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Supplemental information

Drosophila suzukii and *Drosophila melanogaster* prefer distinct microbial and plant aroma compounds in a complex fermented matrix

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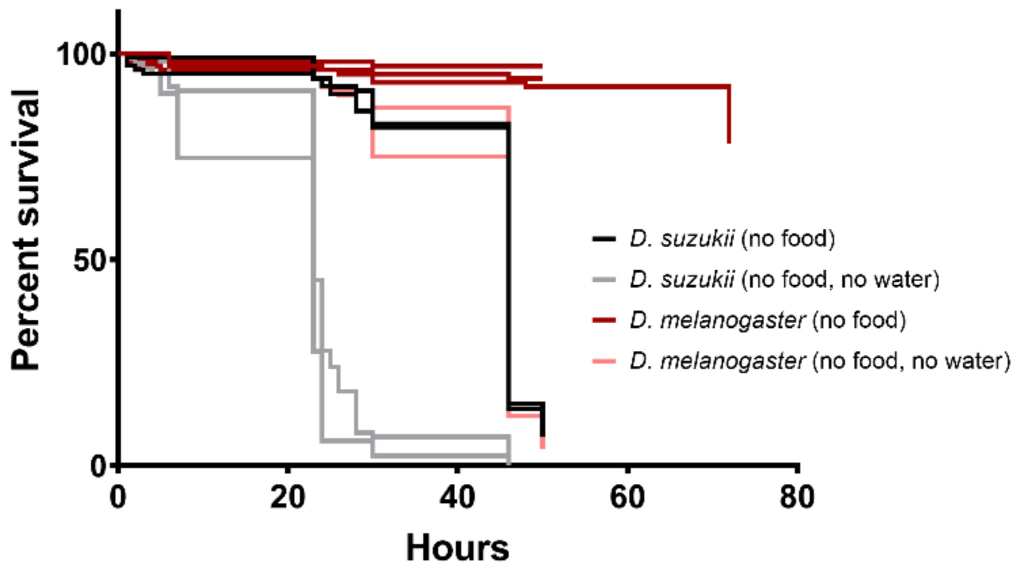


Figure S1. *D. melanogaster* survive starvation longer than *D. suzukii*. Related to Figure 2. Median survival: *D. suzukii* (no food) = 46 hr, *D. suzukii* (no food, no water) = 23 hr, *D. melanogaster* (no food) >72 hr, *D. melanogaster* (no food, no water) = 46 hr.

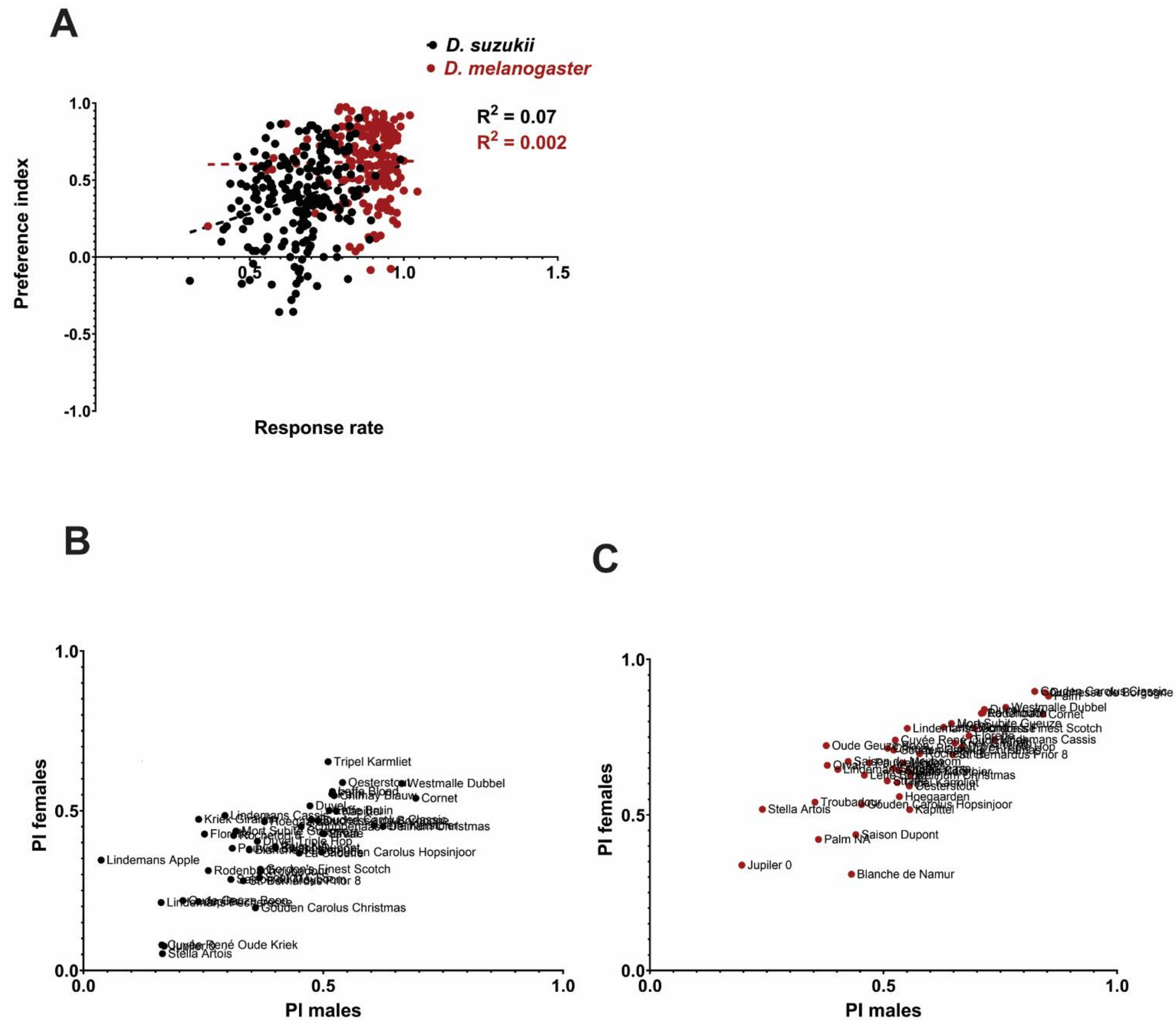
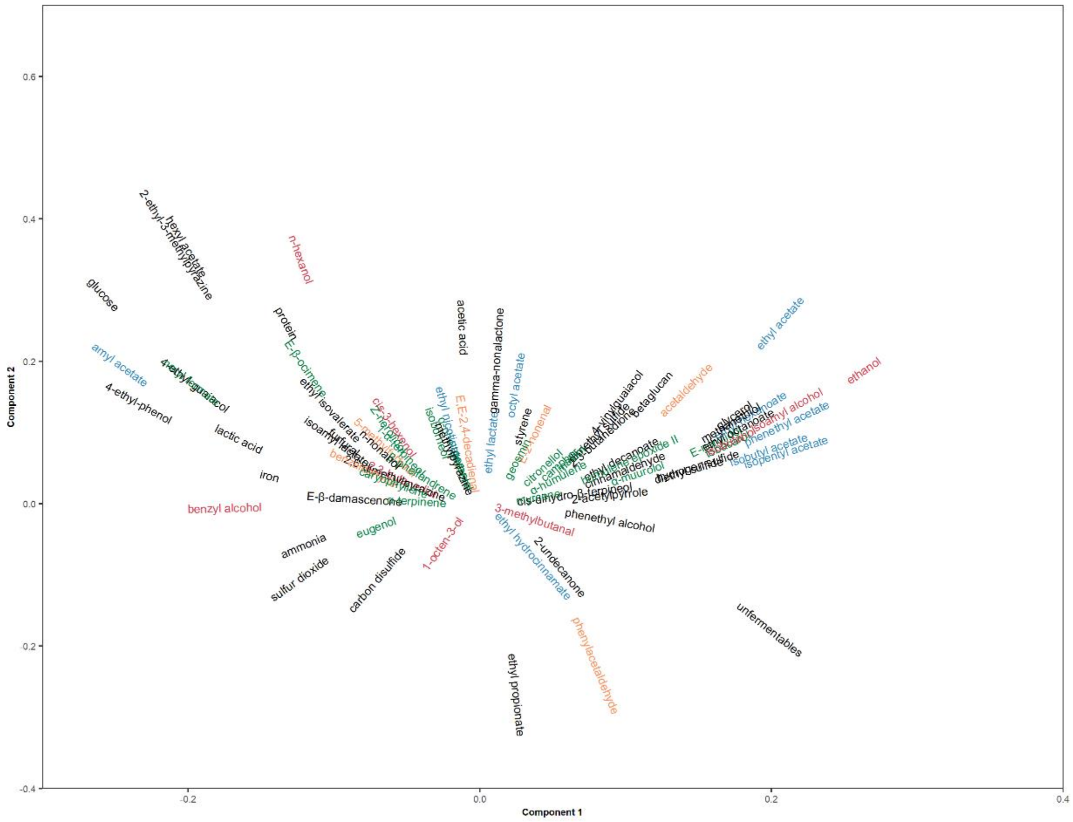


