A FLYWALK-TYPE OLFACTOMETER TO SCREEN THE OLFACTORY ORIENTATION BEHAVIOUR OF TEPHRITIDAE FRUIT FLIES TO A WIDE RANGE OF COMPOUNDS

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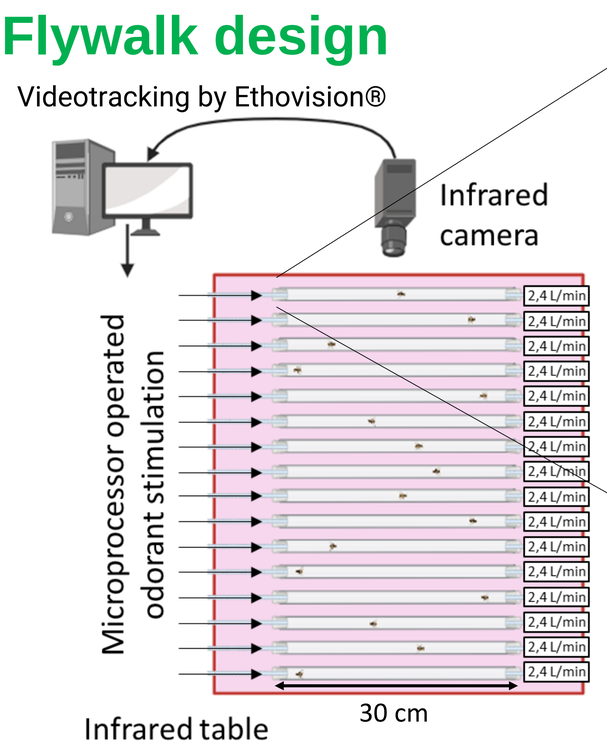
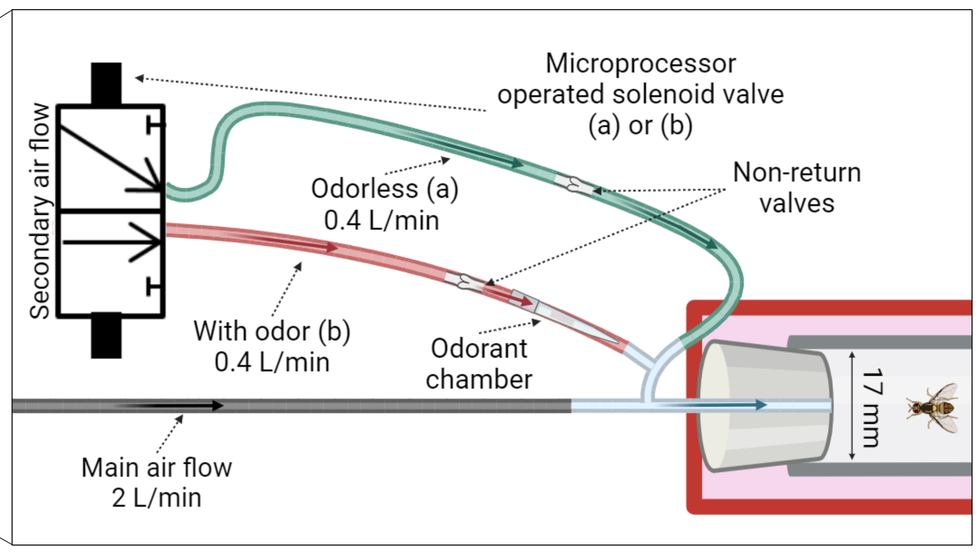
Introduction

The discovery of new attractive compounds to agricultural pests are limited by the experimental effort required to test olfactory orientation behavior. The flywalk olfactometer overcomes this, by measuring at the same time the average orientation of 16 insects in response to the detection of different odors.

