

Curriculum vitae

DEVI SHANKAR SUMAN, Ph.D.

Scientist – D,
Diptera Section,
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Research Interest

My research programme focuses on the medical and veterinary pest, especially mosquitoes and their interactions host and environment. Ecological interactions to mosquitoes influenced their distribution, alterations in survival and reproductive strategies leading to speciation and evolution of variants in the population. These variants are mostly morphologically indistinguishable, however, can be varied in biological potentials and identified by using molecular and electron microscopy. The knowledge on species diversity, ecological interactions, species complex, vectorial capacity, behaviour and effective control measures helps in the development of suitable vector management strategies. My vision is to identify and characterize variants from the species complex, establish their role in disease transmission and finding effective control measures.

EDUCATION

Post-Doctoral Associate in Vector biology & control Rutgers University, New Brunswick, NJ, USA	2010 – 2015
Ph.D. in Zoology Jiwaji University, Gwalior, India	2004 – 2009
Masters of Science in Zoology Jiwaji University, Gwalior, India	2000 – 2002
Bachelor of Science in Biology Jiwaji University, Gwalior, India	1998 – 2000

PROFESSIONAL EXPERIENCES

RESEARCH

Scientist –D

Zoological Survey of India, Kolkata, India

2017-Present

Assessment of mosquito and other dipteran fauna of India for their ecological, medical, veterinary and agricultural importance.

Research Associate,

Center for Vector Biology, Rutgers University, NJ, USA

2015 – 2017

- Managed NIH-funded project on the development of an autodissemination strategy to control of container mosquitoes, particularly *Aedes albopictus*, The Asian tiger mosquito, and *Aedes aegypti*, using insect growth regulator (IGR).
- Organized operational field trials of an autodissemination device with the collaboration of mosquito control counties utilizing adulticides, larvicides, barrier treatments and egg and adult sampling.
- Served as Project Manager, collaborated with mosquito control counties, USDA lab and companies

- Analyzed results and presenting and publishing of data in scientific meetings and research journals.

Post-Doctoral Associate

Center for Vector Biology, Rutgers University, NJ, USA

2010 – 2015

- Established an autodissemination strategy with insect growth regulator (IGR) for the control of container mosquito, particularly *Aedes albopictus*, The Asian tiger mosquito
- Developed an autodissemination device and oil and powder formulations of pyriproxyfen for autodissemination (Patent applications: WO2012158192 A1, US9265247B2)
- Evaluated conventional insecticidal applications for *Aedes albopictus* such back pack and ULV sprayers
- Estimated insecticidal susceptibility/resistance for adulticide, pupicide, larvicide and an ovicide
- Monitored population dynamics of adults, pupae, larvae and eggs using BGS trap and ovitraps
- Developed a novel artificial dietary system for multiple mosquitoes
- Prepared SOPs for field and laboratory experimentations for evaluation of autodissemination strategies
- Presented at scientific meetings and published research in peer reviewed journal
- Provided training and supervision to mosquito control county teams and quality control for various aspects of project

Research Fellow (Junior and Senior Research Fellow)

Defence Research & Development Establishment, Gwalior, India

2004 – 2009

- Identified mosquitoes and conducted population dynamics studies using adult and larval sampling
- Established ecological variations among strains of mosquitoes from desert, semi-desert and costal region using life-table parameters, SEM morphology, and genetic diversity studies
- Differentiated mosquito species using morphology and morphometrics of eggs SEM
- Genetic polymorphism using DNA isolation, PCR, gene sequencing and genetic analysis
- Established insecticide susceptibility and resistance level in different mosquito populations against pyrethroids, organophosphates, BTI, Neem and insect growth regulators
- Revealed sub-lethal effects of IGRs on survival and reproductive parameters
- Morphologically differentiated male & female *Anopheles* at larval stage with naked eyes

MANAGEMENT

District Vector Borne Disease Control Consultant

2009 – 2010

Ministry of Health, Govt. of India

- Managed district malaria and other vector-borne disease transmission program including malaria, filarial, dengue and chikungunya
- Developed micro-management plan for vector-borne disease control including IRS, larvicidal sprays, population monitoring, disease diagnosis, treatment and drug distribution at different health system levels.
- Supervised malaria inspectors, lab technicians, vector control supervisors and health workers at various district levels.
- Provided technical support to district health society for implementation of guidelines, mosquito control operations, logistic distribution, mosquito surveillance and health personnel training

TEACHING

Assistant Professor (Guest Faculty)

2002–2004

Govt. Post Graduate College, Sheopur, Jiwaji University, India

- Taught, developed curriculum activities and coordinated the graduate students for 2 years in entomology, zoology, and general biology
- Conducted laboratory experiments, seminars, and exams

TRAINING & COURSES

• **National Vector Borne Disease Control Programme, New Delhi**

2009

A three months 'Induction training of District Vector Borne Disease Consultant on Malaria at Public Health Foundation, India in collaboration with **National Vector Borne Disease Control Programme**, New Delhi, **National Institute of Malaria Research**, Delhi & **National Center for Disease Control**, India, Sept-Dec.

