

# Dr. Mahabaleshwar Hegde

## Profile

- **Qualifications:** B.Sc.(Hons),M.Sc.,PhD
- **Designation:** Director, Center for innovation in Nutrition Health and Disease, IRSHA, BV (DU)
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## Research experience:

Duration	Institution	Particulars of work done
<b>2000 – Present</b> Scientific Advisor	Interactive Research School for Health Affairs, BV (DU)	Converting ideas in nutrition into innovation for managing health and disease
<b>1995- 2000</b> Project coordinator	National Chemical Laboratory, Pune	Conducting research on omega-3 fatty acids and antioxidants.
<b>1960-1994</b> Retired as Professor and Head of the Department	Biochemistry Division,Department of Chemistry University of Pune	Guiding and teaching post graduate courses in M.Sc, M.Phil, Ph D in Biochemistry
<b>June 85- Sept 85</b> Visiting investigator	Sloan Kettering Cancer Center, New York, USA	Structure and function of DNA polymerases
<b>Jan. 82 May 83,</b> Research associate	Albert Einstein College of Medicine, New York, USA	Molecular biology of Yeast Maltase Recombinant DNA technology, DNA sequencing
<b>March 80- Dec 81</b> Visiting Investigator	Sloan Kettering Cancer Center, New York, USA	Replication of Simliki forest virus Animal tissue culture
<b>March 75-April 75</b>	Bhaba Atomic Research Center, Mumbai	Radioisotope methodology

<b>March 62-April 62</b> UGC Fellow	Indian Institute of Science, Bangalore	Modern Techniques in Biochemistry
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## Projects

S. No.	Name of the project	Funding Agency	Status	Amount Sanctioned
1	Honey as a base for antioxidants in Health foods	Directorate of Science & Technology KVIC, Mumbai	Completed	4.95 Lakhs
2	Egg for health in collaboration Venkateshwara Hatchery	Department of Biotechnology	Completed	17 Lakhs
3	New approach to quick biogas production	DST.KVIC	Completed	4.9 Lakhs
4	Sustainable Rural Livelihood Security in Backward Districts of Maharashtra	ICAR-NAIP III	Completed	235.04 Lakh
5	A Value Chain on Linseed: Processing and Value Addition for Profitability - Production to Consumption System (PCS)	ICAR-NAIP II	Completed	87.16 Lakh
6	Developing high oleic safflower genotypes through functional genomics	ICAR-NASF	Completed	46.44 Lakh
7	Direct beta thalassemia carrier detection kit	DBT-BIRAC	Completed	44.64 Lakh
8	Evaluation of efficacy of novel stabilized omega-3-fatty acid and antioxidants formulation for the prevention and treatment of metabolic syndrome	DST-SERB	Completed	40.36 Lakh
9	ICAR-AICRP-Linseed Value Addition Centre	ICAR	Ongoing	101.08 Lakh

## Area of Interest:

- Role of Nutrition in Human Health and Disease
- Flax Bio-village concept validation and commercialization
- Omega-3 fatty acid Nutritional Security

