

Dr. REVATHY BASKARAN

Senior Principal Scientist and Professor, ACSIR

Department of Fruit and Vegetable Technology

Major areas of research in my lab:



- Minimally processed fruits and vegetables
- Extension of shelf life of perishables using natural plant extracts/ nanoemulsions
- Characterization of nutraceutical compounds in seaweeds and development of functional products for target population like diabetic, obese etc.
- Identification and characterization of phytochemicals/ nutraceuticals by FTIR, HPLC, UPLC-HRMS/MS etc. in fruits
- Fruit and vegetable mucilages: Characterization, biofunctional properties and development of functional products

About my research career so far:

At doctoral level, carried out work on Biotechnological approaches to prevent development of bitterness in custard apple (*Annona squamosa*) fruit during processing.

At post graduate level, carried out work on *In vitro* culture and biochemical studies in *Vitex negundo* L., a medicinal plant.

* Extensive research conducted on minimal processing of around 25 vegetables including **Leafy vegetables** like spinach, coriander leave, curry leaves etc., **Root vegetables** like carrot, beet root, **Tuber crops** like potato, **Bulb crops** like onion, garlic, **Other vegetables** like beans, cauliflower, cabbage, drumsticks etc. involving trimming and washing, minimum pretreatment, packaging and storage conditions have aided to **extend the storage life ranging from 10-30 days for different vegetables.**

The technology has been successfully transferred to 28 entrepreneurs.

* **Modified atmosphere packaging** for extension of shelf life of whole vegetables like cabbage, cauliflower, plantain, drumsticks, carrot, beans, brinjal, bhendi etc. has been standardized. The technology evolved is targeted to aid domestic and export trade.

* **Success in Processing of Custard Apple:** Through deviated steps from the normal course of processing, eight products were developed from Custard Apple, free of bitterness, discolouration and off-flavour. These products are not available in the market till this invention. The protocols are filed as National and International patents.

- * **Reasons for bitterness development in custard apple on thermal processing:** Extraction and characterization of free, bound and esterified phenolics of both fresh and heated pulp by UPLC-ESI-MS/MS. The perceived bitterness in custard apple pulp on thermal processing was probably due to the synergistic effect of phenolic acids, flavanols and certain low molecular weight compounds formed by heat-induced chemical reactions.
- * **Enzymatic approaches to prevent bitterness development:** Enzymes like PPO, tannase and pectinase tested individually and in combination showed prevention of bitterness development to varying extents.
- * **Shelf life of litchi fruits** extended up to 4 weeks. The technology successfully transferred to Research Institute for Fruits and Vegetables, under the Indo-Vietnam collaborative project.
- * **Studies on the effect of low dose gamma irradiation** on the extension of shelf life and maintaining quality of fresh potato, onion and minimally processed potato cubes.
- * **Biochemical changes in wood apple (*Feronia elephantum*) during storage and ripening**
- * **Nutritional and bio-functional properties of West Indian Cherry (*Malpighia puniceifolia* L)**
- * **Development of health products based on sweet potato like soup mix, baby food, extruded products.**
- * **Developed anthocyanins (from garcinia and Jamun fruit) impregnated product from water melon rind**, which is a rich source of citrulline.
- * **Pre-harvest protocols for mango for control of anthracnose**, so as to have better quality mangoes during post-harvest storage.
- * **Eugenol, a major volatile constituent of cloves, was selected as an inhibitor of ethylene** action based on insilico docking studies and was used to extend shelf-life of tomatoes.
- * **Developed chitosan coating for extension of shelf life of mango and banana.** Chitosan coating of mango fruits resulted in an extended shelf-life of mangoes up to 10 days as compared to uncoated fruits at ambient temperature.

