

## Profile

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## Introduction

Dr. Nilesh Gaikwad completed his B. Tech. (Agril. Engg.) from MPKV, Rahuri, Post-graduation and Ph.D. in Agril. Engg. (Agril. Structures and Process Engg.) from IARI, New Delhi. He has served for four years as a Scientist at Central Institute of Post-Harvest Engineering and Technology, Ludhiana, Punjab. He joined ICAR-NRCP on August, 3rd 2013 and serving here since then till date.

## Most Significant Research Achievements:

### Research and Development

- Conceptualized, designed and established commercial scale modern pomegranate processing unit for Juice, ready to serve beverage (capacity of 2.5 tonns fruits/day) with significant contribution in design of pasteurization line and other machineries which are being replicated by industrial scale startups. Established pomegranate peel powder, virgin pomegranate seed oil, minimal processing, juice carbonation and modified atmospheric packaging unit at ICAR-NRCP, Solapur.
- Developed technology of pomegranate juice, RTS beverage and carbonated drink with shelf life of six months. Developed technology of minimal processing and packaging of arils with shelf life of fourteen days.
- Developed technology for sparkling pomegranate wine, pomegranate seed based mouth freshener.
- Developed technology of “A process of extraction of virgin pomegranate seed oil”. The technology has been granted patent vide **Patent Application No 201611011366**.
- Developed technology for microencapsulation of pomegranate seed oil with ionic gelation, spray drying for improvement in stability.
- Designed developed and evaluated the bael (wood apple) pulper machine solving longstanding demand of the bael processing industry and bael producing farmers/tribals/forest dwellers.
- Designed developed and evaluated electronic weight grading machine for oranges.
- Designed and developed fish descaling machine, fish descaling hand tool, fish vending table cum storage unit, poultry dressing table (patent filed and published).
- Bagged the research project entitled “Utilization of pomegranate for development of functional medicinal ingredients” through competitive funding attracting external research funding worth Rs. 82.51 Lakhs from Ministry of AYUSH, GOI & ICAR-EM research scheme.
- Published 23 research papers in peer reviewed international and national journals.
- Patents Granted: 1 and Patent Filed and published: 1 No.

### **Impact of the Research Achievements:**

- The pomegranate juice and RTS beverage development technology has been developed and transferred to seven entrepreneurs, from Maharashtra and Telangana which are processing pomegranate in to juice and RTS beverage.
- The minimal processing of pomegranate arils and packaging technology has been transferred to two entrepreneurs from Maharashtra and Karnataka. The consultancies provided based on these technologies has led to consultancies and establishment of minimal processing and packaging units at Nashik, Solapur, Bangaluru.
- The pomegranate seed oil extraction technology has been transferred to two enterprises from Maharashtra and Telangana.
- Developed interactive information kiosk for pomegranate production technologies and has been installed at ATIC of ICAR-NRCP, Solapur which is being used extensively by visiting pomegranate growers at ICAR-NRCP and **benefited thousands of farmers.**
- Developed mobile APP Solapur Anar in 6 languages namely English, Hindi, Marathi, Kannad, Gujarati and Telagu. The app is available for android and ios platform. The app provides information on all the aspects of the pomegranate cultivation right from planting material to value addition. **The app is downloaded by more than 20000 farmers all across the world.**
- Organized 14 capacity building training programmes for participant farmers/government officers etc. with hundreds of beneficiaries all across the country, participated in 35 exhibitions for dissemination of the technologies developed by ICAR-CIPHET and ICAR-NRC on Pomegranate, Solapur, organized two national seminars, one stakeholders meet, workshops for knowledge dissemination.

### **Research interest (3-5 lines lines)**

- Post-harvest management for improving post-harvest shelf life and quality of fruits
- Value addition in Pomegranate through minimal processing, development of juice and ready to serve beverage, carbonated drink, pomegranate wine, pomegranate seed oil, peel based value added products etc.
- Design and development of pomegranate processing machineries.

### **Important Award/ Honour/ Recognition in bullets**

1. **Best Poster award: Gaikwad N.N., Kalal, A.Y., Babu, K.D.** 2019. “Studies on active modified atmospheric packaging of pomegranate arils”. in Souvenir cum abstract compendium of National Conference on Arid fruits: A way forward for sustainable production and nutritional security, UAS, Raichur, 28-30th November, 2019 p. 211.
2. **Best poster presentation: Nilesh N. Gaikwad, Sujata Raut, Govind Yenge, Swati Suryavanshi, K. Dhinesh Babu, and R. K. Pal** (2018) Enzyme assisted extraction of pomegranate seed oil. In National Seminar on Recent Trends in Plant Science and Agricultural Research, Solapur held on 11-12<sup>th</sup> January 2018.