## Honors/Awards

- Fellowship of Society of Agricultural Biochemists 2016
- For the last 17 years devoted and fully committed to “Omega-3 nutritional security”, through: “Flax agriculture- post harvest technology for human health and IQ”
- The best poster award CSIR, India, (for experimental nutrition) for the work on “Maternal supplementation of fish oil at marginal protein levels influences brain fatty acid levels in Wistar rats” S Joshi, S, Rao, A, Kale, M Hegde, at XXXVI annual meeting of the Nutrition Society of India at Mysore, Nov. 2005.
- 1st prize for the poster presentation entitled “Influence of Seed development, germination and genotypes on omega-3-ALA content in flax”. GKVK, Bangalore, Jan 2006.
- 1st prize for the poster entitled “Flax oil stabilization for preparation of omega-3 enriched food products” Shaheeda Khan, Ulhas Wagh and Mahabaleshwar Hegde at the International Conference tenth convention of Agricultural Biochemists, on “Post-Harvest technology and value addition in cereals, pulses and oil seeds” at CS Azad University of Agriculture and Technology, Kanpur. Nov 2006.
- Best paper award at the First annual Conference of Association of Avian Health Professionals Feb 3-4 2012, Hyderabad7. Best paper award “Estrogenic and embryo-fetotoxic effects of ethanol extract of *Linum usitatissimum* in rats” at International Conference natural Products Chidambaram 2008.
- Best research Publication Award (Ayurved) for the year 2010, at Indian Poultry Science Association, Annual meeting held at Patna 2012.
- Best oral presentation award at the first Annual Conference of Association of Avian Health Professionals and International Symposium 2012 at Project Directorate on Poultry Hyderabad
- Gold medal of DST-Lockheed Martin at India Innovation Growth Programme 2013. Dr. M. V. Hegde, on 2nd May 2013.
- Gold medal of DST-Lockheed Martin at India Innovation Growth Programme 2013. Dr. M. V. Hegde, on 2nd May 2013
- Sevagaurav Award by BV (DU), Dr. M. V. Hegde, on 10th May 2013
- Special Award by BV (DU) Dr. S. S. Bhalerao, on 9th May 2013.
- Dr. P. D. Sethi Best Research papers Awarded to the research paper “Quantification of major bioactive withanolides in *Withaniasomnifera* (Ashwagandha) roots by HPTLC for rapid validation of Ayurvedic products” JPC-Modern TLC, 25, 290-294. Devkar ST, Badhe YS, Jagtap SD, Hegde MV, 2012. Awarded by “ANCHROM Enterprises”.

- **1 Lakh cash award** from DST-Lockheed Martin at India Innovation Growth Programme, Patna 2013. Dr. M. V. Hegde, on 5th Dec. 2013.
- **1 Lakh cash award** from DST-Lockheed Martin at India Innovation Growth Programme, Patna 2013. Dr. S. S. Bhalerao, on 5th Dec. 2013.

### Other activities

In order to commercialize the innovations at CINHD .IRSHA, we have formed a not for profit company, [Real World Nutrition](#) Laboratory Foundation, Pune. As founder Director of this company, I oversee all the activities of this company located within the premises of BV (DU).

### Professional memberships

- Society of Biological chemist
- Society of microbiologist
- Indian Poultry Scientist Association
- Society of Agriculture Biochemists

### Publications:

- International publications: 67
- Book chapters: 14
- Edited book by Faculty: 04
- Patent applications: 07

### Publications

1. Sane, A. S., Hegde, M. V., & Joshi, P. N. (1979). Resolution of enzymes that hydrolyse phosphate esters from agave cantala on amberlite IR-120 (Al3+). *Journal of Chromatography A*, 168(2), 495-499.
2. Hegde, M. V., Roy, F., & Joshi, P. N. (1979). A New Method for the Preparation of  $\beta$ -Amylase from Sweet Potato. *Preparative Biochemistry*, 9(1), 71-84.
3. Pérez-de-Mora, A., Laquitaine, L., & Gaspard, S. (2013). Microorganisms for Soil Treatment. In *Biomass for Sustainable Applications* (pp. 144-221).
4. Chow, T., Goldenthal, M. J., Cohen, J. D., Hegde, M., & Marmur, J. (1983). Identification and physical characterization of yeast maltase structural genes. *Molecular and General Genetics MGG*, 191(3), 366-371.
5. Basu, M., Hegde, M. V., & Modak, M. J. (1983). Synthesis of compositionally unique DNA by terminal deoxynucleotidyltransferase. *Biochemical and biophysical research communications*, 111(3), 1105-1112.
6. Roy, F., & Hegde, M. V. (1985). Rapid procedure for purification of  $\beta$ -amylase from Ipomeabatata. *Journal of Chromatography A*, 324, 489-494.

