Dr. R. Lakshminarayana

Professor

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ACADEMIC QUALIFICATION

- **B.Sc.** (Chemistry, Botany, Zoology)
  Yuvarajas College, University of Mysore, Karnataka, India. (**1996-1999).**

  M.Sc. (Botany), Department of Botany, University of Mysore, Karnataka, India. (**1999-2001).**

- **M.Phil.** (Applied Botany), Department of Biotechnology, University of Mysore, Karnataka, India. (**2002-2002**).

- Qualified **CSIR-UGC-JRF (NET)** (Life Sciences) -(**2001).**

- **Ph.D.** (Biochemistry), Dept. of Biochemistry & Nutrition, Central Food Technological Research Institute (CSIR), Mysore, Karnataka. (**2003-2009)**

  Thesis: Effect of dietary components on the bioavailability and bioactivity of xanthophylls in rats.

TECHNICAL EXPERTISE

- Characterization of carotenoids pigments (plants/microbes/marine sources)
- Culture & maintenance of cells (macrophages/cancer/epithelial cells).
- Handling of animals (rats/mouse) for biochemistry/toxicology studies.
- Biochemical/molecular regulation of vitamin A metabolism
- Molecular targets of intestinal transport of lipids soluble nutrients/drugs.
- Mol. Biol: Cell-cycle regulation, cell signaling, cell-cell communication
- Oxidative stress physiology of cancer cells.
- Carotenoids Metabolomics.
- Biopolymers, nanoencapsulation, drug/nutrient delivery.

MAJOR SUBJECTS TAUGHT FOR TEACHING

- Animal Biotechnology
- Animal cell culture and stem cell biology
- Biochemistry
- Bioanalytical Techniques
- Proteomics and Metabolomics

RESEARCH PUBLICATIONS

1. Lakshminarayana R, Raju M, Krishnakantha TP, Baskaran V (2005) Determination of major carotenoids in a few Indian leafy vegetables by HPLC. **J Agri Food Chem** 53:2838-42. https://pubs.acs.org/doi/10.1021/jf0481711. (IF-2.32). American Chemical Society.

2. Raju M, Lakshminarayana R, Krishnakantha TP, Baskaran V (2005) Influence of phospholipids on β-carotene absorption and conversion into vitamin A in rats. **J Nutr Sci Vitaminol** 51: 216–222. https://doi.org/10.3177/jnsv.51.216 (IF-1.0). Academic Publication-Japan.

3. Lakshminarayana R, Raju M, Krishnakantha TP, Baskaran V (2006) Enhanced bioavailability of lutein by lyso-phosphatidylcholine in mixed

micelles. **Mol Cell Biochem** 281:103-110. https://doi.org/10.1007/s11010-006-1337-3 (IF-2.38). Springer.

4. Raju M, Lakshminarayana R, Krishnakantha TP, Baskaran V (2006) Micellar oleic and eicosapentaenoic acid but not linoleic acid influences the β-carotene absorption and its cleavage into retinol in rats. **Mol Cell Biochem** 288:7-15. https://doi.org/10.1007/s11010-005-9091-5 (IF-2.38). Springer.

5. Raju M, Varakumar S, Lakshminarayana R, Krishnakantha TP, Baskaran V (2007) Carotenoid composition and vitamin A activity of medicinally important green leafy vegetables. **Food Chem** 101:1598-1605. https://doi.org/10.1016/j.foodchem.2006.04.015 (IF-3.00). Elsevier.

6. Lakshminarayana R, Raju M, Krishnakantha TP, Baskaran V (2007) Lutein and zeaxanthin in leafy greens and their bioavailability: Olive oil influences the absorption of dietary lutein and its accumulation in adult rats. **J Agric Food Chem** 55: 6395-6400. https://doi.org/10.1021/jf070482z (IF-2.42). American Chemical Society.

7. Lakshminarayana R, Aruna G, Sangeetha SK, Baskar N, Divakar S, Baskaran V (2008) Possible degradation/biotransformation of lutein in vitro and in vivo. Isolation and structural elucidation of lutein metabolites by HPLC and LC-MS $(APCI)^+$. **Free Radical Biol Med** 45:982-993. https://doi.org/10.1016/j.freeradbiomed.2008.06.011 (IF-5.83). Elsevier.

8. Lakshminarayana R, Raju M, Keshava Prakash MN, Baskaran V (2009) Phospholipid, oleic acid micelles and dietary olive oil influence the lutein absorption and activity of antioxidant enzymes in rats. **Lipids** 44,799-806. https://doi.org/10.1007/s11745-009-3328-0 (IF-2.00). Springer.

9. Lakshminarayana R, Sathish UV, Dharmesh SM, Baskaran V (2010) Antioxidant and cytotoxic effect of oxidized lutein in human cervical carcinoma cells (HeLa). **Food Chem Toxicol** 48: 1811- 1816. https://doi.org/10.1016/j.fct.2010.04.011 (IF-2.42). Elsevier.

10. Raju M, Lakshminarayana R, Baskaran V (2011) Single oral dose of micellar β-carotene containing phospholipids improves β-carotene metabolism and plasma lipids in vitamin A deficient rats. **Eur J Nutr** 50:531–541. https://doi.org/10.1007/s00394-010-0160-5 (IF-3.0). Springer.

