

PACKAGING AND STORAGE STUDIES ON SCENTED SUPARI (PROCESSED ARECANUTS)

By C. S. VIRAKTAMATH

(Central Food Technological Research Institute, Mysore)

Arecanuts, one of the important food adjuvants in the Indian home, is processed and marketed in consumer units of about 1.5 grams of pulverised bits, duly scented, spiced and containing desiccated coconuts¹ and wrapped in glassine paper, closure being effected with starch adhesive. 100 or 50 such small packets are overwrapped in kraft paper bags for sale to dealers. It has been reported that in this package, the delicately scented nuts, lose their characteristic delicate flavour, crispness and often develop stale odour and sometimes even become mouldy. These changes are particularly more pronounced in warm and humid climatic conditions, when the product has a shelf-life of less than a month. Due to inadequate packaging, export of this commodity is rather limited, although a considerable demand exists in foreign countries particularly in the East.

Studies were, therefore, undertaken on the packaging characteristics of the commercially produced scented *supari* and to develop suitable package which would give adequate protection against ingress of moisture and flavour losses during storage and marketing for a sufficiently long period.

Materials and Methods

Freshly prepared scented *supari* was obtained from one of the well known firms dealing in this product. Consumer unit packets of the above product packaged in the conventional way using glassine (imported), glassine (indigenous), plain transparent cellulose film, moisture—proof heat sealable transparent (M.S.T. 300) cellulose films were used for these studies. In the latter case the films were conditioned to 65 per cent humidity so as to make them slip easily since at higher humidity the sheets tend to stick to each other thus impairing the packaging operation. In all other cases, except M.S.T. cellulose film, starch

TABLE I. *Air porosity, greaseproofness and water vapour permeability of packaging materials used in this investigation*

Packaging material	Air resistance in hrs. (50 cc of air through one sq. area)	Grease proofness in seconds	Water vapour permeability gms./sq m. 24 hours at 100°F and 92% R.H.	Resistance to flavours and odours
1. Glassine (Imported)	72	727	High	Fair
2. Glassine (Indian) ...	24	130	High	Fair
3. Plain transparent cellulose film ...	Very high	Very high	Very high	Very good
4. Moisture-proof cellulose film ...	Very high	Very high	15-20	Very good
5. Polyethylene 250 gauge film ...	...	...	7.8	Very poor

adhesive was used, while with M.S.T. film they were closed by quick application of heat. Initially the essential characteristics of the above films were determined using standard test procedures² of TAPPI. Results of these are shown in Table I.

TABLE II. *Humidity-Moisture Relationship of scented supari at 75-78°F*

%R.H.	Equilibrium moisture%	Observations
22	3.83	Good
32	5.05	Good
44	6.30	Good
58	7.31	Good
73	8.15	Good
86	13.68	Mould growth appeared

TABLE III. *Moisture pick up and organoleptic qualities of scented supari in various packages stored at two different conditions of storage*

Package used for primary units	Period of examination (days)	Standard conditions 75-78°F and 72-75% R.H.				Accelerated conditions 100°F and 92-95% R.H.			
		Moisture pick up (%)	Flavour	Crispness	Acceptability	Moisture pick up (%)	Flavour	Crispness	Acceptability
Glassine (Imported)	8	...	...	...	...	5.36	+	+	+
	15	0.98	+++	+++	+++	7.81	-	-	-
	30	1.87	+++	+++	+++				(mouldy)
	45	2.76	+++	++	++				
	60	3.43	++	-	+				
	75	4.38	-	-	-				(slight mouldy)
Glassine (Indian)	8	...	...	...	...	5.10	+	+	+
	15	0.85	+++	+++	+++	7.60	-	-	-
	30	1.75	+++	+++	+++				(mouldy)
	45	2.56	++	++	++				
	60	3.22	+	-	+				
	75	4.12	-	-	-				(slight mouldy)
Plain transparent cellulose	8	...	...	...	...	6.82	-	-	-
	15	0.98	+++	+++	+++				(mouldy)
	30	1.82	+++	+++	+++				
	45	2.92	++	++	++				
	60	3.56	+	-	+				
	75	4.43	-	-	-				(slight mouldy)
M.S.T. (300) cellulose	8	...	...	...	...	4.82	+	+	+
	15	0.82	+++	+++	+++	6.74	-	-	-
	30	1.73	+++	+++	+++				(mouldy)
	45	2.46	+++	++	++				
	60	3.12	++	+	++				
	76	4.08	+	-	-				(slight mouldy)

Note: +++ = Excellent and comparable to original kept in sealed glass container.

++ = Slight loss in the individual characteristics. + = Just acceptable. - = Not acceptable.

The storage characteristics of the scented *supari* was carried out by exposing known quantities of the product to different humidity conditions in desiccators using saturated salt solutions³. The samples were periodically

weighed to constant weight and the equilibrium moisture content under each set of condition determined. The results obtained are shown in Table II.