Figure S2. Additional data on preference indices for *D. melanogaster* and *D. suzukii* for the different beers tested. Related to Figure 2. (A) Response rates and corresponding preference indices for all replicates performed for assays shown in **Figure 2**. R-squared values are shown for each species and represent goodness of fit of a linear regression. (*D. suzukii* black and *D. melanogaster* red) and overall (grey). Preference indices broken down by sex for (B) *D. suzukii* and (C) *D. melanogaster*.



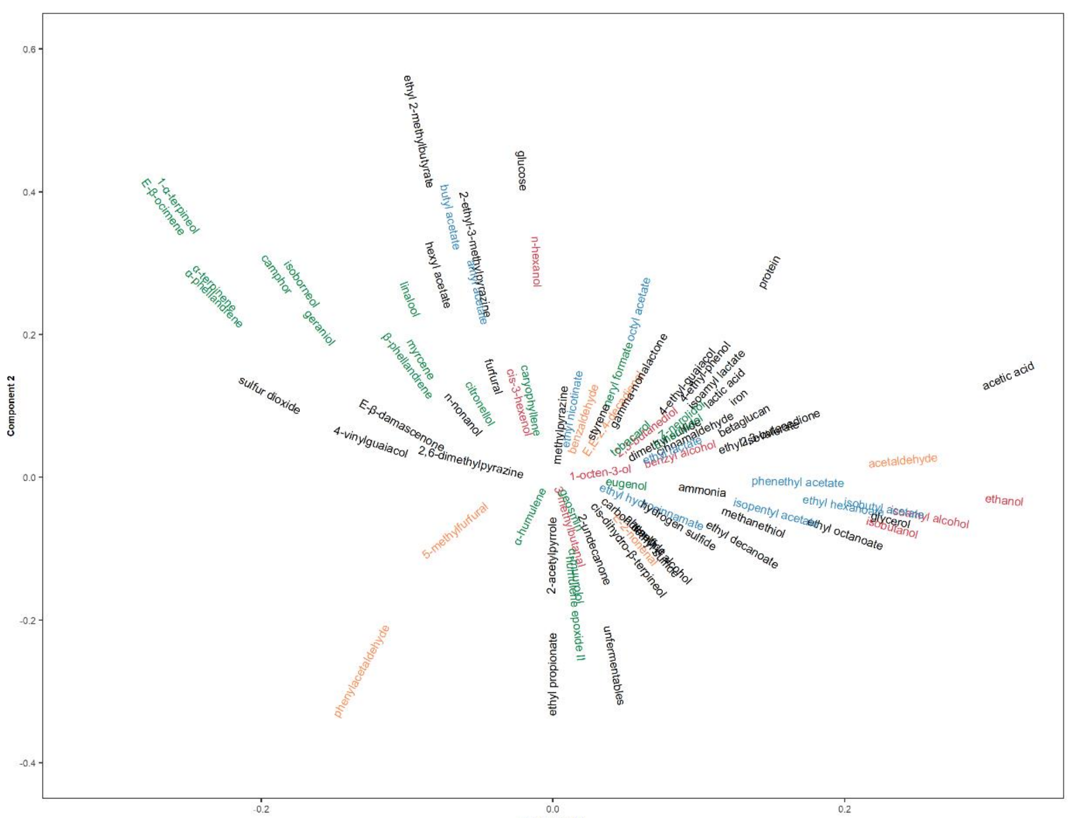


Figure S3. Full set of PLS loadings plots with all compounds for *D. suzukii* (top panel) and *D. melanogaster* (bottom panel). Related to Figure 3. Labels are colored according to compound type (green = terpenoid, blue = esters, red = alcohols, orange = aldehydes, black = misc.).

