

A NOTE ON THE PACKAGING OF FREEZE DRIED MEAT

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Performance of different types of packs for freeze dried meat under different conditions of storage is reported.

Dehydrated meat requires careful packing as it is very hygroscopic and fragile and is subject to a number of deteriorative reactions during storage *viz.* non-enzymic browning, oxidative deterioration, protein denaturation and enzymic deterioration etc. It demands a package which is a complete barrier to the penetration of oxygen and water vapour and also withstands rough handling¹. Metallic cans have long been used as standard containers for the packaging of dried foods,² but they are costly and heavy from the military point of view. The development of flexible packs consisting of aluminium foil has proved to be quite encouraging for packaging freeze dried foodstuffs. These packs are light in weight and provide good barrier to oxygen and water vapour, though they are less resistant to mechanical damage than cans.

MATERIALS AND METHODS

The raw meat (mutton) was trimmed free of surplus fatty tissue, boned, cooked at 15 *psi* for 30 minutes and freeze dried. The dried material was immediately nitrogen packed³ in sterile tin cans and different types of flexible packs (100 gm) mentioned below:—

- (i) Polythene—cellophane laminate.
- (ii) High density polythene.
- (iii) Polyester (mylar)—heat sealable.
- (iv) Paper/aluminium foil/polythene laminate.
- (v) Mylar/aluminium foil/polythene laminate.

A few of the cans as well as flexible packs were not filled with nitrogen and therefore contained only air. The dimensions of flexible packages were 7 in. × 5 in. The chemical composition⁴ of meat determined at various stages of processing is given in Table. 1.

STORAGE TRIALS

Storage behaviour of the packed meat was studied at (a) 35°—37°C; 60—75% R.H. (b) 53°—55°C; 60—70% R.H. During storage, samples were removed periodically for examination. The results are presented in Tables 2—4.

TABLE 1

CHEMICAL COMPOSITION OF MEAT INDICATING LOSSES OF VARIABLES DURING PROCESSING

Material	Moisture (%)	Protein (%)	Fat (%)	Ash (%)	Peroxide No. (in milliequivalents)
Raw meat (boned & defatted)	77.0	20.2	2.38	1.2	0.4
Cooked meat	61.2	32.7	2.05	1.5	0.6
Trimming	59.3	17.8	22.20	1.0	0.6
Dried meat	1.7	85.1	9.10	4.3	0.8

TABLE 2

RESULTS OF STORAGE OF FREEZE DRIED MEAT IN DIFFERENT KIND OF PACKS STORED AT 25°-27°C AND 60-75% R.H.

Packaging material	No. of packs	Observations
Tin can flushed with nitrogen	12	Meaty colour; meaty flavour; reconstituted well. No leakage of the can; no mould growth even after 11 months.
Tin can without nitrogen	8	No increase in moisture content; some off flavour developed after two months.
Mylar (polyester; 100 gauge; heat sealable)	6	Material softened; had musty flavour; yellowish in colour and considerable increase in moisture content after two months.
Polythene (300 gauge)	12	Off flavour developed within one month; increase in moisture content and leakage observed. Change in colour was noted.
Cellophane-Polythene Laminate	6	The product was very tender; yellowish in colour; had musty flavour and high moisture content after two months.
Mylar/aluminium foil/polythene	12	The pouches and the meat remained in excellent condition well up to 12 months of observation. No mould growth and leakage was observed.
Paper/aluminium foil/polythene	12	The meat remained excellent up to 11 months. No leakage was observed and no mould growth seen.

DISCUSSION

From Tables 2 and 3 it is evident that the flexible packs like polythene, polythene cellophane and polyester (mylar) alone did not provide satisfactory barrier against moisture and flavour loss. On the other hand tin can (flushed with nitrogen, and laminates of aluminium such as mylar/foil/polythene and paper/foil/polythene were found to be quite successful packaging material for freeze dried meat. However meat packed in the tin can containing air had developed off flavour though there was no increase in moisture content. The laminate paper/foil/polythene was developed indigenously and was found satisfactory for packaging freeze dried meat. Mylar alone did not keep meat in good condition even upto 6 months and is, therefore, not considered a suitable packaging material but in combination with aluminium foil it nearly satisfies all the conditions of a good barrier,

TABLE 3

RESULTS OF STORAGE OF FREEZE DRIED MEAT IN DIFFERENT KINDS OF PACKS STORED AT 53°—55°C AND 60—70% R.H.

Packaging material used	No. of packs	Observations
Tin can flushed with nitrogen	6	Meaty flavour, no mould growth up to 3 months.
Tin can without nitrogen	6	Slight change in colour and smell after one month, off flavour developed.
Mylar (polyester)	3	Slight off flavour developed; the product was tender and had high moisture content after 1 month.
Polythene (300 guage)	6	Off flavour developed within a month. Ther product was tender and yellowish in colour.
Polythene-cellophane laminate	6	Meat was soft, yellow, having off flavour after 1 month and also considerable increase in moisture content.
Paper/aluminium foil/polythene	4	Meaty colour, meat was in good condition upto 3 months. No leakage was observed.
Mylar/aluminium foil/polythene	6	The meat remained in excellant condition in all respect and no leakage was observed in any of the pouches upto 3 months.

TABLE 4

RESULTS OF ANALYSIS OF FREEZE DRIED MEAT STORED FOR DIFFERENT PERIODS IN VARIOUS PACKAGING-MATERIALS.

Packaging used	Condition of storage	Period of storage (months)	Organoleptic evaluation	Moisture content %	Peroxide No. of fat (in-milliequivalent
Tin can flushed with nitrogen	55°C, 60—70% R.H.	3	Good	1.8	2.4
Tin can packed without nitrogen	Do.	Do.	Bad	1.9	3.8
Mylar/foil/polythene	Do.	Do.	Good	1.8	3.2
Tin can flushed with nitrogen	37°C, 60—75% R.H.	11	Almost like fresh	1.7	2.8
Tin can without nitrogen	Do.	3	Off flavour	2.7	3.7
Mylar/foil/polythene	Do.	11	Good	1.7	3.0
Paper/foil/polythene	Do.	Do.	Good	1.81	3.4
Myiar (polyester)	Do.	6	Off flavour	8.0	8.0
Polythene	Do.	3	Bad	8.6	9.0
Polythene/cellophane	Do.	Do.	Bad	4.2	7.6

The results of analysis of meat packed in various packaging materials for different periods are given in Table 4 and indicate that the freeze dried meat can be successfully packed in tin can (in presence of nitrogen), paper/foil/polythene, and mylar/foil/polythene up to one year at 37°C and 60—75% R.H. without any deterioration in its taste flavour, appearance and texture. The samples packed in polythene bags and pouches of polythene cellophane ocombination were spoiled within three months.

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