

# Peeking into the Stingers: A Comprehensive SWATH-MS Study of the European Hornet *Vespa crabro* (Linnaeus, 1758) (Hymenoptera: Vespidae) Venom Sac Extracts

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**Table S1.** Proteins from class Insecta with upregulated expression in *Vespa crabro* gynes venom sac extract.

Protein	Uniprot code	Species	P Value ( <i>t</i> test)	FC (VSE-G/VSE-W)
<b>Glycogen debranching enzyme family</b>				
Glycogen debranching enzyme	A0A7M7M151	<i>Apis mellifera</i>	0.004	40.141
<b>Hexokinase family</b>				
Phosphotransferase	A0A6P5HFS8	<i>Bombus terrestris</i>	< 0.001	15.077
	A0A154PKM2	<i>Dufourea novaeangliae</i>	0.004	2.744
<b>Class I fructose-bisphosphate aldolase family</b>				
Fructose-bisphosphate aldolase	V9IF40	<i>Apis cerana</i>	< 0.001	12.933
<b>Calponin family</b>				
Transgelin	A0A7M7GX24	<i>Apis mellifera</i>	0.006	12.766
	A0A6P3UBY6	<i>Bombus terrestris</i>	< 0.001	4.731
<b>Glycogen phosphorylase family</b>				
Alpha-1,4 glucan phosphorylase	A0A6P5I5Q8	<i>Bombus terrestris</i>	< 0.001	10.623
	A0A154PP88	<i>Dufourea novaeangliae</i>	< 0.001	10.014
	A0A7M7GQ45	<i>Apis mellifera</i>	0.001	6.047
<b>Actin family</b>				
Actin, indirect flight muscle	V9IG73	<i>Apis cerana</i>	0.028	10.101
actin-interacting protein 1 isoform X1	A0A6P3DB16	<i>Bombus terrestris</i>	0.004	4.993
<b>Heat shock protein family</b>				
heat shock protein beta-1 isoform X2	A0A6P3DLV5	<i>Bombus terrestris</i>	< 0.001	9.777
heat shock 70 kDa protein 4 isoform X2	A0A6P3UJ18	<i>Bombus terrestris</i>	0.018	1.761
<b>Protein kinase superfamily, CAMK Ser/Thr protein kinase family</b>				
Titin	A0A833W593	<i>Frieseomelitta varia</i>	< 0.001	7.688

twitchin isoform X2	A0A6P5I2Y9	<i>Bombus terrestris</i>	0.003	12.711
Twitchin	A0A154PIM3	<i>Dufourea novaeangliae</i>	0.002	2.201
<b>WD repeat EIF2A family</b>				
Eukaryotic translation initiation factor 2A	A0A7M7RBB8	<i>Apis mellifera</i>	< 0.001	7.264
<b>GPI family</b>				
Glucose-6-phosphate isomerase	R9QKY2	<i>Bombus humilis</i>	0.042	6.371
<b>ATPase alpha/beta chains family</b>				
ATP synthase subunit beta	A0A833VWR2	<i>Frieseomelitta varia</i>	0.016	5.725
ATP synthase subunit alpha	V9IFD6	<i>Apis cerana</i>	0.046	2.512
<b>Alpha-ketoglutarate dehydrogenase family</b>				
oxoglutarate dehydrogenase	A0A154P1T4	<i>Dufourea novaeangliae</i>	0.044	5.271
<b>Citrate synthase family</b>				
Citrate synthase	A0A154PEK6	<i>Dufourea novaeangliae</i>	< 0.001	5.199
<b>6-phosphogluconate dehydrogenase family</b>				
6-phosphogluconate dehydrogenase, decarboxylating	A0A833W8Q7	<i>Frieseomelitta varia</i>	0.041	4.594
<b>Malic enzymes family</b>				
Malic enzyme	A0A154PKU8	<i>Dufourea novaeangliae</i>	< 0.001	4.534
	A0A6P3DJM2	<i>Bombus terrestris</i>	0.013	2.787
	A0A833S1K4	<i>Frieseomelitta varia</i>	0.016	2.013
<b>Phosphohexose mutase family</b>				
phosphoglucomutase (alpha-D-glucose-1,6-bisphosphate-dependent)	A0A154PH97	<i>Dufourea novaeangliae</i>	0.005	4.135
<b>Class-I pyridoxal-phosphate-dependent aminotransferase family</b>				
alanine transaminase	V9IKQ3	<i>Apis cerana</i>	< 0.001	3.878
<b>Cation transport ATPase (P-type) (TC 3.A.3) family</b>				
Calcium-transporting ATPase	A0A833WFE3	<i>Frieseomelitta varia</i>	0.025	3.694
<b>ATPase alpha/beta chains family</b>				
H(+)-transporting two-sector ATPase	A0A833W0Z5	<i>Frieseomelitta varia</i>	0.016	3.562
<b>Classic translation factor GTPase family</b>				
Elongation factor 1-alpha	A0A154P1Q6	<i>Dufourea novaeangliae</i>	0.026	3.388
<b>Transaldolase family</b>				
Transaldolase	A0A154P208	<i>Dufourea novaeangliae</i>	< 0.001	3.150
<b>Pyruvate kinase family</b>				
Pyruvate kinase	A0A154PSS0	<i>Dufourea novaeangliae</i>	0.001	3.112