- **Defence Research & Development Establishment, Gwalior, India** 2005
Recent trends in biological mass spectrometry, DRDE, Gwalior. 14th – 18th March.
- **Beekeepers Federation, Punjab, India** 2002
A specialized training course in Beekeeping by 15th – 21st July

KNOWLEDGE & SKILLS

- Mosquito identification and surveillance techniques
- Behavioral assays for attractants/repellents and physiological studies.
- Insecticide susceptibility and resistance status monitoring at egg, larvae and adult stages
- Field evaluation of OP, pyrethroids, IGRs, BTI & plant-based insecticides.
- Evaluation of backpack, ultra-low volume, low-volume and handheld insecticide sprayers.
- Insect repellent and attractant evaluation.
- DNA/RNA isolation, PCR, sequencing and molecular phylogenetic analysis
- Life-tables, morphology and morphometrics, SEM, and genetic variation studies
- Design SOPs, conduct experiments and coordinate research with others organizations
- Data analysis, presenting and publishing research in meetings and scientific journals
- Computer skills: Windows operating system, MS office SPSS, SigmaStat, Statgraphic, Sigma plot
- Imaging techniques: Photography, photo editing, Adobe Photoshop

AWARDS AND RECOGNITIONS

- **John L McColgan Grant In Aid: Northeastern Mosquito Control Association (NMCA)** on “A unidirectional non-insecticidal lethal trap for container mosquito surveillance and control”. 2015
- **Best poster presentation** award in International conference on “Biodiversity of Insects: Challenging issues in management and conservation, T.N., India, 118 (2006).
- **Senior Research Fellowship**, Defence Research and Development Organization, India, 2006 – 2009.
- **Junior Research Fellowship**, Defence Research and Development Organization, India, 2004 – 2006.

SCIENTIFIC PUBLICATIONS: 18 published, 2 communicated

1. **Devi S. Suman**, Yi Wang, Gregory M. Williams, Ary Faraji, Eric Williges, Randy Gaugler. 2017. Seasonal field efficacy of pyriproxyfen autodissemination stations against container-inhabiting mosquito *Aedes albopictus* under different habitat conditions. **Pest Management Science**. <http://dx.doi.org/10.1002/ps.4780>
2. Isik Unlu, Gregory Williams, Iliia Rochlin, **Devi Suman**, Yi Wang, Kshitij Chandel, and Randy Gaugler. 2017. Evaluation of lambda-cyhalothrin and pyriproxyfen barrier treatments for *Aedes albopictus* (Diptera: Culicidae) management in urbanized areas of New Jersey. *Journal of Medical Entomology*. doi: 10.1093/jme/tjx216
3. Isik Unlu, **Devi S. Suman**, Yi Wang, Kim Klingler, Ary Faraji, and Randy Gaugler. 2017. Effectiveness of autodissemination stations containing pyriproxyfen in reducing immature *Aedes albopictus* populations. **Parasite & Vectors** . 10:139. DOI 10.1186/s13071-017-2034-7.
4. K. Chandel, **Devi S. Suman**, Yi Wang, Isik Unlu, Eric Williges, Gregory M. Williams, Randy Gaugler. 2016. Utilizing oviposition behavior of *Aedes albopictus* mosquito to control conspecific immatures in cryptic habitats: a pull & push strategy. **PLOS NTD**. DOI:10.1371/journal.pntd.0005235.