Publications:

S.No	Author(s)	Title	Name of Journal	Volume	Page	Year
1	Anand Prakash, Revathy Baskaran and Vellingiri Vadivel	Citral nanoemulsion incorporated edible coating to extend the shelf life offresh cut pineapples	LWT- Food Science and Technology	118 (108851)		2019
2	Anand Prakash Revathy Baskaran , Paramasivam Nithyanand and Vellingiri Vadivel	Effect of Nanoemulsification on the Antibacterial and Anti-biofilm Activities of Selected Spice Essential Oils and Their Major Constituents Against Salmonella enterica Typhimurium	Journal of Cluster Science	https://doi.org/10.1007/s10876-019-01720-7		2019
3	Om Prakash, Revathy Baskaran and V.B Kudachikar	Characterization, quantification of free, esterified and bound phenolics in Kainth (Pyrus pashia Buch.-ham. ex D.Don) fruit pulp by UPLC-ESI-HRMS/MS and evaluation of their antioxidant activity,	Food Chemistry	https://doi.org/10.1016/j.foodchem.2019.125114		2019
4	Prakash, A., Revathy Baskaran ,	Essential oil based nanoemulsions to improve the microbial quality of minimally processed	Food Research International	111	509-523	2018

	Paramasivam, N., and Vadivel, V	fruits and vegetables: A review .				
5	Anand Prakash, and Revathy Baskaran	Acerola, an untapped functional superfruit: a review on latest frontiers.	Journal of Food Science and Technology	55 (9)..	3373- 3384	2018
6	K.V.Harish Prashanth, Revathy Baskaran, Dhanyashree and Rajashekaramurth y	Bioactive chitosan based coatings: functional applications in shelf- life extension of Alphonso mango – a sweet story.	Pure and Applied Chemistry	88(9)	853- 863	2016
7	Anand Prakash, Prabhudev, M.R.Vijayalakshmi, Maya Prakash and Revathy Baskaran	Implication of processing and differential blending on quality characteristics in nutritionally enriched ketchup (Nutri-Ketchup) from acerola and tomato	Journal of Food Science and Technology	53(8)	3175- 3185	2016
8	Revathy Baskaran, M.S.Krishanprakas h and M.C.Varadaraj	Effect of Minimal Processing and Modified Atmosphere Packaging on the Quality Characteristics of Onion (<i>Allium Ceba</i> L).	The International Journal of Science and Technolog	3(6)	1-5	2016
9	Revathy Baskaran, Dishad Pullencheri and Somasundaram Rajarathnam	Characterization of Free, Esterified and Bound phenolics in Custard apple (<i>Annona squamosa</i> L) fruit pulp by UPLC – ESI-MS/MS	Food Research International	82	121- 127	2016

10	Revathy Baskaran, Ramasamy Ravi and Somasundaram Rajarathnam	Thermal Processing Alters the Chemical Quality and Sensory Characteristics of Sweetsop (<i>Annona squamosal L.</i>) and Soursop (<i>Annona muricataL.</i>) Pulp and Nectar	Journal of Food Science	81(1)	S182- 188	2016
11	Sachin R. Adsare, Ashwini N. Bellary, H.B. Sowbhagya , Revathy Baskaran , Maya Prakash , Navin K. Rastogi	Osmotic treatment for the impregnation of anthocyanins in candies from Indian gooseberry (<i>Emblica officinalis</i>)	Journal of Food Engineering	175	24-32	2016
12	Ashwini N. Bellary , A.R. Indiramma , Maya Prakash, Revathy Baskaran, Navin K. Rastogi (Anthocyanin infused watermelon rind and its stability during storage).. Innovative Food Science and Emerging Technologies	33	554- 562	2016
13	Yamini Lakshmi, Usha Devi and Revathy Baskaran	Post-Harvest Ripening Changes in Wood Apple (<i>Feronia elephantum Corr</i>), An Underutilized Fruit	Inter. J.Fruit Science	15(4)	425- 441	2015
14	Shipra Tiwari, K.V. Harish Prashanth, Revathy Baskaran, Usha Devi, Maya Prakash, N.K. Rastogi and K.S.M.S. Raghavarao	Effect of Chitosan and its Blended Films on the Shelf Life and Quality of Green peppers and Grapes during Modified Atmosphere Storage	Trends in carbohydrate Research	5(1)	33-44	2013
15	<u>Athmaselvi, K. A.</u> <u>Sumitha, P.;</u> <u>Revathy, B.</u>	Development of Aloe vera based edible coating for tomato	International Agrophysics	27(4)	369- 375	2013