<b>MDH type 1 family</b>				
Malate dehydrogenase	A0A154PN63	<i>Dufourea novaeangliae</i>	0.007	3.004
<b>Actin-binding proteins ADF family</b>				
Cofilin/actin-depolymerizing factor	V9II66	<i>Apis cerana</i>	< 0.001	2.025
<b>Peptidase M1 family</b>				
Aminopeptidase	A0A833S8G1	<i>Frieseomelitta varia</i>	0.007	1.924
<b>Succinate/malate CoA ligase beta subunit family</b>				
Succinate--CoA ligase [ADP-forming] subunit beta, mitochondrial	A0A833SBT7	<i>Frieseomelitta varia</i>	0.044	1.901
<b>No family described</b>				
UTP--glucose-1-phosphate uridylyltransferase	A0A6P3UDI8	<i>Bombus terrestris</i>	0.021	2.284
Stress-induced-phosphoprotein 1	V9IJY9	<i>Apis cerana</i>	0.004	3.752
Phosphoglycerate kinase	A0A6P3U6Z7	<i>Bombus terrestris</i>	0.045	2.293
Myosin light chain alkali	V9IF54	<i>Apis cerana</i>	0.039	30.289
muscle LIM protein Mlp84B isoform X2	A0A7M7TFB5	<i>Apis mellifera</i>	0.016	34.597
Multifunctional fusion protein	A0A6P3DM36	<i>Bombus terrestris</i>	0.049	2.005
LOW QUALITY PROTEIN: protein dj-1beta	A0A6P3DG00	<i>Bombus terrestris</i>	0.001	4.927
lamin-C isoform X2	A0A6P3U6Y5	<i>Bombus terrestris</i>	0.001	3.327
Lactoylglutathione lyase	A0A6P3UJ80	<i>Bombus terrestris</i>	0.006	2.104
Glyceraldehyde-3-phosphate dehydrogenase	A0A6P3DDE1	<i>Bombus terrestris</i>	0.002	10.925
Glutathione S-transferase	V9IJF3	<i>Apis cerana</i>	< 0.001	7.419
Amphiphysin	V9ILS0	<i>Apis cerana</i>	0.001	4.341
alpha-actinin, sarcomeric isoform X1	A0A6P3U6D2	<i>Bombus terrestris</i>	0.001	5.621
aldose reductase	A0A7M7RB96	<i>Apis mellifera</i>	0.001	4.080
1,4-alpha-glucan branching enzyme	A0A6P3TVX5	<i>Bombus terrestris</i>	0.031	9.448
Vitellogenin	G8IIT0	<i>Vespula vulgaris</i>	< 0.001	17.755
troponin T, skeletal muscle isoform X3	A0A6P5I4V8	<i>Bombus terrestris</i>	0.004	6.312
troponin C type I isoform X3	A0A7M7GV60	<i>Apis mellifera</i>	0.033	2.457
talin-1 isoform X1	A0A7M7SRL2	<i>Apis mellifera</i>	0.038	1.779
LIM domain-binding protein	A0A2A3EBK6	<i>Apis cerana cerana</i>	0.007	2.388
Nidogen	A0A833W2G7	<i>Frieseomelitta varia</i>	0.007	2.081
Chemosensory protein	Q5Q049	<i>Vespa crabro</i>	< 0.001	3.476
peptidylprolyl isomerase	V9IL23	<i>Apis cerana</i>	0.041	1.594

VSE-G, *Vespa crabro* gyne venom sac extract; VSE-W, *Vespa crabro* worker venom sac extract; FC (VSE-G/VSE-W), fold change of gyne/worker; FC > 1, upregulated protein in VSE-G; Statistical differences by *t* Test, *p* < 0.05.