11. Devaraju KS, Gopi A, Anushree, Girisha ST, Lakshminarayana R (2012). Bioimaging of peroxynitrite with a novel fluorescent probe RBPH. **Annal Neurosci** 19:27. 2012. Indian Academy of Neurosciences.

12. Lakshminarayana R, Aruna G, Sathish UV, Dharmesh SM, Baskaran V (2013) Structural elucidation of possible lutein oxidation products mediated through peroxyl radical inducer 2, 2'-Azobis (2-methylpropionamidine) di-hydrochloride: Antioxidant and cytotoxic influence of oxidized lutein in HeLa cells. **Chemico Biol Inter** 203:448-455. https://doi.org/10.1016/j.cbi.2013.03.006 (IF-2.82). Elsevier.

13. Arathi BP, Dilshad P, Saikat B, Gopal V, Lakshminarayana R (2014) UPLC-PDA and tandem mass spectral characteristics of major lycopene Isomers.

Abstract - **Carotenoid Science** 18:35. Japanese Society of Carotenoids Research.

14. Lakshminarayana R, Sowmya PR, Arathi BP, Vijay K, Baskaran V (2014) Determination of possible lutein oxidation products in rat tissues and optimization of analytical methods. Abstract - **Carotenoid Science** 18:116. Japanese Society of Carotenoids Research.

15. Sowmya PR, Arathi BP, Vijay K, Baskaran V, Lakshminarayana R (2014) Cytotoxicity and anti-proliferation of HeLa cells by carotenoids is depends on selective mode of delivery vehicle. Abstract - **Carotenoid Science** 18:150. Japanese Society of Carotenoids Research.

16. Sowmya PR, Arathi BP, Vijay K, Baskaran V, Lakshminarayana R (2014) Optimization of LC/MS (APCI)+ methods for the determination of possible lutein oxidation products in plasma and tissues of adult rats. **Chromatographia** 77:1633-1642. https://doi.org/10.1007/s10337-014-2765-y (IF-1.38). Springer.

17. Arathi BP, Sowmya PR, Vijay K, Dilshad P, Saikat B, Gopal V, Lakshminarayana R (2015) An improved method of UPLC-PDA-MS/MS analysis of lycopene isomers. **Food Anal Methods** 8:1962–1969. https://doi.org/10.1007/s12161-014-0083-5 (IF-2.0). Springer.

18. Sowmya PR, Arathi BP, Vijay K, Baskaran V, Lakshminarayana R (2015) Role of different vehicles in carotenoids delivery and their influence on cell viability, cell cycle progression, and induction of apoptosis in HeLa cells. **Mol Cell Biochem.** 406:245-53. https://doi.org/10.1007/s11010-015-2442-y (IF-2.61). Springer.

19. Sowbhagya RG, Lakshminarayana R, Raghuveer BS, Ravikiran T (2016) Studies on ellagic acid and 4-hydroxyisophthalic acid isolated from swallow root (Decalepis hamiltonii). **Inter J Pharm Pharmaceut Sci** 8: 278-285. Innovare Academic Sciences.

20. Arathi BP, Sowmya PR, Chempakathinal G, Vijay K, Baskaran V, Lakshminarayana R (2016) Enhanced cytotoxic and apoptosis-inducing activity of lycopene oxidation products in different cancer cell lines. **Food Chem Toxicol.** 97:265-276. https://doi.org/10.1016/j.fct.2016.09.016 (IF-3.58). Elsevier.

21. Sowmya PR, Arathi BP, Vijay K, Baskaran V, Lakshminarayana R (2016) A keto-carotenoid astaxanthin from shrimp efficiently inhibits MCF-7 cells proliferation synergistically with β-carotene and lutein (Abstract). **FEBS Journal**. 283 (Suppl. 1) 58–123 DOI: 10.1111/febs.13807 87. (IF-4.21). FEBS.

22. Vijay K, Sowmya PR, Arathi BP, Lakshminarayana R (2016) Evaluation of anti-inflammatory and anti-proliferative effect of hydroxy-, keto-, and epoxy-carotenoids in Raw 264.7 and HL-60 cells. **J Food Chem Nanotechnol.** 2: 153-161. http://dx.doi.org/10.17756/jfcn.2016-024. United Scientific Group.

23. Sowmya PR, Arathi BP, Vijay K, Baskaran V, Lakshminarayana R (2017) Astaxanthin from shrimp efficiently modulates oxidative stress and allied

cell death progression in MCF-7 cells treated synergistically with β-carotene and lutein from greens. **Food Chem Toxicol.** 106: 58-69. https://doi.org/10.1016/j.fct.2017.05.024 (IF-3.70). Elsevier.

24. Vijay K, Sowmya PR, Arathi BP, Shilpa S, Shwetha HJ, Raju M, Baskaran V, Lakshminarayana R (2018). Low dose of doxorubicin with carotenoids selectively alters redox status and up regulates oxidative stress-mediated apoptosis in breast cancer cells. **Food Chem Toxicol.** 118:675-690 https://doi.org/10.1016/j.fct.2018.06.027 (IF-3.70). Elsevier.

25. Arathi BP, Sowmya PR, Chempakathinal G, Shilpa S, Shwetha HJ, Sharath K, Raju M, Baskaran V, Lakshminarayana R (2018). Fractionation and characterization of lycopene oxidation products by LC-MS $(ESI)^+$: Elucidation of chemoprevention potency of oxidized lycopene in breast cancer cell lines**. J Agri Food Chem**. 66: 11362-11371. https://doi.org/10.1021/acs.jafc.8b04850 (IF-3.57). American Chemical Society.

