Profile of Scientist

Name of the Scientist: Dr Satya Nand Sushil

Designation: Principal Scientist (Agricultural Entomology)

Joining date in ICAR: 21.07.1993

Field of Specialization: Agricultural Entomology, Biological Control, IPM, Biosystematics, Lac Culture, Apiculture, Plant Protection Regulations & Policies

List of ongoing projects:

1. Development of eco-friendly technologies for the management of termites in sugarcane.... **As P.I. (2018-Till date)**
2. Utilization of Entomopathogenic Nematodes (EPNs) against white grubs in Sugarcane....**As Co-P.I. (2018-till date)**
3. Bio-prospecting of *Bacillus* spp. against white grubs.... **As Co-P.I. (2018-till date)**
4. Dispersal, host location, kairomonal effect and recovery of bioagents, *Trichogramma chilonis* and *Tetrastichus howardi*....**As Co-P.I. (2018-till date)**
5. Entreprenurship development for sugarcane seed production and multiplication... **As Co-P.I. (2016-till date)**
6. Study on tillage and management practices on rice-wheat-sugarcane-ratoon-wheat cropping system under conservation agriculture.... ... **As Co-P.I. (2016-till date)**

Technologies developed:

- Played a key role as entomologist in development of six varieties of rice viz., VL Dhan 207, VL Dhan 208, VL Dhan 209, VL Dhan 65, VL Dhan 85, VL Dhan 86 at ICAR-VPKAS, Almora.
- A low cost, light weight, user friendly, efficient light trap for mass trapping and management of beetles of white grubs has been developed. The trap has been found very effective and has become very popular in NW Himalayan region. Technology has been transferred to three companies on non-exclusive basis. Patent has been granted by Patent office, Govt. of India vide patent no. 290170 dated 30.11.2017 for a period of 20 years from 15.11.2007.
- New bacterial pathogen, *Bacillus cereus* strain WGPSB-2 discovered against white grubs. A talc based formulation developed and demonstrated for its efficacy under field conditions in several villages of low, mid and high altitudes. Technology has been transferred to one company for commercialization on non-exclusive basis.
- IPM Technology for tomato and garden pea under Hill and Mountain Agro Ecosystem developed. The technology developed has been promoted in NW Himalayan region under Horticulture Technology Mission (MM-I).

- Planned honeybee pollination of cross pollinated European vegetables has been developed under protected as well as field conditions of Hill and Mountain Ecosystem. The technique has been demonstrated to the farmers of 18 villages of low, mid & high altitudes under HTM (MM-I). The technology has spread to large number of villages in Uttarakhand.
- IISR-combo insect trap has been designed and developed for monitoring and mass trapping of white grub beetles and moths of lepidopteran pests in sugarcane and insect pests of other crops. The newly developed trap is a combination of light and pheromone. Technology has been transferred to one company for commercialization. The technology has spread to various sugar mills of UP & Maharashtra.
- A new trivoltine species of lac insect, *Kerria sharda* sp. nov. thriving on kusum trees was discovered and cultivation started.
- Biological control of lac insect predators using certain egg parasitoids established for the first time and promoted in large area in Jharkhand and West Bengal.

Patents: 01 (granted) and 01 (filed)

Technology commercialized: 03

Prominent Awards:

- **WIPO Gold Medal-2008** by World Intellectual Property Organization, Geneva (United Nations Organization) on "Eco-friendly management of white grubs"- **as Team Leader**

- **Societal Innovation Award-2008** by National Research Development Corporation, New Delhi, Ministry of Science & Technology, Govt. of India on "Eco-friendly Novel Technology for Managing White Grubs in North-West Himalayas." The award included a cash prize of Rs. 3.0 lakh and citation.**- as Team Leader**

- **ICAR Award for Outstanding Interdisciplinary Team Research in Agriculture and Allied Sciences for the Biennium 2005-06.** by Indian Council of Agricultural Research (ICAR), Govt. of India, New Delhi, 2008. The award included a cash prize of Rs. 1.0 lakh and citation. - **as Team Member**

- **Outstanding Scientist Award-2009** by Uttarakhand Organic Commodity Board, Dehradun, Uttarakhand.

- **Certificate of Appreciation awarded in 2014** for excellent contribution to Plant Quarantine by ICAR-National Bureau of Agriculturally Important Insects and Society for Biocontrol Advancement, Bangalore.

