

SCIENTIFIC STUDY AND DEVELOPMENT OF MEAT BARIAN – A TRADITIONAL FOOD PRODUCT

Part II. Study of Various Formulations and Technologies

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Part II of this study deals with the multiple formulations of pulses used in the traditional methods. Dal Mash, Mung, Lantils and gram singly and in combination have been tested. The possibility of using a machine in the method of "barian" making has been tested. Three different drying methods, i.e. open-sun, solar and oven-drying have been used to see their effect on the product quality and the drying time. In effort has been made to incorporate beef in the traditional pulses-mix of "barian". Fresh and pre-treated beef, minced, fibre-like or chopped, were examined for their use in giving meaty look and taste to the traditional product.

Key words: Pulses, Barian; Meat.

INTRODUCTION

"Barian" is a popular traditional food product common to the Indian subcontinent. It is prepared by wet or dry mixing of ground pulses and condiments, with or without meat. No scientific data are as yet available on this product, except for an overview which forms Part I of the present study (Ahmed *et al.*, unpublished data). Since this product is mostly produced in households or on cottage scale in rural areas, no standard recipes, methods of preparation and standards of hygiene during preparation are followed. These products therefore have no uniform quality and are of limited shelf-life. The product has a sizeable potential for local, urban and rural consumption, as well as for export. This necessitates the hygienic production of uniform standard quality product on a regular basis. Scientific study of standardisation of the various parameters in the production is therefore essential. As a part of the standardisation, initially, work was undertaken to study the effect of various combinations of dals with and without meat and method of casting and drying on the organoleptic quality of "barian". The present paper deals with the findings of these studies. It is also known that 70-80 % of the traditional products are made and used/consumed in rural areas. The information so obtained will be used to improve and extend the traditional technology of the product for the benefit of our rural population mainly. Improved formulation and hygienic production accompanied by the use of modern packaging of any traditional food products would also ensure its greater share in the urban food markets.

MATERIALS AND METHODS

"Dal" preparation. The "dals" (lentils) freshly purchased from the local market were sieved and washed before soaking. After 2 hr of soaking at room temperature (upto 25^o), these were dehulled (where required) under running tap water by hand rubbing. The soaking time of 2 hr was selected on the basis of water absorption curves made for each "dal" as shown in Fig. 1. The dehulled wet "dals" were spread again at room temperature for 1 hr to effect some reduction in the moisture content which leads to the desired dough consistency.

Meat (Beef) preparation. Freshly purchased or frozen stored buffalo meat (Beeflo) in the required quantity was trimmed and chopped into 3 to 4 cm cubes. Curing mixture comprised 300 ppm and 200 ppm. of potassium nitrate and sodium nitrite respectively were dissolved in about 100-125 ml of tap water for every kg. of beef chops. These chops were then dipped in the curing solution for 2 hr. at room temperature. The time of curing was chosen after performing a series of experiments under different time schedules.

The chops were then cooked to the extent that almost all the water, both added and that exuding from the meat, dried up. Normally the boiling and cooking took 20 to 30 min. The cured and cooked meat were then spread on false bottom trays until cooled to room temperature.

The cured and cooked beef chops were then passed through a meat mincing machine with sieve holes size of about 2 mm dia. The minced meat so obtained is mentioned as "minced meat" in the tables of results. The fibre type

