POST HARVEST TECHNOLOGY AND PRODUCT UTILIZATION IN ARECANUT

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INTRODUCTION

Arecanut is traditionally used as a masticator in the countries of Indo- Malayan Peninsula. The ethano religious importance of arecanut in India is unique. Chewing of supari with betel leaf with a dash of slaked lime and a pinch of tobacco of the chewing variety is a ritual for many Indians. Almost the entire quantity of arecanut produced in India goes into the traditional habit of chewing either in the cured or uncured form. But, there is a steady decline in the masticatory habit for the last three decades. Added to this, the trade of arecanut is also not attractive often causing high degree of price fluctation. Hence studies on the alternate and better uses of arecanut was taken up in the early fifties, by the erstwhile Central Arecanut Committee and ICAR as a collaborative programme with various organisations/ research institutes like CLRI, Madras, IDRL, Pune, CFTRI, Mysore, Department of Chemical Technology, Bombay University, Oil Technological Research Institute, Ananthapur and Punalur Paper Mills, Kerala and was monitored through CPCRI, Kasaragod. Majority of the post harvest technological aspects of arecanut had been worked out in these institutes.

CHEMICAL COMPOSITION OF ARECANUT

The nut contains fat, polyphenols (tannins), polysaccharides, fibre and protein. The mineral matter contains Ca (0.05%), Phosphorous (0.1 %) and Iron (1.5 mg/100 g). It also contains Vitamin B6 (286.92 mg) and Vitamin C (416.2 mg).

The chemical composition of arecanut changes with different stages of maturity. Polyphenols decresae with maturity, while polysaccharides, fat and fibre increases. The free fatty acids shows a decrease, indicating the biosynthesis of fat. Fat increases from 1-4% in the tender stages to a level of 10-15% in the ripe nuts, while the hydrolyzable polysaccharides increase from about 5% in the tender stage to 25% in the ripe stage. Fibre increases from 1-2% steadily to a value of 15% in the ripe nut. Among alkaloids, ripe arecanuts have a higher arecoline content of 0.2 to 0.3 % compared to tender nuts with 0.05 to 0.1 %. Thus, the overall pattern shows that at tender stages, water extractives containing polyphenols, nitrogen and ash contents are high.

USES OF INDIVIDUAL CONSTITUENTS

Tannins : Polyphenols or tannins form the major constituent of the nut. Tender nut contains about 38-47 %, while ripe nuts have only 16-22 %. Tannins are obtained as a byproduct from the process of preparing immature nuts for masticatory purposes. Tannins from whole nut has got better tanning properties and hence can be utilized for retanning chrome leathers. These are widely used for dyeing clothes, ropes etc.

Tannins especially tannin - formaldehyde adhesive is used in ply board

manufacture. Another possible use of tannins is as a food colour. Isolation of the colouring matter is possible which can be used to dye food products and as dyes. In the present scenario of increasing ban on synthetic food colours, this natural product assumes greater significance.

Arecanut fat : The nut contains about 8-12 % fat, which is extractable with organic solvents like hexane or chloroform. The fat has a white plastic appearance on cooling with no particular odour.

The fat contains both saturated and unsaturated fatty acids and is highly rich in myristic acid. Hence it can be a good indigenous source for preparing myristic acid and its derivatives. Refining of the fat can be done with alkali, which makes it as an edible fat, which is harder than cocoa butter. Sweets, savouries and biscuits prepared from this fat are comparable with those from vanaspathi. The blended fat with cocoa butter in the ratio 1:1 can be substituted for cocoa butter or hydrogenated coconut oil.

Alkaloids : Arecanut has 1.5 % alkaloids viz., arecoline, arecolidine, arecaidine, guvacine, isoguvacine and guvacolidine of which arecoline alone accounts for 0.24 %. They possess potential medicinal properties and are antihelmintic and effective against tape worms and round worms. It is also used as a CNS depressant drug. Orotund (full and round arecanuts) has got antibacterial property and it inhibits the growth of *E. coli.*, *S. typhi* and *S. aureus*. The blood sugar lowering effect of arecoline is mentioned in Ayurveda.