26. Thriveni V. Manjunatha H. Lakshminarayana R. (2019). Curcumin and capsaicin modulate LPS induced expression of COX-2, IL-6 and TGF-β in human peripheral blood mononuclear cells. **Cytotechnology** 71: 963–976. https://doi.org/10.1007/s10616-019-00338-x (IF-1.67). Springer.

27. Shwetha HJ, Shilpa S, Mousami B, Ambedkar R, Raichur AR, Lakshminarayana R (2020). Inclusion of phosphatidylcholine improves sustain release, basolateral secretion and transport of lutein delivered through chitosan nanoparticles in Caco-2 cells. **Inter J Biol Macromol.** 163: 2224-2235. https://doi.org/10.1016/j.ijbiomac.2020.09.040 (IF-6.95). Elsevier.

28. Shilpa S, Shwetha HJ, Madan Kumar P, Manjunatha H, Baskaran V, Lakshminarayana R (2021) Turmeric, red pepper and black pepper affect carotenoids solubilized micelles properties and bioaccessibility: capsaicin/piperine improves and curcumin inhibits carotenoids uptake and transport in Caco-2 cells**. J Food Sci.** 86:4877–4891. https://doi.org/10.1111/1750-3841.15926 (IF-3.15) .Wiley's.

29. Rohit G, Vemuri R, Ranga Rao A, Lakshminarayana R, Wenying Lu, Rajaraman ED (2021) Tunicamycin via ER stress mediated 6^{th} hour time point aggravates cell migration, cell invasion and cell proliferation in colonic epithelial cells. **Adv Cancer Biol Metastasis.** 2, 100007. doi.org/10.1016/j.adcanc.2021.100007. Elsevier.

30. Shwetha HJ, Arathi BP, Mousami BM, Ambedkar R, Shilpa S, Raichur AR, Lakshminarayana R (2022) Zein-alginate-phosphatidylcholine nanocomplex efficiently delivers lycopene and lutein over dietary-derived carotenoid mixed micelles in caco-2 cells. **J Agri Food Chem**. 70, 15474–15486. https://doi.org/10.1021/acs.jafc.2c05008 (IF-5.68). American Chemical Society.

31. Vijay K, Ambedkar R, Sowmya PR, Suresh R, Ranga Rao A, Rohit G, Manjunatha H, Malarvili MB, Rishya M, Lakshminarayana R* (2023) Prevention of aspirin-mediated secondary toxicity by combined treatment of carotenoids in macrophages. **3 Biotech** 13:223.

https://doi.org/10.1007/s13205-023-03632-w.(IF-3.44). Springer.

National Journals

32. Shilpa S, Ambedkar R, Shwetha HJ, Lakshminarayana R (2021) Spice active ingredients affect the micellization, permeation and bioavailability of structurally different carotenoids in human intestinal epithelial Caco-2 cells. **Ind J Nut Diet.** 58: 326-338. https://doi.org/10.21048/IJND.2021.58.3.27336. Infor. publishing limited.

33. Shwetha HJ, Arathi BP, Shilpa S, Ambedkar R, Lakshminarayana R* (2021). Isolation of high pure lycopene from ripened tomato and its Nano preparation with corn zein protein for improved stability and bioaccessibility. **Int J Bot Studies** 6, 235-242.

34. Shilpa S, Ambedkar R, Shwetha HJ, Lakshminarayana R* (2021). Isolation and LC-MS $(APCI)^+$ analysis of carotenoids from red pepper: Influence of capsaicin as a major constituent of capsicum on physicochemical properties of carotenoids solubilized micelles and their bioaccessibility. **Int J Bot Studies** 6, 552-559.

REVIEW ARTICLES

1. Lakshminarayana R and Baskaran V (2013) Influence of olive oil on carotenoids bioavailability. **Eur J Lipid Sci Technol.** 115:1085–1093. https://doi.org/10.1002/ejlt.201200254 (IF-2.42). Wiley's.

2. Arathi BP and Lakshminarayana R (2015). Concept notes on carotenoid metabolites. **Cell Mol Med** 1:1-3, 2015. DOI10.21767/2573-5365.100002 Insight Medical Publishing (iMedPub).

3. Arathi BP, Sowmya PR, Vijay K, Baskaran V, Lakshminarayana R (2015) Metabolomics of carotenoids: The challenges and prospects. **Trends Food Sci Technol.** 45:105–117. https://doi.org/10.1016/j.tifs.2015.06.003 (IF-5.16). Elsevier.

BOOK CHAPTERS

1. Arathi BP, Sowmya PR, Vijay K, Baskaran V, Lakshminarayana R. Biofunctionality of carotenoid metabolites - An insight on qualitative and quantitative analysis (Edited by Jeevan Kumar Prasain) Metabolomics-Fundamentals and Applications. Pages 19-42. Publishers: Intech Publishers (ISBN: 978-953-51-2853-3), 2016. DOI: 10.5772/66210.

2. Arathi BP, Sowmya PR, Vijay K, Baskaran V, Lakshminarayana R. Progress in enrichment and metabolic profiling of diverse carotenoids in tropical fruits: Importance of hyphenated techniques (Edited by Noureddine BENKEBLIA) Modern Biotechnologies and Phytonutritional Improvement of Crops. Pages 271-307. Publishers: Wiley-Blackwell (ISBN: 978-1-119-07994-1), 2017. https://doi.org/10.1002/9781119079972.ch8.

