Success story

Areca referral laboratory at UAHS, Shivamogga

Horticulture : Value addition

In India areca in grown in an area of 4.73 lakh hectare with the production of 7.06 lakh tons. The production of areca has increased from 2.51 lakh ton in 1991-92 to 7.06 lakh ton in 2016-17. Export of the product is only 8510 tons in 2014-15 where as we are still importing 50036 ton. The areca industry is widely fluctuating because of high price disparities, threat of ban on areca products, poor value addition and highly inadequate export potentials.

Challenge

Major portion of areca is used for chewing purpose. Some efforts have been made to utilize arecanut for alternate uses *viz.* areca tea, soaps, diabetes formulations, tooth powder, pan masala, gutka, softdrinks, wines, medicines / ayurvedic preparations. Further areca is processed by dry and wet processing methods. During wet processing areca is subjected to boiling in water for few hours during which several cheaply available materials like jamun tree bark, cooking oil, jaggary, beetel leaf, lime etc., are added in order impart good colour, taste and glassy appearance.

Now the areca industry is in cross roads became of use of atleast 50% unprocessed / chali areca for gutka making. Gutka is a combination of arecanut, slaked lime, paraffin, katechu along with tobacco, mouth freshner and mixture of a combination of 4000 chemicals. Gutka is stimulant and relaxant. It has chemicals of nitrosamine, arsenic, benzopyrenes, chlorine, ammonium compound atc,. Many of these chemicals are said to be carcinogenic.

Because of diverse nature of products it is highly essential to have the facilities for systematic quality analysis of the products obtained by different processing methods and also products manufactured by arecanut. The analysis is needed to understand the impact of these product on human health and enhance export potential.

Initiative:

Establishment of quality analysis laboratory

An UHPLC lab has been established for quality analysis of areca products and other products. The facility can be used for qualitative / quantitative analysis of organic molecules. The laboratory includesUHPLC, deep freezer, air conditioner, precision balance, sonicator, moisture balance, vacuum pump, water softener, Millipore water purification system etc.

View of UHPLC laboratory @ UAHS, Shimoga

An ICPOES lab has been set up for analysis of areca product for their content of inorganic nutrients. This has facilitated analysis of more than 10 elements including heavy metals in a single feeding of samples.

View of ICPOES laboratory @ UAHS, Shimoga

An advanced microwave digestion system has been installed in the laboratory for precise and speedy digestion of plant / soil samples before they are used for chemicals analysis : similarly, a fibrotron instrument is included in the laboratory for precise estimation of fibre content in plant samples.

Microwave Digestion system

Summary of beneficiaries of the laboratory

Sl No	Particulars	2015-16	2016-17	2017-18
1	Areca project samples	850	850	100
2	UAHS samples	125	300	500
3	Students samples	25	75	100
4	Institutional samples	30	45	25
5	Farmers samples	48	15	150

Key results / results / interesting fact

For quality analysis , areca samples were collected from 850 farmers located in important areca growing districts of Karnataka (Shimoga, Chikkamagalore, Davanagere, Chitradurga, Dakshina kannada and Udupi). Samples were pooled on hobly basis before they are subjected to quality analysis

Table1. Summary of variability in inorganic nutrients in arecanut in different districts of Karnataka