5. Devi S. Suman, Yi Wang, Randy Gaugler. 2015. The insect growth regulator pyriproxyfen terminates egg diapause in the Asian tiger mosquito, *Aedes albopictus*. *PLoS One*. 10(6): e0130499. doi:10.1371/journal.pone.0130499. **Impact factor 3.324**
6. Sarwar Hashimi, Yi Wang, Devi Suman, Ranjit S Parhar, Kote Collison, Walter Conca, Futwan Al-Mohanna, Randy Gaugler. 2015. Human cancer: is it linked to dysfunctional lipid metabolism? *Biochimica et Biophysica Acta*. 1850, 352-364. **Impact factor 4.381**
7. Devi S. Suman, Ary Farajollahi, Sean Healy, Gregory M. Williams, Yi Wang, George Schoeler, Randy Gaugler. 2014. Point-source and area-wide field studies of pyriproxyfen autodissemination against urban container-inhabiting mosquitoes. *Acta Tropica* 135, 96-131. **Impact factor 2.270**
8. Yi Wang, Devi S. Suman, Jacques Bertrand, Limin Dong and Randy Gaugler. 2013. Dual treatment autodissemination station with enhanced transfer of an insect growth regulator to mosquito oviposition sites. *Pest Management Science*. 70, 1299–1304. DOI 10.1002/ps.3702. **Impact factor 2.694**
9. Devi S. Suman, Yi Wang, Limin Dong, Randy Gaugler. 2013. Effects of larval habitat substrate on pyriproxyfen efficacy against *Aedes albopictus* (Diptera: Culicidae). *Journal of Medical Entomology*, 50, 1261-1266. **Impact factor 1.953**
10. Devi S. Suman, Yi Wang, Anwar L. Bilgrami, Randy Gaugler. 2013. Ovicidal activity of three insect growth regulators against *Aedes* and *Culex* mosquitoes. *Acta Tropica*, 128, 103-109. **Impact factor 2.270**
11. Devi Shankar Suman, Christopher W. Brey, Yi Wang, Manar Sanad, Muhammed S. M. Shamseldean, and Randy Gaugler. 2012. Effects of insect growth regulators on the mosquito-parasitic nematode *Romanomermis iyengari*. *Parasitology Research*, 112, 817-824. **Impact factor 2.098**
12. Devi S. Suman, Sean P. Healy, Ary Farajollahi, Scott S. Crans, and Randy Gaugler. 2012. Efficacy of Duet™ dual-action adulticide against caged *Aedes albopictus* with the use of an ultra-low-volume cold aerosol sprayer. *Journal of the American Mosquito Control Association*, 28(4):338–340. **Impact factor 0.948**
13. Yi Wang, Zainal Lutfi, Limin Dong, Devi S. Suman, Manar Sanad, Randy Gaugler. 2012. Host cues induce egg hatching and pre-parasitic foraging behavior in the mosquito parasitic nematode, *Strelkovimermis spiculatus*. *International Journal for Parasitology*, 42, 881–886. **Impact factor 3.872**
14. R. Gaugler, D. S. Suman, Y. Wang. 2012. An autodissemination for the transfer of an insect growth regulator to mosquito oviposition sites. *Medical and Veterinary Entomology*, 26, 37-45. **Impact factor 2.860**
15. D. S. Suman, A. R. Shrivastava, S. C. Pant, B. D. Parashar. 2011. Differentiation of *Aedes aegypti* and *Aedes albopictus* (Diptera: Culicidae) with egg surface morphology and morphometrics using scanning electron microscopy. *Arthropod Structure & Development*, 40, 479-483. **Impact factor 1.650**
16. D. S. Suman, Sachin N. Tikar, M J Mendki, D. Sukumaran, B. D. Parashar, O. P. Agrawal & Shri Prakash. 2011. “Variations in life-table attributes among geographically isolated strains of *Culex quinquefasciatus* mosquito. *Medical and veterinary Entomology*, 25, 276-288. **Impact factor 2.860**
17. D. S. Suman, B. D. Parashar & Shri Prakash. 2010. Effect of sublethal dose of diflubenzuron and azadirachtin on various life table attributes of *Culex quinquefasciatus* (Dipter: Culicidae). *Journal of Medical Entomology*, 47: 996-1002, **Impact factor 1.953**
18. D. S. Suman, B. D. Parashar & Shri Prakash. 2010. Efficacy of various insect growth regulators on Organophosphate resistant immatures of *Culex quinquefasciatus* (Diptera: Culicidae) from different geographical areas of India. *Journal of Entomology*, 7 (1): 33-43. **Peer reviewed.**
19. D. S. Suman, Sachin N. Tikar, B. D. Parashar & Shri Prakash. 2010. Development of insecticide resistance in *Culex quinquefasciatus* mosquito (Diptera: Culicidae) from different locations in India. *Journal of Pesticide Science*, 35, 27-32. **Impact factor 0.722**
20. D. S. Suman, A. R. Shrivastava, B. D. Parashar, S. C. Pant, O. P. Agrawal & Shri Prakash. 2009. Variations in morphology & morphometrics of eggs of *Culex quinquefasciatus* mosquitoes from different ecological regions of India. *Journal of Vector Ecology*, 34, 191-199. **Impact factor 1.172**
21. D. S. Suman, A. R. Shrivastava, B. D. Parashar, S. C. Pant, O. P. Agrawal & Shri Prakash. 2008. Scanning electron microscopic studies on egg surface morphology and morphometrics of *Culex*

tritaeniorhynchus and *Culex quinquefasciatus* (Diptera: Culicidae). **Parasitology Research**, **104**: 173-176.
Impact factor 2.098