3. Shilpa S, Shwetha HJ, Raju M, Lakshminarayana R. Factors affecting bioaccessibility and bio- efficacy of carotenoids. (Edited by Charis Galanakis) Carotenoids: properties, recovery & applications. Pages 41-73. Publishers: Academic Press, Elsevier (ISBN: 9780128170670), 2020.

https://doi.org/10.1016/B978-0-12-817067-0.00002-6

4. Shwetha HJ, Shilpa S, Arathi BP, Raju M, Lakshminarayana R. Biofortification of carotenoids in agricultural and horticultural crops: A promising strategy to target vitamin A malnutrition. (Edited by Noureddine BENKEBLIA) Vitamins and Minerals Bio-fortification of Edible Plants. Pages 123-161. Publishers: Wiley-Blackwell, (ISBN: 978-1-119-51111-3), 2020. https://doi.org/10.1002/9781119511144.ch7

5. Sowmya PR, Ambedkar R, Lakshminarayana R. Role of carotenoids on oxidative stress-mediated signaling in cancer cells. (Editors: Sajal C, Bimal KR, Sushanta R**)** Hand book of oxidative stress and cancer. Pages 1-20. Publishers: Springer (ISBN: 978-981-15-4501-6), 2021. https://doi.org/10.1007/978-981-15-4501-6_91-1

6. Raju M, Sowmya PR, Ambedkar R, Arathi BP, Lakshminarayana R. Carotenoids metabolic pathways and their functional role in health and diseases (Editors: Ravishankar G, Ambati R**)**. Global perspectives on astaxanthin: From industrial production to food, health, & pharmaceutical applications. Pages 671-91. Publishers: Academic Press-Elsevier (ISBN: 978-012-82-3304-7), 2021. https://doi.org/10.1016/B978-0-12-823304-7.00034-9

7. Lakshminarayana R and Biswajit Paul. Free radical chemistry of carotenoids and on oxidative stress-physiology of cancer. (Editor: Sajal Chakraborti) Hand book of oxidative stress and cancer- Therapeutic Aspects, Publishers: Springer (ISBN: 978-981-16-1247-3), 2022. https://doi.org/10.1007/978-981-16-1247-3_262-1

8. Lakshminarayana R, Vijay K, Ambedkar R, Ranga Rao A, and Ravishankar GA. Biological activities and health benefits of seaweed carotenoids with special reference to fucoxanthin (Editors: Ravishankar GA, Ambati R**)**. Sustainable global resources of seaweeds: Food, Pharmaceutical and Health Applications-Vol-II. Publishers: Springer Nature (ISBN: 978-3-030-92173-6), 2022. https://doi.org/10.1007/978-3-030-92174-3_29.

PAPERS PRESENTED IN CONFERENSES (WITHIN INDIA)

1. Lakshminarayana R, Raju M, Rathinaraj K, Krishnakantha TP, Baskaran V. Isolation and purification of carotenoids from few leafy vegetables. **IFCON**, 5-8th December 2003, CFTRI (CSIR) (**Mysore, Karnataka**).

2. Baskaran V, Sugawara T, Raju M, Lakshminarayana R, Nagoa A. Lysophosphatidylcholine modulates the intestinal absorption and conversion of β-carotene into vitamin-A in mice **IFCON**, 5-8th December 2003, CFTRI (CSIR) (**Mysore, Karnataka**).

3. Lakshminarayana R & Baskaran V. Influence of phospholipids on the physical properties and intestinal uptake of mixed micelles containing lutein in rats. **New Horizons in Food Technology**, 5th March 2004, Osmania University (**Hyderabad, Andhra Pradesh**).

4. Lakshminarayana R, Krishnakantha TP, Baskaran V. Phospholipids and fatty acids in mixed micelles modulate the intestinal absorption of lutein and its accumulation in macula of rats. **National symposium SBC (I)**

2004, 21-24th November, G.B. Pant Agricultural University (**Pantnagar, Uttaranchal)**.

5. Raju M, Varakumar S, Lakshminarayana R, Krishnakantha TP, Baskaran V. Carotenoid composition and retinol equivalents of provitamin A carotenoids in green leafy vegetables. **National symposium SBC (I) 2005**, 7-9th November, CDRI (CSIR) (**Lucknow, Uttar Pradesh**).

6. Lakshminarayana R & Baskaran V. Evaluation of macular pigments in green leafy vegetables and dietary approach in modulating their levels in eyes of adult rats. International conference on ethnopharmacology & alternative medicine, 20-22nd January 2006 (**Thrissur, Kerala**).

7. Lakshminarayana R, Vasanthi G, Keshava Prakash MN, Krishnakantha TP, Baskaran V. Manipulation of lutein and zeaxanthin levels in plasma and eyes of aged rats deficient in macular pigments through dietary means. **International Symposium on Food and Nutrition**, 23-25th June 2006, CFTRI (CSIR) (**Mysore, Karnataka**).

8. Lakshminarayana R, Krishnakantha TP, Baskaran V. Identification and structural elucidation of photo - and auto-oxidized products of lutein in vitro. **ICFOST**, 16-17th November 2006, N.G Ranga Agricultural University (**Hyderabad, Andhra Pradesh**).