Flywalk design

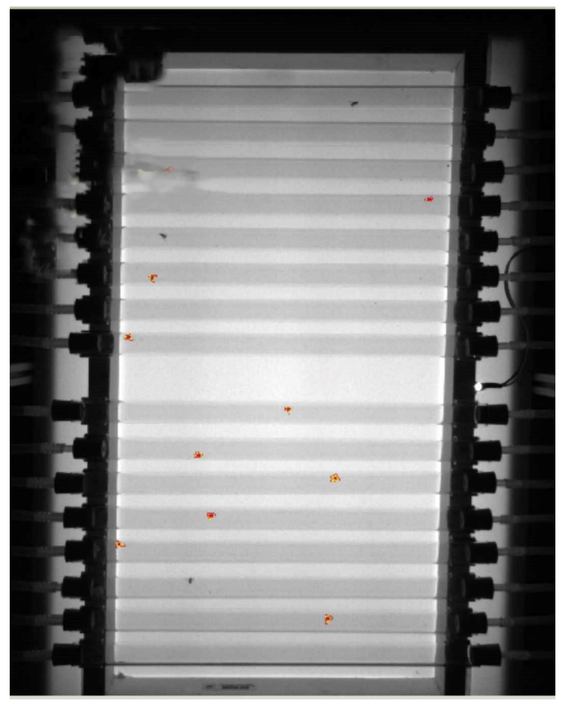


Overview of the Flywalk



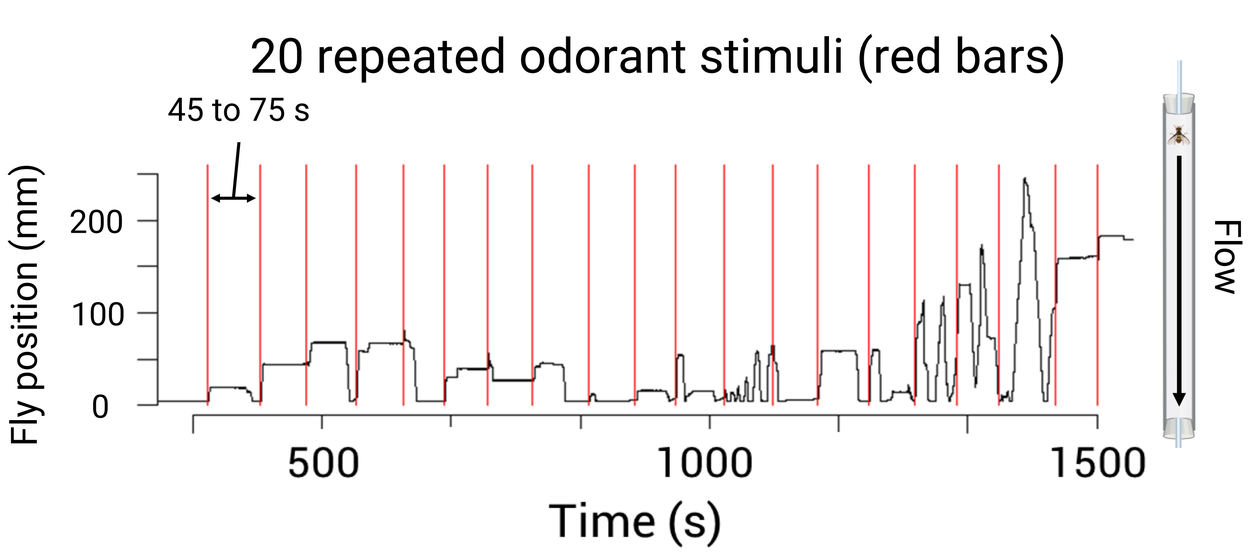
Zoom on microprocessor operated odorant stimulation

At stimulation time (1 sec long), the solenoid valve directs a flow of air through and odorant chamber. Alternatively, the same flow is directed through an odorless tube. It is added a main flow of pure air, which is constantly delivered.