		P (1%)	K (%)	Ca (%)	Mg (%)	Zn (ppm)	Fe (ppm)	Cr (ppm)	Ni (ppm)	Cu (ppm)	Mn (ppm)	(p
Shimoga	H	0.19	0.25	0.11	0.08	29.0	253	23	9	35	60	
	L	0.10	0.13	0.07	0.05	11.0	114	11	3	16	11	
Chikamagalur	H	0.20	0.30	0.11	0.66	21.0	254	23	12	27	23	
	L	0.14	0.20	0.09	0.04	14.0	187	11	4	18	14	
Davanagere	H	0.23	0.23	0.08	0.09	12.0	129	12	10	24	20	
	L	0.15	0.15	0.06	0.05	6.0	82	6	4	13	11	
D.K	H	0.16	0.47	0.10	0.07	12.0	226	18	10	25	24	
	L	0.08	0.24	0.06	0.05	6.0	46	13	3	17	19	
Chitradurgga	H	0.29	0.36	0.08	0.09	18.0	298	15	9	14	20	
	L	0.16	0.26	0.07	0.05	12.0	139	9	3	11	15	
Udupi	H	0.25	0.25	0.09	0.09	9.0	72	19	9	10	19	
	L	0.19	0.15	0.05	0.06	8.0	68	17	5	8	14	
Mean	H	0.22	0.31	0.09	0.08	16	205	18	9	22	27	
Mean	L	0.14	0.19	0.06	0.05	9	106	11	3	13	14	
Upper limit For humans/ day/person		7.5g	6.0g	2500mg	250 mg	25mg	50mg	1.0mg	150mg	5mg	800mg	9

Table 2. Abstract of level of organic nutrients in areca samples collected from different districts of Karnataka

		Arecoline (ppm)	Tannin (%)	Polyphenols (%)	Fiber (%)	Vit-B6 (ppm)	VitC(ppm)
Shimoga	H	1230	3.85	4.11	82	52	1408
	L	73	1.60	0.91	18	10	352
Chikamagalur	H	818	4.61	2.56	61	72	1321
	L	103	1.95	0.75	20	10	528
Davanagere	H	813	2.83	8.15	59	84	1321
	L	109	0.62	0.57	20	10	792
D.K	H	1444	2.48	13.90	78	91	792
	L	162	0.97	0.91	38	10	264
Chitradurgga	H	969	4.40	6.07	65	72	792
	L	101	1.18	0.93	45	10	264
Udupi	H	527	2.16	2.43	77	81	792
	L	83	1.14	0.93	63	10	264
Mean	H	966	3.39	6.20	70	75	1071
Mean	L	105	1.24	0.83	34	10	410
Upper limit For humans		0.25mg per kg body wt	_	_	_	25mg per day/person	1.0g per day/person

Table 3. List of main ingredients used for wet processing of areca

Sl No	Shimoga		Chikamagalur		Davanagere		Chitradurga		D.K		Udupi	
	Ingredient	%	Ingredient	%	Ingredient	%	Ingredient	%	Ingredient	%	Ingredient	%
1	Jaggery	59	Jaggery	100	Jaggery	100	Kaachu	71	-Dry Process ing-		-Dry Process ing-	
2	Cooking oil	48	Jamun bark	86	Cooking oil	92	Jaggery	71				
3	Jamun tree bark	43	Betel leaf	52	Lime	92	Jamun tree bark	57				
4	Betel leaf	43	Cooking oil	72	Betel leaf	92	Lime	43				
5	Banana leaf tip	24	Lime	52	Jamun tree bark	64	Betel leaf	36				

Impact

The arecanut samples contained a mean of 0.22, 0.31, 0.09, 0.08 percent of P, K, Ca and Mg as upper limit where as their respective lower limits were 0.14, 0.09, 0.06 and 0.05 percent. The contents of Zn, Fe, Cr, Ni, Cu and Mn were 16, 205, 18, 9, 22 and 27 ppm as upper limit. The arecanut contained all these element below the limit recommended for human consumption (Table 1).

The pooled data all the samples collected from the Hoblies of different districts of Karnataka indicated that contents of arecoline (966ppm), vitamin B6 (75 ppm), vitamin C (1071ppm) were within the acceptable limit for human consumption. The district wise / region wise significant variability couldn't be established between any of the organic nutrients studied in this project may be because of variation in age of plantation, stage of harvest, weather condition, agronomic practises, varieties, inter croppings, processing methods etc., (Table 2).