3. Honoured with **Young Scientist Award 2016** for outstanding contribution in the field of pomegranate processing by Society for Advancement of Research in Pomegranate, Solapur, Maharashtra.
4. **Best oral presentation: Nilesh N. Gaikwad**, Vaijenath H. Yedle, Govind B. Yenge, Swati Suryavanshi, and Ram Krishna Pal (2017) Development of fruit based carbonated drink from pomegranate and grapes" at National conference on advance trends in agriculture and food engineering to be held on 7-8th April 2017.
5. **Best Poster award: Nilesh N. Gaikwad**, K Dhinesh Babu, Swati K. Suryavanshi, Vaijenath Yedle, R K Pal (2017) effect of wax coating and packaging on storability of pomegranate fruits. In 2nd National seminar cum farmers fair Pomegranate for Health, Growth and Prosperity to be held at ICAR-NRCP Solapur during 28-30 Apr. 2017.
6. **Best Poster award: Nilesh Gaikwad**, R.K.Pal, K. D. Babu, Swati K.Suryavanshi. 2014. Effect of thermal processing and extraction methods on quality of pomegranate (cv. Bhagwa) juice. National Seminar on Pomegranate: Nutrition, livelihood security and entrepreneurship development, 5-7 December, 2014, NRCP, Solapur.pp.284-285.
7. **Best Poster award: K. Dhinesh Babu, Nilesh Gaikwad**, N.V. Singh, A. Maity, Swati K. Suryawanshi, R.K. Pal and Ram Chandra. 2014. Determination of maturity indices for harvesting of pomegranate cv. Bhagwa. National Seminar on Pomegranate: Nutrition, livelihood security and entrepreneurship development, 5-7 December, 2014, NRCP, Solapur.
8. Bagged **AIR 1** in Ph.D. entrance examination conducted by IARI, New Delhi and received IARI merit fellowship for Ph.D. in Agril. Structures and Process Engineering (Agril. Engg.)
9. Bagged **AIR 2** in ICAR Junior Research Fellowship in Agricultural Engineering discipline in year 2002.
10. Elected as **Editor** of the Society for Advancement of Research on Pomegranate (SARP), Solapur.

### **Salient/ important research publications**

1. **Gaikwad NN**, Kalal AY, Suryavanshi SK, Patil PG, Sharma D, Sharma J. (2021) Process optimization by response surface methodology for microencapsulation of pomegranate seed oil. J Food Process Preserv. 2021;00:e15561. <https://doi.org/10.1111/jfpp.15561> (**IF: 1.405, NAAS Score: 7.41**)
2. A Maity, **N Gaikwad**, KD Babu, A Sarkar, P Patil (2021) Impact of zinc and boron foliar application on fruit yield, nutritional quality and oil content of three pomegranate (*Punica granatum L.*) cultivars. Journal of Plant Nutrition, 2021 DOI: 10.1080/01904167.2021.1884711(**NAAS Score: 7.13**)
3. Yalamalle V. R., **Gaikwad N.N.**, Ithape, D.M. Kumar, A., Gorrepati, K., Singh, M. (2020). Loss of seed viability in onion (*Allium cepa L.*) in relation to degradation of lipids during storage. Journal of Applied and Natural Science, 12(4): 635 - 640. <https://doi.org/10.31018/jans.v12i4.2431>(**NAAS Score: 4.28**)