9. Lakshminarayana R & Baskaran V. Column chromatography, HPLC and LC-MS (APCI) techniques for purification, separation and characterization of carotenoids from food and biological samples. **IFCON**, 15-19th December 2008, CFTRI (CSIR) (**Mysore, Karnataka**).

10. Lakshminarayana R, Sathish UV, Dharmesh SM, Baskaran V Antiproliferative property of oxidised lutein human cervical carcinoma cell lines. **IFCON**, 15-19th December 2008, CFTRI (CSIR) (**Mysore, Karnataka**).

11. Mamatha BS, Lakshminarayana R, Aruna G, Baskaran V. Dietary manipulation of macular pigment in aged rats with lutein deficiency. National Conference- **NUTRIFE [A] ST**- 2008, November 20-22th 2008, Nutrition Society of India (**Chennai, Tamilnad**).

12. Lakshminarayana R, Devaraju KS, Baskaran V. Purification and analysis of carotenoids and their metabolites in biological samples. International Society of Biotechnology, 28-30th December 2008 (**Gangtok, Sikkim**).

13. Lakshminarayana R, Sathish UV, Dharmesh SM, Baskaran V. Structural elucidation of lutein oxidation products mediated through lipid radical inducer 2, 2′-azo-bis [2, 4- dimethylvaleronitrile]: Antioxidant and antiproliferative effect of oxidized lutein in human cervical carcinoma cells. International Conference Society of Free Radical Research (SFRR) 11–13th January 2010, Marriott Hotel (**Hyderabad, Andhra Pradesh**).

14. Sowmya PR. and Lakshminarayana R**.** Characterization and antioxidant activity of photo degraded lutein products**.** International Conference- Society of Free Radical Research (SFRR) 9-11th January 2011 **(Chennai,**

Tamilnad).

15. Darshan DL, Sowmya PR, Lakshminarayana R. Assessment of phytochemical composition and bioactive potentials of insulin plant leaf extract in vitro. **12th International congress of ethno-pharmacology**, Jadavpur University 17-19th February 2012. **(Kolkata, West Bengal).**

16. Sowmya PR, Darshan DL, Lakshminarayana R. Exploration of microorganisms for xanthophylls production. **International conference on advances in biological sciences**, University of Kannur, 15-17th March 2012 (**Kannur, Kerala**).

17. Sowmya PR, Darshan DL, Arathi BP, Lakshminarayana R. Role of selective vehicle on carotenoids delivery and its influence on antioxidant status, cytotoxicity and proliferation of breast cancer cells. International Conference-Society of Free Radical Research (SFRR), **Institute of Toxicology Research,** 27-30th January 2013 (**Lucknow, Uttar Pradesh**).

18. Arathi BP, Inchara CM, Sowmya PR, Darshan DL, Lakshminarayana R. Determination of phytochemical composition of few leafy greens and evaluation of their extracts on antioxidant and cytotoxic potentials in cancer cells. International Conference-Society of Free Radical Research (SFRR), Institute **of Toxicology Research,** 27-30th January 2013 (**Lucknow, Uttar Pradesh**).

19. Darshan DL, Sowmya PR, Lakshminarayana R. Hepatoprotective influence of Costus igneus N.E. Br. and Rumex acetocella L. leafy extracts against carbon tetrachloride-induced oxidative stress in rats. International Conference-Society of Free Radical Research (SFRR), **Institute of Toxicology Research,** 27-30th January 2013 (**Lucknow, Uttar Pradesh**).

20. Sowmya PR, Arathi BP, Vijay K, Baskaran V, Lakshminarayana R. Standardization and validation of di-hydroxy carotenoid analysis for the partial characterization and formation of its oxidation products/metabolites. 82nd Annual Meeting of Society of Biological Chemists, 2-5th December 2013, University of Hyderabad (**Hyderabad, Andhra Pradesh**).

21. Roshan A, Sowmya PR, Arathi BP, Vijay K, Lakshminarayana R. Simple scheme for preparation of natural astaxanthin and HPLC quantification. NCETNCB, **MGR Institution**, 19 & 20th February – 2014 (**Hosur, Tamilnad**).

22. Roshan A, Sowmya PR, Arathi BP, Vijay K, Lakshminarayana R. Exploration of bioactive component from shrimp waste and evaluation of its antioxidant properties in vitro. International Conference on Nano bio, Bio-mimetic Materials and its applications, 27 & 28th February 2014 (**Coimbatore, Tamilnad**).

23. Vijay K, Sowmya PR, Arathi BP, Lakshminarayana R. Nutrient profiles of few seaweeds of industrial importance and exploration of marine carotenoids as nutraceuticals. International Conference on Emerging Trends in Biotechnology, 6-9th November 2014, **Jawaharlal Nehru**

University (New Delhi).

24. Arathi BP, Vijay K, Sowmya PR, Arathi BP, Lakshminarayana R. Manipulation of carotenoids and its doses affect the proliferation of few human cancer cell lines. International Conference on Emerging Trends in Biotechnology, 6-9th November 2014, **Jawaharlal Nehru University (New Delhi).**

25. Sowmya PR, Arathi BP, Vijay K, Lakshminarayana R. Comparison and efficiency of THF, DMSO and FBS for the delivery of structurally different carotenoids against anti-proliferation of human cervical cancer cells. International conference- NANOS-2015. 14-17th December 2016, **GITAM University, (Visakhapatnam, Andhra Pradesh).**

26. Vijay K, Sowmya PR, Arathi BP, Lakshminarayana R. Seaweeds extract rich in carotenoids are efficiently modulates the anti-inflammatory and antiproliferative activities in vitro. International Conference-Society of Free Radical Research (SFRR), 7-9th January 2016, **University of Kalyani (Kolkata (West Bengal)**.