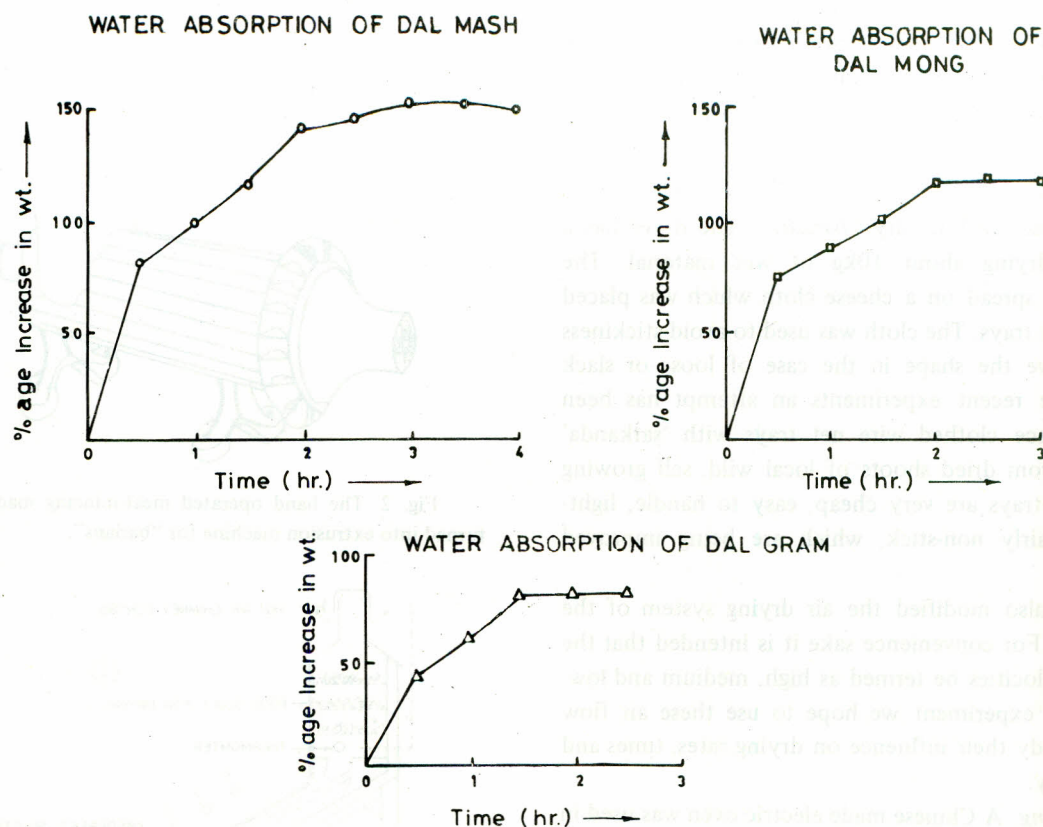


Fig. 1 Water absorption of various pulses (dals).

was made from the cured beef chops by tearing them apart manually into as small fibres as possible. These fibres were about 1-2 mm in diameter and about 1-2 cm. long. The "chopped meat" mentioned in the tables was prepared by putting the minced meat into a Moulinex chopper type 320, and blending it for 15 sec, in three jerks of about 5 sec. each.

Grinding and mixing. The wet "dal" and cured cooked meat chops were fed into the mincer having a plate of pore size 4 mm and the following condiments were added:

For 1 kg 'Dal'

Salt	86 g
Red chillies	12 "
White cumin	20 "
Coriander (crushed)	34 "
Black pepper	14 "

A more thorough mixing was effected by manual kneading. Introduction of a suitable machine to improve this step is anticipated. The mixed uniform dough was either allowed to ferment to a limited extent by holding in

a refrigerator for over-night or was used as such for casting of "barian."

Casting. Two kinds of casting were tried to shape the "barian."

(a) **Machine casting:** A hand operated mincing machine (local size No. 21) was adopted for use with two different extrusion heads through a manual operation. Through one extrusion head 6 corner star shaped sticks of about 3.0 cm. outer diameter. The bars were cut to suitable sizes or smaller pieces to look like traditional "barian" product. The second extrusion head was so shaped that it yielded the same six corner star shaped bars which were hollow from within, due to a central hole. The hole was about 8 mm in diameters were drawn. The machine is shown in Fig. 2.

(b) **Manual casting.** In this case "barians" were made by careful hand casting, to size them round or oval shape approximately and near uniform weight approximately 10 g each. The hand casting can vary from person to person in shape and size. For this reason wide varieties of manual cast

"barians" were made for comparison with the ones available in the commercial market.

Drying was effected by mechanical means, oven and solar drying.

Mechanical. Cabinet dryer of M/s Mitchell Dryers, Manchester, was used to dry "barians". The dryer has a capacity of drying about 10kg of wet material. The "barian" were spread on a cheese cloth which was placed on its wire net trays. The cloth was used to avoid stickiness and to preserve the shape in the case of loose or slack dough. In the recent experiments an attempt has been made to replace clothed wire net trays with 'sarkanda' trays (made from dried shoots of local wild, self growing plant). These trays are very cheap, easy to handle, light-weight and fairly non-stick, which are being improved further.

We have also modified the air drying system of the cabinet dryer. For convenience sake it is intended that the free airflow velocities be termed as high, medium and low. In our future experiment we hope to use these air flow speeds and study their influence on drying rates, times and product quality.

