



Dr. Saudan Singh
Chief Scientist

Research Interests:

Dr Saudan Singh born on August, 12, 1964 in a farming family is an agriculturist by profession and agronomist by training. He is the product of Indian Agricultural Research Institute (IARI), New Delhi. He started his career in 1991 as Scientist-B at the CSIR-Central Institute of Medicinal and Aromatic Plants and promoted at various positions there on. At present he is working as Chief Scientist & Head, Division of Agronomy & Soil Science in the same Institute.

Dr Singh has over 77 research papers in the journals of national and international repute, besides several popular articles, book chapters, farmer's bulletins, patents and improved varieties of Medicinal and Aromatic Crops.

His research accomplishments include development of Early Mint Technology (**EMT-REDUCTION IN COST OF CULTIVATION WITH ENHANCEMENT IN THE PRODUCTIVITY**), low cost field agro-technology for the saving of rose scented geranium during extreme climatic conditions (**Reduction in cost of single propagules from Rs 35 / prapagule in AC glass house to Rs 2/- per propagules under field conditions**), development of cost effective agri-practices for enhancing productivity of biologically active substances in important medicinal and aromatic crops, designing and development of efficient cropping systems involving food and agricultural crops as well as medicinal and aromatic crop under normal and stressed soil and environment.

He has also been actively involved in the transfer of medicinal and aromatic plants related agro-technologies on farmer's field.

Research, Teaching, Extension and Management Summary:

As a **agronomist** developed a number of demand based, translational, problem solving and marketable agro-technologies for medicinal and aromatic plants of commercial value such as **menthol mint, other mint species, rose scented geranium, aromatic grasses, Indian basil, scented rose, African marigold, ashwagandha, safed musli, sarpgandha, kalmegh, senna, Aloe vera, opium poppy, pyrethrum etc.**

The specific interventions made by our team are briefed as under:

- Early Mint Technology by which mint productivity is enhanced by 30% with reduction in the cost of production up to 30%. Mint oil production cost can come down by Rs 150/kg
- Sucker production technology in Menthol mint.
- Technology for Co-cultivation of Menthol mint with traditional crops for enhancing farm productivity and profit and provide the opportunity to produce menthol mint oil as bonus crop.
- Development of low cost field technology for the production of rose scented Geranium propagules during extreme climate conditions for its profitable cultivation in Northern Indian plains.
- Agro-technology for the geranium farming under northern Indian plains.
- Production technology for the cultivation of Senna for northern Indian plains as summer season crop.
- Developed 10 more cost effective technologies which are successfully deployed. These are (i) Development of MACs based cropping system for rainfed/ water stress prone area (ii) Water management practices for mint and aromatic grasses (iii) Pruning method for scented rose (iv) Technology for withania cultivation as overlap crop with /after rainy season crops (v) Development of Safed musali based intercropping systems (vi) Intercropping of basil with aromatic grasses (vi) System for basil intensification for rained areas (vii) Harvest management in Indian basil for multiple harvests. (ix) Enhancing productivity of pyrethrum (*Tanacetum cinerariifolium* (Trevir) through use of calliterpinone) (x) Optimization of seed rate and seedling establishment technique for raising the nursery of French Basil (*Ocimum basilicum* L.)

As a **extension worker** contributed significantly in the technology dissemination programmes of the institute and participated as faculty in more than 200 training programmes organised by the CIMAP across the country. He delivered about 600 lectures on improved agro-technology of production of important medicinal and aromatic crops of commercial value. About 10,000 participants are benefited by these programmes. Delivered **more than 100 invited lectures** for the popularization of the cultivation of MAPs. Summary is given as under:

Faculty in AcSIR and CIMAP -JNU Ph.D Programme: Teaching 03 courses as professor.

Co-ordinator CSIR-UGC-NET examination: From December 2015 to June 2019

Co-ordinator CSIR-CIMAP Research Centres

Societal contribution: Underutilised area of about 3000 ha. which was prone to a number of problems has been converted in to highly productive area through cultivation high value / low volume MAPs by the efforts made under **aroma and phyto-pharmaceutical projects**. These activities are being coordinated by our group.