7. Nehete, P. N., Hegde, M. V., Gurucharan Reddy, L., & Shankar, V. (1987). Immobilization of amyloglucosidase on polystyrene anion exchanger resin II. Kinetics and stabilities. *Biotechnology letters*, 9(9), 651-654.
8. Roy, F., & Hegde, M. V. (1987). Immobilization of  $\beta$ -amylase on polystyrene cation exchange resin equilibrated with  $Al^{3+}$  ions (IR-120  $Al^{3+}$ ). *Enzyme and microbial technology*, 9(9), 550-552.
9. Chow, T., Goldenthal, M. J., Cohen, J. D., Hegde, M., & Marmur, J. (1983). Identification and physical characterization of yeast maltase structural genes. *Molecular and General Genetics MGG*, 191(3), 366-371.
10. Shah, N., Shah, N., Upadhyay, C., Nehete, P., Kothari, R., Hegde, M. (1989). An economically upgraded stabilized and efficient preparation of amyloglucosidase. *Journal of Biotechnology*, 10, 267-276.
11. Karyekar, S. K., & Hegde, M. V. (1989). Affinity purification of penicillin acylase on phenylacetic acid linked to Indion 48-R: effect of spacer variation. *Biotechnology techniques*, 3(3), 145-148.
12. Shah, N. K., Upadhyay, C. M., Nehete, P. N., Kothari, R. M., & Hegde, M. V. (1990). An economical, upgraded, stabilized and efficient preparation of  $\alpha$ -amylase. *Journal of biotechnology*, 16(1-2), 97-108.
13. Karyekar, S. K., & Hegde, M. V. (1991). The hydrophobic domain of penicillin acylase is negatively charged. *Enzyme and microbial technology*, 13(2), 139-141.
14. Pathak, S. U., Karyekar, S. K., Ghole, V. S., & Hegde, M. V. (1992). Effect of activation methods on affinity chromatography of potato polyphenol oxidase. *Phytochemistry*, 31(5), 1481-1483.
15. Nayak, A. R., Nair, J. S., Hegde, M. V., Ranjekar, P. K., & Pant, U. (1991). Genome analysis of two mosquito species. *Insect biochemistry*, 21(7), 803-808.
16. Bankar, M. P., Kate, S. L., Ranade, S. A., Barnabas, R. J., Mokashi, G. D., Phadke, M. A., & Hegde, M. V. (1993). Prenatal diagnosis of sickle cell anemia using polymerase chain reaction. *Indian pediatrics*, 30(11), 1340-1343.
17. Phadke, M. A., Barnabas, R., Bhate, S. M., Gambhir, P. S., Kate, S. L., & Hegde, M. V. (1996). Hb-pune: A new gamma beta crossover hemoglobin from an Indian family. *INTERNATIONAL JOURNAL OF PEDIATRIC HEMATOLOGY/ONCOLOGY*, 3(2), 147-151.
18. Ranjekar, P. K., Hinge, A., Hegde, M. V., Ghate, M., Kale, A., Sitasawad, S., ...& Mahadik, S. P. (2003). Decreased antioxidant enzymes and membrane essential polyunsaturated fatty acids in schizophrenic and bipolar mood disorder patients. *Psychiatry research*, 121(2), 109-122.
19. Joshi, S., Rao, S., Girigosavi, S., Daware, M., Kale, A., & Hegde, M. (2004). Differential effects of fish oil and folic acid supplementation during pregnancy in rats on cognitive performance and serum glucose in their offspring. *Nutrition*, 20(5), 465-472.
20. Rao, S., Joshi, S., Kale, A., Hegde, M., & Mahadik, S. (2006). Maternal folic acid supplementation to dams on marginal protein level alters brain fatty acid levels of their adult offspring. *Metabolism*, 55(5), 628-634.
21. Hegde, M. V., Patil, S., & Bhalerao, S. (2008). A philosophy for integration of ayurveda with modern medicine: A biochemist's perspective. *Current science*, 95(6), 721-722.
22. Zanwar, A. A., Hegde, M. V., & Bodhankar, S. L. (2010). In vitro antioxidant activity of ethanolic extract of *Linum usitatissimum*. *Pharmacologyonline*, 1, 683-696.