Oven drying. A Chinese made electric oven was used in these experiments. "Barians" were kept in this oven on the same sarkanda trays as used in the mechanical drying. The oven had a temperature variation of about $\pm 1^{\circ}$ but vigilance was maintained to minimise this variation. Air circulation was very small in this oven compared with the cabinet dryer. The oven was from SHUANG WUJIN.

Solar drying. For this purpose open air drying in the sun and in the solar dryer were studied. In the former case the "barians" were spread on wire net trays with muslin cloth underneath and put on an iron table covered with loose bricks. Two types of solar dryers were used. One was a simple solar dryer as derived from its very general and simple design. The other, a modern solar dryer, built on a French model/design as shown in Fig. 3.

The simple solar dryer consists of an iron table with loose bricks on it, covered from all sides with window glass of 5 mm thickness, to the height of 9". On one side it is attached to a solar collector, painted all black insulated and covered with glass from all sides with an air inlet at the lower side of the slope (Fig. 4). A fine wire net at the inlet seals off flies, insects, rodents, and possible large dust contaminants.

Consumer acceptability. Products from every batch of development studies were evaluated for consumer acceptability. Laboratory staff were given samples to take home and prepare dishes ("salan"/curry) as they would prepare by using market products. Their evaluation of taste,

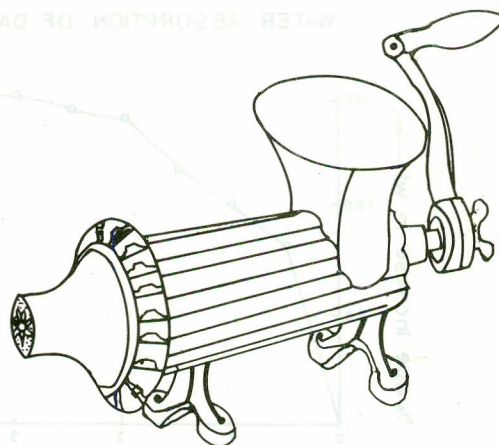


Fig. 2. The hand operated meat-mincing machine which was turned into extrusion machine for "barians".

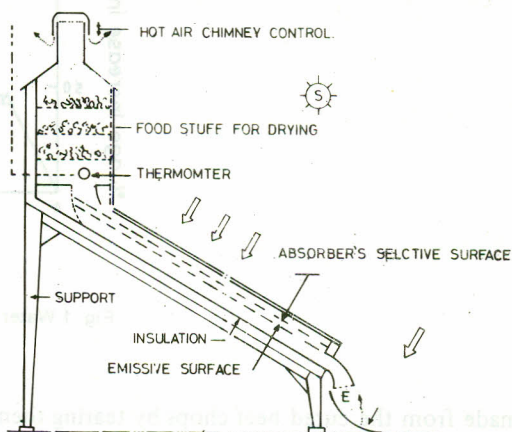


Fig. 3. Drawing of the modern solar dryer (French Model).

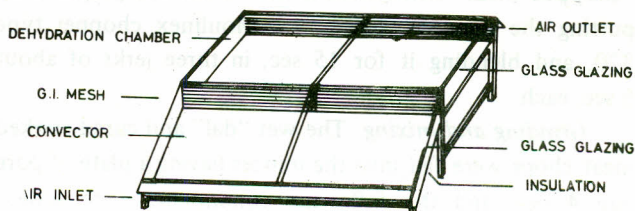


Fig. 4. Simple solar dryer.

texture, flavour, cooking and drying characteristics on a village stove was noted down.

RESULTS AND DISCUSSION

Beef-pulses products ("barians") were prepared using various concentrations of beef and pulses as shown in Tables 1-3. Different percentages of beef have been used with various combinations of pulses and dried under 3 different systems. This was done in order to test about

multiple combinations of grinding, forms of beef used (fabricated, chopped, minced), machine extruded or manually cast and drying methods on the final products. The results are summed up in the end column of Tables 1-3.

The effects of additions of *garam masala* and *soda bicarbonate* have also been tested. *Garam masala* is a mixture of black pepper, cloves, cinamon, cardamoms and cumin seeds in an unfixed proportion, varying with regions or ethnic groups, commonly used in the curries, roasts etc. The drying of "barians" was carried out in three different ways: (1) cabinet dryer, (2) laboratory oven, and (3) solar drying.

Grinding of pulses was effected in two different ways so as to evaluate their influence on the end product:

(1) Dry grinding of pulses to powder stage and then wet-mixing.

(2) Wet grinding, after soaking of pulses, to the hard paste state.