16	Getachew addis, ,Revathy Baskaran, A. Ushadevi and Marisiddaiah Raju and V.Baskaran	Effect of blanching and drying process on carotenoids composition of underutilized Ethiopian [<i>Coccinia grandis</i> (L.) Voigt.] and Indian (<i>Trigonella foenum-graecum</i> L.) green leafy vegetables	J. Food Process. Preservation	33	744-763	2009
17	M.N.Shashirekha, Revathy Baskaran, L.Jaganmohan Rao. M.R.Vijayalakshmi and S.Rajaratnam	Influence of processing conditions on flavour compounds of custard apple (<i>Annona squamosa</i> L).	LWT Food Sci	41	236-243	2008
18	Revathy Baskaran, A.Usha Devi, Chetan, V.B.Kudachikar, M.N.Keshava Prakash, Maya Prakash and N.K.Rastogi	Effect of low dose gamma irradiation on the shelf life extension of minimally processed potato cubes. Radiation Physics and Chemistry	Radiation Physics and chemistry	76	1042-1049	2007
19	Sameer Babu, V.B.Kudachikar, Revathy Baskaran, A.Usha Devi, R.S.Matché and K.V.R.Ramana	Extension of shelf life and maintaining the quality of litchi (<i>Litchi chinensis</i> Sonn) for internal and export trade	J. Food Science.Tech	44(1)	106-109	2002
20	P.Srinivas, Revathy Baskaran, M.N.Ramesh, Harish Prashanth and R.N.Tharanathan	Storage studies of mango packed using biodegradable chitosan film	European Food Res.Tech	215	504-508	2002

21	Revathy Baskaran, Surekha Puyed and Habibunnisa	Effect of MAP and waxing on storage behaviour of Avocado fruits	J.Food Sci.Tech	39(3)	284-287	2002
22	Habibunnisa, Revathy Baskaran, Rajendraprasad and M.S.Krishnaprakash	Storage behaviour of minimally processed pumpkin (<i>Cucurbita maxima</i>) under modified atmosphere packaging conditions	European Food Res. & Tech	212	165-169	2001
23	Revathy J and P.Narasimham	Litchi (<i>Litchi chinensis</i> Sonn) fruit: Influence of pre and post harvest factors on storage life and quality for export trade: A critical appraisal	J.Food Sci.Tech	34(1)	1-19	1997
24	Revathy J and Ramaswamy N M	<i>In vitro</i> and Biochemical studies of <i>Vitex negundo</i> L. a medicinal plant	J. Soc. for <i>In vitro</i> Biol.	32(3)II	71A	1996

Patents:

S.No	Patent Title	Name of Applicant(s)	Patent No.	Award Date	Agency/Country
1	An improved process for the retention of freshness in cut vegetables	Habibunnisa, Revathy Baskaran, M.S.Krishnaprakash, M.C.Varadaraj and P.Narasimham	192519		India
2	A process for the preparing shelf stable custard apple pulp and powder	M.N.Shashirekha S. Rajarathnam M.R.Vijayalakshmi & Revathy Baskaran	WO/2005/063032) A1	July 2005	France

3	Ready to serve beverage from custard apple by Microfiltration	N.I.Singh,M.R.Vijayalakshmi, M.N.Shashirekha, Revathy Baskaran and S. Rajarathnam	1-2002-000225	July 3 , 2010	Phillipines
4	Process for the preparation of custard apple jam and jam thus obtained	Rajarathnam Somasundaram, M.R.Vijayalakshmi, MN. Shashirekha and Revathy B	115193	March 2003	Singapore
5	A Process for the the preparation of jelly from custard apple	M.N.Shashirekha S. Rajarathnam M.R.Vijayalakshmi & Revathy Baskaran	PCT 0434- WO/2005/06 3044	July 2005	India
6	Process for preparation of custard apple nectar	S.Rajarathnam, M.N.Shashirekha, M.R.Vijayalakshmi and Revathy Baskaran	A 23 L1/ 64	April 2007	India