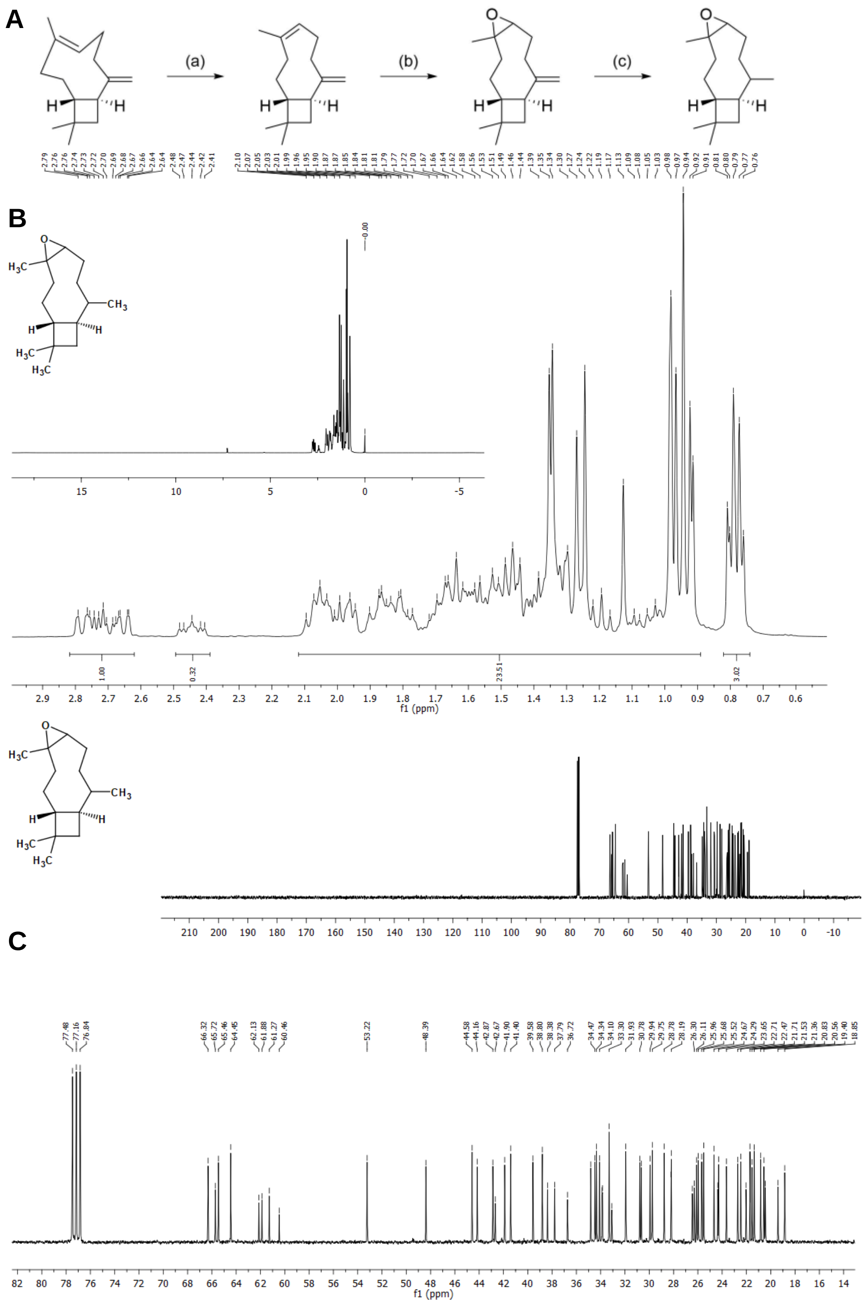


Figure S4: Synthesis and NMR spectra of dihydroisocaryophyllene oxide (tobacarol). Related to Figure 4.
(A) Synthetic pathway; reagents and conditions: (a) CAN, ACN, 80 °C, 4 h. (b) *m*CPBA, DCM, rt, 4 h. (c) PtO_2, H_2, THF, rt, 70 h. (B) ^1H NMR spectrum of dihydroisocaryophyllene oxide (4 diastereomers) ($CDCl_3$, 400 MHz): δ 2.82 – 2.62 (m), 2.50 – 2.39 (m), 2.13 – 0.88 (m), 0.83 – 0.73 (m). (C) ^{13}C NMR spectrum of dihydroisocaryophyllene oxide (4 diastereomers) ($CDCl_3$, 101 MHz): δ 66.3, 65.7, 65.5, 64.5, 62.1, 61.9, 61.3, 60.5, 53.2, 48.4, 44.6, 44.2, 42.9, 42.7, 41.9, 41.4, 39.6, 38.8, 38.4, 37.8, 36.7, 34.8, 34.5, 34.3, 34.1, 33.9, 33.9, 33.3, 33.1, 31.9, 30.8, 30.7, 29.9, 29.8, 28.8, 28.2, 28.2, 26.5, 26.3, 26.1, 26.0, 25.7, 25.5, 24.7, 24.4, 24.3, 23.7, 22.7, 22.5, 22.0, 21.7, 21.5, 21.4, 20.8, 20.6, 20.5, 19.4, 18.9.