23. Zanwar, A. A., Aswar, U. M., Hegde, M. V., & Bodhankar, S. L. (2010). Estrogenic and embryofetotoxic effects of ethanol extract of *Linum usitatissimum* in rats. *Journal of Complementary and Integrative Medicine*, 7(1).
24. Mahabaleshwar, H., Nupur, H., Revati, D., Garish, G., & Shahida, K. (2010). Oral precancerous lesions show increased levels of glutathione compared to cancerous tissue. *Current Nutrition & Food Science*, 6(3), 223-226.
25. Krishna, K., B Pradhan, A., V Hegde, M., A Zanwar, A., I Pathan, S., Patil, A., & A Khan, S. (2010). Can Progression of Alcoholic Liver Disease be Predicted from Certain Biochemical Indices?. *Current Nutrition & Food Science*, 6(3), 204-208.
26. Bhalerao, S., Hegde, M., Ranad, A., Nikam, S., Kshirsagar, K., & Kadam, S. (2010). Studies in the production of Omega 3 enriched chicken meat: II. *Indian Journal of Poultry Science*, 45(3), 273-279.
27. Zanwar, A., Hegde, M., & Bodhankar, S. (2011). Cardioprotective activity of flax lignan concentrate extracted from seeds of in isoprenaline induced myocardial necrosis in rats. *Interdisciplinary toxicology*, 4(2), 90-97.
28. Mali, A. V., Wagh, U. V., Hegde, M. V., Chandorkar, S. S., Surve, S. V., & Patole, M. V. (2012). In vitro anti-metastatic activity of enterolactone, a mammalian lignan derived from flax lignan, and down-regulation of matrix metalloproteinases in MCF-7 and MDA MB 231 cell lines. *Indian journal of cancer*, 49(1), 181.
29. Kasote, D. M., Hegde, M. V., & Deshmukh, K. K. (2011). Antioxidant activity of phenolic components from n-butanol fraction (PC-BF) of defatted flaxseed meal. *Am J Food Technol*, 6(7), 604-612.
30. Mahadev, K. D., Vishnu, H. M., & Kashinath, D. K. (2011). HPTLC and LC-ESI-MS characterization of ether insoluble phenolic components from n-butanol fraction (EPC-BF) of defatted flaxseed meal. *Int. J. Drug Dev. & Res*, 3(3), 126-130.
31. Hegde, M. V., & Saraph, A. A. (2011). Unstable genes unstable mind: beyond the central dogma of molecular biology. *Medical Hypotheses*, 77(2), 165-170.
32. Bhalerao, S., Hegde, M., Kadam, S. (2011). Omega-3, Omega-6 fatty acids in human health and disease, *Bharati Vidyapeeth (Deemed to be University) Journal* 11, 3-9.
33. Bhalerao, S., Hegde, M., Ranade, A., Desai, D., & Kadam, S. (2011). Studies in the production of Omega 3 enriched chicken meat: 1. *Indian Journal of Poultry Science*, 46(1), 40-45.
34. Zanwar, A. A., Hegde, M. V., & Bodhankar, S. L. (2012). Antihyperlipidemic effect of flax lignan concentrate in triton induced hyperlipidemic rats. *International Journal of Pharmacology*, 8(5), 355-363.
35. Kasote, D. M., Badhe, Y. S., Zanwar, A. A., Hegde, M. V., & Deshmukh, K. K. (2012). Hepatoprotective potential of ether insoluble phenolic components of n-butanol fraction (EPC-BF) of flaxseed against CCl<sub>4</sub>-induced liver damage in rats. *Journal of pharmacy & bioallied sciences*, 4(3), 231.
36. Kasote, D. M., Zanwar, A. A., Devkar, S. T., Hegde, M. V., & Deshmukh, K. K. (2012). Immunomodulatory activity of ether insoluble phenolic components of n-butanol fraction (EPC-BF) of flaxseed in rat. *Asian Pacific Journal of Tropical Biomedicine*, 2(2), S623-S626.

