

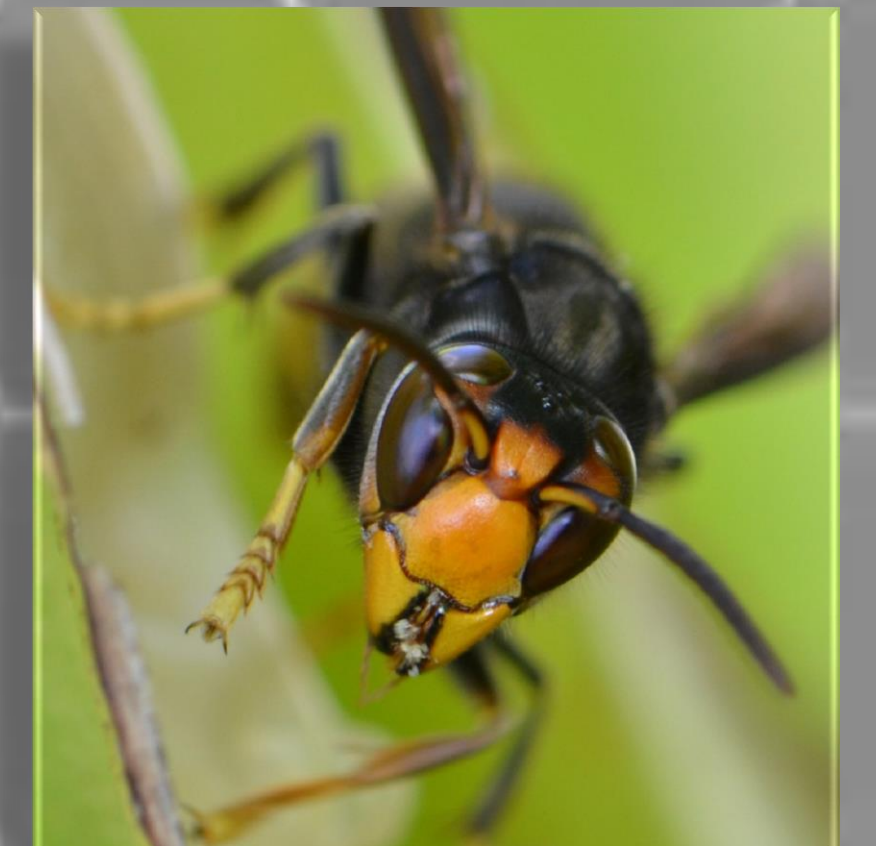
Variations of cuticular hydrocarbons in the invasive hornet *Vespa velutina nigrithorax* in France

The research project "FRELON", supported by the local government (region Centre, France, 2011-2014), (1) analyzes the biology and the ecology of the invasive hornet *Vespa velutina nigrithorax* in Europe, and (2) develops a selective trap against this species. This hornet was accidentally introduced in France from China in 2004. This hornet is a pest in France, because it preys upon domestic honeybees, *Apis mellifera*. Beekeeping operations are affected by this predation, with some beekeepers reporting colony losses. Among different subjects analyzed in the project, we wanted to identify the cuticular hydrocarbons (CHCs) which constitute the chemical signature of this species. These compounds could be used as a tool to identify the colony origin of workers predated in front of bee hives, and could be used to increase the selectivity of a specific trap.