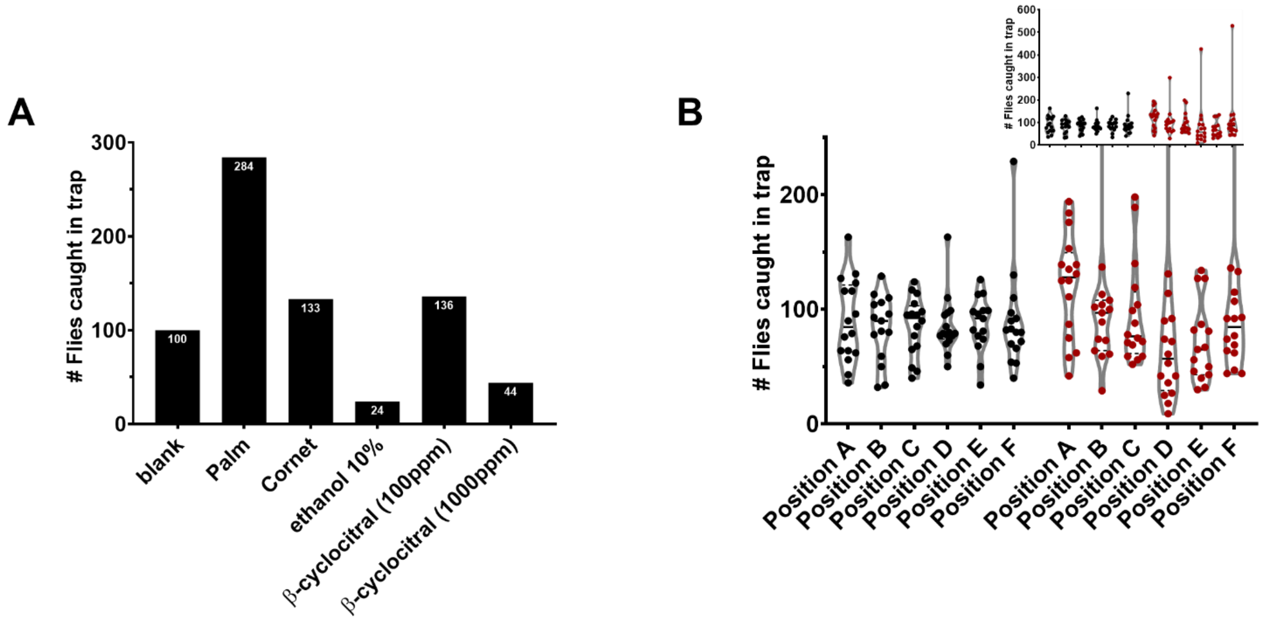


Figure S5. Pilot arena assays demonstrate efficacy of compound screen as well as lack of position bias. Related to Figure 4. A) Pilot assay of arena assay using *D. suzukii* against known or potential attractants. Blank is unspiked control beer (Piedboeuf Blond). (B) Position bias of arena assay for *D. suzukii* (black) and *D. melanogaster* (red). Inset shows the outliers of *D. melanogaster* acetaldehyde tests. One-way ANOVA with multiple comparison tests showed no significant difference between positions (**Table S3**).