37. Bhalerao, S., Hegde, M., Atkare, S., Gondchar, D., Jadhav, R., Kadam, S. (2011). Rural employment through omega-3 chicken production by resourcing linseed as a source of omega-3 fatty acids, *J Bombay Vet Coll.* 19, 26-29.
38. Devkar, S., Badhe, Y., Jagtap, S., &Hegde, M. (2012). Quantification of major bioactive withanolides in *Withaniasomnifera* (Ashwagandha) roots by HPTLC for rapid validation of Ayurvedic products. *JPC-Journal of Planar Chromatography-Modern TLC*, 25(4), 290-294.
39. Zanwar, A. A., Hegde, M. V., &Bodhankar, S. L. (2013). Protective role of concomitant administration of flax lignan concentrate and omega-3-fatty acid on myocardial damage in doxorubicin-induced cardiotoxicity. *Food Science and Human Wellness*, 2(1), 29-38.
40. Kasote, D. M., Badhe, Y. S., &Hegde, M. V. (2013). Effect of mechanical press oil extraction processing on quality of linseed oil. *Industrial Crops and Products*, 42, 10-13.
41. Kasote, D. M., Pawar, N. M., Sadgir, S. K., Bharati, K. T., Jagtap, S. D., &Hegde, M. V. (2013). Antioxidant and collagenase inhibitory activity of ether soluble phenolic components of n-butanol fraction (ESP-BF) of flaxseed. *International Food Research Journal*, 20(6), 3133.
42. Kasote, D. M., Hegde, M. V., &Katyare, S. S. (2013). Mitochondrial dysfunction in psychiatric and neurological diseases: cause (s), consequence (s), and implications of antioxidant therapy. *Biofactors*, 39(4), 392-406.
43. Hegde, M. V., Mali, A. V., &Chandorkar, S. S. (2013). What is a cancer cell? Why does it metastasize?. *Asian Pacific Journal of Cancer Prevention*, 14(6), 3987-3989.
44. Badhe, Y., Kukade, D., Gosavi, T., Karandikar, M., Hegde, M. (2013). Significance of fatty acid analysis in lipid profile. *Bharati Vidyapeeth (Deemed to be University) research journal*, Volume number 3, 5-15.
45. Zanwar, A. A., Hegde, M. V., Rojatkar, S. R., &Bodhankar, S. L. (2014). Antihyperlipidemic activity of concomitant administration of methanolic fraction of flax lignan concentrate and omega-3-fatty acid in poloxamer-407 induced experimental hyperlipidemia. *Industrial Crops and Products*, 52, 656-663.
46. Zanwar, A. A., Hegde, M. V., Rojatkar, S. R., Sonawane, K. B., Rajamohanam, P. R., &Bodhankar, S. L. (2014). Isolation, characterization and antihyperlipidemic activity of secoisolariciresinoldiglucoside in poloxamer-407-induced experimental hyperlipidemia. *Pharmaceutical Biology*, 52(9), 1094-1103.
47. Bhalerao, S., Hegde, M., Katyare, S., &Kadam, S. (2014). Promotion of omega-3 chicken meat production: an Indian perspective. *World's Poultry Science Journal*, 70(2), 365-374.
48. Devkar, S. T., Jagtap, S. D., Katyare, S. S., &Hegde, M. V. (2014). Estimation of Antioxidant Potential of Individual Components Present in Complex Mixture of *Withaniasomnifera* (Ashwagandha) Root Fraction by Thin-Layer Chromatography—2, 2-Diphenyl-1-Picrylhydrazyl Method. *JPC–Journal of Planar Chromatography–Modern TLC*, 27(3), 157-161.
49. Suryavanshi, S., Zanwar, A., Hegde, M., &Kaul-Ghanekar, R. (2014). Standardization of a polyherbal formulation (HC9) and comparative analysis of its cytotoxic activity with the individual herbs present in the composition in breast cancer cell lines. *Pharmacognosy Journal*, 6(2).
50. Gosavi, T. P., Kumar, V. S., Kandhare, A. D., Zanwar, A. A., Hegde, M. V., &Bodhankar, S. L. (2014). A comprehensive metaanalysis and systematic review on effect of genistein on metabolic syndrome. *Pharmacologia*, 5, 120-126.

