



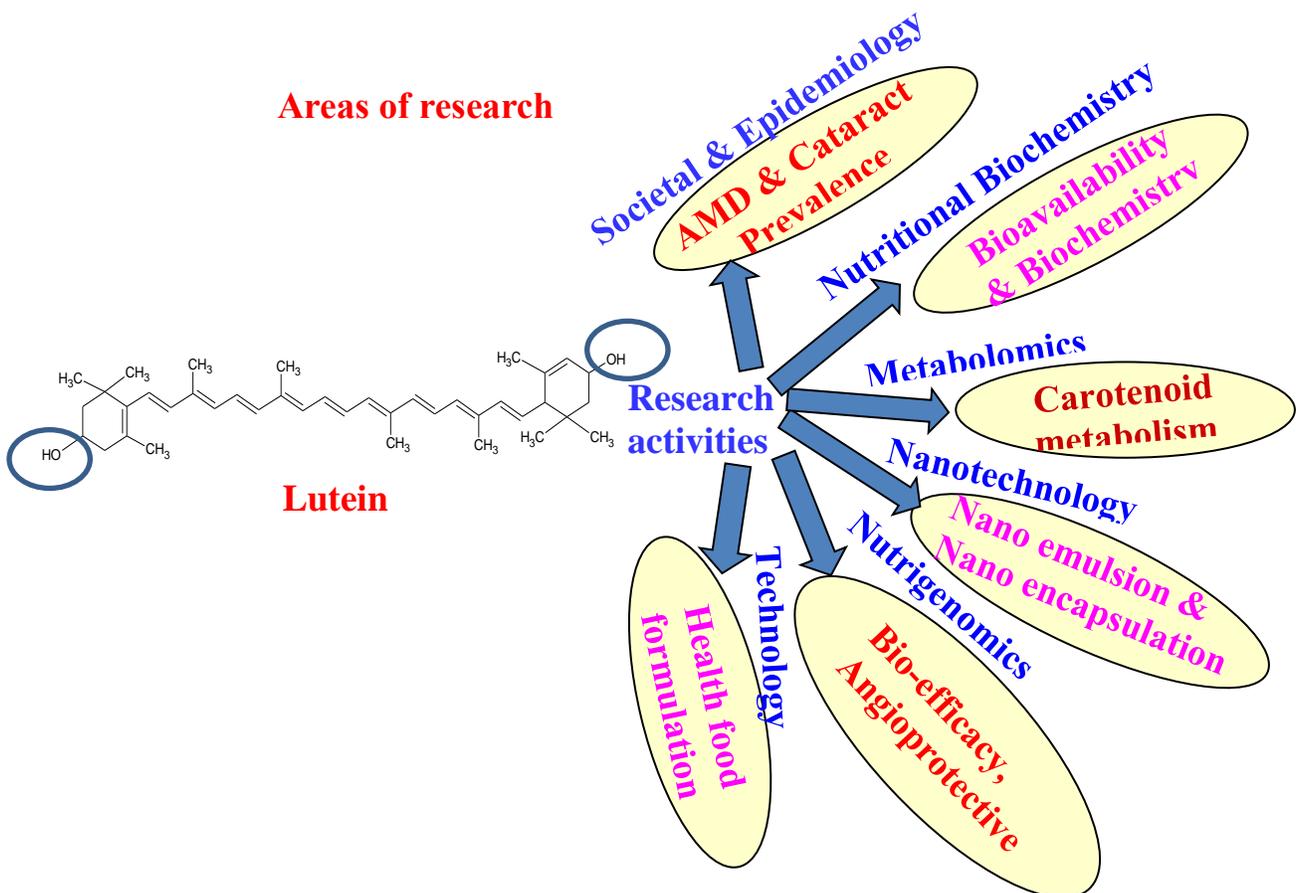
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Research activities:

- **Nutritional Biochemistry/Molecular Nutrition** – Role of lipids on phytonutrients bioavailability, their metabolomics, structural–function relations, structural characterization and bio-functionality (anticancer, thermogenic, anti-diabetic property) at molecular levels.
- **Retinal angiogenesis** - In depth studies on retinal angio-protective potential of phytonutrients like lutein and its derivatives.
- **Nano-technology/ Nano-encapsulation of nutraceuticals** – preparation, characterization, interaction and efficacy studies in cell lines and animal models so as to achieve targeted delivery of nutrients and their pharmacokinetics and pharmacodynamics properties.
- **Hospital based studies** – Epidemiological and nutrition intervention studies with regard to nutritional deficiency and retina related disorders like VAD, ARMD.