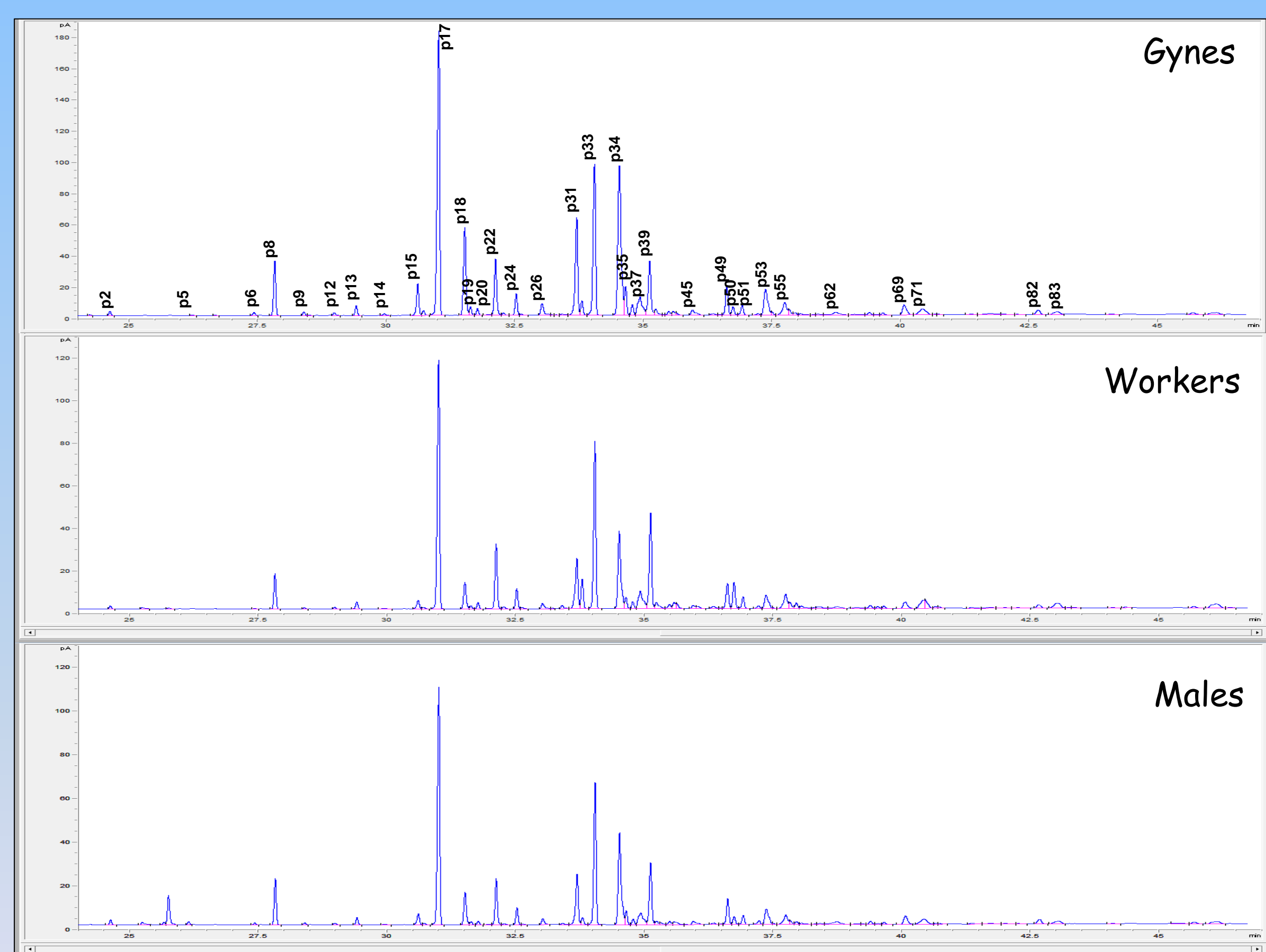
MATERIALS AND METHODS



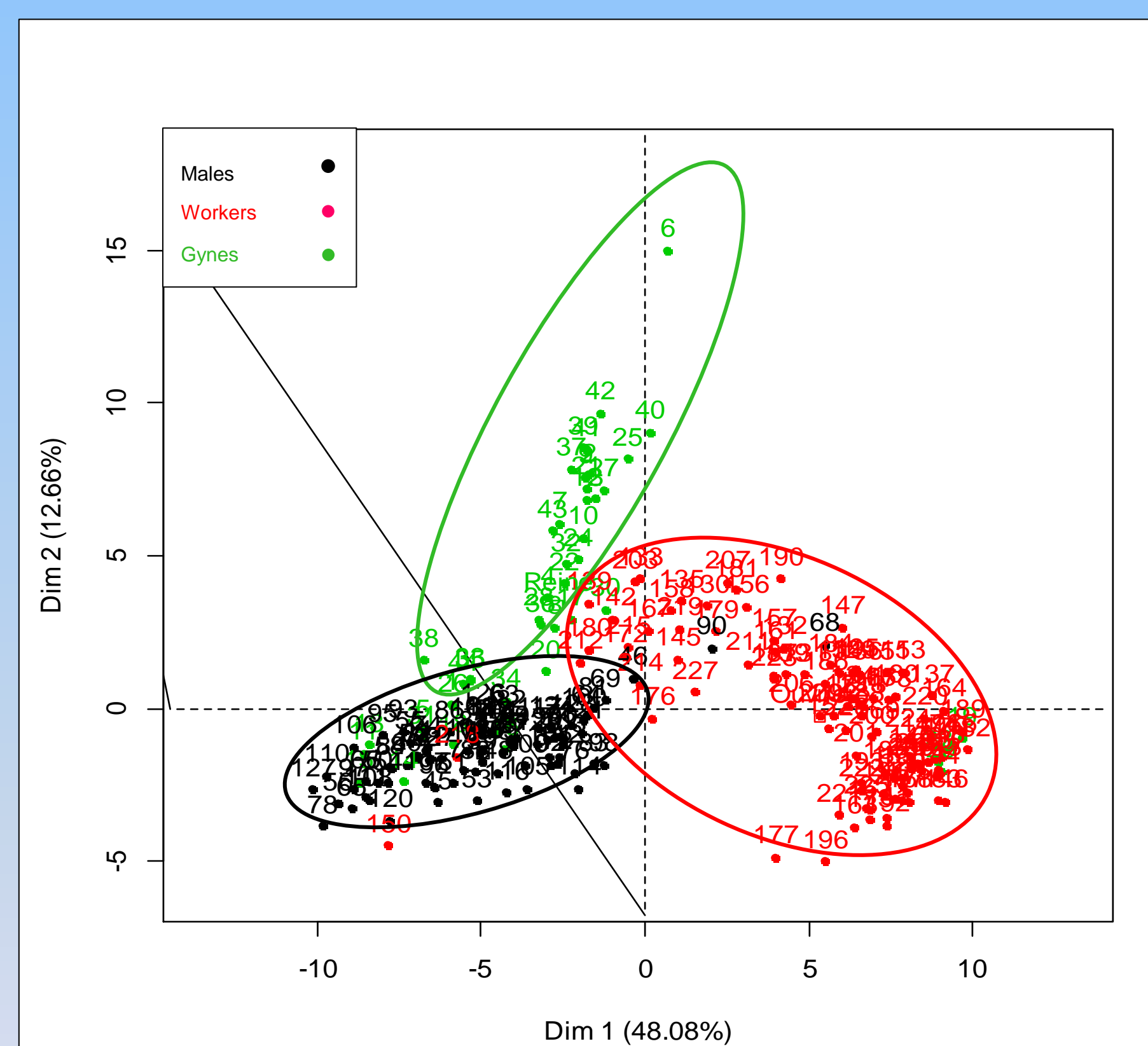
- 10 hornets from each caste (gyne, worker and male) were isolated in 15 colonies.
- Cuticular hydrocarbons (CHCs) were extracted with pentane.
- CHCs were analyzed by GC-FID.
- Compounds were identified by GC-MS for each caste (pools of CHCs from 9 hornets).
- Statistical tests: MANOVA and Principal Component Analysis (PCA)



RESULT 1: CHEMICAL SIGNATURE OF CASTES



CHCs profiles of the three castes (gynes, workers and males). Only the main peaks were selected for more readability.