During wet processing farmers of Shimoga, Chikkamagalur, Davanagere and Chitradurga commonly make use of jiggery, cooking oil, jamun tree bark and betel leaf. Some farmers of Shimoga district make use of lime and 13 different cheaply available materials for wet processing with the objective of imparting good colour and shining to the finished products. In Davanagere people use lime, kaachu, sandal wood, pongamia and eucalyptus for the processing where as, the growers of Chitradurga additionally use betel leaves, banana leaves and areca powder (Table 3).

Lesson learned

(i) What did you learn in this process? What was difficult or challenging?

- True sampling was a greatest difficulty because of different method of processing, wide range of products, vast range of material / chemicals use in processing / manufacturing.

More precise sampling is essential.

(ii) How do you overcome the challenges faced?

- Large number of sampling (850 samples x 2 years) was done.

(iii) If you were to do it all over again, what would you do differently?

- During quality analysis of the product from the point of human health / export orientation following guide lines will be taken into consideration.

(a) Crop variety, age of plantation, cultural practices, method of processing, climatic condition, soil characteristic etc.,

(b) Alternative products, processing methods, additives, human health and export standards.

8. Supporting Quotes and Images

Following training programmes were conducted during project implementation period.

(a) Advanced instrumentation methods for analysis of inorganic and organic nutrients in plants (29-30/Nov,2016)

A referral lab has been established for analysis of areca / any agricultural / plant samples obtained by the farmers, researches, institions etc. In order to train the students and researches / students of the university and create awareness among the people about the available facilities, a two days training was conducted.

Application scientists from thermofisher (Ind) pvt.ltd and perkin Elmer (Ind)pvt.ltd imparted training on the use of UHPLC, ICPOES, AAS, microwave digestion and automatic nitrogen analysis. During the programme 104 no. of Researches, post graduate students and lecturers obtained the basic knowledge of the instruments.

(b) One day work shop on " Alternate uses of arecanut"(31st January,2017)

A fair / workshop on the alternate uses of arecanut was organised at UAHS, Shimoga on 31st January,2017.

During the workshop, an exhibition of various areca products *viz.* Soaps, areca tea, dia areca, different medicinal formulations, areca wine, areca mosquito repellents and areca stem wall, floor panel etc. was organised. The workshop was benefitted by 304 no. of progressive farmers, businessmen, students and researchers of the zone.

9. Additional information

(i) List of all project partners :Dr. S.P. Nataraju

Professor
Dept. of crop physiology
ZAHRS, Shimoga-577225

Dr. K.C. Shashidhar
Professor
Dept. of Agri. Engineering
college of Agriculture
UAHS, Shimoga-577225

Dr. K.S. Sheshagiri
Associate Professor
Dept. of Horticulture
college of Agriculture
UAHS, Shimoga

(ii) Links : -

(iii) Contact person : Dr. B.R Gurumurthy
Professor of Crop physiology
ZAHRS & College of Agriculture
UAHS, Shimoga-577225
Phone: 8050483330
E mail: shimogagurumurthy@gmail.com

(iv) Other :

10. Checklist

No	Question to consider	Yes	No
1	Is the story interesting to the target audience of the project/activity report?	✓	
2	Does the story explain what new insights the project brings? What is the main lesson learned from this story? Does the story describe a key insight on what works and what doesn't and something that future project could build on	✓	
3	Does the story describe the outcomes the project produces and the people who are benefitting? What changes-in skills, knowledge, attitude, practice or policy-has the project brought and who is benefitting from these changes?	✓	
4	Does the story make a compelling point that people will remember? Does the story show how the project makes a difference to improving livelihoods and lessening poverty?	✓	
5	Does the story provede an interesting fact that people will remember? For example, how much yields increased, how many hectares of land could become more productive from this innovation or technology?	✓	
6	Does the story explain what kind of impact this innovation or technology could have if scaled up?	✓	
7	Does the story show which partners contributed and how?	✓	
8	Does the story include quotes form Stakeholders or beneficiaries?		✓
9	Have I provided links to other media (journal articles, website news, newsletter, belogs, annual reports of other Programme/ project) that also feature this story?	Journal articles annual reports	
10	Have I provided the contact details of people who can provide more information	✓	