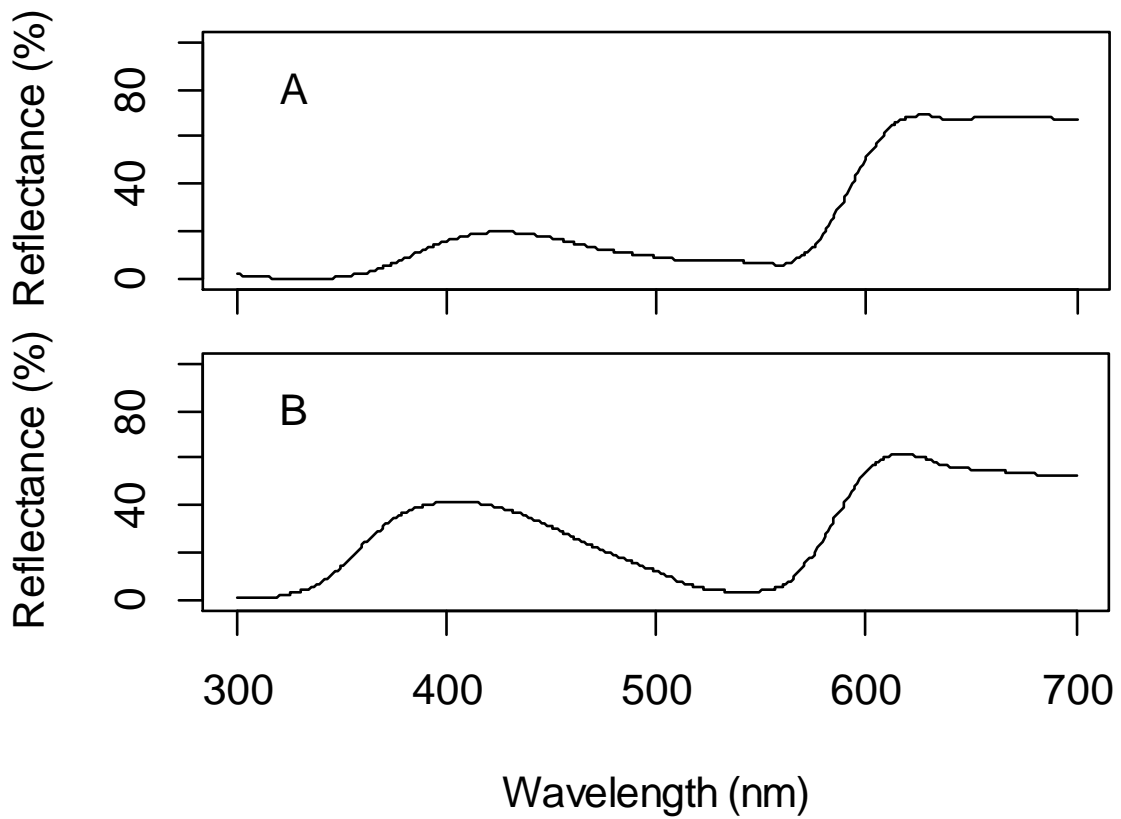


Figure S2 Spectral reflectance of A) Pink non-UV model flower (contribution of UV to total brightness: 4 %) and B) Pink UV model flower (contribution of UV to total brightness: 15 %), chromatic contrast = 6.77 JND (same method as described in Fig S1)