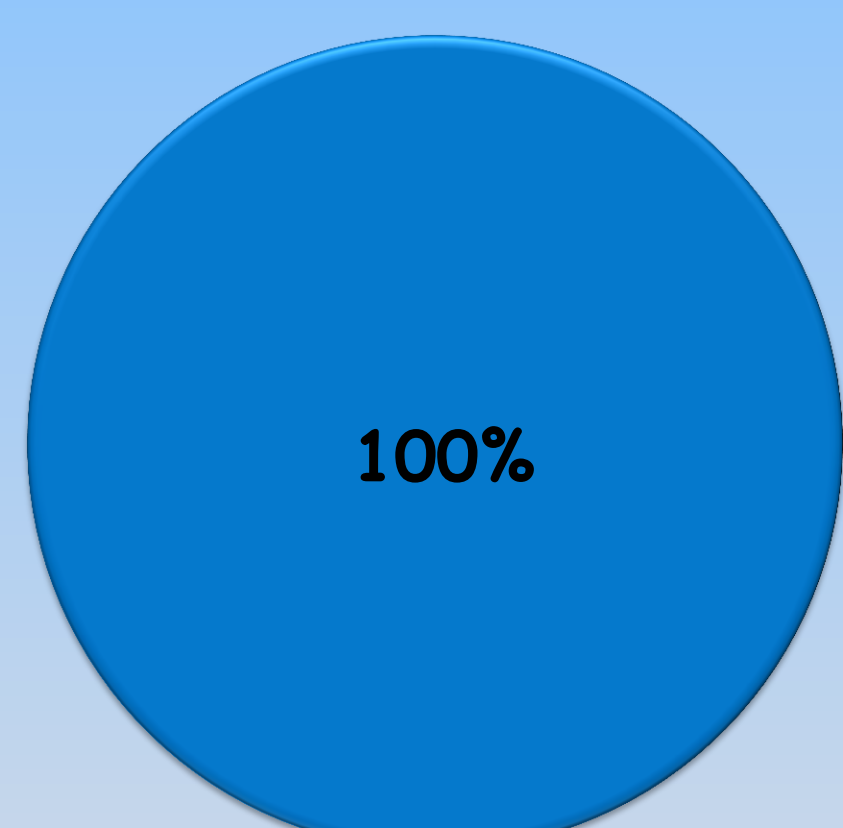


Principal Component Analysis of castes within a colony

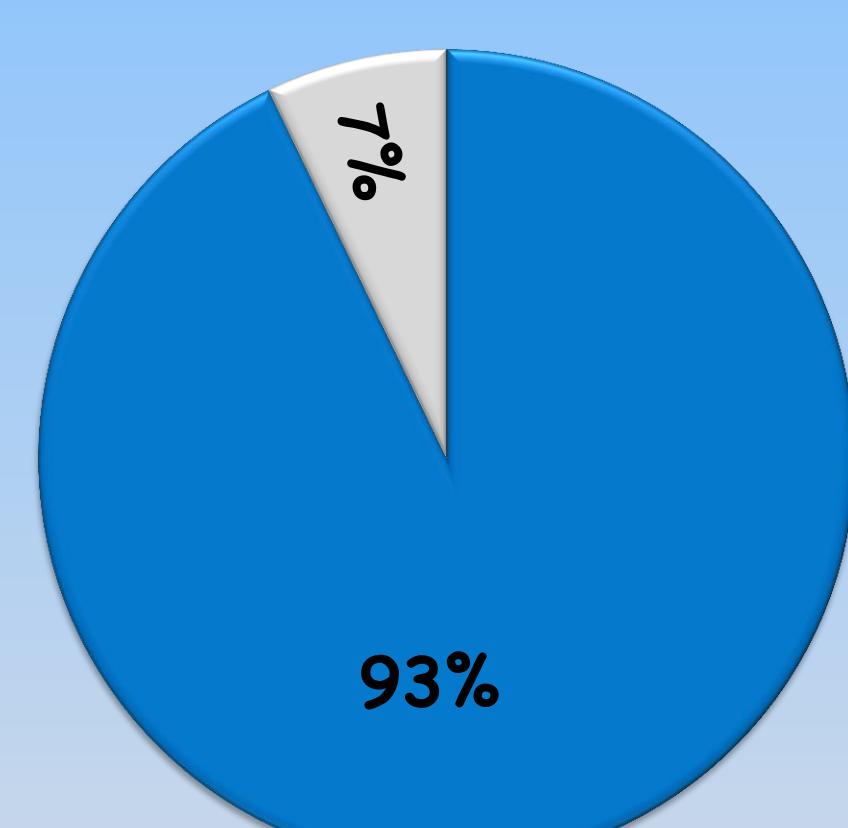
- Among the 95 peaks detected in the chemical signature, only 71 were selected for this study.
- The relative quantity of these 71 CHCs varies according to the castes. Each caste presents a specific chemical signature.

➔ Each caste presents a specific chemical signature in *Vespa velutina*.