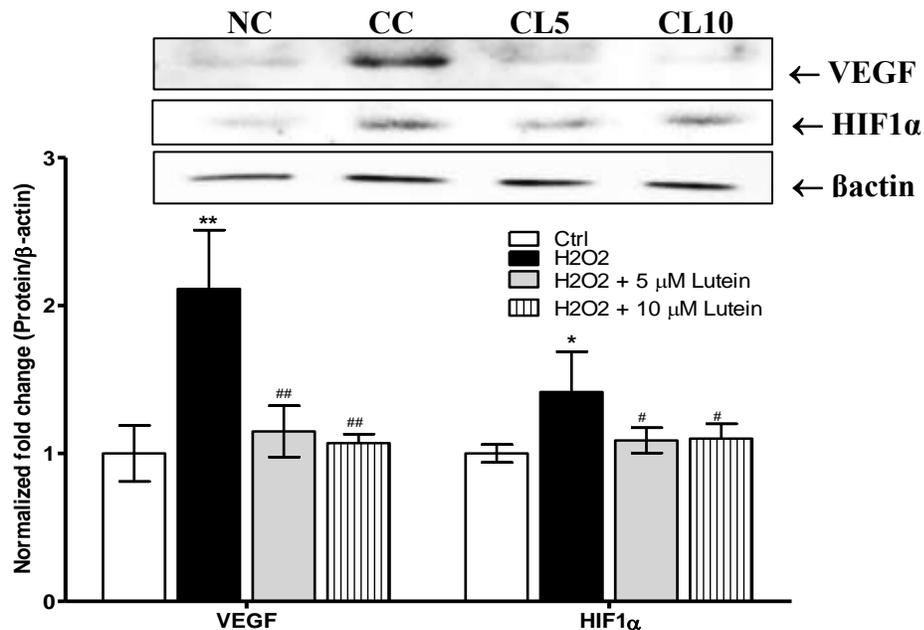
Areas of research



Ongoing and Future research:

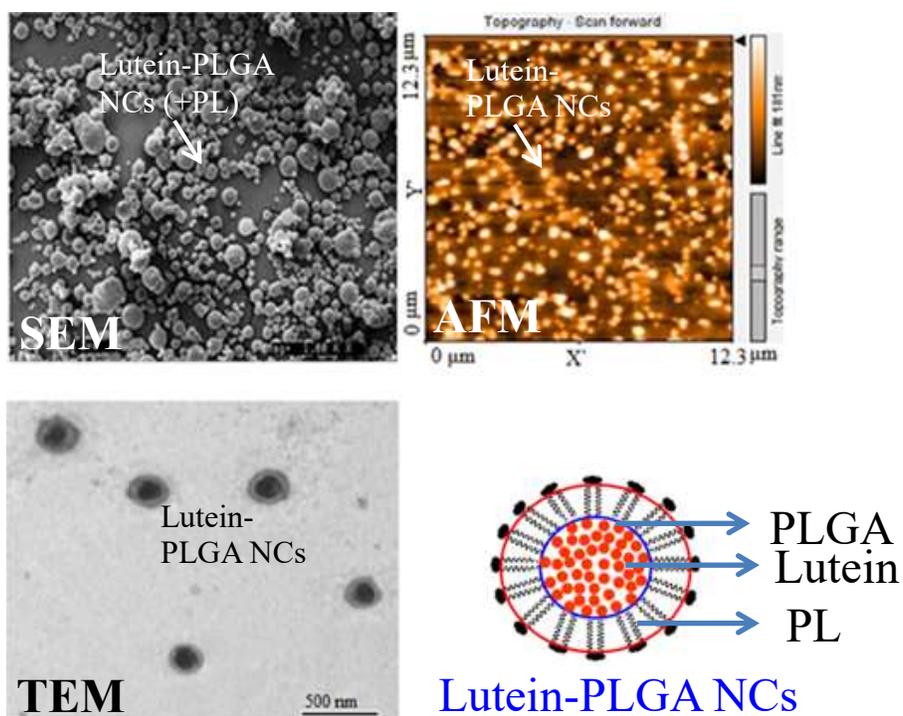
Research in the field of Nutritional Biochemistry/Molecular Nutrition: Our research activities in this field are interdisciplinary in nature that applies the bioavailability, metabolomics and anti-inflammatory property of phytonutrient lutein, astaxanthin, lactucaxanthin, fucoxanthin and lipids. Rodents fed on lutein oxidized compounds and challenged with LPS resulted in inhibition of production of inflammatory mediators (TNF- α , IL-6, PGE₂) in serum and tissues more efficiently than lutein. In molecular docking studies the binding efficiency with target enzymes and receptors of glucose homeostasis like DPP4, alpha-amylase, alpha 1, 6 glucosidase, etc. using lutein in comparison with drugs are under progress. Outcome of the study will contribute to replace partly the drug therapy with nutritional therapy for diabetics and dyslipidemia.

