

Mengling Chen

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EDUCATION:

- B.Sc in Agriculture in Plant protection** GPA:3.4/5.0 (Sep'16- July'20)
College of Plant Protection, Southwest University (Project 211 university), Chongqing, China
Thesis title: "Functional analysis of UGTs based on RNAi involved in malathion resistance in *Bactrocera dorsalis*"
- M.Sc in Agricultural Entomology and Pest Control** GPA:4.1/5.0 (Sep'20- July'23)
College of Plant Protection, Southwest University (Project 211 university), Chongqing, China
Thesis title: "Molecular mechanism of malathion resistance mediated by overexpression of *BdUGT301D2/BdUGT429A1* regulated by *BdCncC/BdMaf-K* in *Bactrocera dorsalis*"
- PhD Candidate in Laboratory of Molecular Entomology** (Sep'23- Present)
Department of Biology, University of Crete, Crete, Greece
Thesis title: "Functional genetic analysis of complex insecticide resistance mechanisms in mosquitoes"

RESEARCH EXPERIENCES:

Key Laboratory of Entomology and Pest Control Engineering, Southwest University

***BdCncC/BdMaf-K* regulates *BdUGT301D2/429A1* and participates in the resistance function of *Bactrocera dorsalis* to malathion** (Mar'17- Aug'23)

- The UGT enzymes played an important role in malathion resistant strains (MR) in *B. dorsalis* by synergistic experiment and enzyme specific activity measurement. 31 UGT genes were identified based on *B. dorsalis* genome database (**Publication 1**), and *UGT301D2/429A1* was up-regulated in MR strains. IHC and RT-qPCR were used to identify the specific expression of the two genes in midgut and Malpighian tubules.
- Based on the RNAi, molecular docking and heterologous expression, then identified *UGT301D2/429A1* could obstruct malathion in *B. dorsalis*. To verify what lead to the up-regulation of *UGT301D2/429A1*, we used the online prediction, RNAi, dual luciferase reporter system etc. It was proved that *CncC/Maf-K* transcription factor pathway regulated the up-regulated expression of two UGT genes (**In preparation**).

Knockdown *Bdorβ1* affects the susceptibility to neonicotinoids in *B. dorsalis* (Dec'17- Dec'18)

- Identified and characterized the *Bdorβ1* (**Publication 4**), then analyzed the temporal and spatial expression profiles. After the *Bdorβ1* was silenced by double micro-injection, the reduction of *Bdorβ1* decreased susceptibility to oxy-bridge trans-neonicotinoids (including imidacloprid, thiamethoxam, dinotefuran), but not to cis-nitromethylene neonicotinoid (cyclozaprid).

Knockout *Bda6* by CRISPR/cas9 confers the spinosyns resistance in *B. dorsalis* (Apr'20- Aug'23)

- Using the CRISPR/Cas9 genome-editing system, a homozygous strain (*Bda6*-KO) with 13-bp deletion caused a premature truncation of *Bda6* was successfully constructed. Insecticide bioassay showed that *Bda6*-KO 24.3-fold higher resistance to spinosad.

ceRNA regulatory network mediated cuticular penetration resistance in *B. dorsalis* (Feb'18- Feb'23)

- In MR strains, abundant *lnc19419* (**Publication 7**) sponge miR-994, weakened the regulation of miR-994 to CPCFC, causing up-regulation of CPCFC. In addition, the critical chitin synthetase *CHS* up-regulated in MR strains increased chitin. The abundant CPCFC protein and chitin combined result in cuticular thickening and form insecticide penetration resistance (**Publication 2**).

Multiple GSTs up-regulated in MR strains could metabolize malathion and malaoxon (Feb'18- Feb'23)

- GSTd5* (**Publication 3**) and *GSTd9* (**Publication 8**) were up-regulated in MR strains, and analyzed the temporal and spatial expression profiles. After decreasing the expression of GST genes by RNAi, their resistance to malathion was reduced. The results of 3D structure simulation, molecular docking and heterologous expression showed that GST protein could metabolize malathion and its toxic oxide malaoxon.

Weekly lab seminars and guest expert reports (Dec'16- Aug'23)

- Reported research progress and literature review regularly, host seminars or took meeting minutes regularly

PROFESSIONAL SKILLS

- Gene cloning, RT-qPCR, bioassay, protein expression, Immunofluorescence assays, heterologous substance metabolism, Western Blot
- RNAi, CRISPR/Cas 9, mammalian and insect cell culture (CHO and Sf9) and dual-luciferase reporter system
- Basic bioinformatics analysis, Polo plus, protein 3D structure simulation and molecular docking