Publications:

Research Publications (Last 5 Years): (Google Scholar Citation 447; h-index: 11)

1. Nilofer, Anil Kumar Singh, **Saudan Singh***, S P Gangwar, Man Singh, Rupal Singh, Anju Yadav (2015). Effect of weather conditions on growth, yield and quality of Menthol mint (*Mentha arvensis* L.) cultivars transplanted in different years on different dates under sub-tropical climate of north India. International Journal of Agronomy and Agriculture Research. 6 (2):82-88.
2. Nilofer Absar, Parminder Kaur, Anil Kumar Singh, Nidaf Khan, **Saudan Singh*** (2016) Optimization of seed rate and seedling establishment technique for raising the nursery of French Basil (*Ocimum basilicum* L.) Industrial crops and products. 85: 190-197. I.F. 2.7.
3. Rashmi Lahiri, R.K Lal, S. Sarkar, Devendra Kumar, B.K Dubey, Shama Shukla, **Saudan Singh** (2017) Plants Genetics of alkaloids in poppy straw with other morphological traits in opium poppy (*Papaver somniferum* L.) Journal of Applied Research on Medicinal and Aromatic Plants, 7: 74-83.
4. RK Lal, CS Chanotiya, AK Shasany, AK Gupta, VR Singh, S Sarkar, Smita Singh, SS Dhawan, Pankhuri Gupta, OP Dhawan, A. Kalra, HP Singh, B. Kumar, VKS Tomar, Sanjay Kumar, **Saudan Singh**, Susheel Kumar Singh, R. Chandra, Anju Yadav, Ranjana Maurya (2017) Registration of high-yielding Khusilal [nor-sesquiterpene (C14) aldehydes] rich variety CIM-Samridhi of vetiver (*Chrysopogon zizanioides* L.) Nash. Journal of Medicinal and Aromatic Plant Sciences, 39(2-4),2017; 139-144.
5. RK Lal, CS Chanotiya, AK Gupta, VR Singh, AK Shasany, Smita Singh, Sougata Sarkar, Ranjana Maurya, OP Dhawan, A Kalra, HP Singh, SS Dhawan, Pankhuri Gupta, B Kumar, VKS Tomar, Sanjay Kumar, S Tandon, **Saudan Singh**, Priti Srivastava, M Zaim, Anju Yadav (2017). Registration of variety: CIM- Snigddha: A methyl cinnamate rich and high essential oil yielding variety of French basil (*Ocimum basilicum*). Journal of Medicinal and Aromatic Plant Sciences, 39(2-4),2017; 125-129.
6. Nidaf Khan, **Saudan Singh**, Sunita Singh Dhawan (2017). Development of species specific ScoT markers and analysis of genetic diversity among *Mentha* genotypes.

International Journal of Innovative Science, Engineering & Technology. Vol. 4 Issue 2, ISSN 2348-7968, 2017.