27. Vijay K, Shwetha HJ, Shilpa S, Sowmya PR, Arathi BP, Lakshminarayana R. Combination of carotenoids with doxorubicin elevates the cell death progression in MCF-7 and MDA-MB 231 cells. 7th International Conference on Stem Cells and Cancer: proliferation, differentiation and apoptosis, 21-23rd October 2016 (**Margao, Goa**).

28. Sowmya PR, Vijay K, Shwetha HJ, Shilpa S, Arathi BP, Lakshminarayana R. Evaluation of structurally different carotenoids role on hydrogen peroxides mediated cytotoxicity in lung cancer cell lines. 7th International Conference on Stem Cells and Cancer**:** proliferation, differentiation and apoptosis, 21-23rd October 2016 (**Margao, Goa**).

29. Shilpa S, Shwetha HJ, Vijay K, Sowmya PR, Arathi BP, Manjunatha H, Lakshminarayana R. Dietary spices alter physico-chemical properties of carotenoids solubilized mixed micelles and their absorption in human intestinal cells lines. 85th Annual Meeting of Society of Biological Chemists (I), 21st - 24th November 2016, **CFTRI (CSIR)** (**Mysore, Karnataka**).

30. Shwetha HJ, Shilpa S, Vijay K, Sowmya PR, Arathi BP, Baskaran V, Lakshminarayana R. Supplementation of green vegetables with specific dietary modulators enhances lutein (macular pigment) bioavailability: A dietary approach for managing age-related macular degeneration. IV World Congress on Geriatrics & Gerontology, 23- 25th November 2016, **Indian Institute of Science** (**Bangalore, Karnataka**).

31. Vijay K, Sowmya PR, Arathi BP, Lakshminarayana R. Influence of lutein and its derived products on mitigation of carbon tetrachloride mediated hepatotoxicity. International Conference-Society of Free Radical Research (SFRR), 18-20th February 2018, **All Indian Institute of Medical Science (New Delhi).**

32. Sowmya PR, Vijay K, Lakshminarayana R. Elucidation of beneficial or detrimental action of carotenoids in lung cancer cell lines. International

Conference-Society of Free Radical Research (SFRR), 18-20th February 2018, **All Indian Institute of Medical Science (New Delhi).**

33. Sowmya PR, Vijay K, Lakshminarayana R. Combination of β-carotene with oxygenated carotenoids promotes cytotoxicity in benzo[a]pyrene treated lung cancer cells. International Conference-Society of Free Radical Research (SFRR), 18-20th February 2018, **All Indian Institute of Medical Science (New Delhi).**

34. Shwetha HJ, Shilpa S, Arathi BP, Lakshminarayana R.Synthesis, characterization and bioavailability of lycopene-zein-alginate based nanoparticles. International Conference on Nanomaterials & their Applications, 1 & 2nd March 2018, **University of Mysore (Mysore, Karnataka).**

35. Shwetha HJ, Shilpa S, Lakshminarayana R. Scavenger receptor binding protein-1 efficiently mediates the transport of lutein encapsulated with chitosan nanoparticles fabricated with phosphatidylcholine. 88th Annual Meeting of Society of Biological Chemists (I), 1-3rd November 2019, **BARC** Anushaktinagar, **(Mumbai, Maharashtra)**.

36. Shilpa S, Shwetha HJ, Lakshminarayana R. Capsicum annuum supplemented with green leafy vegetables improves β-carotene absorption antagonist to decrease cleavage efficiency of retinoids in Caco-2 human intestinal cell lines. 88th Annual Meeting of Society of Biological Chemists (I), 1st-3rd November-2019, **BARC** Anushaktinagar, **(Mumbai, Maharashtra)**.

37. Shwetha HJ, Shilpa S, Lakshminarayana R. Exploration of zein-alginate nanocarriers to enhance synergistic action of potent carotenoids, lycopene and lutein in colon cancer cells. National Conference on Phytochemicals & Microbial Bioactive Compounds-Role in agriculture and human welfare. 3-4th October, 2019, **Bangalore University (Bangalore, Karnataka).**

38. Shilpa S, Shwetha HJ and Lakshminarayana R*. Influence of dietary spices alters bioaccessibility, physico-chemical properties and bioavailability of carotenoids in Caco-2 cell line. National Conference on Phytochemicals & Microbial Bioactive Compounds-Role in agriculture and human welfare. 3-4th October 2019, **Bangalore University (Bangalore, Karnataka).**

39. Lakshminarayana R. Synergistically xanthophylls enhanced cytotoxicity in lung cancer cells treated β-carotene under high oxidative stress. International Conference on Life, Chemical, and Health Sciences, 24-26th, October 2019, MS Ramaiah College **(Bangalore, Karnataka).**

40. Shwetha HJ and Lakshminarayana R. Zein-alginate biopolymer enhances delivery and bio-functionality of lycopene in colon cancer cells. International Conference on Materials for Environment, Sustainable Society and Global Empowerment, 20-26th December 2019, **Department of Nanotechnology, Visvesvaraya Technological University** (VTU), (**Chikkaballapur, Karnataka**).