Processes :

1. **Modified Atmosphere Packaging of minimally processed vegetables.** Habibunnisa, **Revathy Baskaran**, M.N.Krishna Prakash, M.C.Varadaraj & H.S.Satish .
2. Sweetened juice and concentrate from debittered kinnow orange. M.N.Shashirekha, **Revathy Baskaran**, Venkatesh Murthy, Nambiar, S.Rajarathnam, M.R.Vijayalakshmi and M.R.Asha.
3. Process for the preparation of jelly and spray dried powder from kinnow orange, free of bitterness. M.N.Shashirekha, **Revathy Baskaran**, Nambiar, S.Rajarathnam, M.R.Vijayalakshmi and M.R.Asha.
4. RTS beverage from microfiltered custard apple juice. Ibomoya Singh, M.N.Shashirekha, **Revathy Baskaran**, S.Rajarathnam, M.R.Vijayalakshmi and M.R.Asha.
5. A process for biopreservation of sugarcane chunks. **Revathy Baskaran**, A.Usha Devi, M.R.Vijayalakshmi, A.Tamil Selvi and Maya Prakash.

6. Process know how for “Preparation of value added products from Custard apple fruit i) Shelf-stable pulp ii) RTS beverage from micro filtered juice and iii) Jelly filed and cleared by PDRUC and process know charges fixed (No. TTBD/PDRUCFL-34/VSC/11) M.N.Shashirekha, Revathy Baskaran, S.Rajarithnam, Nambiar, M.R.Vijayalakshmi, M.R.Asha.
7. Process know how for “Preparation of products from Pear fruit i) Dehydrated ii) Juice and iii) Powder and cleared by PDRUC and process know charges fixed (No. TTBD/PDRUCFL-34/VSC/11)

List of projects handled and being handled as PI and Co-PI

Sl.No	Title of Project
	Characterization of nutraceutical compounds from <i>Ulva lactuca</i> and development of functional food products
1.	Minimally processed fruits with extended shelf-life
2.	Development of technology protocol for extension of shelf-life and maintaining quality of litchi (<i>Litchi chinensis</i> Sonn) for internal and export trade.
3.	Translation of technology of minimally processed refrigerated vegetables at selected centers.
4.	Extension of shelf life of diced tropical fruits (papaya, pineapple and jackfruit)
5.	Modified Atmosphere Packaging of ready to use moringa leaves for extension of shelf-life
6.	Development of post-harvest treatments for mango (alphonso) to assure quality maintenance, extended shelf-life and quarantine security
7.	Synergistic effect of phytonutrients for development of antiobesity health drink from selected fruits and vegetables Development of novel functional foods by impregnation of bioactives/ physiologically active compounds
8.	Modified Atmosphere Packaging of ready-to-use banana pseudostem
9.	Standardization of process conditions for chitosan based coating formulations for shelf life extension of identified fruits
10.	Geraniol and Eugenol as agents for delaying/ ripening of fruits
11.	Scale up of chitosan based coating formulation for preservation of selected fruits

Future line of work:

Fruits, Vegetables and their wastes are a good source of dietary fibers, phytonutrients, provitamins, antioxidants, polyphenols and minerals. In order to reduce the environmental impact of these wastes these health benefiting bioactives/ compounds can be transformed into useful products. The possible synergistic effect of the plethora of bioactive molecules in fruit and vegetable waste has not been explored specially with reference to lifestyle disorders like obesity and related complications.

- Isolation and characterization of bioactives from fruit and vegetable waste, preparation of nutraceutical enriched product, bioavailability of the phytonutrients, biofunctional properties like anti-obesity and related complications using *in vitro* and *in vivo* models.
- Bioavailability of polyphenols, characterization of phenolic metabolites, structure activity relationship and health effects of the metabolites

Contact: revbas@cftri.res.in; revbas@yahoo.com