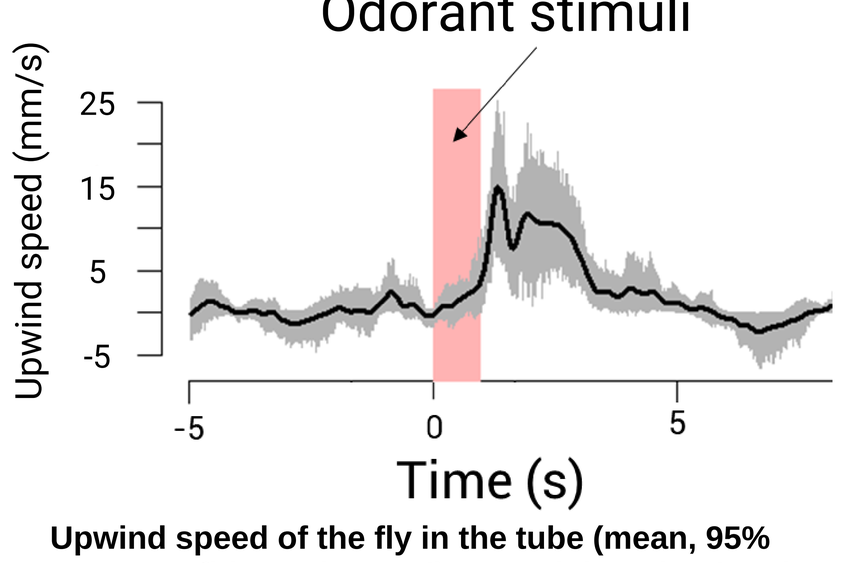


Screenshot of video capture from Ethovision® software

Case study : behavioral response of one fly to an odorant

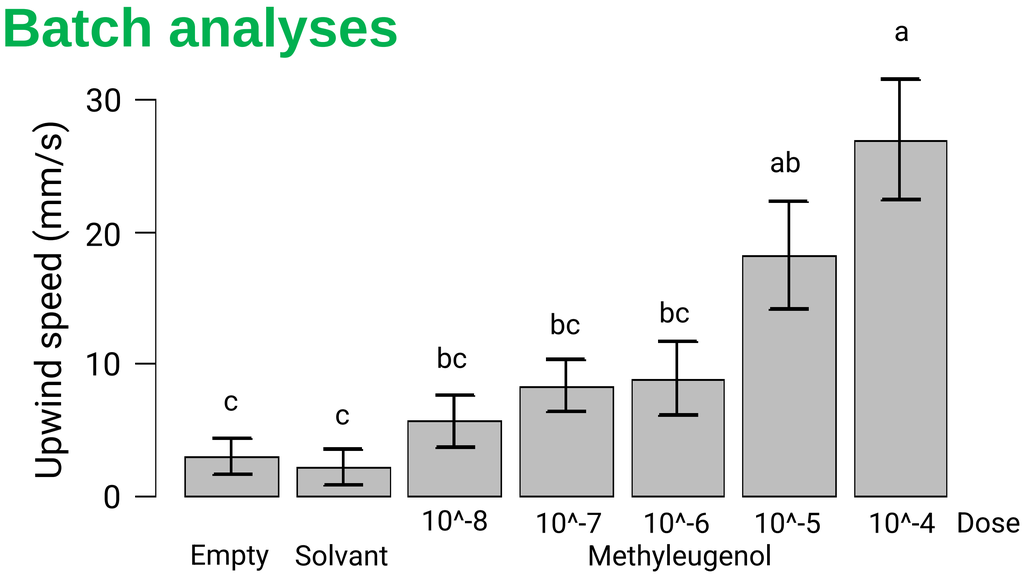


Position of a fly in a tube (in mm) as a function of time (s)

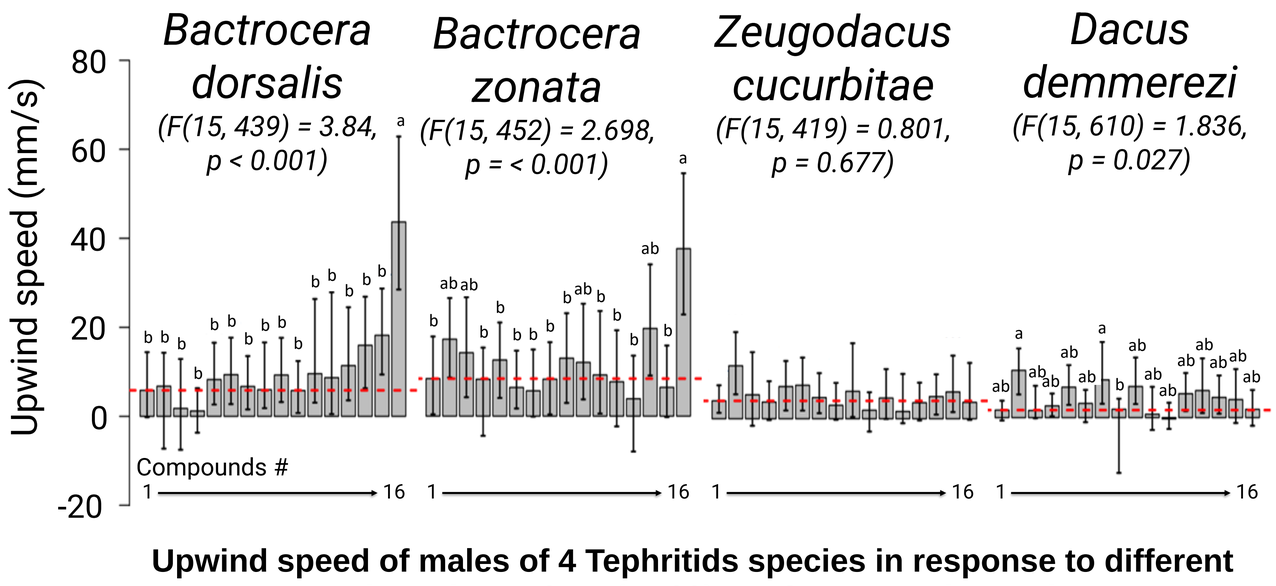


Upwind speed of the fly in the tube (mean, 95% bootstrap confidence interval) around the stimulus time

Batch analyses



Upwind speed (mean, 95% bootstrap confidence interval) of *B. dorsalis* males in reponse to Methyleugenol (ME) at different doses (N=64). ANOVA (F(6, 429) = 10.26, p < 0.001), Post-hoc Tukey test.



Upwind speed of males of 4 Tephritids species in response to different compounds at dose 10^-5 (N=32). ANOVA, Post-hoc Tukey test.

Compounds #

1) Paraffine oil
2) Cuelure
3) 1,7Dioxaspiro[5,5]undecane
4) Ethyl parahydroxybenzoate
5) Raspberry ketone
6) Anisylacetone
7) Dihydroeugenol
8) Alpha-ionol
9) 4-phenyl-2-butanone
10)Trimedlure
11)Alpha-ionone
12)Isophorone
13)Zingerone
14)Methylisoeugenol
15)Isoeugenol
16)Methyleugenol

Conclusion

The flywalk provides a fine quantitative measure of the degree of attraction to an odor. It enables screening for the attraction or repulsion of fruit flies to multiple volatile compounds. It has the potential to accelerate the discovery of new semiochemicals for the biocontrol of agricultural pests and to improve our understanding of the species ecology.