

Table S1. Quantum catch of all photoreceptors given for all tested colour stimuli and the respective background and illumination (Daylight: D65; fluorescent tubes: Fl. tubes). Name of experiment, figure with the respective results and experimental light conditions and background are given. Moreover the corresponding wavelength (Corresp. λ) and the spectral purity (Spectral purity) of the colour stimuli are given. Colour stimuli which were tested simultaneously are shaded similarly. The last column (Prefer.) presents frequency of choices or indicate strong (+), middle (~) or no (-) preference for the trained colour or the spontaneously chosen colour.

	Colour	R7p	R7y	R8p	R8y	R1-6	Corresp. λ	Spectral purity	Prefer.
Mutiple-choice experiment Fig. 2 D65; AV400	Bright blue UV+	3.372	4.341	5.064	2.263	4.584	430	0.101	0
	Bright blue UV-	1.480	3.701	4.929	2.278	4.326	484	0.175	13
	Bright red UV+	4.809	3.054	2.455	1.571	2.510	389	0.130	1
	Bright red UV-	1.099	1.916	2.352	1.610	2.185	490	0.156	3
	Bright yellow UV+	5.644	4.125	3.297	5.434	3.720	573	0.062	14
	Bright yellow UV-	1.080	2.385	2.640	5.100	2.862	515	0.200	10
	Bright green UV+	3.246	3.031	2.851	3.277	2.979	569	0.020	1
	Bright green UV-	1.055	2.335	2.748	3.348	2.753	508	0.200	3
	Bright pink UV+	9.685	6.974	6.229	3.160	6.097	407	0.089	0
	Bright pink UV-	2.146	4.696	6.145	3.360	5.493	488	0.124	7
	White UV+	16.350	12.621	11.493	7.679	11.388	400	0.029	0
	White UV-	2.782	7.212	9.369	6.818	8.580	497	0.112	6
	Dark blue UV+	2.779	3.538	4.121	1.789	3.722	429	0.124	0
	Dark blue UV-	1.284	3.005	3.970	1.783	3.484	480	0.184	3
	Dark red UV+	2.948	1.787	1.380	0.926	1.438	376	0.178	0
	Dark red UV-	0.794	1.049	1.193	0.876	1.143	480	0.109	0
	Dark yellow UV+	2.653	1.995	1.494	4.128	1.876	558	0.138	24
	Dark yellow UV-	0.874	1.552	1.542	4.378	1.844	531	0.200	13
	Dark green UV+	2.214	1.958	1.790	2.079	1.892	582	0.042	1
	Dark green UV-	0.820	1.428	1.605	1.955	1.631	512	0.180	2
Dark pink UV+	4.559	3.056	2.673	0.975	2.596	410	0.263	0	
Dark pink UV-	1.220	1.862	2.349	0.921	2.086	440	0.193	3	
Grey UV+	11.676	9.504	8.922	5.987	8.778	404	0.034	1	
Grey UV-	2.370	5.997	7.762	5.623	7.115	497	0.125	3	
Colour learning and discrimination Fig. 3 Grey; Fl. tubes	Bright yellow	1.578	1.876	1.948	2.509	1.965	526	0.063	+
	Bright blue	1.200	2.283	2.669	1.669	2.500	480	0.155	+
	Bright yellow	1.321	1.492	1.512	2.153	1.554	536	0.080	~
	Fluorescent white	1.546	3.512	4.273	2.180	3.911	477	0.158	+
	Mustard yellow	0.160	0.110	0.072	0.500	0.112	563	0.639	+
	Red orange	0.670	0.637	0.631	0.713	0.639	559	0.039	+
	Green	0.316	0.385	0.335	1.310	0.420	546	0.408	~
	Orange	0.373	0.303	0.254	0.724	0.301	558	0.334	~
	Pink	0.781	0.780	0.852	0.260	0.790	426	0.474	~