4. Krishnendu Manna, Snehasis Mishra, Moumita Saha, Supratim Mahapatra, Chirag Saha, Govind Yenge, **Nilesh Gaikwad**, Ramkrishna Pal, Dasharath Oulkar, Kaushik Banerjee, Krishna Das Saha. (2019) Amelioration of diabetic nephropathy using pomegranate peel extract-stabilized gold nanoparticles: assessment of NF- $\kappa$ B and Nrf2 signaling system. *International Journal of Nanomedicine*, 14:1753-1777. (IF:4.37, NAAS Score: 10.37).
5. Sukhvinder Pal Singh, Ram Krishna Pal, Manpreet Kaur Saini, Jagdeep Singh, **Nilesh Gaikwad**, Shilpa Parashuram and Charanjit Kaur. (2019) Targeted metabolite profiling to gain chemometric insight into Indian pomegranate cultivars and elite germplasm. *the Journal of the Science of Food and Agriculture*, 99 (11):5073-5082. doi: 10.1002/jsfa.9751. (NAAS Score: 8.38).
6. Khan, Z. S., Mandal, A., Maske, S., Ahammed Shabeer, T. P., **Gaikwad, N.**, Shaikh, S., & Banerjee, K. (2020). Evaluation of fatty acid profile in seed and oil of Manjari Medika, a novel Indian grape cultivar and its comparison with Cabernet Sauvignon and Sauvignon Blanc. *Sustainable Chemistry and Pharmacy*, 16. <https://doi.org/10.1016/j.scp.2020.100253>. (IF:3.294, NAAS Score:9.294)
7. Yedle, V.H., Kanawade, V.L., Yenge, G.B., **Gaikwad, N.N.**, Kenghe, R.N. and Shelar, S.D. (2020) Studies on shelf life extension of guava (Cv. Sardar) using different packaging materials. *Journal of Environmental Biology*, 41:247-254. (NAAS Score: 6.56).
8. Maity, A., **Gaikwad, N.**, Babu, K. D., More, A. K. and Sarkar. A. (2019). Physico-chemical and nutritional characteristics of main pomegranate (*Punica granatum L.*) cultivars grown in Deccan Plateau of India. *Agrochimica*, 63(2): 105-12. *Agrochimica*. (NAAS Score: 6.65)
9. Rawat, Indu, **Gaikwad, Nilesh**. (2020) Work environment in the wheat mills of Punjab, India, *Current Science*, 118 (04): 526-531. (NAAS Score: 6.76).
10. Patil, P.G., Singh, N.V., Parashuram, S. Bohra, A., Sowjanya, R., **Gaikwad, N.**, Mundewadikar, D.M., Sangnure, V.R., Jamma, S.M., Injal, A.S., Babu, K.D., Sharma, J. Genome-wide characterization and development of simple sequence repeat markers for genetic studies in pomegranate (*Punica granatum L.*). *Trees* 34, 987–998 (2020). <https://doi.org/10.1007/s00468-020-01975-y>.
11. Rawat, I., **Gaikwad, N.N.**, Meena, M.S., Swarnajeeta, S., Purohit, Nischita. Occupational Noise Hazards in Agri-Based Industries in India. *Natl. Acad. Sci. Lett.* (2020). <https://doi.org/10.1007/s40009-020-00975-3> (NAAS Score: 6.33)
12. Rahul S Yadav, S K Jha, J P Sinha, Pramod Aradwad, **Nilesh Gaikwad**, Arun Kumar T V And D V K Samuel (2019) Cross-flow thin bed drying characteristics of maize (*Zea mays*) using continuous sample weight measurement. *Indian Journal of Agricultural Sciences*, 89 (3): 458–62. (NAAS Score: 6.23)
13. **Nilesh N. Gaikwad**, Tanbir Ahmad, Govind B. Yenge and Ajeet Singh (2017) Design, development and performance evaluation of fish descaling machine. **Fishery Technology** 54 (2017): 273 – 278. (NAAS Score: 5.25)
14. **Nilesh N. Gaikwad**, V.H. Yedle, Govind Yenge, Swati Suryavanshi, K.D. Babu, R.K. Pal and Susheel Sarkar (2017) Effect of microwave pretreatment on extraction yield of pomegranate seed (cv. Bhagwa) oil. **International Journal of Chemical Studies** 5(4):1291-1294. (NAAS Score: 5.31).
15. **Nilesh N. Gaikwad**, R K Pal, Swati Suryavanshi, K.D. Babu, Ashis Maity and Susheel Sarkar. (2017) Effect of extraction method and thermal processing on retention of