The net conclusion of these experimentation has been very interesting and explicit. The wet grinding was significantly superior over dry grinding of the pulses. The products of dry pulse powder was dark in colour hard and not of acceptable shape. On the other hand those "barians" prepared from wet grinding of pulses appeared

light in colour and weight, smooth on the surface, crisp and porous from inside. Probable explanation for this phenomenon may be greater incorporation of air in the wet grinding method.

The comparison of machine extruded product with the manual cast also depicted a clear superiority in favour of the latter. Perhaps due to the application of high pressure in the extrusion process the particles of different ingredients are pushed too close to yield the tough and hard structure in "barians".

The use of *dal gram* and lentils ("dal masoor") reduced the drying time and added a crispy feeling to the end product. It was a highly desirable characteristic. It may however be noted that lentils are the most expensive of all dals. The use of "dal moong" gave a shiny surface which may or may not be cherished.

In most of our studies the temperature of drying was kept at 65° or around so that crust formation/case hardening may not occur. Higher temperatures upto 100° have however, been tested but the best results were obtained between 60-65°. It was generally observed that drying took around 16-18 hr. and when more of dal mash was used in the blend drying time was found to increase. The use of dal moong and lentils reduced the drying time. In the case of solar drying to an equivalent drying state, a period of more than one day was needed in summer and about 3-4

Table 1. Composite table of beef-pulses product ("Barian") cabinet dryer

Sl. No.	Pulses		Grinding of pulses wet/dry	Beef		Forming/casting of product	Drying temperature (°C)	Drying time (hr.)	Purpose of experiment
	Variety	Percentage		Form	Percentage				
1.	Mash	100	Dry	—	—	Machine	65	10	To check and reduce the drying time.
2.	Mash	84	Dry	Minced	16	"	65	—	To examine the use of cured beef in "barian".
3.	Mash	84	Dry	Minced	16	Manual	65	—	To examine the effect of attachment of beef mince and fibre-type on the surface of "barians" with gelatin and egg albumin.
4.	Mash	63	Dry	Fiber type	16	"	65	—	Two different dryers i.e. solar and cabinet tested for drying.
5.	Mash	63	Wet	Fiber type	37	Manual	65	11	To find difference in the drying time of 2.5-5 cm long star shaped/machine made "barians".
6.	Mash	63	Dry	Minced	37	Machine	65	15	To see the darkening effect of the machine metal on the colour of machine and hand cast "barians."
7.	Mash	63	Dry	Minced	37	"	65	21	To observe the difference between the drying time in electric oven (of China) and cabinet dryer.
8.	Mash	63	Dry	Minced	37	Manual	65	21	
9.	Mash	63	Wet	Minced	37	"	65	19	

The percentages of beef and pulses expressed above are based on mixing in parts. For example. 37 % beef means 5 parts of fresh dal and 3 parts of fresh lean beef. Similarly 16 % beef means 5 parts of dals and one part of fresh lean beef.

Table 2. Composite table of beef – pulses product “barian” oven (electric)