**Table S2.** Proteins from class Insecta with downregulated expression in *Vespa crabro* gynes venom sac extract.

Protein	Uniprot code	Species	P Value ( <i>t</i> test)	FC (VSE-G/VSE-W)
<b>CRISP family</b>				
Venom allergen 5	P0DMB9	<i>Vespa velutina</i>	0.006	0.026
<b>Lipase family</b>				
Phospholipase A1	C0HLL3	<i>Vespa velutina</i>	< 0.001	0.052
Phospholipase A1 verutoxin-2b	P0DMB8	<i>Vespa velutina</i>	0.041	0.089
<b>Peroxiredoxin family</b>				
Peroxiredoxin-6	V9IET2	<i>Apis cerana</i>	0.042	0.321
<b>2-oxoacid dehydrogenase family</b>				
Dihydrolipoamide acetyltransferase component of pyruvate dehydrogenase complex	A0A7M7R8J0	<i>Apis mellifera</i>	0.012	0.125
<b>MAM33 family</b>				
Ras-related protein Rab-43	A0A833W2V6	<i>Frieseomelitta varia</i>	0.011	0.136
<b>Prohibitin family</b>				
Prohibitin	V9IIF6	<i>Apis cerana</i>	0.412	0.148
<b>Glycosyl hydrolase family</b>				
Hyaluronidase A	C0HLL4	<i>Vespa velutina</i>	0.001	0.148
Hyaluronidase B	C0HLL5	<i>Vespa velutina</i>	< 0.001	0.280
Alpha-galactosidase	A0A7M7H421	<i>Apis mellifera</i>	0.001	0.390
<b>Peptidase family</b>				
Aminopeptidase	A0A154PMQ1	<i>Dufourea novaeangliae</i>	0.021	0.186
	A0A833RCD6	<i>Frieseomelitta varia</i>	0.013	0.325
Proteasome subunit alpha type	A0A833W9A3	<i>Frieseomelitta varia</i>	< 0.001	0.313
<b>Cu-Zn superoxide dismutase family</b>				
Superoxide dismutase [Cu-Zn]	A0A7M7MMK3	<i>Apis mellifera</i>	< 0.001	0.205
<b>Aldehyde dehydrogenase family</b>				
Retinal dehydrogenase	A0A2A3EJU2	<i>Apis cerana cerana</i>	0.028	0.257
<b>Glyceraldehyde-3-phosphate dehydrogenase family</b>				
Glyceraldehyde-3-phosphate dehydrogenase	A0A088AHC8	<i>Apis mellifera</i>	< 0.001	0.274
<b>NAD-dependent glycerol-3-phosphate dehydrogenase family</b>				

Glycerol-3-phosphate dehydrogenase [NAD(+)]	A0A154PH44	<i>Dufourea novaeangliae</i>	0.022	0.308
<b>Triosephosphate isomerase family</b>				
Triosephosphate isomerase	A4ZXC4	<i>Apis mellifera</i>	0.016	0.282
<b>Class-I pyridine nucleotide-disulfide oxidoreductase family</b>				
Dihydrolipoyl dehydrogenase	A0A7M7R758	<i>Apis mellifera</i>	0.034	0.369
<b>Heat shock protein family</b>				
Heat shock protein 83	A0A154PI85	<i>Dufourea novaeangliae</i>	0.047	0.604
<b>No family described</b>				
carbonyl reductase (NADPH)	A0A6P3DFV2	<i>Bombus terrestris</i>	0.047	0.193
Chemosensory protein 1	A0A384ZVP9	<i>Vespa velutina</i>	0.001	0.302
Calcium-transporting ATPase	A0A6P5I2P0	<i>Bombus terrestris</i>	0.030	0.249
Hornet silk protein Vssilk 4	D6RU88	<i>Vespa xanthoptera</i>	0.032	0.312
Hornet silk protein Vssilk 3	A9CMG8	<i>Vespa xanthoptera</i>	0.033	0.454
Dipeptidylpeptidase IV	A4UA14	<i>Vespa basalis</i>	0.015	0.216
Anticoagulant serine protease	B7SD94	<i>Vespa magnifica</i>	< 0.001	0.150
Calmodulin	V9I7W9	<i>Apis cerana</i>	0.025	0.052
alpha-glucosidase	L7ZBB3	<i>Apis cerana indica</i>	< 0.001	0.066
	Q25BT7	<i>Apis mellifera</i>	0.005	0.225
	A0A6P3DPJ9	<i>Bombus terrestris</i>	0.037	0.301
uncharacterized protein LOC100642610	A0A6P3U365	<i>Bombus terrestris</i>	0.025	0.114

VSE-G, *Vespa crabro* gyne venom sac extract; VSE-W, *Vespa crabro* worker venom sac extract; FC (VSE-G/VSE-W), fold change of gyne/worker; FC > 1, upregulated protein in VSE-G; Statistical differences by *t* Test, *p* < 0.05.