41. Shilpa S and Lakshminarayana R. Influence of spices on carotenoids solubilization/micellisation, permeation and basolateral secretion of carotenoids in Caco-2 cells. International Conference on Global Trends in Health and Life Sciences. 27-29th September 2021, **Reva University (Bangalore, Karnataka).**

42. Lakshminarayana R. Influence of major constituent of spices on solubilization and formation of nanostructured carotenoids solubilized micelles. International Conference on Sustainable Utilization of Bioresources-Janaury 10-15th, 2022. **University of Kerala, Thiruvanthapuram (Kerala).**

43. Lakshminarayana R. Relative physiological concentration of carotenoids with a minimal dose of aspirin efficiently down regulates redox based NF-κB signalling in macrophages.2nd **World Congress on Pharmacology-**2022 "Drug Discovery and Development" 30th Janaury 2022. **BioGenesis Health Cluster, Bangalore.**

PAPERS PRESENTED IN CONFERENSES (ABROAD)

44. Lakshminarayana R, Aruna G, Sangeetha SK, Baskar N, Divakar S, Baskaran V (2008). Possible degradation/biotransformation of lutein in vitro and in vivo: isolation and structural elucidation of lutein metabolites by HPLC and LC-MS (APCI+). 15th International Symposium on Carotenoids, 22-27th June 2008 **(Okinawa, Japan).**

45. Arathi BP, Dilshad P, Saikat B, Gopal V, Lakshminarayana R. UPLC-PDA and tandem mass spectral characteristics of major lycopene Isomers. 17th International Symposium on Carotenoids, 27th June-4th July 2014 (**Salt Lake City, Utah- USA)**.

46. Arathi BP, Shwetha HJ, Shilpa S, Lakshminarayana R. Role of lycopene derived products on selective antiproliferation of MCF-7 cancer cells. 18th International Symposium on Carotenoids, 9-14th July 2017 (**Lucerne, Switzerland)**.

47. Sharmila T, Sowmya PR, Vijay K, Shwetha HJ, Shilpa S, Lakshminarayana R. Evaluation of bioaccessibility and acceptability of microbial carotenoids in Caco-2 cell lines. 18th International Symposium on Carotenoids, 9-14th July 2017 (**Lucerne, Switzerland)**.

48. Arathi BP, Vijay K, Sowmya PR, Lakshminarayana R. Fractionation and characterization of lycopene oxidation products by LCMSMS: Elucidating their biological mode of action. 18th International Symposium on Carotenoids, 9-14th July 2017 (**Lucerne, Switzerland)**.

49. **Shilpa S**, Shwetha HJ, Arathi BP, Manjunatha H, Lakshminarayana R. Influence of dietary spices on physicochemical properties of lutein solubilised mixed micelles and its bioavailability in Caco-2 cells. 18th International Symposium on Carotenoids, 9-14th July 2017 (**Lucerne, Switzerland)**.

AWARDS/ RECOGNITION/ FELLOWSHIP/

- **CSIR-NET-Junior Research Fellow**-2003-2005.
- **CSIR-Senior Research Fellow**-2005-2008.
- **CFTRI (CSIR)** foundation annual award (**Best research paper** 2008-2009).

CERTIFICATES

- Research abstract selected for **International Travel award (750 US $ Dollars)** and invited for 17th International Symposium on Carotenoids held on 27th June to 4th July 2014 at **Salt Lake City, Utah (USA)**.
- Research abstract selected for **International Travel award (500 US $ Dollars)** and invited for **18th International Symposium on Carotenoids** held on 9-14th July 2017 at **Lucerne, Switzerland**.
- Received the **International Travel grant** from Science & Engineering Research Board (**Dept. of Science & Technology**, Govt. of India) for participation and presentation of research paper at **18th International Symposium on Carotenoids** held on 9-4th July 2017 at **Lucerne, Switzerland.**

JOURNAL REVIEWER RECOGNITION

- Journal of Agricultural & Food Chemistry (American Chemical Society)
- Food Chemistry (Elsevier)
- Food & Chemical Toxicology (Elsevier)
- Journal of Food Composition & Analysis (Elsevier)
- Experimental Cell Research (Elsevier)
- Molecular & Cellular Biochemistry (Springer)
- Functional Foods (Elsevier)
- Scientific Reports (Nature)
- Bioscience Reports (Biochemical Society, Portland Press)
- Journal of Herbal Medicine (Elsevier)
- Journal of Biomedicine & Pharmacotherapy (Elsevier)
- Drug Delivery and Translational Research (Springer)
- Journal of Food Bioscience (Elsevier)
- Journal of Cancer Research & Clinical Oncology (Springer)
- Biomaterials advances.
- Molecular Nutrition and Food Research (Wily's)
- Journal of Food Science (Elsevier)
- British Journal of Nutrition….etc

MEMBERSHIP OF PROFESSIONAL BODIES/SOCIETY/ ORGANIZATION/ UNIVERSITY

- Life member, Society of Biological Chemists, India
- Member, International Carotenoids Society,
- Fellow member, International Society of Biotechnology (FISBT).