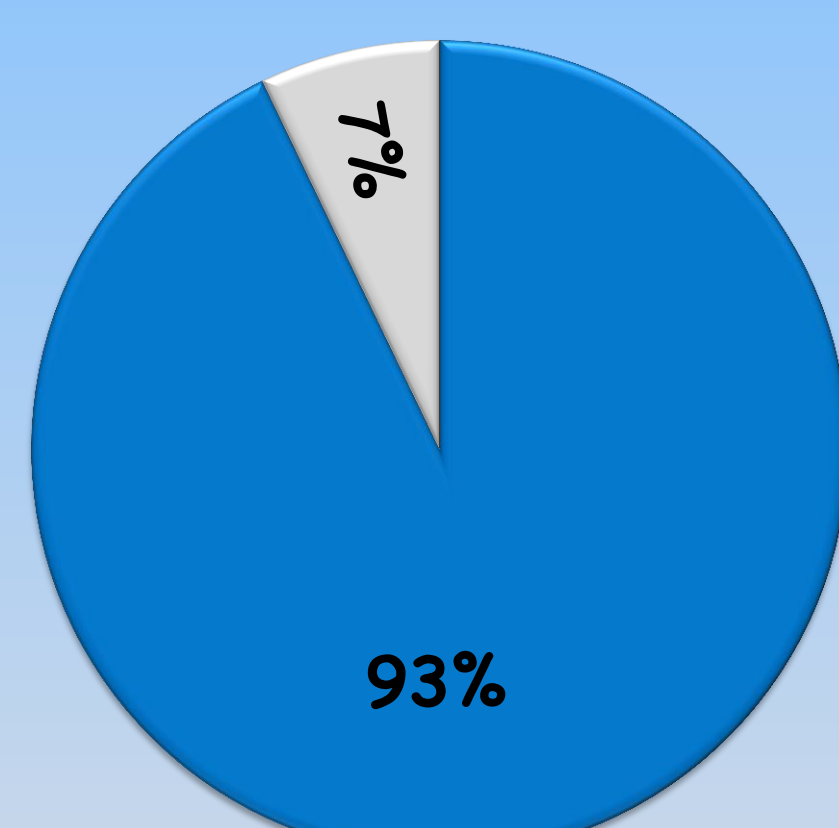
RESULT 2: COLONIAL CHEMICAL SIGNATURE



Males (55 Comparisons)



Workers (28 comparisons)



Gynes (28 comparisons)

■ Chemical signature significantly different at 5%

□ Chemical signature not significantly different at 5%

- CHCs comparisons have been performed between colonies for each caste (10 individuals by caste, colonies comparisons side-by-side).
- For males, 55 comparisons were performed showing a significant difference for chemical signature.
- In both workers and gynes, for 28 respective comparisons, 93% show a significant difference for chemical signature.

➔ *Vespa velutina* presents a colonial signature for each caste in its invasive area.

IDENTIFICATION OF CHCs BY GC-MS

Peaks	Identification
p2	n-C21
p3	11-MeC21
p5	n-C22
p6	C23:1
p7	C23:1
p8	n-C23
p9	11-MeC23
p10	7-MeC23
p11	5-MeC23
p12	3-MeC23
p13	n-C24
p14	12-MeC24
p15	C25:1
p16	C25:1
p17	n-C25
p18	13+11-MeC25
p19	7-MeC25
p20	5-MeC25
p21	C26:1
p22	3-MeC25
p23	5,11+5,9-diMeC25
p24	n-C26
p25	diMe or triMeC25
p26	12+10-MeC26
p27	?
p28	?
p29	?
p30	4-MeC26
p31	C27:1
p32	C27:1
p33	n-C27
p34	13+11+9-MeC27
p35	7-MeC27
p36	5-MeC27
p37	11,15-diMeC27
p38	9,15-diMeC27
p39	3-MeC27
p40	5,15-diMeC27
p41	?
p42	?
p43	n-C28
p44	diMe or triMeC27
p45	12-MeC28
p46	8-MeC28
p47	4-MeC28
p48	C29:2
p49	C29:1
p50	C29:1
p51	n-C29
p52	?
p53	13+11+9-MeC29
p54	7-MeC29
p55	11,15+11,17-diMeC29
p56	3-MeC29
p57	5,17-diMeC29
p58	n-C30
p62	4-MeC30
p65	C31:1
p66	?
p67	n-C31
p69	15+13+11-MeC31
p70	?
p71	11,15-diMeC31
p80	C33:1
p81	n-C33
p82	15+13+11-MeC33
p83	11,19+11,17-diMeC33
p88	?
p93	11-MeC35
p94	13,19+11,17-diMeC35
p95	?

■ Males specific CHCs
 ■ Workers specific CHCs
 ■ Gynes specific CHCs

CONCLUSIONS

- The chemical signature (CHCs) of *V. velutina* was analyzed in this study.
- Hornets present a specific chemical signature which is linked to their sex, caste and colonial origin.
- The identification of these CHCs could allow us for further studies, for example: How these compounds are perceived by individuals? Could they have an attractive or repulsive effect? Could they be used for the elaboration of a selective trap?