- **Certificate of Appreciation awarded in 2016** for distinguished contribution to the farmers' welfare by Federation of Indian Chambers of Commerce & Industry (FICCI).

Fellowship of Society:

- Fellow of Entomological Society of India
- Fellow of the Society for Biocontrol Advancement

- Fellow of Agricultural Zoologists Research Association
- Fellow of Society for Sugar Research & Promotion

Visits Abroad:

- Attended 09 international conventions/ meetings/ workshop as member/team leader of Indian delegation.

Chairman/ Member of important national level committees

- Chairman, FAD 01 committee on Pesticides, Bureau of Indian Standards, Govt. of India (Ex-officio Chairman as Plant Protection Advisor to Govt. of India)-(2013-2016).
- Member, Registration Committee for Pesticides, Govt. of India (Ex-officio Member as PPA to Govt. of India)-(2013-2016).
- Member, Central Insecticide Board, Govt. of India (Ex-officio Member as PPA to Govt. of India)-(2013-2016).
- Member, Genetic Engineering Appraisal Committee (GEAC), Govt. of India (Ex-officio Member as PPA to Govt. of India)-(2013-2016).
- Chairman, Expert Group on "Harmonization of data of bio-pesticides of already registered strains" constituted by Registration Committee of Pesticides, Govt. of India-(2014-2015).
- Chairman, Expert Group for review of various guidelines of registration of insecticides by the Registration Committee, Govt. of India-(2014).
- Member, Institute Management Committee of ICAR-Indian Institute of Sugarcane Research, Lucknow-(2012-2013).
- Member, Institute Management Committee of ICAR-Central Research Institute of Jute & Allied Fibres, Barrackpore-(2013-2016)
- Chairman, Committee for assessment of whitefly problem in Punjab in 2016. The committee was constituted by the Govt. of India.
- Member, Quinquennial Review Team (QRT) of ICAR-National Research Centre for Integrated Pest Management (NCIPM) for the period 2014-2019.

Chairman/ Member of International delegation : (As Plant Protection Adviser, Govt. of India)

- As member of Indian delegation, attended 28th session of APPPC from 22nd to 29th September, 2013 held at Jeju Island, Korea.
- As member of Indian delegation, attended India-Australia joint working group on cooperation in Agriculture and plant technical meeting from 20th to 27th November, 2013 held at Melbourne and Canberra, Australia.
- As member of Indian delegation, attended the 9th Session of the Commission on Phytosanitary Measures from 31st March to 4th April, 2014 held at FAO, Rome, Italy.
- As leader of Indian delegation, attended the 10th Session of the Commission on Phytosanitary Measures on March 16-20, 2015 held at FAO, Rome, Italy.

- As leader of Indian delegation, attended the 11th Session of the Commission on Phytosanitary Measures on April 4-8, 2016 held at FAO, Rome, Italy.
- As leader of Indian delegation, attended SATNET Asia Inter-regional visit and workshop on Agricultural Trade Facilitation during September 23-26, 2014 held at Bangkok, Thailand.
- As member of Indian delegation, attended India-South Africa joint working group on cooperation in Agriculture from June 1-3, 2015 held at Pretoria, South Africa.

Publications: Total: **335**

- Research papers : **82**
- Paper presented in symposium/ seminars (Abstracts): **36**
- Books: **11**
- Book chapters: **11**
- Popular articles: **14**
- Research/ Extension bulletins/ Manuals etc.: **113**
- Extension leaflets/Folders: **35**
- TV/ Radio talks: **33**

List of Important Research Papers:

1. **Sushil, S.N.,** Chandra, A., Roy, S., Jaiswal, A.K., Singh, M.R. and Pathak, A.D. 2019. Determination of morpho-logical and biochemical basis of resistance against top borer, *Scirpophaga excerptalis* Walker in sugarcane. *Sugar Tech* (Springer), DOI: 10.1007/s12355-019-00767-0).
2. **Sushil, S.N.,** Joshi, D., Tripathi, G.M., Singh, M.R., Baitha, A., Rajak, D.C. and Solomon, S. 2018. Exploring efficacious microbial bioagents and insecticides against white grubs in sugarcane in Indo-gangetic plains. *Sugar Tech* (Springer), **20**(5): 552-557.
3. Stanley, J.; Sah, K.; Jain, S.K.; Bhatt, J.C. and **Sushil, S.N.,** 2015. Evaluation of pesticide toxicity at their field recommended doses to honey bees, *Apis cerana* and *A. mellifera* through laboratory, semi-field and field studies. *Chemosphere***, 119**: 668-674.
4. **Sushil, S.N.,** Mohan, M., Singh, K.P., Stanley, J., Bhatt, J.C., and Gupta, H.S., 2011. Designing efficient scarab beetle (Coleoptera: Scarabaeidae) trap and its field evaluation for mass trapping in North West Himalayan hills of India. *Entomologia Generalis* **33**(3): 199-206
5. **Sushil,S.N.,** Mohan, M., Selvakumar, G., Bhatt, J.C. and Gupta, H.S., 2008. Isolation and toxicity evaluation of bacterial entomopathogens against phytophagous white grubs (Coleoptera: Scarabaeidae) in Indian Himalayan hills. *International Journal of Pest Management* (U.K.) **54**: 301– 307.
6. Mohan, M., **Sushil, S.N.,** Selvakumar, G., Bhatt, J.C., Gujar, G.T. and Gupta, H.S.. 2009. Differential toxicity of *Bacillus thuringiensis* and their crystal toxin against high altitude himalayan populations of diamond back moth, *Plutella xylostella* L. *Pest Management Science* (U.K.) **65**: 27-33.
7. Roy, Sharmila; Jaiswal, A.K.; **Sushil, S.N.**; Baitha, A. and Roy, M.M. 2019. Landscape based habitat engineering for sugarcane ecosystem: a green technological option for pest management. *Sugar Tech* (Springer), **21** (2): 213–226.

8. **Sushil, S.N.,** Mohan, M., Selvakumar, G. and Bhatt, J.C. 2006. Relative abundance and host preference of white grubs (Coleoptera: Scarabaeidae) in Kumaon hills of Indian Himalayas. *Indian Journal of Agricultural Sciences* **76**(5) : 338-339.
9. Mohan M., Selvakumar, G., **Sushil, S.N.,** Bhatt, J.C. and Gupta, H.S., 2011. Entomo-pathogenicity of endophytic *Serratia marcescens* strain SRM against larvae of *Helicoverpa armigera* (Noctuidae: Lepidoptera). *World Journal of Microbiology and Biotechnology,* **27(11)**: 2545-2551
10. Mohan, M., **Sushil, S.N.,** Bhatt, J.C., Gujar, G.T. and Gupta, H.S., 2008. Synergistic interaction between sublethal doses of *Bacillus thuringiensis* and *Campoletis chlorideae* in managing *Helicoverpa armigera*. *BioControl* (Netherlands), **53**:375-386.
11. Selvakumar, G., **Sushil, S.N.,** Bhatt, J.C. and Singh, R.D., 2003. Isolation of *Yersinia* sp. from diseased white grub larvae. *Indian Journal of Microbiology* **43**(3) : 211-212.
12. **Sushil, S.N.,** Mohan, M., Hooda, K.S., Bhatt, J.C. and Gupta, H.S., 2006. Efficacy of safer management tools against major insect pests of tomato and garden pea in north west Himalayas. *Journal of Biological Control.* **20**(2): 113-118.
13. Sharma, K.Krishan,, Bhattacharya, A. and **Sushil, S.N.** 1999. Indian lac insect, *Kerria lacca*, as an important source of honey dew. *Bee World* (UK), (Journal of Apicultural Research) **80** (3): 115-118
14. Selvakumar, G., Mohan, M., **Sushil, S.N.,** Kundu, S., Bhatt, J.C. and Gupta, H.S., 2007. Characterization and phylogenetic analysis of an entomopathogenic *Bacillus cereus* strain WGPSB-2 (MTCC 7182) isolated from white grub, *Anomala dimidiata* (Coleoptera: Scarabaeidae). *Biocontrol Science and Technology*, **17**(5): 525-535
15. Selvakumar, G., **Sushil, S.N.,** Stanley, J., Mohan, M., Deol, A., Rai, D., Ramkewal, Bhatt, J.C. and Gupta, H.S., 2011. *Brevibacterium frigoritolerans* strain HSB-15 (MTCC 9816) - a novel entomopathogen of *Anomala dimidiata* (Hope) and *Holotrichia longipennis* Blanchard (Scarabaeidae: Coleoptera). *Biocontrol Science and Technology,* **21**(7): 821-827.
16. **Sushil, S.N.** and Khan,M.A., 1999. A new species of the genus *Obesulus* Boucek (Hymenoptera : Eulophidae) from Northern India. *Journal of Entomological Research*, **23** (3): 239-242.
17. **Sushil, S.N.**, Mishra,Y.D., Bhattacharya,A. and Kumar, P., 1999. Screening of some egg parasitoids against *Pseudohypatopa pulverea* (Meyr.) (Lepidoptera:Blastobasidae)- a serious predator of lac insect, *Kerria lacca* (Kerr.). *Journal of Entomological Research*, **23 (4)**: 365-368.
18. **Sushil, S.N.,** Pant, S.K. and Bhatt, J.C., 2004. Light trap catches of white grub and its relation with climatic factors in Kumaon region of N-W Himalayas. *Annals of Plant Protection Sciences.* **12**(2) 254-256
19. **Sushil,S.N.** and Khan,M.A. 1995. Two new species of *Psyllaephagus* (Hymenoptera : Encyrtidae) from Northern India. *Journal of Insect Science* **8** (1) : 20-23.
20. **Sushil,S.N.** and Khan,M.A. 1996. Five new species of the genus *Anagyrus* Howard (Hymenoptera :Encyrtidae) from Northern India. *Journal of Insect Science*, **9** (1) : 19-27.
21. **Sushil,S.N.** and Khan,M.A. 1996. A new species of *Protyndarichoides* Noyes (Hymenoptera : Encyrtidae) from Northern India. *Journal of Insect Science*, **9** (2) : 112-114.
22. Hooda, K.S., Bhatt, J.C., Joshi, D., **Sushil, S.N.** and Gupta, H.S., 2006. Impact of biocontrol agents on the health of garden pea (*Pisum sativum*) in Kumaon hills of Himalayas. *Indian Journal of Agricultural Sciences* **76** (9): 573-574.
23. Mishra,Y.D. and **Sushil, S.N.**, 2000. A new tri-voltine species of the genus *Kerria* Targioni-Tozzeti (Homoptera : Tachardiidae) thriving on *Schleichera oleosa* (Lour.)Oken from eastern India. *Oriental Insects* (USA) **34** : 215-220