7. Absar Nilofer, Anil Kumar Singh, Devendra Kumar, Parminder Kaur, Anuj Kumar, Anjali Singh, Puja Khare, Neelam Singh Sangwan, Alok Kalra, **Saudan Singh*** (2018). A novel method for survival of rose scented geranium (*Pelargonium graveolens* L.) mother plants under extreme climate conditions. *Industrial Crops and Products*, 126 (2018); 227-237.
8. Nilofer, Anil Kumar Singh, Anjali Singh, **Saudan Singh*** (2018). Impact of sowing and harvest times and irrigation regimes on the sennoside content of *Cassia angustifolia* Vahl. *Industrial Crops and Products* 125 (2018); 482-490.
9. Nilofer Absar and **Saudan Singh*** (2018). Senna (*Cassia angustifolia* Vahl.): Recent advances in pharmacognosy and prospects of cultivation in India. *Bioved*,29(2): 399-408, 2018.
10. Sunita Singh Dhawan, Susheel Kumar Singh, Raj Kishori Lal, Anand Mishra, Pankhuri Gupta, Ruchi Singh, Manju Singh, Karuna Shanker, **Saudan Singh** (2018). Registration of an advance breeding line of Kewanch with early and high yield of seeds and L- DOPA: CIM-Sfurti. *Journal of Medicinal and Aromatic Plant Sciences*.40(1-4),2018;67-71
11. Janhvi pandey, Rajesh Kumar Verma, and **Saudan Singh*** (2018). Screening of most potential candidate among different lemongrass varieties for phytoremediation of tannery sludge contaminated sites. *International Journal of Phytoremediation*. 1-10
12. Janhvi Pandey, Rajesh Kumar Verma, and **Saudan Singh*** (2018). A review: suitability of aromatic plants for phytoremediation of heavy metal contaminated areas. *International journal of Phytoremediation*. 1-14.
13. Vineet Yadav, T, Karak, **Saudan Singh**, Anil Kumar Singh and Puja Khare*(2019). Benefits of biochar over other organic amendments: Responses for plant productivity (*Pelargonium graveolens* L.) and nitrogen and phosphorus losses. *Industrial Crops and Products*. 131, May, Pages 96-105.
14. Pandey J., Chand S., Chaurasiya S., Rajkumari, Verma R. K., Patra D.D. and **Singh, S***. (2019). Effect of tannery sludge amendments on the activity of soil enzymes and phytoremediation potential of two economically important cultivars of geranium (*Pelargonium graveolense*). *Soil and sediments contamination: An international Journal*. 28(4): 395-410.
15. Khare P, Srivastava S, Nigam N, Singh A.K, **Singh S.**(2019) Impact of essential oils of *E. citriodora*, *O. basilicum* and *M. arvensis* on three different weeds and soil microbial activities. *Environmental Technology & Innovation [IF: 2.800] Netherland* 14, (100343) 1-13. <https://doi.org/10.1016/j.eti.2019.100343>
16. Pandey, J., Sarkar, S., Verma, R. K., & **Singh, S.*** (2020). Sub-cellular localization and quantitative estimation of heavy metals in lemongrass plants grown in multi-metal contaminated tannery sludge. *South African Journal of Botany*, 131, 74-83. 1.0 UK

17. Pandey J, Verma R. K, **Singh S*** (2020) Trace element accumulation potential in lemongrass varieties (*Cymbopogon* species) and prediction through regression model equations followed by path analysis: a field study. *Chemosphere*, 257, 127102
18. Nilofer, Kushal Pal Singh, Kirti Verma, Devendra Kumar, Anil Kumar Singh, Puja Khare, CS Chanotiya and **Saudan Singh*** (2020). Quality assessment of menthofuran rich essential oil of *Mentha piperita* (CIMAP-PATRA) stored at different temperatures and containers. *Journal of Pharmacognosy and Phytochemistry*. 9(5): 1603-1610.
19. Devendra Kumar, Rakesh Kumar, Anil Kumar Singh, Kirti Verma, Kushal Pal Singh, Nilofer, Anuj Kumar, Parminder Kaur, Anjali Singh, Janhvi Pandey, Puja Khare and **Saudan Singh*** (2020). Influence of planting methods on production of suckers (Rhizome or propagative material), essential oil yield and quality of menthol mint (*Mentha arvensis* L.). *Int.J.Curr.Microbiol.App.Sci* . 9(7): 3675-3689.
20. Nilofer, Anil Kumar Singh, Namita Singh, Birendra Kumar, **Saudan Singh*** (2020). Effect of seed heteromorphism and seed collection time on germination of the medicinal plant *Centella asiatica* (L.) Urban in sub-tropical plains of north India. *J. Medicinal and Aromatic Plant Sciences*. 42(3-4): 229-233.
21. Nilofer, Anil Kumar Singh, Namita Singh, Birendra Kumar, **Saudan Singh*** (2020). Effect of seed heteromorphism and seed collection time on germination of the medicinal plant *Centella asiatica* (L.) Urban in sub-tropical plains of north India. *J. Medicinal and Aromatic Plant Sciences*. 42(3-4): 229-233.
22. Kirti Verma, Kushal Pal Singh, Anjali Singh, Nikil Bhashkar Lothe, Nilofer, Devendra Kumar, Anil Kumar Singh, Rakesh Kumar, Puja Khare, **Saudan Singh*** (2021). Co-cultivation of a medicinal plant kalmegh [*Andrographis paniculata* (Burm. F.) Wall ex. Nees] with food crops for enhancing field productivity and resource use efficiency. *Industrial Crops & Products*. 159: 113076.
23. Devendra Kumar, Rakesh Kumar, Anil Kumar Singh, Kirti Verma, Kushal Pal Singh, Nilofer, Anuj Kumar, Vivek Singh, Parminder Kaur, Anjali Singh, Anandakumar TM, Puja Khare, **Saudan Singh*** (2021). A novel and economically viable agro-technique for enhancing productivity and resource use efficiency in menthol mint (*Mentha arvensis* L.). *Industrial Crops & Products*. 162: 113233.
24. Anjali Singh, Kirti Varma, Devendra Kumar, Nilofer, Nikhil Bhaskar Lothe, Anuj Kumar, Archana Chaudhary, Parminder Kaur, Kushal Pal Singh, Anil Kumar Singh, Rakesh Kumar, Anandakumar T.M., **Saudan Singh.*** (2021). Optimized irrigation regime and planting technique improve yields and economics in aloe vera [*Aloe barbadensis* (Miller)]. *Industrial Crops and Products*. 167: 113539.
25. Tripathi P., Singh R P., Srivastava S., Shivanna B., Singh A,K,, **Singh S.**, Khare P. (2021). Quantifying the Boron demand of *Pelargonium graveolens* for optimum biomass yield and balanced C:G ratio of essential oil under field conditions. *Journal of Plant nutrition*. DOI: 10.1080/01904167.2021.1943681.