PUBLICATION

- [1] **Chen ML**, Zhang SX, Guo PY, Qin QS, Meng LW, Yuan GR[#], Wang JJ[#]. Identification and characterization of UDP-glycosyltransferase genes and the potential role in response to insecticides exposure in *Bactrocera dorsalis*. **Pest Management Science**. 2023, 79: 666-677.
- [2] Meng LW⁺, Yuan GR⁺, **Chen ML**, Zheng LS, Dou W, Peng Y, Bai WJ, Li ZY, John Vontas, Wang JJ[#]. Cuticular competing endogenous RNAs regulate insecticide penetration and resistance in a major agricultural pest. **BMC Biology**. 2023, 21: 187. ⁺ Contribute equally
- [3] Zhang SX⁺, **Chen ML**⁺, Meng LW, Dou W, Wang JJ, Yuan GR[#]. Functional analysis of an overexpressed glutathione S-transferase *BdGSTd5* involved in malathion and malaoxon detoxification in *Bactrocera dorsalis*. **Pesticide Biochemistry and Physiology**. 2023, 194: 105498. ⁺ Contribute equally
- [4] Yuan GR⁺, **Chen ML**⁺, Peng ML, Lei W, Meng LW, Dou W, Wang JJ[#]. Knockdown of a nicotinic acetylcholine receptor subunit gene *Bdorβ1* decreases susceptibility to oxa-bridged *trans*- instead of *cis*-nitromethylene neonicotinoid insecticides in *Bactrocera dorsalis*. **Journal of Agricultural and Food Chemistry**. 2022, 70: 13554-13562. ⁺ Contribute equally
- [5] Meng LW, **Chen ML**, Yuan GR, Zheng LS, Dou W, Peng Y, Zhang SX, Wang JJ[#]. An antenna-abundant glutathione S-transferase *BdGSTd8* participates in detoxification of two organophosphorus insecticides in *Bactrocera dorsalis* (Hendel). **Journal of Agricultural and Food Chemistry**. 2023, 71: 8400-8412.
- [6] Li ZY, **Chen ML**, Bai WJ, Zhang SX, Meng LW, Dou W, Wang JJ, Yuan GR[#]. Identification, expression profiles and involvement in insecticides tolerance and detoxification of carboxylesterase genes in *Bactrocera dorsalis*. **Pesticide Biochemistry and Physiology**. 2023, 193: 105443.
- [7] Meng LW⁺, Yuan GR⁺, **Chen ML**, Dou W, Jing TX, Zheng LS, Peng ML, Bai WJ, Wang JJ[#]. Genome-wide identification of long non-coding RNAs (lncRNAs) associated with malathion resistance in *Bactrocera dorsalis*. **Pest Management Science**. 2021, 77: 2292-2301.
- [8] Meng LW, Peng ML, **Chen ML**, Yuan GR, Zheng LS, Bai WJ, Smagghe G[#], Wang JJ[#]. A glutathione S-transferase (*BdGSTd9*) participates in malathion resistance via directly depleting malathion and its toxic oxide malaoxon in *Bactrocera dorsalis* (Hendel). **Pest Management Science**. 2020, 76: 2557-2568.
- [9] Yang L, Tian Y, Fang Y, **Chen ML**, Smagghe G, Niu JZ[#], Wang JJ[#]. A saliva alpha-glucosidase MpAgC2-2 enhance the feeding of green peach aphid *Myzus persicae* via extra-intestinal digestion. **Insect Biochemistry and Molecular Biology**. 2022, 150: 103846.
- [10] Yuan CY, Jing TX, Li W, Liu XQ, Liu TY, Liu Y, **Chen ML**, Jiang RX, Yuan GR, Dou W[#], Wang JJ[#]. NADPH-cytochrome P450 reductase mediates the susceptibility of Asian citrus psyllid *Diaphorina citri* to imidacloprid and thiamethoxam. **Pest Management Science**. 2020, 77: 677-685.

CONFERENCES:

- Chinese Entomological Society 2021 Annual Conference, Shaanxi, China (oral presentation)
- The 4th International Conference of Insect Genomics & The 7th International Symposium on Insect Physiology, Biochemistry and Molecular Biology, 2019, Chongqing, China (present)
- Chinese Entomological Society 2019 Annual Conference, Guilin, China (present)

HONOR, AWARDS AND PROJECTS:

- **National scholarship** for Postgraduates of China (Dec'21)
- Chongqing Outstanding Student Cadre (June'20)
- Chongqing Innovation Advanced Individual Student (June'20)
- Chongqing Merit student (June'23)
- Chongqing excellent postgraduates student (June'23)
- "Academic Exchange Report" in the 2nd National College Students Plant Protection Professional Ability Contest (Second prize) (Sep'19)
- First Class Academic Scholarship of Southwest University (Dec'20, Dec'21)
- First Class Scholarship of Southwest University (Dec'18, Dec'19)
- **National Student's Program** for Innovation and Entrepreneurship Training Program, China (201910635037) (May'19-May'20)
- Chongqing Graduate Scientific Research Innovation Project (CYS21125) (June'21-June'22)

WORK AND VOLUNTARY EXPERIENCE:

- Served as class monitor and grade leader (Sep'16-June'20)
- **International Conference Volunteer**
The 18th China International Agricultural Products Fair, Chongqing, China (Dec'20)

HOBIES

- Basketball
- Table tennis
- Badminton
- Swimming