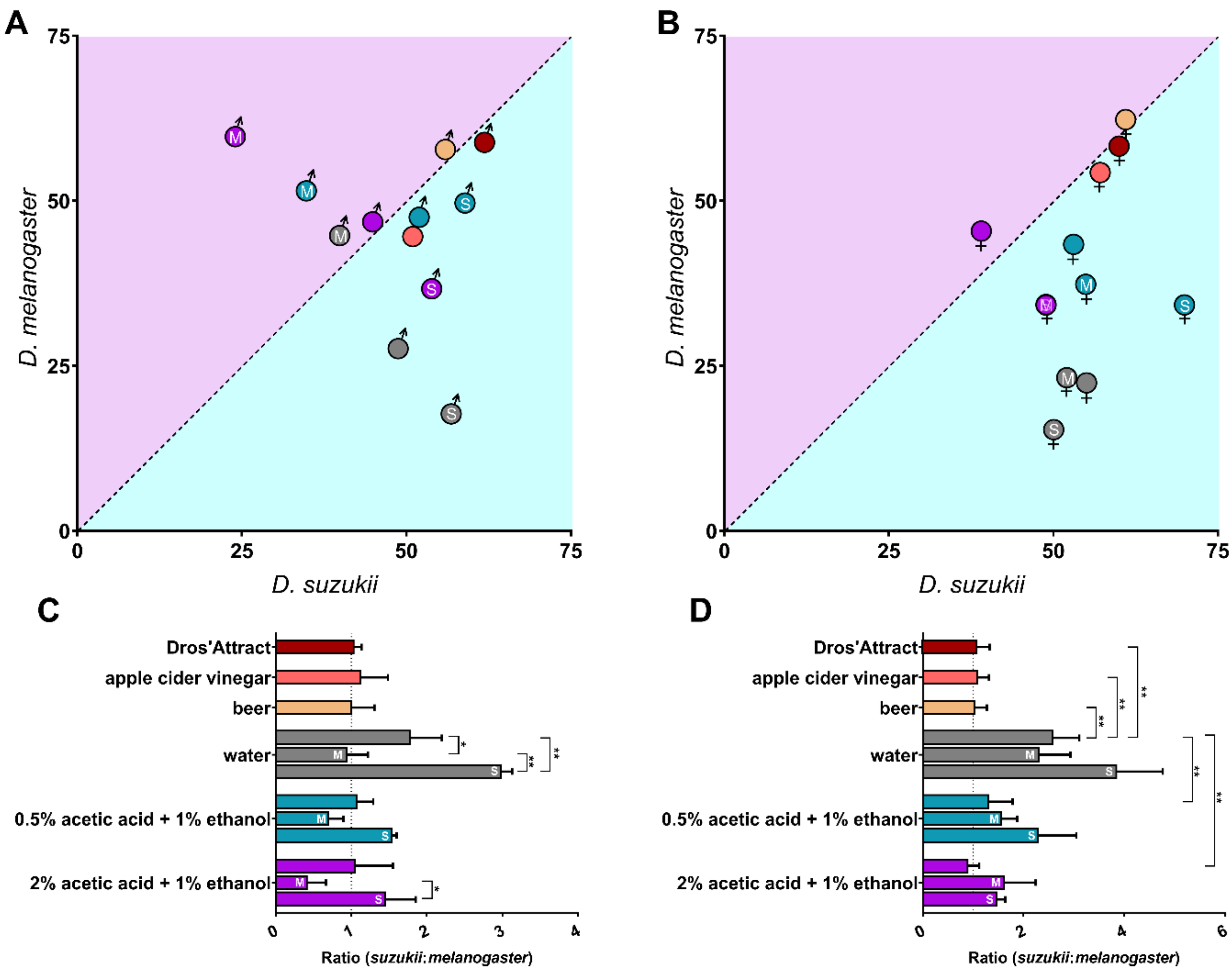


Figure S6. Number of flies caught in Droso'Trap assays of Figure 6 broken down by sex. Related to Figure 6. A. Total number of *D. suzukii* males vs *D. melanogaster* males caught in the same trap. **B**. Total number of *D. suzukii* females vs *D. melanogaster* females caught in the same trap. Colors of data points correspond to the background matrix as indicated in panel C and D. Data points with "S" contain linalool, geraniol, dimethyl sulfide, and β-cyclocitral. Data points with "M" contain pentyl acetate, ethyl acetate, isoamyl acetate, and isoamyl alcohol. (**C, D**) Ratio of *D. suzukii* to *D. melanogaster* caught in the same trap (mean ± SD, n = 3). Bar colors correspond to those in panel A. Significance was calculated using one-way ANOVA with multiple comparisons between the background matrices and controls as well as between lures with their respective backgrounds (**Table S4-S8**). **p* < 0.05, ***p* < 0.01

Table S1. List of beers tested for drosophilid preference. Related to Figure 1 and Figure 2.

Category	Beer
Amber	Palm
	Pauwel Kwak
Blond	Kapittel Blond
	Leffe Blond
	La Chouffe
Brett	Orval
	Schuppenaas
Brown	Gouden Carolus Classic
	Leffe Bruin
	St. Bernardus Prior 8
Christmas	Delirium Christmas
	Gouden Carolus Christmas
	Leffe Kerst
Dubbel	Floreffe Dubbel
	Westmalle Dubbel
Flemish Ales	Duchesse de Bourgogne
	Rodenbach
Fruit Beer	Lindemans Apple
	Lindemans Cassis
Geuze	Mort Subite Gueuze
	Oude Geuze Boon
Hoppy	Duvel Triple Hop
	Gouden Carolus Hopsinjoor
Kriek	Cuvée Rene Oude Kriek
	Kriek Girardin
	Lindemans Pêcheresse
Low-No Alcohol	Jupiler 0.0
	Palm NA
	Piedbœuf Blond
Pils	Jupiler
	Stella Artois
Saison	Saison du Meyboom
	Saison Dupont
Scotch	Gordon’s Finest Scotch
	Scotch CTS
Stout	Oesterstout
	Troubadour Obscura
Strong Ale	Chimay Blauw
	Rochefort 8
Tripel	Cornet
	Duvel
	Straffe Hendrik
	Tripel Karmeliet
Witbier	Blanche de Namur
	Hoegaarden

Table S2. Compounds tested in the arena trap assay. Related to Figure 4.

Compound	Method of detection (in beer)[a]	Compound Category[b]	Concentration[c]	Odor[d]	Natural Occurrence[e]	Main Source in beer[f]
1-octen-3-ol	GC-MS	alcohol	0.07 ppm	earthy	mushroom, clover, wheat, herbs, spices	Wheat, spices
2,3-butanediol	GC-FID	alcohol	0.50 ppm	creamy, buttery	cocoa butter	yeast
2,3-butanedione (diacetyl)	GC-MS	ketone	0.50 ppm	buttery	butter, vinegar, coffee	Yeast
4-ethyl-guaiacol	GC-MS	phenol	3.6 ppm	spicy, clove-like, medicinal	arabica coffee, plants	Yeast
4-ethyl-phenol	GC-MS	phenol	1.0 ppm	smoky, phenolic	arabica coffee	Yeast
4-vinylguaiacol	GC-MS	phenol	0.68 ppm	woody, clove	buckwheat	Yeast
acetaldehyde	GC-FID	aldehyde	19 ppm	fresh, fruity, musty	plants, tobacco smoke, microbes	Yeast
acetic acid	Enzymatic assay	acid	33 g/L	acidic, vinegar		Yeast, bacteria
α-humulene	GC-MS	terpenoid	0.019 ppm	woody	pine, orange, tobacco	Hops
ammonia	Enzymatic assay	inorganic	200 mg/L	Urine, sweat	decomposing organic material	Barley (malt), hops, yeast
benzaldehyde	GC-MS	aldehyde	1.9 ppm	fruity, almond, cherry	Almonds, stonefruits	Yeast
β-caryophyllene	GC-MS	terpenoid	0.034 ppm	woody, spice, clove	rosemary, cannabis	Hops
β-cyclocitral	GC-MS	terpenoid	100 ppm	tropical, saffron, herbal	saffron	Hops
camphor	GC-MS	terpenoid	1.4 ppm	woody	camphor laurel wood, rosemary	Hops
diethyl sulfide	GC-FPD	sulfur	4.7 ppb	sulfurous	durian, potatoes	Barley
dimethyl sulfide	GC-FPD	sulfur	154 ppb	sulfury, onion, cabbage	cooked vegetables	Barley, yeast, bacteria
ethanol	Spectrophotometric	alcohol	11.6%	alcoholic, medical		yeast
ethyl acetate	GC-FID	ester	130 ppm	fruity, sweet, nail polish	fruit	yeast
ethyl isovalerate	GC-FID	ester	0.14 ppm	fruity, pineapple	Fruits, vegetables	yeast