26. Nilofer, A. K. Singh, R. Kumar, D. Kumar, P. Kaur, A. Singh, K. Shanker and **S. Singh*** (2021). Optimization of primary post-harvest processing techniques for *Cassia angustifolia* Vahl. **Journal of Pharmacognosy and Phytochemistry**. 10(5): 197-204.
27. Nilofer, A. K. Singh, Parminder Kaur, Devendra Kumar, Kirti Verma, Rakesh Kumar, T.M. Anandakumar, C.S. Chanotiya, **Saudan Singh*** (2021) Productivity and quality of *Cymbopogon martinii* (Roxb.) Wats. as influenced by harvesting at different phenological stages. **Industrial Crops and Products**. 174 (2021) 114215.
28. Parminder Kaur, A. K. Singh, Nilofer, Devendra Kumar, Anuj Kumar, Kirti Verma, Anjali Singh, Kushal Pal Singh, Archana Chaudhary, T.M. Anandakumar, Rakesh Kumar, **Saudan Singh*** (2021) Evaluation of productivity and quality of *Withania somnifera* (L.) Dunal under different plant populations, irrigation levels and moisture conservation practices in sub-tropical plains of North India. **Journal of Medicinal and Aromatic Plant Sciences**. 43(1-2):37-48.
29. R. Soni, D. Kumar, V. Gupta, **S. Singh*** (2021) Comparative performance of the traditional and improved methods of menthol mint sucker production on farmer's field in Barabanki district of Uttar Pradesh-A case study. **Journal of Medicinal and Aromatic Plant Sciences**. 43(3-4):133-142.
30. Nilofer, Yashdeep Srivastava, Anuj Kumar, Puja Khare, Anil Kumar Singh, **Saudan Singh*(2022)**. Variation in morphophysiological responses and differential expression of sennoside biosynthesis pathway genes under water stress in *Cassia angustifolia* Vahl. **Industrial Crops and Products**. Volume 184, 115047.
31. Kumar, A., Verma, N., Kaur, P., Kumar, D., Ghosh, D., Singh, A., Siddiqui, A., Kumar, N., Singh, A.K., Khare, P. and **Singh, S*(2022)** Physiological and chemical changes induced by transparent polythene+ green net shed on *Pelargonium graveolens* L. mother plants during monsoon season. **Industrial Crops and Products**. Volume188, p.115686
32. V. Pandey, D. Mishra, R. Yadav, A. Siddiqui, C. Hiremath, B. Kumar, K. Shanker, A. K. Singh, **S. Singh**, Puja Khare,*(2023) Phyto-exclusion of Pb and Cd by different genotypes of *Andrographis paniculata* (Burm. F.) nees: A novel approach for safe cultivation. **Industrial Crops & Products**, Volume.191, 115977.
33. Versha Pandey , Ranu Yadav , Anupama Singh, Disha Mishra, Karuna Shanker, **Saudan Singh** , Puja Khare* (2023). Differential behaviour of four genotypes of *Andrographis paniculata* (Burm.f.) Nees toward combined toxicity of As, Cd, and Pb: An ionomics and metabolic interpretation. **Journal of Hazardous Materials**. Volume .10, 100274

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Patents/Technologies/Varieties

Patent: 2 nos.