- 22. D. S. Suman**, B. D. Parashar & Shri Prakash. 2008. Morphological Sexual dimorphism in three species of *Anopheles* mosquito larvae. **Journal of American Mosquito Control Association**, **24**, 308-310.
Impact factor 0.948

CONFERENCES / SYMPOSIUMS: Presented

- 1. Devi S Suman. 2018. The 7th National Conference on Respiratory Allergy and Immunology, ALLERCON-2017.** University of Calcutta, Allergy and Asthama Research Center, Kolkata. January 14, 2018.
- 2. Devi S. Suman**, Yi Wang, Kshitij Chandel, Isik Unlu, Gregory M. Williams, Randy Gaugler. 2017. A novel strategy to manage dengue and chikungunya vector mosquito *Aedes albopictus* using pyriproxyfen autodissemination station. 10th NMCA. The national conference on vector-borne and zoonotic diseases: emerging challenges in surveillance, diagnosis and control in the context of global travel, urbanization and climate change. Postgraduate Department of Zoology, Asutosh College, Kolkata, December 8-9, 2017.
- 3. Devi S. Suman**, Yi Wang, Kshitij Chandel, Isik Unlu, Gregory M. Williams, Randy Gaugler. A pyriproxyfen autodissemination station efficacy in *Aedes albopictus* hot spots in residential areas. **XXV International Congress of Entomology, Orlando, September 25-30, 2016.**
- 4. Yi Wang, Devi S. Suman**, Kshitij Chandel, Randy Gaugler. Targeting the breeding sites of container mosquitoes using habitat sharing heterospecific species carrying insect growth regulator. **XXV International Congress of Entomology, Orlando, September 25-30, 2016.**
- 5. Devi S. Suman**, Yi Wang, Kshitij Chandel, Isik Unlu, Gregory M. Williams, Randy Gaugler. Efficacy of pyriproxyfen-autodissemination station against *Aedes albopictus* in residential areas. **64th Annual Meeting, American Society of Tropical Medicine & Hygiene, Philadelphia, October 25-29, 2015.**
- 6. Wang, Y., Devi S. Suman**, Isik Unlu, Eric Williges, Gregory M. Williams, Randy Gaugler. Field efficacy of an autodissemination station against *Aedes albopictus*, Pull and push technology symposium invited talk, **81th Annual meeting American Mosquito Control Association, New Orleans, LA, 2015.**
- 7. Devi S. Suman**, Yi Wang, Ary Farajollahi, Isik Unlu, Eric Williges, Gregory M. Williams, Randy Gaugler. Field efficacy of an autodissemination station against *Aedes albopictus* using pyriproxyfen. **63rd Annual Meeting, American Society of Tropical Medicine & Hygiene, New Orleans, Louisiana November 2-6, 2014.**
- 8. Wang, Y., B. Tao, D. S. Suman** and R. Gaugler. Dual Treatment Autodissemination Station and Formulation Development for Container Mosquito Control, **NJMCA Annual Conference, Atlantic City, NJ, 2014.**
- 9. Randy Gaugler**, Greg Williams, Yi Wang, Scott Crans, Ary Farajollahi, **Devi Suman**. Precision mosquito control concepts. **62nd Entomological Society of America Annual conference Oregon, November 16-19, 2014.**
- 10. Randy Gaugler**, Gregory Williams, Scott Crans, Rafael Valentine, **Devi Suman** and Yi Wang. Re-envisioning mosquito control: development of a robotic multirotor aircraft. **80th Annual meeting American Mosquito Control Association, Seattle, WA, USA, Feb. 3, 2014.**
- 11. Devi S. Suman**, Yi Wang, Ary Farajollahi, Gregory M. Williams, Eric Williges and Randy Gaugler. Autodissemination of pyriproxyfen under field condition. **New Jersey Mosquito Control Association 101st Annual meeting, Atlantic City, NJ, USA, March, 4-7, 2014.**
- 12. Devi S. Suman**, Yi Wang, Ary Farajollahi, Gregory M. Williams, Eric Williges, Jacques C. Bertrand and Randy Gaugler. Field evaluation of an autodissemination station using an insect growth