Colour learning and discrimination Fig. 3 Grey; Fl. tubes	Violet	0.716	0.881	1.010	0.287	0.923	430	0.470	~
	Dark yellow	1.172	1.385	1.430	1.823	1.448	526	0.073	-
	Bright yellow	1.163	1.300	1.295	2.102	1.354	541	0.108	+
	Bright yellow	1.177	1.303	1.296	2.063	1.353	541	0.103	+
	Bright green	0.631	0.872	0.892	1.455	0.933	526	0.165	-
	Grey blue	1.550	2.311	2.592	2.001	2.476	485	0.094	~
	Bright blue	1.753	2.822	3.216	2.274	3.046	482	0.098	+
	Olive green	0.475	0.556	0.527	1.223	0.587	544	0.255	-
	Yellow green	0.393	0.420	0.352	1.465	0.450	549	0.390	+
	Blue green	0.943	1.640	1.854	1.561	1.785	492	0.162	+
	Bright green	0.571	0.931	0.997	1.327	1.011	512	0.197	+
	Dark grey	0.325	0.390	0.414	0.341	0.404	472	0.099	-
	Bright grey	1.132	1.492	1.624	1.383	1.575	487	0.084	+
	Bright blue	0.507	1.077	1.302	0.510	1.186	459	0.298	+
	Dark blue	0.375	0.639	0.767	0.211	0.691	439	0.513	-
Dual-choice Experiment Fig. 4 D65; AV400	Yellow 150	0.519	0.629	0.563	1.481	0.692	549	0.257	+
	Yellow 200	0.557	0.873	0.792	2.562	1.023	542	0.266	++
	Yellow 230	0.592	1.102	1.017	3.497	1.328	534	0.260	+++
	Yellow 245	0.637	1.297	1.219	4.197	1.583	529	0.253	++++
	Yellow 255	0.658	1.398	1.314	4.679	1.719	527	0.253	+++++
	Low-saturated blue	6.409	5.596	5.639	2.272	5.294	415	0.126	++
	High-saturated blue	5.334	5.458	6.008	1.856	5.440	419	0.165	+
Innate proboscis reflex Fig. 5 Grey; Fl. tubes	<i>Helianthus annuus</i>	0.171	0.225	0.193	1.086	0.261	545	0.571	+
	<i>Taxus baccata</i>	0.367	0.953	1.072	1.545	1.078	506	0.377	-
	<i>Corylus avellana</i>	0.181	0.535	0.553	1.463	0.618	514	0.523	+
	<i>Juglans nigra</i>	0.202	0.619	0.662	1.444	0.711	512	0.507	~
	<i>Typha latifolia</i>	0.183	0.517	0.528	1.467	0.597	516	0.512	+
	<i>Typha angustifolia</i>	0.215	0.662	0.696	1.707	0.764	513	0.504	+
	<i>N. pseudonarcissus</i>	0.308	0.857	0.949	1.624	0.977	509	0.420	-
	<i>Bellis perennis</i>	0.211	0.348	0.324	1.355	0.404	536	0.467	+
	<i>Centaura jacea</i>	0.476	1.092	1.234	1.525	1.223	504	0.309	-
	<i>Malva sylvestris</i>	0.266	0.611	0.686	0.884	0.683	506	0.378	-
	<i>Papaver orientale</i>	0.142	0.214	0.238	0.186	0.228	485	0.234	-
	Mixture 1	0.242	0.688	0.741	1.539	0.787	512	0.465	~
	Mixture 2	0.310	0.661	0.702	1.629	0.757	518	0.378	~
	Mixture 3	0.254	0.472	0.479	1.426	0.542	527	0.397	+
Mixture 4	0.280	0.581	0.625	1.275	0.660	517	0.375	~	
Fig. 6 D65; AV400	β -carotene UV+	3.068	1.869	1.243	2.705	1.537	578	0.184	17.27
	β -carotene UV-	0.437	0.826	0.836	2.476	1.002	531	0.308	15.57

Table S2. Complete dataset. Excel worksheets presenting the calculations of the colour loci of the stimuli presented in the results; the worksheet tabs refer to the numbers of the figures in the results section. Excel worksheets are using the spectral reflectance of the colour stimuli and backgrounds and the spectral distribution of the ambient light (referred to as illumination) conditions in 1 nm steps as well as the adapted spectral sensitivity curves of the photoreceptor types of *Eristalis tenax*. The calculations of the spectral locus is done with the normalized spectral sensitivity curves in two steps as follows: `monoch.lim1` shows the calculation of the spectral locus from 350nm to 550nm and mixed purple monochromatic stimuli; `monoch.lim2` shows the calculation of the purple part of the spectral locus using mixtures of two monochromatic stimuli, which are 350 nm and 550nm. For all calculations it is assumed that the photoreceptors are half-maximally sensitive when stimulated by the background colour. In separate sheets the values for the spectral reflectance of all stimuli, the spectral sensitivity of all photoreceptors and the spectral distribution of illuminations and backgrounds are given. Not filled but yet numbered columns in the worksheets are formatted in order to calculate the colour loci of further stimuli. Note that the illumination and background must be customized for this purpose.

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