PROCESSING OF ARECANUT

The processing method of orotund differ in each state. In Assam, fresh nuts are preserved in thick layers of mud to have a moist chewing feel in the mouth when consumed. The product is known as bura tumul. In Kerala, fresh fruits are stored by steeping in water. These preserved nuts are known as Neetadaka and a favourite of many chewers.

TYPES OF PROCESSED NUTS

Chali or Kottapak : Ripe nuts are dried in the sun for 35-40 days, dehusked and marketed as whole nuts. This is known as chali. The different grades of decreasing order of chali are Moti, Srivardhan, Jamnagar and Jini. The main producing areas of chali are Kerala, Karnataka, Assam and Maharashtra. Sometimes the fruits are cut longitudinally into two halves and sundried for 10 days. The kernels are scooped out and given a final drying. This product is known as parcha and is popular in Kerala and Karnataka.

Mechanial driers are also used to make chali. The material is kept in a tray and hot air is allowed to penetrate through a centrifugal blower. Drying takes 60-70 hrs over a period of 7-8 days at 45-70°C. The dehusking can be done using arecanut dehusker developed by CPCRI (in 1980), which is manually operated. About 40 kg of chali can be made within a period of 8 hrs.

Kalipak : Nuts of 6-7 month old maturity are dehusked, cut into pieces, boiled with water or a diluted extract from previous boiling, coated with kali and dried. This is prevalent in Kerala and Karnataka.

Kali coating can be repeated 3-4 times to get a good glossy appearance. (Kali is the extract obtained after 3-4 batches of boiling

and then concentrated 10-fold, tannins are its major components).

In interior parts of Karnataka, the boiling and kali coating operations are combined using a thicker extract known as chogaru. The kalipak is rated with a dark brown colour, glossy appearance, crisp chewing feel and absence of immature nuts. The major adulterants are sago palm nuts, sweet potato and tapioca which can be identified either by physical examination or through chemical analysis.

The kalipak is known by different names depending on the number, shape and size of the cuts. Api or unde (without any cuts), Batlu (transverse cut into two halves) Choor (several longitudinal cuts), Podi (both longitudinal and transverse cuts) and Erazel (transverse thin slices).

Iylon is another variety made from green arecanuts in which nuts are cut transversely into 5-6 discs and without kali coating. These are mainly used in Tamil Nadu and Andhra Pradesh.

Scented Suparl: Here, dried arecanuts are broken into bits, blended with flavour mixture and packed in butter paper. In South India, kalipak is used for this purpose, by adding spices and synthetic flavours. Instead of raw spices essential oils are used for easy blending, with coconut gratings to avoid microbial growth. In Central and North India, supari made from chali are more popular. Saccharin is occasionally used for sweetening, with additives like colour and flavour.

MARKET PREFERENCES FOR PROCESSED NUTS

Kalipak and scented suparis are used as masticatory, while chali nuts are used alongwith slaked lime and betel leaf. Combination of these are known as beda, which are flavoured with spices like clove. About 75% of the marketed produce is consumed after processing either as kalipak or chali.

Market preferences differ with region. In Bombay market, big size of nut is preferred, while in Nagpur and Allahabad, smaller ones are in great demand. Superior quality of nuts have light brown skin colour and a clear core with a smooth cut surface with well-defined brown veins. Interior cracking of nuts indicate proper drying and is desirable. Maturity is another important factor in trade. Bacterial spoilage and infestation and excessive astringency are considered as defects.

PROCESSING OF ARECA HUSK

The husk of arecanut constitutes about 60-80 % of the total weight of the nut. About one lakh tonnes of dry husk is produced in India annually, which is used only as an inferior fuel or mulch. The major constituents in the husk are Pectin (1.5-3.6 %), protopectin (1.5-2.1 %), hemicellulose (35.0-65.8 %), lignin (13.0-26.0 %), furfuraldehyde (18.8 %) and ash (4.4 %).

The husk fibres are prodominantly made of cellulose, with lower amounts of hemicellulose, lignin, pectin etc. "Hard fibres" are those adjoining the inner layer, while soft fibres form the middle layer. During maturity of the nut, the hemicellulose content decreases, while the lignin content increases.