Sl. No.	Pulses Variety	Pulses Percentage	Grinding of pulses wet/dry	Beef From	Beef Percentage	Forming/casting of product	Drying temperature (°C)	Drying time (hr.)	Purpose of experiment
1	2	3	4	5	6	7	8	9	10
1.	Mash	63	Wet	Fibre type	37	Manual	70	long time	To study the effect of wet and dry grinding of dal on product quality.
2.	"	63	Dry and Wet	Minced	37	"	65	15	
3.	"	100	Dry	—	—	Machine	65	—	To test a new shape of machine made “barian” which were porous from the centre.
4.	"	63	Wet	Minced	37	"	65	16	To compare the difference between the hand and machine made products.
5.	"	63	"	"	37	Manual	65	16	
6.	"	63	Dry	"	37	Machine	65	12	Various combinations of dals, mash, lentils and Gram were compared.
7.	Mash + lentils	44 + 19	"	"	37	"	65	12	
8.	Mash + gram (dal)	44 + 19	"	"	37	"	65	12	
9.	Mash	63	"	"	37	Manual	65	—	Addition of — % NaHCO ₃ to “barian” dough was probed.
10.	"	63	Wet	Chopped	37	"	65-78	19	Effect of the addition (S. No. 10) and absence (S. No. 11) of appropriate amount of garam masala was tested.
11.	"	63	"	Minced	37	"	65-78	19	
12.	"	63	"	Chopped	37	"	65-78	19	The use of chopped beef with dals was tested for making “barians”.
13.	"	63	"	(1) " (2) Minced	37	"	65	20	Comparison of the use of chopped and minced beef in the manually cast “barians”.
14.	Mash + lentils	44 + 19	Wet	Minced	37	Manual	65	20	To compare the dal combinations with the presence (S. NO. 14, 15) and absence (S. NO. 16) of appropriate amount of garam masala.
15.	Mash + gram (Dal)	44 + 19	"	"	37	"	65	20	
16.	Mash + lentils	31.5 + 31.5	"	"	37	"	65	19	
17.	Mash	63	"	"	37	"	65	18	To see the effect of addition of garlic (1.5 %) and ginger (1.5 %) on “barians”.
18.	Mash	100	"	—	—	"	65	24	
19.	Mash + lentils	50 + 50	"	—	—	"	65	24	
20.	Mash + gram (dal)	50 + 50	"	—	—	"	65	24	To test the various dal combinations without beef, using dal mash base.
21.	Mash + lentils+ Gram	33.3 + 33.3 + 33.3	"	—	—	"	65	24	
22.	Mash	63	"	Minced	37	"	65	20	
23.	Mash + lentils	31.5 + 31.5	"	"	37	"	65	20	To test the various dal combinations with beef using the dal mash base.
24.	Mash + gram	31.5 + 31.5	"	"	37	"	65	20	
25.	Mash + lentils + gram	21 + 21 + 21	"	"	37	"	65	20	

(continued.....)

(Table 2, continued)

1	2	3	4	5	6	7	8	9	10
26.	Moong	63	Wet	"	37	"	65	—	
27.	Moong + gram + lentils	31 + 16 + 16	"	"	37	"	65	—	
28.	Moong + gram + lentils	16 + 31 + 16	"	"	37	"	65	—	To test various dal combinations with beef using the <i>dal mung</i> base.
29.	Gram + lentils	31.5 + 31.5	"	"	37	"	65	—	
30.	Moong	100	"	—	—	"	65	18	
31.	Moong + gram + lentils	50 + 25 + 25	"	—	—	"	65	18	
32.	Moong + gram + lentils	25 + 50 + 25	"	—	—	"	65	18	To test various dal combinations without beef using <i>dal Mung</i> base.
33.	Gram + lentils	50 + 50	"	—	—	"	65	18	

1. The percentage of beef and pulses expressed above are based on mixing in parts e.g. 37 % beef means 5 parts of fresh dal and 3 parts of fresh lean beef. Similarly 16 % beef means 5 parts of dals and one part of fresh lean beef.
2. The drying time, when not given, means that the experiment was undertaken to ascertain some other property.

Table 3. Composite table of beef-pulses product ("Barian") solar and sun drying.

S1. No.	Pulses Variety	Pulses Percentage	Grinding of pulses wet/dry	Beef Form	Beef Percentage	Forming/casting of product	Drying temperature (°C)	Drying time (hr.)	Purpose of experiment
1.	Mash	63	Wet	Fiber type	37	Manual	62-77	13	
2.	"	63	Wet	Minced	37	"	25-46	—	
3.	"	63	"	"	37	"	Sun-drying	—	
4.	"	63	"	"	37	"	15-46	—	All the experiments were made to test the open sun drying and drying in the solar dryer at different times of year to cover all weather conditions.
5.	"	100	"	—	—	"	15-46	—	
6.	"	63	"	"	37	"	13-23	—	
7.	"	100	"	—	—	"	Sun-drying (Winter)	—	
							13-23 (Winter)	—	
							Sun drying	—	

1. The percentages of beef and pulses expressed above are based on mixing in parts, e.g. 37 % beef means 5 parts of fresh dal and 3 parts of fresh lean beef. Similarly 16 % beef means 5 parts of dals and one part of fresh lean beef.
2. Open sun drying often spoiled the samples due to cloudy or rainy weathers. The product also contained a lot of dust.

days in winter season. The effect of other parameters discussed above was irrespective of the method of drying (solar or mechanical).

In certain studies the wet dough was allowed to stay for some time (3-5 hr) at room temperature so as to ferment to a limited extent. In other experiments the dough

was left overnight in the refrigerator. In such cases, the quality of "barians" was improved directly proportional to the holding time for the purpose of drying and cooking/rehydration. The experiments using gelatin, egg albumin as binder for minced meat on the surface did not prove to be of significant use.