- BOS member (PG) (2018-19), Bangalore North University.
- BOS member (PG) (2018-19), Bangalore City University.
- BOE member (PG) (2019-2020), Kuvempu University.
- BOS member (Microbiology and Biotechnology), Bangalore University.
- BOE member in Biotechnology (PG) (2021-22), Bangalore University.
- BOE member (Molecular Biology-PG) (2021-22), Bangalore University.
- BOE member (Plant Science-PG) (2021-22), Bangalore City University.
- BOS member (PG) 2022-2023, Life and allied health sciences, Ramaiah University of Applied Sciences.
- BOE member (PG) in Biotechnology (2022-2023), Kuvempu University.
- BOE member (PG) in Microbiology (2023), Kuvempu University.
- Member, Governing Council of affiliated colleges of Bangalore University (2023-2024).

- Organizing committee Member- National Symposium on Innovations in Biotechnology: Enterepreurial Opportunities and IPR, 23-25th October-2007 at Central College Campus, Bangalore University, Bangalore.

- Organizing committee Member-Conference on recent Trends in Genomics and Proteomics: 26-27th May 2011. Bangalore University, JB Campus, Bangalore.
- Organizing committee Member -National Conference on "Secondary Metabolites of Endophytic Fungi/Medicinal Plants and their Anti-Cancer properties" held on 5 & 6th March 2015, Bangalore University (UGC-SAP sponsored).
- Organizing Committee Member, National Conference on Phytochemicals and Microbial Bioactive Compounds - Role in Agriculture and Human welfare, 3 and 4th October, 2019 (Supported by UGC SAP-II) at Department of Microbiology and Biotechnology, Bangalore University.
- Organizing committee Member for webinar series- 2021
- Organizing Committee Member, National Conference on "Advances in Microbial Biotechnology: Current trends and Future Prospects (AMBT-2022), In Association with Microbiologists th Society, India -MSI) held on 28th & 29 , April 2022 at Department of Microbiology and Biotechnology, Bangalore University.

❖ **PhD. Thesis Evaluated: 16 Numbers**

❖ **Dissertation Students Guided: 36 Numbers**

❖ RESEARCH/PhD. GUIDANCE

No.	Candidates	Research Topic	Project/ Fellowship	Period/ status
1	P.R. Sowmya	Studies on the influence of carotenoids on cell cycle regulation and proliferation of cancer cells.	DST (WOS-A)	2017 Awarded
2	B.P. Arathi	Role of lycopene and its oxidative products in the stimulation of gap junction communn. and proliferation of cancer cells.	DST (WOS-A)	2017 Awarded
3	K.Vijay	Studies on bioactive properties of marine carotenoids against the proliferation of human macrophage and cancer cell lines.	DST-JRF & CSIR-SRF	2019 Awarded
4.	S.Shilpa	Studies on influence of dietary spices in regulation of intestinal uptake and transport mechanism of carotenoids in vitro.	UGC-RGNF	2021 Awarded
5.	H.J.Shwetha	Studies on molecular mechanism of bioavailability and biofunctionality of nanoemulsion based delivery of carotenoids in human intestinal cell lines.	ICMR-JRF & ICMR-SRF	2021 Awarded

❖ RESEARCH PROJECTS- on-going/completed

S.No.	Title of the Project	Funding Agency	Grant (Lakhs)	Duration
1.	Influence of major xanthophylls and their oxidative products on biological function **(Principal Investigator)**.	**UGC**	**13,45,000**	2010-2013 (Completed)
2.	Investigation on microbial carotenoids and its importance **(Principal Investigator)**.	**BURIF**	**1,00,000**	2011-2012 (Completed)
3	Studies on regulation of apoptosis by carotenoids in cancer cells **(Scientist Mentor).**	**DST** (WOS-A)	**20,30,000**	2011-2014 (Completed)
4	Role of lycopene and its oxidative products in stimulation of gap junction communication and proliferation of cancer cells **(Scientist Mentor).**	**DST** (WOS-A)	**23,30,000**	2012-2015 (Completed)
5.	Evaluation of anti-inflammatory and anticancer effect of marine carotenoids as nutraceuticals and their exploration in human cell lines. **(Principal Investigator)**.	**DST** (SERB)	**45,80,000**	2013-2017 (completed)
6.	Studies on efficient solubilization & bioavailability of carotenoids from green leafy vegetables in human intestinal Caco-2 cell lines **((Principal Investigator)**.	**ICMR** (DHR)	**17,00,000**	2014-2017 (completed)
7.	Studies on regulation of PPARγ and ISX by dietary lipids: Efficiency of BCMO1 activity and SR-B1 mediated uptake of provitamin A carotenoids in Caco-2 cells **(Principal Investigator)**.	**DST** (SERB)	**49,09,640**	2019-2023 (on-going)
8.	Evaluation of carotenoids role on anti-inflammatory and anticancer drug mediated secondary complications **(Principal Investigator)**.	BUB	**2,00,000**	2021-2023 (on-going)

University and Department Programmes or Projects

- **DST-PURSE project-**Investigation on role of carotenoids and their derived oxidative products or metabolites in regulation and chemoprevention action of cancer cell proliferation- **Principal Investigator-Biotechnology** (2017-2021), (**Rs.2,71,96,000**).
- **UGC-SAP (DRS II) project-**Exploration of medicinally important edible plants, seaweeds and microbes for potential natural compounds as anti-inflammatory and anti-cancer agents**- Project Member** (2018-2023). (**Rs. 85,00,000**)