On comparison of areca husk fibre with the characteristics of jute fibre, it is seen that the average filament length is only 2.4 cm,

while for jute, it is 68 cm. The course fibre filament is 10 times as strong as jute, while the fine filament is similar to jute fibre. Based on the work of JTRL, Calcutta, areca husk fibre could be used for thick boards, fluffy cushions and non-woven fabrics. Fibre extraction is done by soaking the husk for 3 weeks and beating with a mallet.

PRODUCTS FROM ARECA HUSK

1. Hard boards and plastic boards: Detailed studies at Forest Research Institute, Dehradun have shown that plastic and hard boards of comparable strength properties could be made from areca husk. CNSL can be used for tempering the boards which gives good water resistance, higher strength and less microbial growth. So far, these processes have not been commercially exploited.

2. Insulation wool: This is prepared by air-dry husk with wooden mallet. The wool is comparable in thermal conductivity, packing density etc. with standard products like Palcowool, defabricated teak bark etc. Its utility in thermal installation, packing etc. is promising.

3. Cushions: Softened husk using pectinolytic bacteria is an excellent cushion material . Work done at CFTRI, Mysore revealed that soft cushion pads obtained from spongy fibres are comparable with standard cushion pads. Thick mattresses can also be made from areca husk fIbre in admixture with coir fibre.

4. Pulping and paper boards: Areca pulp be chemically prepared by digesting with chemicals at 170°C for 4 hrs. With 45-50% yield and with a fibre length of 0.96 mm. The strength properties are not satisfactory for kraft wrapping paper, but brown wrapping paper can be prepared when mixed with jute or bamboo pulp.

Areca husk when treated with 17.5 % NaOH at 170°C for 2 hrs. and beaten for one and a half hours, give pulp material having ordinary kraft paper quality. Good quality kraft paper could be produced by beating banana pseudostem pulp to areca husk pulp. Commercial exploitation of the whole process is hindered by two factors viz., high cost of transporting husk to the factory and the high amount of chemicals required for digesting the husk.

5. Furfural, Xylose, Activated carbon and Charcoal: Areca husk contains 18.75% furfuraldehyde, which on acid hydrolysis gives 5.5% furfural. The residue after distillation can be used as a filler in plastics. Areca husk is a good source of xylose. Xylitol can be obtained from xylose , which can be used instead of sucrose in diabetic patients. The residue after extraction of xylose when mixed with $ZnCl_2$ and heated to 800°C for 2 hrs gives charcoal, which is comparable with that of E.Merck. The yield is about 25-28 %.

PROCESSING OF ARECA STEM AND LEAF SHEATH

Arecanut stem is a useful building material. The timber can be used for making variety of elegant utility articles due to its hardness and golden yellow colour. Stationery articles like rulers, shelves, waste paper baskets made of arecanut stem are both durable and attractive. Sharpened stems are used for dehusking coconuts.

A large portion of arecanut leaf sheaths are wasted except for use as inferior fuel, making head caps for farm workers, eating

bowls, containers for toddy, art objects etc. It can also be used for making ply boards (3-ply) and found to have a tensile strength of 1/3 rd of that of conventional 3-plyboards and better flexibility. These are suitable for making cases like tea chests, for medicine, tobacco etc.

The flexibility and mouldability of the sheath, when wet, makes it a good material for heat moulding. CFTRI has developed a machine for making tea cups and throw-away plates with areca leaf sheath. The machine is manually operated and can produce 100 cups / hour. Here the leaf sheath is subjected to 158°C for 2 hrs for moulding. Recently, small scale units have been opened in South Karnataka for this purpose. Due to the natural colour and grain variation of leaf sheath, it is suitable for making decorative veneer panels and picture mounts. Even house chappals can be made from areca leaf sheath due to its easy yielding for stiching and resemblance to animal hide. Brief cases, brief bags, spectacle cases, tea or coffee trays are other products that can be made from areca leaf sheaths. Establishing small scale rural industries based on arecanut leaf sheath generate additional income to the arecanut growers and also additional employment for the rural sector in our country.

POSSIBLE AREAS FOR PRODUCT DEVELOPMENT

There are good prospects for product development in arecanut. The possibilities of using various constituents of arecanut like fat and polyphenols including it as a colouring agent for food and as an ingredient in tooth paste, as chewing gum etc. can be studied in depth. Developing an integrated processing unit wherein the individual components are serially extracted and utilised will be ideal and economically feasible.