ethyl lactate	GC-MS	ester	0.12 ppm	tart, fruity, butterscotch	Various fruits	yeast
eugenol	GC-MS	terpenoid	0.89 ppm	spicy, clove, woody	clove, nutmeg, cinnamon, bay leaf	hops
γ-nonalactone	GC-MS	ketone	0.22 ppm	coconut	bourbon whiskey	yeast
geosmin	GC-MS	terpenoid	0.0040 ppm	earthy	beets, petrichor	yeast
geraniol	GC-MS	terpenoid/alcohol	1.5 ppm	floral, fruity, rose, citrus	rose oil, citronella oil	hops
isoamyl alcohol	GC-FID	alcohol	102 ppm	alcoholic, banana	black truffles	yeast
isoamyl lactate	GC-MS	ester	0.72 ppm	fruity, creamy, nutty		Yeast
isopentyl acetate (isoamyl acetate)	GC-FID	ester	13.1 ppm	banana, fruity	honey bee stings	Yeast
Isomerized hop extract	NA	acid	6%	none		Hops
lactic acid	Enzymatic assay	acid	5.9 g/L	none	Sour milk products such as yoghurt	bacteria
linalool	GC-MS	terpenoid	6.6 ppm	citrus, floral, woody	mint, laurels, cinnamon, rosewood, citrus	hops
myrcene	GC-MS	terpenoid	0.11 ppm	peppery, spicy, balsam	plant oils	hops
nerolidol	GC-MS	terpenoid	0.077 ppm	floral, citrus, woody	bay, cannabis, thyme, parsley, cardamom	hops
pentyl acetate	GC-MS	ester	0.016 ppm	fruity, pear, apple	fruit	Yeast
phenylacetaldehyde	GC-MS	aldehyde	0.064 ppm	honey, floral, chocolate	chocolate, buckwheat, flowers	Yeast

a. Mode of detection of compound in beer from [S1,S2]
b. Category names used for color coding in **Figure 3** and **Figure S3**.
c. Concentrations correspond to levels detected in beer from [S1,S2].
d. Odor descriptors from The Good Scents database http://www.thegoodscentscompany.com
e. Occurrence of compounds; apart from beer fermentation.
f. Main source of compound in beer. Yeast= produced by yeast during fermentation.

Table S3. One-way ANOVA and multiple comparison test between different arena positions. Related to Figure 4.

	D. suzukii					
	A	B	C	D	E	F
A		0.99268886	0.99789999	0.99875088	0.99972513	0.99999956
B			0.99999227	0.99996977	0.99976729	0.99629917
C				0.99999997	0.99999143	0.99919017
D					0.99999864	0.99957727
E						0.99994114
F						
	D. melanogaster					
	A	B	C	D	E	F
A		0.97137487	0.92246393	0.66383803	0.41550297	0.99893184
B			0.99996151	0.98091684	0.88057023	0.99865772
C				0.99525598	0.93952189	0.99065007
D					0.99843477	0.87110261
E						0.65547625
F						

Table S4. One-way ANOVA and multiple comparison test between species ratios for different background matrices. Related to Figure 6.

	Dros'Attract	apple cider vinegar	beer	water	0.5% acetic acid + 1% ethanol	2% acetic acid + 1% ethanol
Dros'Attract		0.99979	0.99706	0.00011	0.98540	0.97347
apple cider vinegar			0.97692	0.00015	0.99870	0.91089
beer				0.00006	0.87634	0.99968
water					0.00026	0.00004
0.5% acetic acid + 1% ethanol						0.74077
2% acetic acid + 1% ethanol						

Significant *p* values highlighted in yellow

Table S5. One-way ANOVA and multiple comparison test between species ratios for different lures and respective background matrices. Related to Figure 6.

	water	water + S	water + M
water		0.00115	0.01961
water + S			0.00010
water + M			
	0.5% acetic acid + 1% ethanol	**0.5% acetic acid + 1% ethanol + S**	**0.5% acetic acid + 1% ethanol + M**
0.5% acetic acid + 1% ethanol		0.06678	0.73048
0.5% acetic acid + 1% ethanol + S			0.02608
0.5% acetic acid + 1% ethanol + M			
	2% acetic acid + 1% ethanol	**2% acetic acid + 1% ethanol + S**	**2% acetic acid + 1% ethanol + M**
2% acetic acid + 1% ethanol		0.04475	0.52709
2% acetic acid + 1% ethanol + S			0.01208
2% acetic acid + 1% ethanol + M			

Significant *p* values highlighted in yellow

Table S6. One-way ANOVA and multiple comparison test between total number of *D. suzukii* caught for different lures and respective background matrices. Related to Figure 6.