Research in the field of Nutritional Biology: The R&D work underway on the role of food molecules on type 2 diabetics (T2D) is expected to have societal impact. The studies included under the umbrella of nutrition biology ranging from bio-prospecting of anti-diabetic and anti-obese food molecules and their bio-functionality with regard to biochemical complications in diabetic retinopathy (mitochondrial biogenesis, neovascularization) and molecular mechanism involved in thermogenic process of adipocyte fat. Outcome of the study will contribute to develop nutritional therapy to diabetics and dyslipidemia.

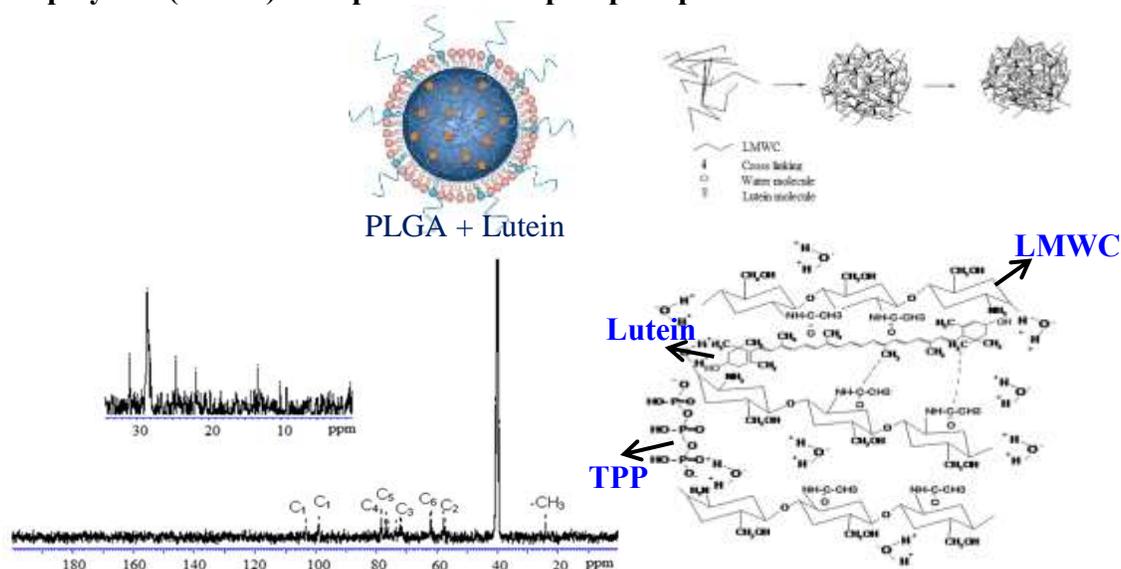


Effect of lutein on angiogenic marker proteins in oxidative stress-induced ARPE19 cells

Nano-technology/ Nano-encapsulation of carotenoids: Our activities in the area of nanotechnology are very vital to understand the complex bimolecular systems (polymer-carotenoid-lipid) interaction and found to be excellent as carrier for heat and light labile carotenoids. Studies demonstrate biodegradable polymers can be an efficient carrier for enhancing hydrophilicity and bioavailability of carotenoids.