1. Sushil kumar, B. R. Tyagi, J. R. Bahl, H. Singh , V. Singh, S. P. S. Khanuja, A.K. Shasnay, R. S. Shukla, A, Sattar, D. Singh, A. Haseeb, V. P. Singh, P. Ram, K. Singh, **S. Singh**, S. P. Singh, M. Alam., M. Ram, K. K. Agarwal and K. Singh (1999). Himalaya- a high yielding clone of Menthol mint (*Mentha arvensis* L) **United States**. No. PP 10935.
2. Singh AK, Bagchi G.D, **Singh S**, Dwivedi PD, Gupta AK and Khanuja SPS. (2004) Use of phyllocladane diterpenoides for plant growth promotion and alleviation of growth retardant allelochemicals, **United States**. No. 6, 673,749, G.B.2411651

Technologies: 5 nos.

1. **Saudan Singh**, Anil Kumar Singh, Nilofer, Rupal Singh, Surendra Kumar Sharma, Dharni Dhar Patra, virendra Kumar Singh Tomar, sanjay Singh (2015). Co-Cultivation of menthol mint with traditional crops for enhancing farm productivity and profit.CSIR-CIMAP,Lucknow.Pg-1-10.
2. **Saudan Singh**,Anil kumar Singh, Nilofer, Parminder Kaur, Devendra Kumar, Surendra pal Gangwar,Raghubind Kumar,S.K.Sharma,Chandan Singh Chunauiya,Sudip Tandon, Alok Kalra, Virendra Kumar Singh Tomar, Sanjay Kumar, Hemendra Pratap Singh.(2016) Early Mint Technology. CSIR-CIMAP,Lucknow.Pg. 1-14.
3. **Saudan Singh**, Anil Kumar Singh, Nilofer, Puja Khare, Neelam Singh Sangwan, Devendra Kumar, Parminder Kaur, Janhvi Pandey, Anuj Kumar, Raghuvind Kumar, S.K.Sharma, Alok Kalra, Rajesh Kumar Verma, Manoj Semwal, Kishore B. Bandmaravuri, Sudeep Tandon(2017).Agrotechnology for saving of geranium plant during rainy season.Pg-1-14.
4. Devendra kumar, Anil Kumar Singh, Kirti Verma, Kushal Pal Singh, Nilofer, Janhvi Pandey, Parminder Kaur, Anjali Singh, Pooja Khare, Anuj Kumar, , **Saudan Singh**.(2019). Menthol mint ke Sakar (Jad) Utpadan ki unnat krishi takniki.
5. Anil kumar Singh, Anuj Kumar, Nilofer, Devendra Kumar, Archana Chaudhary, Anjali Singh, Kushal Pal Singh, Kirti Verma, Janhvi Pandey, Parminder Kaur ,Sukhmal Chand,S.K.Sharma, Pooja Khare, Rakesh Kumar, Rajesh Kumar Verma, Alok Kalra, Kishore B. Bandmaravuri, **Saudan Singh (31-01-2020)**. Hand Book of Geranium. CSIR-CIMAP, Lucknow.

Varieties:

Team member in the development of the 20 varieties of medicinal and aromatic cro



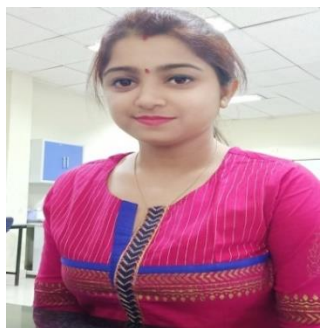
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