Tukey's multiple comparisons test	Mean Diff,	95,00% CI of diff,	Below threshold?	Summary	Adjusted P Value
apple cider vinegar vs. Dros'Attract	-13	-60,42 to 34,42	No	ns	0,9987
apple cider vinegar vs. water	4,333	-43,08 to 51,75	No	ns	>0,9999
apple cider vinegar vs. beer	-8,667	-56,08 to 38,75	No	ns	>0,9999
apple cider vinegar vs. matrix 1	3	-44,42 to 50,42	No	ns	>0,9999
apple cider vinegar vs. matrix 2	24,67	-22,75 to 72,08	No	ns	0,8079
apple cider vinegar vs. Lure-S (water)	1,667	-45,75 to 49,08	No	ns	>0,9999
apple cider vinegar vs. Lure-S (beer)	-6	-53,42 to 41,42	No	ns	>0,9999
apple cider vinegar vs. Lure-S (matrix 1)	-20	-67,42 to 27,42	No	ns	0,9465
apple cider vinegar vs. Lure-S (matrix 2)	5	-42,42 to 52,42	No	ns	>0,9999
apple cider vinegar vs. Lure-M (water)	15,67	-31,75 to 63,08	No	ns	0,9923
apple cider vinegar vs. Lure-M (beer)	4,667	-42,75 to 52,08	No	ns	>0,9999
apple cider vinegar vs. Lure-M (matrix 1)	19	-28,42 to 66,42	No	ns	0,9631
apple cider vinegar vs. Lure-M (matrix 2)	35,67	-11,75 to 83,08	No	ns	0,302
Dros'Attract vs. water	17,33	-30,08 to 64,75	No	ns	0,9819
Dros'Attract vs. beer	4,333	-43,08 to 51,75	No	ns	>0,9999
Dros'Attract vs. matrix 1	16	-31,42 to 63,42	No	ns	0,9908
Dros'Attract vs. matrix 2	37,67	-9,751 to 85,08	No	ns	0,2322
Dros'Attract vs. Lure-S (water)	14,67	-32,75 to 62,08	No	ns	0,9958
Dros'Attract vs. Lure-S (beer)	7	-40,42 to 54,42	No	ns	>0,9999
Dros'Attract vs. Lure-S (matrix 1)	-7	-54,42 to 40,42	No	ns	>0,9999
Dros'Attract vs. Lure-S (matrix 2)	18	-29,42 to 65,42	No	ns	0,9756
Dros'Attract vs. Lure-M (water)	28,67	-18,75 to 76,08	No	ns	0,6239
Dros'Attract vs. Lure-M (beer)	17,67	-29,75 to 65,08	No	ns	0,9789
Dros'Attract vs. Lure-M (matrix 1)	32	-15,42 to 79,42	No	ns	0,46
Dros'Attract vs. Lure-M (matrix 2)	48,67	1,249 to 96,08	Yes	*	0,0401
water vs. beer	-13	-60,42 to 34,42	No	ns	0,9987
water vs. matrix 1	-1,333	-48,75 to 46,08	No	ns	>0,9999
water vs. matrix 2	20,33	-27,08 to 67,75	No	ns	0,94
water vs. Lure-S (water)	-2,667	-50,08 to 44,75	No	ns	>0,9999
water vs. Lure-S (beer)	-10,33	-57,75 to 37,08	No	ns	0,9999
water vs. Lure-S (matrix 1)	-24,33	-71,75 to 23,08	No	ns	0,8211
water vs. Lure-S (matrix 2)	0,6667	-46,75 to 48,08	No	ns	>0,9999
water vs. Lure-M (water)	11,33	-36,08 to 58,75	No	ns	0,9997
water vs. Lure-M (beer)	0,3333	-47,08 to 47,75	No	ns	>0,9999
water vs. Lure-M (matrix 1)	14,67	-32,75 to 62,08	No	ns	0,9958
water vs. Lure-M (matrix 2)	31,33	-16,08 to 78,75	No	ns	0,4919
beer vs. matrix 1	11,67	-35,75 to 59,08	No	ns	0,9996
beer vs. matrix 2	33,33	-14,08 to 80,75	No	ns	0,3986
beer vs. Lure-S (water)	10,33	-37,08 to 57,75	No	ns	0,9999

beer vs. Lure-S (beer)	2,667	-44,75 to 50,08	No	ns	>0,9999
beer vs. Lure-S (matrix 1)	-11,33	-58,75 to 36,08	No	ns	0,9997
beer vs. Lure-S (matrix 2)	13,67	-33,75 to 61,08	No	ns	0,9978
beer vs. Lure-M (water)	24,33	-23,08 to 71,75	No	ns	0,8211
beer vs. Lure-M (beer)	13,33	-34,08 to 60,75	No	ns	0,9983
beer vs. Lure-M (matrix 1)	27,67	-19,75 to 75,08	No	ns	0,673
beer vs. Lure-M (matrix 2)	44,33	-3,084 to 91,75	No	ns	0,0844
matrix 1 vs. matrix 2	21,67	-25,75 to 69,08	No	ns	0,9088
matrix 1 vs. Lure-S (water)	-1,333	-48,75 to 46,08	No	ns	>0,9999
matrix 1 vs. Lure-S (beer)	-9	-56,42 to 38,42	No	ns	>0,9999
matrix 1 vs. Lure-S (matrix 1)	-23	-70,42 to 24,42	No	ns	0,8691
matrix 1 vs. Lure-S (matrix 2)	2	-45,42 to 49,42	No	ns	>0,9999
matrix 1 vs. Lure-M (water)	12,67	-34,75 to 60,08	No	ns	0,999
matrix 1 vs. Lure-M (beer)	1,667	-45,75 to 49,08	No	ns	>0,9999
matrix 1 vs. Lure-M (matrix 1)	16	-31,42 to 63,42	No	ns	0,9908
matrix 1 vs. Lure-M (matrix 2)	32,67	-14,75 to 80,08	No	ns	0,4288
matrix 2 vs. Lure-S (water)	-23	-70,42 to 24,42	No	ns	0,8691
matrix 2 vs. Lure-S (beer)	-30,67	-78,08 to 16,75	No	ns	0,5245
matrix 2 vs. Lure-S (matrix 1)	-44,67	-92,08 to 2,751	No	ns	0,0799
matrix 2 vs. Lure-S (matrix 2)	-19,67	-67,08 to 27,75	No	ns	0,9525
matrix 2 vs. Lure-M (water)	-9	-56,42 to 38,42	No	ns	>0,9999
matrix 2 vs. Lure-M (beer)	-20	-67,42 to 27,42	No	ns	0,9465
matrix 2 vs. Lure-M (matrix 1)	-5,667	-53,08 to 41,75	No	ns	>0,9999
matrix 2 vs. Lure-M (matrix 2)	11	-36,42 to 58,42	No	ns	0,9998
Lure-S (water) vs. Lure-S (beer)	-7,667	-55,08 to 39,75	No	ns	>0,9999
Lure-S (water) vs. Lure-S (matrix 1)	-21,67	-69,08 to 25,75	No	ns	0,9088
Lure-S (water) vs. Lure-S (matrix 2)	3,333	-44,08 to 50,75	No	ns	>0,9999
Lure-S (water) vs. Lure-M (water)	14	-33,42 to 61,42	No	ns	0,9973
Lure-S (water) vs. Lure-M (beer)	3	-44,42 to 50,42	No	ns	>0,9999
Lure-S (water) vs. Lure-M (matrix 1)	17,33	-30,08 to 64,75	No	ns	0,9819
Lure-S (water) vs. Lure-M (matrix 2)	34	-13,42 to 81,42	No	ns	0,3694
Lure-S (beer) vs. Lure-S (matrix 1)	-14	-61,42 to 33,42	No	ns	0,9973
Lure-S (beer) vs. Lure-S (matrix 2)	11	-36,42 to 58,42	No	ns	0,9998
Lure-S (beer) vs. Lure-M (water)	21,67	-25,75 to 69,08	No	ns	0,9088
Lure-S (beer) vs. Lure-M (beer)	10,67	-36,75 to 58,08	No	ns	0,9998
Lure-S (beer) vs. Lure-M (matrix 1)	25	-22,42 to 72,42	No	ns	0,7943
Lure-S (beer) vs. Lure-M (matrix 2)	41,67	-5,751 to 89,08	No	ns	0,1294
Lure-S (matrix 1) vs. Lure-S (matrix 2)	25	-22,42 to 72,42	No	ns	0,7943
Lure-S (matrix 1) vs. Lure-M (water)	35,67	-11,75 to 83,08	No	ns	0,302
Lure-S (matrix 1) vs. Lure-M (beer)	24,67	-22,75 to 72,08	No	ns	0,8079
Lure-S (matrix 1) vs. Lure-M (matrix 1)	39	-8,417 to 86,42	No	ns	0,1927
Lure-S (matrix 1) vs. Lure-M (matrix 2)	55,67	8,249 to 103,1	Yes	*	0,011
Lure-S (matrix 2) vs. Lure-M (water)	10,67	-36,75 to 58,08	No	ns	0,9998
Lure-S (matrix 2) vs. Lure-M (beer)	-0,3333	-47,75 to 47,08	No	ns	>0,9999
Lure-S (matrix 2) vs. Lure-M (matrix 1)	14	-33,42 to 61,42	No	ns	0,9973