- bioactive compounds of pomegranate (cv. Bhagwa) juice. **Indian Journal of Agricultural Sciences**. 87 (11):1445-1452. (NAAS Score: 6.25)
16. **Gaikwad N.N.**, Raut Sujata, Yenge Goving, Suryavanshi Swati, Babu K. Dhinesh and R K Pal. (2018) Enzyme assisted extraction of pomegranate seed oil. **Contemporary Research in India**. Special Issue: National Seminar “Recent trends in Plant Sciences and Agricultural research.” PSAR-Jan., 2018, 89-94. (NAAS Score: 3.23)
  17. Ram Krishna Pal and **Nilesh N. Gaikwad** (2016) Exploiting full pomegranate potential for double benefit. **Indian Horticulture**. Vol. 61, No. 6, 15-17.
  18. R.K. Pal, K. Dhinesh Babu, N.V. Singh, Ashis Maity and **Nilesh Gaikwad** (2014) Pomegranate Research in India - Status and future challenges. **Progressive Horticulture**, Vol. 46, No. 2, 184-201. (NAAS Score: 3.53)
  19. K. Dhinesh Babu, N.V. Singh, **Nilesh Gaikwad**, A. Maity, S K Suryavanshi and R K Pal. 2017 Determination of maturity indices for harvesting of pomegranate (punica granatum L.) **Indian Journal of Agricultural Sciences**. 87 (9):1225-1230. (NAAS Score: 6.25)
  20. Tanbir Ahmad, **Nilesh N. Gaikwad**, Yogesh Kumar and Rahul K. Anurag. (2016) Ergonomics design and development of poultry dressing table for hygienic processing. **Journal of Agricultural Engineering** 53 (3), 34-39. (NAAS Score: 5.59)
  21. Dhanashree Sangolagi, M G Bhosale, and **Nilesh Gaikwad** (2015) Effect of different pretreatments on minimally processed pomegranate arils during storage **International Journal of Science, Engineering and Technology**, Vol. 3 (4),1112-1116.
  22. **Nilesh N. Gaikwad**, D. V. K. Samuel, Manpreet Kaur Grewal and M. Manjunatha (2014) Development of Orange Grading Machine on Weight Basis, **Journal of Agricultural Engineering**, Vol. 51 (3), 1-8. (NAAS Score: 5.59)
  23. M. Manjunatha, D. V. K. Samuel, Rahul K. Anurag and **Nilesh Gaikwad** (2012). Development and performance evaluation of a garlic peeler. **Journal of Food Science and Technology**. 51(11): 3083–3093. (NAAS Score: 7.85)
  24. Manpreet Kaur Grewal, **Nilesh N. Gaikwad**, S.N. Jha, D.M. Kadam, Jaspreet Kaur, Harleen Kaur. (2012) Relationship between physical and internal quality attributes of kinnow mandarin. **Journal of Agricultural Engineering**, Vol. 49(4) 20-24. (NAAS Score: 5.59)
  25. Tanbir Ahmad, Yogesh Kumar, **Nilesh Gaikwad** and Deepak Raj Rai (2015). Correlation between some quality parameters and bleeding status of poultry meat. **Asian Journal of Dairy & Food Research**. 34 (4), 332-334. (NAAS Score: 4.20).

## Patents

1. **Gaikwad Nilesh N.** and Pal Ram Krishna “A Process of Extraction of Virgin Pomegranate Seed Oil with retention of bioactive compounds” Patent Filed Application No. 201611011366 E-2/528/2017/DEL. (**Granted**)
2. Tanbir Ahmad, **Nilesh N. Gaikwad** and Yogesh Kumar. (2012). An innovative poultry processing table. CBR No. 9785 APP. No. 3172/DEL/2012. (**Filed, published**)

## Books Edited

1. M.M. Pandey, D. Rama Rao, S. Ganeshan, D. Dhingra and **Nilesh Gaikwad**. (2014) Agricultural Technologies commercialised: Agricultural Engineering. Vol. I. Indian Council of Agricultural Research Publication. ISBN No.:978-81-910388-0-4.
2. **निलेश गायकवाड** आणि डी. टी. मेश्राम (२०१७) डाळिंब उत्पादन, विपणन आणि उपयोगिता. तांत्रिक पुस्तिका क्र. २०१७/१. भारतीय कृषी अनुसंधान परिषद -राष्ट्रीय डाळिंब संशोधन केंद्र, सोलापूर, ४१३ २५५ (महाराष्ट्र)
3. K. Dhinesh Babu, Ashis Maity, N.V. Singh, **Nilesh Gaikwad** and D T Meshram (2015) NRCP Annual Report 2014-15, National research Centre on Pomegranate
4. K. Dhinesh Babu, Ashis Maity, N.V. Singh, **Nilesh Gaikwad** and D T Meshram (2016) NRCP Annual Report 2015-16, National research Centre on Pomegranate
5. एन. वी. सिंह, डी. टी. मेश्राम, **एन. एन. गायकवाड**, यू. आर. सांगले, के.डी. बाबू और आशिस माइती, (२०१७) रा. अ. अनु. के., वार्षिक रिपोर्ट, २०१५-२०१६ , राष्ट्रीय अनार अनुसन्धान केन्द्र , सोलापूर- ४१३ २५५, महाराष्ट्र.
6. K. Dhinesh Babu, Jyotsna Sharma, Ashis Maity, N.V. Singh, and **Nilesh Gaikwad** (2017) ICAR-NRCP Annual Report 2016-17, ICAR-National Research Centre on Pomegranate, Solapur- 413 255, Maharashtra
7. R.K. Pal, Jyotsna Sharma, K. Dhinesh babu, N.V. Singh, and **Nilesh Gaikwad**.. (2017) Pomegranate Revolution In India A Success Story of ICAR, October 2017, ICAR NRC on Pomegranate. 14 p.
8. R.K. Pal and **Nilesh Gaikwad** (2017) Pomegranate Processing: A Value Chain Approach. ICAR- NRCP. 13 P.

## Book Chapter

1. N. N. Gaikwad, P.G. Patil, N.B. Patil, M. Cano-Lamadrid, Á. A. Carbonell-Barrachina (2021) Processing and Industrialization In The Pomegranate Botany, Production and Uses Eds. A. Sarkhosh, A.M. Yavari and Z. Zamani. CAB International.