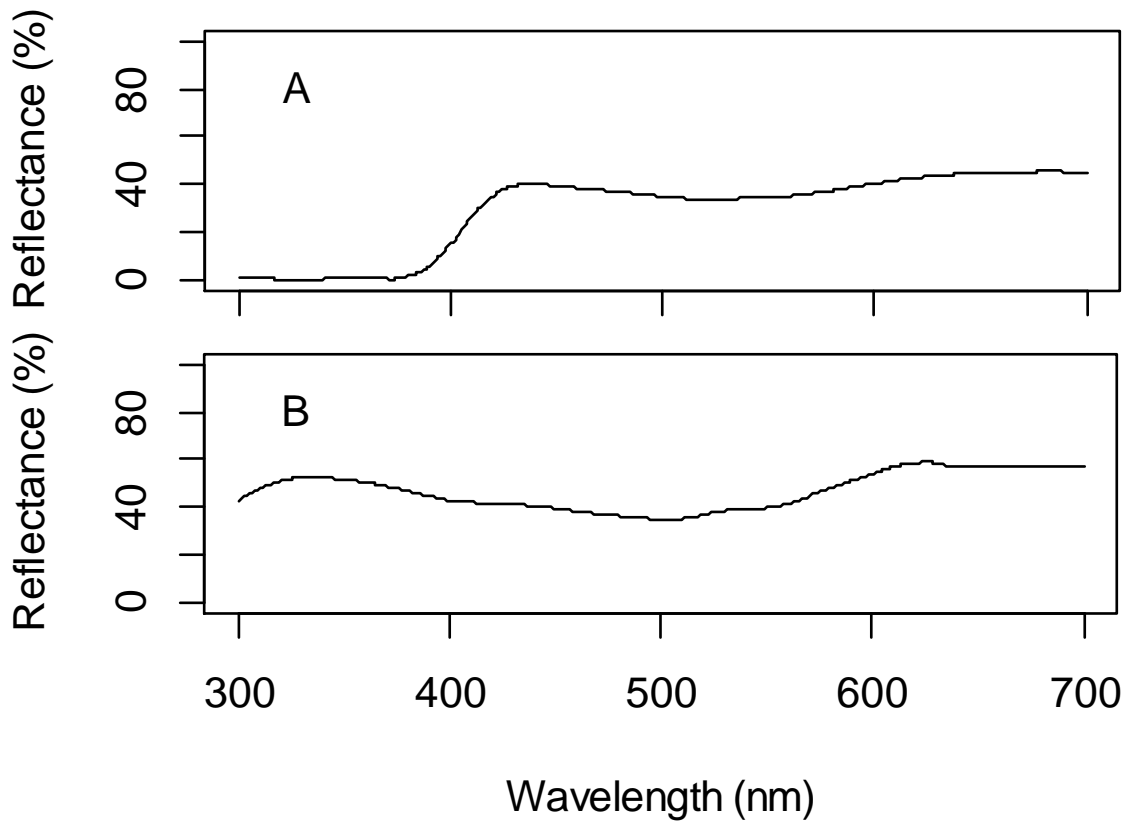


Figure S3 Spectral reflectance of A) *E. aristata* after treatment with sunscreen (contribution of UV to total brightness: 3 %) and B) untreated *E. aristata* flowers (contribution of UV to total brightness: 25 %)

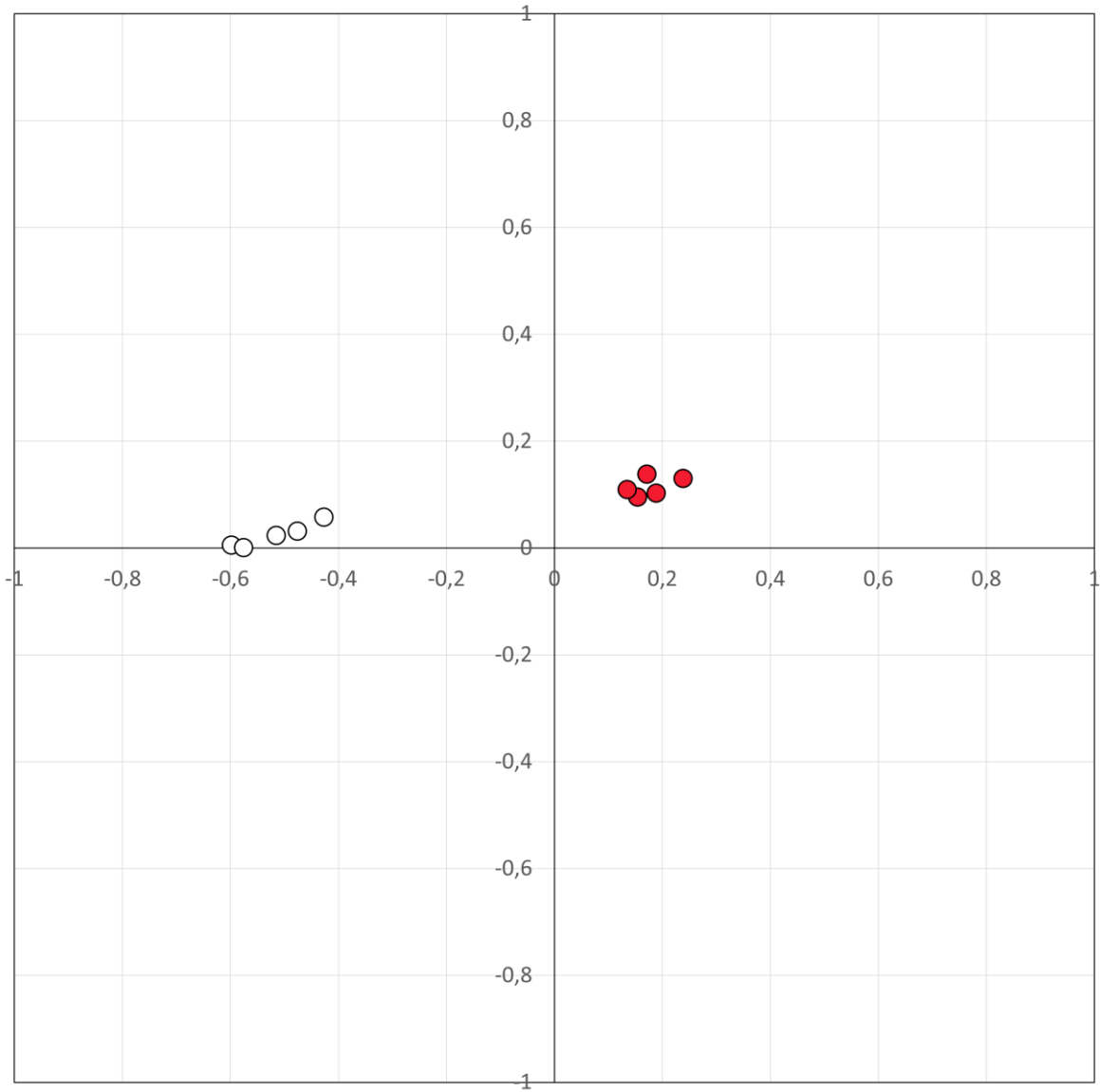


Figure S4 Reflectance spectra of untreated (red) *Erica aristata* flowers and flowers that were treated with sunscreen to remove UV reflectance (white). Treated and untreated flowers of *E. aristata* are different according to the Troje fly colour model as they are in different segments.