Lure-S (matrix 2) vs. Lure-M (matrix 2)	30,67	-16,75 to 78,08	No	ns	0,5245
Lure-M (water) vs. Lure-M (beer)	-11	-58,42 to 36,42	No	ns	0,9998
Lure-M (water) vs. Lure-M (matrix 1)	3,333	-44,08 to 50,75	No	ns	>0,9999
Lure-M (water) vs. Lure-M (matrix 2)	20	-27,42 to 67,42	No	ns	0,9465
Lure-M (beer) vs. Lure-M (matrix 1)	14,33	-33,08 to 61,75	No	ns	0,9966
Lure-M (beer) vs. Lure-M (matrix 2)	31	-16,42 to 78,42	No	ns	0,5082
Lure-M (matrix 1) vs. Lure-M (matrix 2)	16,67	-30,75 to 64,08	No	ns	0,9869

Table S7. One-way ANOVA and multiple comparison test between species ratios (males and females) for different background matrices. Related to Figure 6.

	MALES					
	Dros'Attract	**apple cider vinegar**	**beer**	**water**	**0.5% acetic acid + 1% ethanol**	**2% acetic acid + 1% ethanol**
Dros'Attract		0.99877	1.00000	0.13619	0.99999	1.00000
apple cider vinegar			0.99715	0.24006	0.99985	0.99977
beer				0.12142	0.99993	0.99996
water					0.16745	0.16134
0.5% acetic acid + 1% ethanol						1.00000
2% acetic acid + 1% ethanol						
	FEMALES					
	Dros'Attract	**apple cider vinegar**	**beer**	**water**	**0.5% acetic acid + 1% ethanol**	**2% acetic acid + 1% ethanol**
Dros'Attract		1.00000	0.99999	0.00246	0.96677	0.98791
apple cider vinegar			0.99997	0.00260	0.97257	0.98458
beer				0.00197	0.93551	0.99625
water					0.00873	0.00095
0.5% acetic acid + 1% ethanol						0.73328
2% acetic acid + 1% ethanol						

Significant *p* values highlighted in yellow

Table S8. One-way ANOVA and multiple comparison test between species ratios (males and females) for different lures and respective background matrices. Related to Figure 6.

	MALES				FEMALES		
	water	water + S	water + M		water	water + S	water + M
water		0.00671	0.03159			0.15740	0.90567
water + S			0.00040				0.09125
water + M							
	0.5% acetic acid + 1% ethanol	**0.5% acetic acid + 1% ethanol + S**	**0.5% acetic acid + 1% ethanol + M**		**0.5% acetic acid + 1% ethanol**	**0.5% acetic acid + 1% ethanol + S**	**0.5% acetic acid + 1% ethanol + M**
0.5% acetic acid + 1% ethanol		0.842837	0.322613			0.176691	0.844168
0.5% acetic acid + 1% ethanol + S			0.160020				0.352509
0.5% acetic acid + 1% ethanol + M							
	2% acetic acid + 1% ethanol	**2% acetic acid + 1% ethanol + S**	**2% acetic acid + 1% ethanol + M**		**2% acetic acid + 1% ethanol**	**2% acetic acid + 1% ethanol + S**	**2% acetic acid + 1% ethanol + M**
2% acetic acid + 1% ethanol		0.51360	0.19221			0.289587	0.159752
2% acetic acid + 1% ethanol + S			0.04424				0.884687
2% acetic acid + 1% ethanol + M							

Significant *p* values highlighted in yellow

SUPPLEMENTARY INFORMATION REFERENCES

S1. Roncoroni, M. & Verstrepen, K. *Belgian Beer: Tested and Tasted*. (Lannoo Publishers, 2018).

S2. Schreurs, M., Piampongsant, S., Roncoroni, M., Cool, L., Herrera-Malaver, B., Vanderaa, C., Theßeling, F. A., Kreft, Ł., Botzki, A., Malcorps, P., Daenen, L., Wenseleers, T. & Verstrepen, K. J. Predicting and improving complex beer flavor through machine learning. *Nat. Commun.* **15,** 2368 (2024).