51. Devkar, S. T., Suryapujary, S. M., Jagtap, S. D., Katyare, S. S., & Hegde, M. V. (2015). Effect of macronutrient deficiency on withanolides content in the roots of *Withaniasomnifera* and its correlation with molybdenum content. *Pharmaceutical Biology*, 53(4), 518-523.
52. Kasote, D. M., Katyare, S. S., Hegde, M. V., & Bae, H. (2015). Significance of antioxidant potential of plants and its relevance to therapeutic applications. *International journal of biological sciences*, 11(8), 982.
53. Devkar, S. T., Kandhare, A. D., Sloley, B. D., Jagtap, S. D., Lin, J., Tam, Y. K., ... & Hegde, M. V. (2015). Evaluation of the bioavailability of major withanolides of *Withaniasomnifera* using an in vitro absorption model system. *Journal of advanced pharmaceutical technology & research*, 6(4), 159.
54. Mali, A. V., Bhise, S. S., Hegde, M. V., & Katyare, S. S. (2016). Altered erythrocyte glycolytic enzyme activities in type-II diabetes. *Indian Journal of Clinical Biochemistry*, 31(3), 321-325.
55. Devkar, S. T., Kandhare, A. D., Zanwar, A. A., Jagtap, S. D., Katyare, S. S., Bodhankar, S. L., & Hegde, M. V. (2016). Hepatoprotective effect of withanolide-rich fraction in acetaminophen-intoxicated rat: decisive role of TNF- $\alpha$ , IL-1 $\beta$ , COX-II and iNOS. *Pharmaceutical Biology*, 54(11), 2394-2403.
56. Goswami, S., Kandhare, A., Zanwar, A. A., Hegde, M. V., Bodhankar, S. L., Shinde, S., ... & Kharat, R. (2016). Oral L-glutamine administration attenuated cutaneous wound healing in Wistar rats. *International wound journal*, 13(1), 116-124.
57. Honmore, V. S., Kandhare, A. D., Kadam, P. P., Khedkar, V. M., Sarkar, D., Bodhankar, S. L., ... & Natu, A. D. (2016). Isolates of *Alpiniaofficinarum* Hance as COX-2 inhibitors: Evidence from anti-inflammatory, antioxidant and molecular docking studies. *International immunopharmacology*, 33, 8-17.
58. Mali, A. V., Joshi, A. A., Hegde, M. V., & Kadam, S. S. (2017). Enterolactone suppresses proliferation, migration and metastasis of MDA-MB-231 breast cancer cells through inhibition of uPA induced plasmin activation and MMPs-mediated ECM remodeling. *Asian Pacific journal of cancer prevention: APJCP*, 18(4), 905.
59. Mali, A. V., Bhise, S. S., Katyare, S. S., & Hegde, M. V. (2018). Altered kinetics properties of erythrocyte lactate dehydrogenase in type II diabetic patients and its implications for lactic acidosis. *Indian Journal of Clinical Biochemistry*, 33(1), 38-45.
60. Hegde, M. (2019). Unleashing the Power of Linseed to Improve Public Health and Combat Non-Communicable Disease Menace in the Country. *Indian Journal of Agricultural Biochemistry*, 32(1), 1-9.
61. Mali, A. V., Joshi, A. A., Hegde, M. V., & Kadam, S. S. (2018). Enterolactone modulates the ERK/NF- $\kappa$ B/Snail signaling pathway in triple-negative breast cancer cell line MDA-MB-231 to revert the TGF- $\beta$ -induced epithelial-mesenchymal transition. *Cancer biology & medicine*, 15(2), 137.
62. Mali, A. V., Padhye, S. B., Anant, S., Hegde, M. V., & Kadam, S. S. (2019). Anticancer and antimetastatic potential of enterolactone: clinical, preclinical and mechanistic perspectives. *European journal of pharmacology*, 852, 107-124.
63. Bhise, S. S., Rao, J. R., Hegde, M. V., & Katyare, S. S. (2020). Compositional alterations in erythrocyte membranes in Type II diabetes. *Indian Journal of Experimental Biology (IJB)*, 58(10), 671-679.



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65. Jagtap, A. A., Badhe, Y. S., Farde, P. D., Hegde, M. V., &Zanwar, A. A. (2021). Long-term Storage Stability Assessment of Omega-3-Fatty Acid Emulsified Formulation Containing Micronutrients. *Journal of Pharmaceutical Innovation*, 1-10.
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67. Joshi, A., Hegde, M., &Zanwar, A. (2022). Flaxseed oil and palm olein blend to improve omega-6: Omega-3 ratio. *Journal of Food Science and Technology*, 59(2), 498-509.