24. **Sushil,S.N.,** Mishra, Y.D., Bhattacharya, A., Jaiswal, A.K. and Sharma, K.K. 1997. Safety of Endosulfan and Dichlorvos to four parasitoids of lac predators. *Pest Management in Horticultural Ecosystems,* **3** (1) : 39-41.
25. **Sushil,S.N.**, Bhattacharya, A., Mishra, Y.D. and Kumar P. 2000. Parasitising efficiency of some egg parasitoids against *Eublemma amabilis* Moore (Lepidoptera : Noctuidae) - a serious lac insect predator. *J.Appl.Zool.Res.,* **11** (2&3): 152-154.
26. **Sushil,S.N.,** Bhattacharya, A., Jaiswal, A.K., and Kumar, P. 2002. Record of *Telenomus remus* Nixon as an egg parasitoid of *Chrysopa* spp.- a predator of lac insect. *J.Appl.Zool.Res.,* **13**(1): 102.
27. **Sushil,S.N.,** Bhattacharya, A., Jaiswal, A.K., and Kumar, P. 2002. Predatory response of *Chrysoperla carnea* (Stephens) (Neuroptera: Chrysopidae) against lac insect, *Kerria lacca* (Kerr.). *J.Appl.Zool.Res.,* **13**(1) : 100-101.
28. Hooda, K.S., **Sushil, S.N.,** Joshi, D., Bhatt, J.C., Hedau, N.K. and Gupta, H.S, 2011. Efficacy of different modules for the management of major pests of tomato (*Lycopersicon esculentum*) and garden pea (*Pisum sativum*) in Himalayas. *Indian Phytopathology* **64(4)**:335-341
29. Mohan, M., **Sushil, S.N.** and Bhatt, J.C., 2005. Toxicity and growth inhibitory effect of *Bacillus thuringiensis* subspecies *tolworthi* against Lepidopterous insect pests of Kumaon hills. *Pesticide Research Journal* **17**(2): 34-38.
30. Mohan, M., **Sushil, S.N.** and Bhatt, J.C., 2007. Development of insecticide resistance and carboxyl-esterase activity in *Helicoverpa armigera* (Hubner) from Kumaon Himalayas. *Pesticide Research Journal* **19**(2): 220-225.