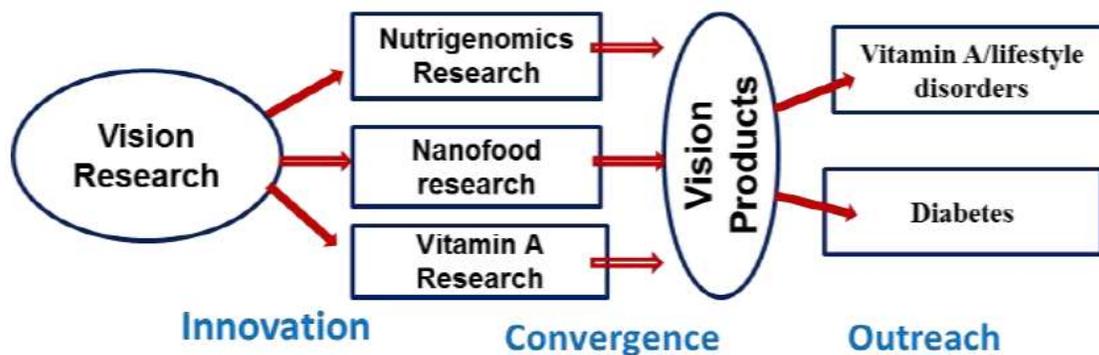


Lutein-polymer (PLGA) nanoparticles with phospholipid



Interaction between the lutein and LMWC

Research in the field of Public/Clinical Nutrition: Our robust effort to bring the frontier research to common people in our society in terms of understanding epidemiology and prevalence of protein, vitamin-A and lutein deficiency related health complications (Hospital based study) and development of nutritious food formulation with protein and eye protective carotenoids from leaf source are obvious from our work and publications in scientific journals.



Ongoing research projects (2017-2019)

Sl. No	Title of Project	Funded
1.	Indian brown algae and their nutraceutical constituent mediated attenuation of diet induced obesity: Role of inflammation and thermogenic pathway molecules	DST-SERB
2.	Process scale-up for preparation of hydrocolloid-lipid hybrid nano-capsules loaded with eye protective carotenoid lutein and its efficacy in diabetes induced molecular regulators of angiogenesis.	DST-JSPS
3.	Dietary lutein and astaxanthin in combination with lipids on modulation of age related cataract.	DST
4.	Plant derived food molecules as viable therapeutic agents to down regulate hyperglycemia and its complications	UGC

HRD activities: Students are welcome to peruse their Ph.D in our laboratory under AcSIR and Mysore or Mangalore University. Coordinating several Ph.D and Post-Doctoral fellows.

Students pursued and pursuing for their Ph.D degree and Post-Doctoral fellowship:

Sl. No	Name of the Student	Status	Year of award
1.	Dr. Raju, M	Awarded	2007
2.	Dr. Lakshminarayana, R	Awarded	2008
3.	Dr. Sangeetha Ravi Kumar	Awarded	2011
4.	Dr. Mamatha B.S	Awarded	2012
5	Dr. Aruna G	Awarded	2012
6	Dr. Amit Kumar Rai	Awarded	2012
7	Dr. Nidhi Bhatiwada	Awarded	2014
8	Dr. Ravi Hindupur	Awarded	2016
9	Dr. Arunkumar R	Awarded	2017
10	Mrs. Hemalatha N	Pursuing from 2013	Finishing 2018
11	Mrs. Smitha Padmanabha	Pursuing from 2014	Finishing 2018
12	Mr. Sharavana G	---	Submitted, 2017
13	Mr. Raghunandan	---	Finished 2017
14	Mr. Veeresh T	Joined 2017	
15	Ms. Priya	Project JRF, 2017	
16	Ms. Anitha	Joined 2017	
17	Dr. Naveen (Post-Doc)	Pursuing from 2015	

Present Research Group



Research Publications from the lab:

<https://scholar.google.co.in/citations?user=slcKTdYAAAAAJ&hl=en>

1. Arunkumar R, Ravi H, and **Baskaran V** Biocompatible lutein-polymer-lipid nanocapsules: Acute and subacute toxicity and bioavailability in mice. *Materials Science and Engineering: C*, 2016. 69: 1318-1327. Impact Factor: 3.2
2. G. Sharavana, G. S. Joseph and Vallikannan Baskaran. Lutein attenuates oxidative stress markers and ameliorates glucose homeostasis through polyol pathway in heart and kidney of STZ-induced hyperglycemic rat model. *Eur J Nutr.* 2016, DOI: 10.1007/s00394-016-1283-0. Impact Factor: 3.20.
3. PR Sowmya, BP Arathi, K Vijay, V Baskaran, R Lakshminarayana. A keto-carotenoid astaxanthin from shrimp efficiently inhibits MCF-7 cells proliferation synergistically with beta-carotene and lutein, *FEBS JOURNAL*, 2016. 283: 87-87. Impact factor: 4.237.
4. B.P. Arathi, P. R. Sowmya, G. C. Kuriakose, K. Vijay, V. Baskaran, C. Jayabaskaran, R. Lakshminarayana. Enhanced cytotoxic and apoptosis inducing activity of lycopene oxidation products in different cancer cell lines. *Food and Chemical Toxicology*, 2016, 97: 265-276, Impact Factor: 3.584.
5. R Jini, B Bijinu, V Baskaran, N Bhaskar. Utilization of Solid Wastes from Tanneries as Possible Protein Source for Feed Applications: Acute and Sub-acute Toxicological Studies to Assess Safety of Products Prepared from Delimed Tannery Fleshings. *Waste and Biomass Valorization* 2016. 7: 439-446. Impact Factor: 0.915
6. Sharavana, G., & Baskaran, V. (2017). Lutein downregulates retinal vascular endothelial growth factor possibly via hypoxia inducible factor 1 alpha and X-box binding protein 1 expression in streptozotocin induced diabetic rats. ***Journal of Functional Foods*, 31, 97-103. Impact Factor: 3.7.**
7. Ravi, H, and V. Baskaran (2017). Chitosan-glycolipid nanocarriers improve the bioavailability of fucoxanthin via up-regulation of PPAR γ and SRB1 and antioxidant activity in rat model. ***Journal of Functional Foods* 28; 215-226. Impact Factor: 3.7.**
8. Gopal, Sowmya Shree, et al Lactucaxanthin—a potential anti-diabetic carotenoid from lettuce (*Lactuca sativa*) inhibits α -amylase and α -glucosidase activity in vitro and in diabetic rats. 2017, ***Food & Function*. 8, 1124–1131. Impact Factor: 2.7.**
9. Ravi H. and Baskaran V. Biodegradable chitosan-glycolipid hybrid nanogels: A novel approach to encapsulate fucoxanthin for improved stability and bioavailability. ***Food Hydrocolloids*, 2015. 43, 717-725. Impact Factor: 3.85**
10. Ravi H, Arunkumar R and Baskaran V. Chitosan-glycolipid nanogels loaded with anti-obese marine carotenoid fucoxanthin: Acute and sub-acute toxicity evaluation in rodent model. ***Journal of Biomaterials Applications*, 2015, 30:420-34, Impact factor: 2.1.**
11. Arunkumar R, Harish Prashanth KV, Manabe Y, Hirata T, Sugawara T, Shylaja MD and Baskaran V. Biodegradable PLGA-PEG nanocapsules: An Efficient Carrier for improved solubility, bioavailability and anticancer property of lutein. ***Journal of pharmaceutical sciences*, 2015, 104, 2085–2093, Impact Factor: 2.5.**
12. Nidhi B, G Sharavana, T R. Ramaprasad and Baskaran V. Lutein derived fragments exhibit higher antioxidant and anti-inflammatory properties than lutein in lipopolysaccharide induced inflammation in rats. ***Food & Function*. 2015, 6, 450-460. Impact Factor: 2.6.**
13. Sowmya P.R., Arathi B.P., Vijay K., Baskaran V. and Lakshminarayana R. Role of different vehicles in carotenoid delivery and their influence on cell viability, cell cycle