- regulator. **79th Annual meeting American Mosquito Control Association, Atlantic City, NJ, USA, Feb., 24-28, 2013.**
13. Wang, Y., J. Bertrand, **D. S. Suman**, L. Dong and R. Gaugler. Bi-phase Autodissemination Station enhanced transfer of insect growth regulator to mosquito oviposition sites, **AMCA 79th Annual conference, Atlantic City, NJ, 2013.**
 14. Wang, Y., B. Tao, **D. S. Suman** and R. Gaugler. Dual Treatment Autodissemination Station and Formulation Development for Container Mosquito Control, **Autodissemination Symposium invited talk, 62nd American Society of Tropical Medicine & Hygiene Annual Conference, DC. 2013.**
 15. **D. S. Suman**, Yi Wang, Ary Farajollahi, Gregory M. Williams, Eric Williges, Jacques C. Bertrand, Randy Gaugler. An autodissemination station with insect growth regulator: A control strategy for container mosquito *Aedes albopictus*. **61st Annual Meeting, American Society of Tropical Medicine & Hygiene, Atlanta, GA, USA, Nov., 11-15, 2012.**
 16. Wang, Y., J. Bertrand, **D. S. Suman**, L. Dong and R. Gaugler. Dual treatment enhanced transfer of insect growth regulator to mosquito oviposition site, **60th Entomological Society of America Annual conference, Knoxville, TN, 2012.**
 17. **D. S. Suman, Yi wang, R Gaugler.** An autodissemination station for the transfer of an insect growth regulator to container mosquitoes. **59th Annual Meeting, Entomological Society of America, Reno, Nevada, USA. 1466, Nov. 16, 2011.**
 18. **D. S. Suman**, M J Mendki, Sachin N. Tikar, D. Sukumaran , B. D. Parashar, O. P. Agrawal & Shri Prakash. Variations in the life table attributes among geographically isolated, strains of *Culex quinquefasciatus* (Say, 1823) (Diptera: Culicidae). **9Th International Symposium on Vectors and Vector Borne Diseases, Puri, India 169, 2008.**
 19. **D. S. Suman**, B. D. Parashar, Shri Prakash & Sekhar K. Efficacy of insecticides Temephos and Fenthion against laboratory populations of mosquito larvae of *Culex quinquefasciatus* and *Aedes aegypti* (Diptera: Culicidae). **International conference on “Biodiversity of Insects: Challenging issues in management and conservation, T.N., India, 118, 2006.**
 20. Mendki, M.J., Chandel K.C., **Suman D.S.**, Saraswat D., Shri Prakash & Sekhar K. Identification of ISSR markers for polymorphic DNA studies in various mosquito vector species). **International Conference: BICMC, T.N., India, 57, 2006.**
 21. Chandel K.C., Mendki, M.J., R. Parikh, Soche Y., **Suman D.S.**, Shri Prakash & Sekhar K. PCR RFLP markers for the identification of five different mosquito vector species. **International Conference: BICMC, T.N., India, 58, 2006.**
 22. **D. S. Suman**, B. D. Parashar & Shri Prakash. Novel morphological sexual dimorphism in three species of anopheles mosquito larvae. **8th ISVBD, Madurai, India. 21, 2006.**

PATENTS

1. **US2013/0303574A1 & WO2012158192A1** Autodissemination of an insect growth regulator for insect management.
➤ **Optional License Agreement signed with SpringStar Inc. Woodinville, WA, U.S.A.**
2. U.S. Provisional Application 62/215,469. A non-membrane feeding device and diet formulation for mosquito colony production (filed).
3. Methods and apparatus for management of mosquito populations with habitat sharing non-conspicuous insects carrying insect growth regulators. US Patent (filed).

4. Collapsible stackable disposable inexpensive pesticide free traps and attractant for surveillance and control of Aedes container breeding mosquitoes and other container breeding insects (Filed).

RESEARCH PROJECTS

Current Research Project:

Medical and veterinary fauna of North Bengal national parks and wildlife sanctuaries.

PROFESSIONAL SERVICES

Reviewer: *PLOS ONE, Parasite & Vectors, Acta Tropica, Journal of Environmental entomology, Journal of Entomology, BMC Developmental Biology, Journal of Vector Ecology, International journal of Molecular Sciences, Tropical Biomedicine, Toxins, Environmental Health Insights, International Journal of Malaria Research, Journal of Developmental Biology and Tissue Engineering, Tropical Biomedicine, Science Alert group journals, La Press Academia Journals*