Similarly, the individual packets as prepared

TABLE IV. Storage studies of scented supari packed in glassine and packaged in different films and stored at two temperature and humidity conditions

Packaging pattern	Period of examination in days	Standard conditions (75-78°F and 72-75% R.H.)				Accelerated conditions (100°F and 92-95% R.H.)			
		Moisture pick up (%)	Flavour	Crispness	Acceptability	Moisture pick up (%)	Flavour	Crispness	Acceptability
Glassine packets in: (a) Kraft paper (Trade package)	8	...	...	...	...	4.02	++	++	++
	15	0.82	+++	+++	+++	6.40	-	-	-
	30	1.58	+++	+++	+++				(mouldy)
	45	2.28	++	++	++				
	60	3.18	+	+	+				
	75	4.82	-	-	-				(slight mouldy)
(b) M.S.T. (300) cellulose	8	...	...	...	...	4.80	++	++	++
	15	0.80	+++	+++	+++	7.30	-	-	-
	30	1.59	+++	+++	+++				(mouldy)
	45	2.35	+++	++	++				
	60	3.21	++	+	+				
	75	4.91	-	-	-				(slight mouldy)
(c) Polyethylene 250 gauge film	8	...	...	...	...	0.82	+++	+++	+++
	15	0.23	+++	+++	+++	1.70	++	+++	++
	30	0.48	++	+++	++	2.10	+	+++	+
	45	0.70	+	+++	++	2.80	-	++	-
	60	0.91	-	+++	++				
	75	1.12	-	+++	++				
	90	1.38	-	+++	+				
	120	1.61	-	+++	-				
(d) M.S.T. (300) cellulose + Polyethylene 250 gauge	8	...	...	...	...	0.61	+++	+++	+++
	15	0.18	+++	+++	+++	1.10	+++	+++	+++
	30	0.34	+++	+++	+++	1.60	+++	+++	+++
	45	0.52	+++	+++	+++	2.30	+++	++	++
	60	0.78	+++	+++	+++	2.91	++	++	++
	75	0.92	+++	+++	+++	...	...	...	...
	90	1.13	+++	+++	+++				
	120	1.31	+++	+++	+++				
	150	1.64	+++	+++	+++				

Note: +++ = Excellent and comparable to original kept in sealed glass containers.

++ = Slight loss in the individual characteristics.

+ = Just acceptable.

- = Not acceptable.

were exposed to different humidity and temperature conditions *viz.*, (a) standard conditions: 75-78°F and 72-75 per cent R.H. and (b) accelerated storage conditions; 100°F and 92-95 per cent R.H., and the individual packets weighed in order to find out the pick up in weight till the

nuts lost their aroma, crispness or mould growth whichever was earlier. Results are presented in Table III.

Since none of the packaging material used for small packets could give adequate protection, and in trade 100-50 units are overwrapped in

kraft paper, the same pattern was followed by overwrapping 50 units of the scented *supari* in M.S.T. cellulose film, and 250 gauge polyethylene film both singly and in combination and stored in the above humidity and temperature conditions. Samples in the trade package and in glass bottles were stored alongside for comparison. Results are shown in Table IV.

Results and Discussion

It is seen from Table II that the critical moisture content of the product from the point of view of mould growth is about 13.6 per cent, while its crispness seems to be affected at a moisture level of about 10 per cent. The product has an initial moisture content of 8.1 per cent thus leaving a permissible moisture pickup of about 1.9 per cent during storage before organoleptic deterioration sets in.

Samples wrapped in glassine (imported and Indian) plain cellulose film and stored at standard conditions, tend to become just acceptable at the end of 45—50 days, while in M.S.T., they retain all their qualities during the same period. On the other hand at 100°F and 92—95 per cent R.H. none of the films gave adequate protection for even 10 days as revealed by Table III.

These findings become obvious by examining the properties of various films used as shown in Table I.

Table IV indicates the storage life of the packets in different moisture barrier films singly or in combination. For this study, product in primary units made in glassine (imported) were used, since under accelerated conditions all the films behaved in a similar manner.

Results indicate that all the films except trade package and M.S.T., could give a shelf-life of over three months under standard conditions of storage, as against 45—50 days in the trade package and M.S.T. film.

In the accelerated conditions, the product in the trade package and M.S.T. bags shows a shelf life of about 10 days, while in polyethylene or a combination of 300 M.S.T. film and

250 gauge polyethylene film, the product was in satisfactory condition for 30 and 60 days respectively. Assuming an acceleration factor of 4, and in view of the fact that under standard conditions the product was as good as the control samples in sealed glass bottles for 90 days, it may be concluded that the product would have about 140 days' storage life under normal conditions of storage, with the use of an outer bag of polyethylene plus M.S.T. which is evident from Table IV.

Summary

1. Humidity moisture relationship studies reveal that at 10—11 per cent moisture the product lost its crispness, and mould growth appeared at 13—14 per cent moisture.

2. Packaging and storage studies of unit packets in imported glassine, Indian glassine, M.S.T. cellulose film and plain transparent cellulose film gave only limited protection to the ingress of moisture and loss of flavour.

3. Unit packets with an overwrap of moisture barrier films enhanced considerably the storage period under standard conditions, compared to trade packages in kraft paper. However, under accelerated conditions, only polyethylene+M.S.T. cellulose film was useful for storage upto 60 days.

Acknowledgment

The author is indebted to Dr V. Subrahmanyam and Dr A. Sreenivasan for their interest in the work and (Major) N. V. R. Iyengar for the guidance.

The author is also thankful to Shri M. K. Krishna Chetty, Asoka Betelnut Manufacturer, Coimbatore for having supplied the material for studies.

REFERENCES

1. Krishna Chetty, M. K., *Technical Aid to Industries*, C.F.T.R.I., 1953, p. 247.
2. *Testing methods* (TAPPI), 1935.
3. Wink, W. A., *Ind. Engg. Chem.*, (Anal. Ed.) 1946, **18**, 251.
4. Farber, L., *Food Technol.*, 1958, **12**, 177.