- progression, and induction of apoptosis in HeLa cells. **Molecular and Cellular Biochemistry**, 2015, 406, 245-253 **Impact Factor: 2.39**.
14. Mamatha, B. S. and Arunkumar, R. and Nidhi, Bhatiwada and Ramprasad, T. R. and Baskaran, V. Dietary Components Affect the Plasma and Tissue Levels of Lutein in Aged Rats with Lutein Deficiency A Repeated Gavage and Dietary Study. **Journal of Food Science**, 2015. 80: 2322-2330. **Impact Factor: 1.65**.
 15. B.S Mamatha, B. Nidhi, C.A. Padmaprabhu, Prabhu Pallavi, V. Baskaran. Risk Factors for Nuclear and Cortical Cataracts: A Hospital Based Study. **J Ophthalmic Vis Res** 2015; **10: 243-249**.
 16. Rai A.K., Bhaskar N. and Baskaran V. Effect of feeding lipids recovered from fish processing waste by lactic acid fermentation and enzymatic hydrolysis on antioxidant and membrane bound enzymes in rats. **Journal of Food Science and Technology**, 2015. **52: 3701-3710 Impact Factor: 1.2**.
 17. Nidhi B., Ramaprasad T.R. and **Baskaran V**. Dietary fatty acid determines the intestinal absorption of lutein in lutein deficient mice. **Food Research International**, 2014. 64, 256–263. **Impact Factor: 2.6**
 18. Sowmya P.R., Arathi B.P., Vijay K., **Baskaran V**. and Lakshminarayana R. Optimization of LC/MS (APCI)+methods for the determination of possible lutein oxidation products in plasma and tissues of adult rats. **Chromatographia**, 2014. 77, 1633-1642. **Impact Factor: 1.33**.
 19. Nidhi B., Mamatha B.S. and **Baskaran V**. Olive oil improves the intestinal absorption and bioavailability of lutein in lutein-deficient mice. **European Journal of Nutrition**, 2014. 53, 117–126. **Impact Factor: 3.2**
 20. Arunkumar R., Mamatha B.S. and **Baskaran V**. Quality characteristics and lutein bioavailability from maize and vegetable-based health food. **Journal of Dietary Supplements**, 2014. 11(2), 131–144. **Impact Factor: 1.05**.
 21. Aruna G. and **Baskaran V**. Wheat germ oil: A potential facilitator to improve lutein bioavailability in mice. **Nutrition**, 2013. 29(5), 790-795. **Impact Factor: 2.6**.
 22. Nidhi B. and **Baskaran V**. Acute and Subacute Toxicity Assessment of Lutein in Lutein-Deficient Mice. **Journal of Food Science**, 2013. 78(10), T1636-T1642. **Impact Factor: 1.68**.
 23. Ranga Rao A., **Baskaran V.**, Sarada R. and Ravishankar G.A. *In vivo* bioavailability and antioxidant activity of carotenoids from microalga biomass - A repeated dose study. **Food Research International**, 2013. 54, 711–717. **Impact Factor: 2.6**.
 24. Nidhi B., Mamatha B.S., Padmaprabhu C.A., Prabhu P. and **Baskaran V**. Dietary and lifestyle risk factors associated with age related macular degeneration: A hospital based study. **International Journal of Ophthalmology**, 2013. 61(12), 722-727. **Impact Factor: 0.927**
 25. Lakshminarayana R. and **Baskaran V**. Influence of olive oil on the bioavailability of carotenoids. **European Journal of Lipid Science and Technology**, 2013. 115, 1085-1093. **Impact Factor: 1.9**
 26. Arunkumar R., Prashanth K.V.H. and **Baskaran V**. Promising interaction between nanoencapsulated lutein with low molecular weight chitosan: Characterization and bioavailability of lutein *in vitro* and *in vivo*. **Food Chemistry**, 2013. 141(1), 327-337. **Impact Factor: 4.02**.
 27. Lakshminarayana R., Aruna G., Sathisha U.V., Dharmesh S.M. and **Baskaran V**. Structural elucidation of possible lutein oxidation products mediated through peroxy radical inducer 2, 2'-Azobis (2-methylpropionamide) dihydrochloride: Antioxidant and

- cytotoxic influence of oxidized lutein in HeLa cells. **Chemico-Biological Interactions**, **2013**. 203(2), 448-455. *Impact Factor: 2.62*.
28. Rai A.K., Bhaskar N. and **Baskaran V.** Bio-efficacy of EPA–DHA from lipids recovered from fish processing wastes through biotechnological approaches. **Food Chemistry**, **2013**. 136(1), 80–86. *Impact Factor: 4.02*.
29. Aruna G. and **Baskaran V.** Glycolipids improve lutein bioavailability and accumulation in eyes in mice. **European Journal of Lipid Science and Technology**, **2012**. 114, 710-717. *Impact Factor: 1.95*.
30. Mamatha B.S., Arunkumar R. and **Baskaran V.** Effect of processing on major carotenoid levels in corn (*Zea mays*) and selected vegetables: Bioavailability of lutein and zeaxanthin from processed corn in mice. **Food Bioprocess Technology**, **2012**. 5(4), 1355-1363. *Impact Factor: 2.57*
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32. Nidhi B. and **Baskaran V.** Influence of vegetable oils on micellization of lutein in a stimulated digestion model. **Journal of American Oil Chemists Society**, **2011**. 88(3), 367-372. *Impact Factor: 1.803*.
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34. Mamatha B.S., Sangeetha R.K. and **Baskaran V.** Provitamin-A and xanthophyll carotenoids in vegetables and food grains of nutritional and medicinal importance. **International Journal of Food Science and Technology**, **2011**. 46, 315-323. *Impact Factor: 1.172*.
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40. Aruna G. and **Baskaran V.** Comparative study on the levels of carotenoids lutein, zeaxanthin and β -carotene in Indian spices of nutritional and medicinal importance. **Food Chemistry**, **2010**. 123, 404-409. *Impact Factor: 3.146*

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