#### Patent applications:

1. **Mahabaleshwar. Hegde**, UlhasWagh and Shahida Khan, Omega-3 Fatty acid compositions with honey, World Patent, PCT/IN05/00163 dated 24.05.2005.
2. **MahabaleshwarHegde**, SurekhaBhalerao, ShivajiraoKadam, Indian patent application No 1971/MUM/2012-Composition for chicken feed for production of Omega-3 Chicken and method thereof. Date of filling: 9-Jul-12, Publication date (U/S 11A)-07-02-2014.
3. **Mahabaleshwar V Hegde**, Surekha S. Bhalerao, "Omega-3 supplement feed composition for omega -3 eggs production" Indian Patent Application No. 2193/MUM/2014 dated 7-Jul-14.
4. **Mahabaleshwar. Hegde**, UlhasWagh. Nutritional and rejuvenative food supplement capable of fortifying any food products. Application Number 1717/MUM/2012. Publication date (U/S 11A)-14/02/2014
5. **Mahabaleshwar Hegde**, Anand A. Zanwar, Subhash L. Bodhankar, TejasGosavi, Yogesh S. Badhe. Fortified omega-3 ghee and process for preparation thereof. Indian Full Patent Application-3719/MUM/2013. Publication date (U/S 11A)- 27/12/2013.
6. Shanta Modak, Chathuranga De Silva, Arnabkumar Ghosh, Anand Zanwar, Mahabaleshwar Hegde. Polymer films with antimicrobial agents. International Patent Application No. PCT/US18/44247 WO2019/023685A1. 27/07/2018
7. ShantaModak, Arnab Kumar Ghosh, Chathuranga C. De Silva, **MahabaleshwarHegde**, Anand Zanwar, SantoshkumarDongre, Shivajirao S. Kadam. Coatings and methods for infection-resistant medical devices. US Provisional Patent Application no. 62333905. Priority date-10-05-2016.

#### Books

1. "Biochemistry for undergraduate "M.V.Hegde, A.M.Diwan and M.V. Athavale. NarendraPrakashan (1978).

2. A course in Industrial Chemistry" part I: A chapter on Sugar Industries: N.R.Ayyengar, **M.V.Hegde**, A.J.Mukhedkar, N.S.Narasimhan, P.G.Pol and A.C.Ranade. Orient Longman (1977).
3. "A course in Industrial Chemistry" part II : A chapter on Fermentation Industries : **M.V.Hegde**, S.B.Kulkarni, A.J.Mukhedkar, P.G.Pol and D.L. Roy. Orient Longman (1978).
4. **Mahabaleshwar V. Hegde**, Anand A. Zanwar, Sharad P. Adekar. Omega-3 Fatty Acids - Keys to Nutritional Health 2016. Humana Press Springer Science. Springer International Publishing Switzerland. DOI: 10.1007/978-3-319-40458-5. ISBN: 978-3-319-40456-1 (Print) 978-3-319-40458-5 (Online).

#### Book chapters:

1. A course in Industrial Chemistry" part I: A chapter on Sugar Industries: N.R.Ayyengar, **M.V.Hegde**, A.J.Mukhedkar, N.S.Narasimhan, P.G.Pol and A.C.Ranade. Orient Longman (1977).
2. "A course in Industrial Chemistry" part II : A chapter on Fermentation Industries : **M.V.Hegde**, S.B.Kulkarni, A.J.Mukhedkar, P.G.Pol and D.L. Roy. Orient Longman (1978).
3. "Cultural and Socioeconomic Differences in Dietary Intake of Essential Fatty Acids and Antioxidants: Effects on the Course and Outcome of Schizophrenia." Sahebrao P. Mahadik, MeenaMulchandani, **Mahabaleshwar. Hegde** and Prabhakar K. Ranjekar. A chapter in "Phospholipid spectrum Disorders in Psychiatry" (1998).
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