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# SCIENTIFIC STUDY AND DEVELOPMENT OF MEAT-BARIAN, A TRADITIONAL FOOD PRODUCT

## *Part -IV*. Comparison Chemical Constituents of Commercial and Laboratory Made Legume Product (Barian)

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Comparison of chemical analysis of the nutritionally important components in the laboratory made Mash/Mung dal barian containing 25% beef has been made with a variety and market samples collected from Lahore, Jhelum, Multan, Rawalpindi and Peshawar. Protein content did not differ in quantity although quality difference existed due to the use of animal protein in case of Laboratory samples. Other parameters like starch, fat, ash, calcium, iron have also been compared without any significant differences. Titre value and dehydration value were determined to evaluate quality of the scientifically prepared laboratory products. Extract water analysis after 1 and 4 hr. of soaking of Barian in the water has been determined to prove improved quality of the laboratory made products.

***Key words***: Pulse, Meat, Barian

### Introduction

Legumes are important and economical sources of proteins and calories as well as of certain vitamins and minerals, essential to human nutrition. Legume grains have world-wide distribution. The staple pulses of Pakistan are mash, mung, grams, peas, beans etc. A special problem with some food legumes is that they require long cooking times with high consumption of energy. It may, therefore, be desirable to prepare them in the form of various legume products to save energy and for ease of cooking.

'Barian' is a popular traditional food item common in the sub-continent. It is generally prepared by using dal mash and mung with spices and other food ingredients. Ahmad *et al.* [1-3] concluded that dal mash 'Barian' is the best due to the greater binding capacity and the regional traditional concept about the use of this dal in 'Barian'. There are quite a few varieties of this product which may vary due to region and taste.

According to Khan and Hussain [4], the consumption of pulses and proteins is 20.36 and 4.29 g respectively per capita per day in Pakistan. Legume seeds are good sources of protein and other nutrients and thus provide significant amount of calories to both the rural and the urban population [5]. Dal Barians are mostly eaten during moonsoon and winter seasons, due to the reduced availability of fresh clean vegetables at this time of the year. The severe winter conditions in the north leads to increased demand for high calorific, condensed and preserved food products like meat 'Barian'. A previous market survey by Naeem and Ahmad (1986), has revealed that some of the commercially prepared 'Barian' were of highly inferior quality and hygeine. So an overall serial study was undertaken to look into the feasibility of producing a more nutritious and hygienic traditional product than the one commercially available.

The present work consists of comparisons of chemical constituents, such as proteins, starch, fat, fibre and trace elements like Ca and Fe, between commercial and laboratory-made 'Barian' samples, the later also containing beef. Rehydration values of both types of 'Barian' samples were also determined, as an indicator of the cooking ease and quality of the product.

### Materials and Methods

*Sample collection*. Sixteen different samples of 'Barian' with or without meat were collected as under:

(a). Six samples purchased from diferent areas of Lahore; (b). Six samples purchased from other cities (Jhelum, Rawalpindi, Multan and Peshawar); (c). Four samples provided by International Development Research Centre (IDRC)- Canada-Meat Project, PCSIR Laboratories Complex, Lahore.

All these samples were stored in tightly closed plastic bottles to save them from environmental effects and infestation. Each sample was ground to fine powder and stored in a sample bottle.

Moisture, ash and fibre contents were estimated using standard methods [6]. Fat estimation was carried out by Sohxlet method using hexane as a solvent. The estimation of protein content in the flour of 'Barian' samples was carried out by a standard micro-kjeldahl technique using the nitrogen-to-protein conversion factor of 6.25.

Calcium in the flour of 'Barian' samples was estimated by a titration method [9]. Iron was measured colorimetrically

using dipyridyl and ferrous solutions at 520 nm by the method of Andrews and Fett [7].

Estimation of starch was made using a standard technique described by Kent Jones [8]. Titre value was determined by the water extraction method given by Pearson [9]. Rehydration values of 'Barian' and pH values of the water left after rehydration were also determined. Protein and sugar in extract water were determined using standard techniques.

## Results and Discussion

*Moisture content.* Moisture content of commercial 'Barian' ranged between 9.3 - 13.6%, excluding sample $OC_3$ and $OC_4$ and that of the laboratory 'Barian' as shown in Table 1. The higher moisture value of certain pieces of $OC_3$ and $OC_4$ samples may be due to their larger sizes which prolong the drying process with the possibility of incomplete drying in some pieces. It is most often the case with sun-drying than the others. Core-water removal is made difficult and retension of water is eased by the larger size of 'Barian' pieces. Laboratory samples had comparatively low moisture content, due to better drying as result of a smaller particle size and the prevention of rehydration by packaging the product in polythene bags promptly after preparation. The results were similar to that of Khan and Chughtai [10] who found the moisture content of stored lentil, mung, mash and gram as 12.2, 10.4, 10.9 and 10.8% respectively. 'Barian' is an admixture of one or more of these ground legumes with spices etc. and with or without meat.

*Promixate analysis.* Starch is quantitatively, the largest component of the legumes and legume products. However, in the laboratory made 'Barian' the starch content was found to be slightly reduced (Table 1) due to the incorporation of lean meat (25% beef). The results are comparable with those of Etchevers [11] who analyzed different legumes, grown in the province of Nuble. The percentage of starch in Urd varieties as reported by Kureel and Srivastava [12] was low compared to our results. For 'Urd Barian' Tandon and Singh [13] have, however, reported a slightly higher percentage of carbohydrates which was decreased when defated soyflour was added.

Pulses are rich sources of protein which supply building materials for the body. The pulse-based 'Barian' samples analysed in this investigation contained 19.25-27.35% protein (Table 1). These protein levels are close to those found for legumes by Vijagaraghavan and Srivinram [14], namely *Cicer arietinum* 20.8%, *Phaseolus radiatus* 26.81%, *Phaseolus mungo* 25.25% and *Lens esculanta* 26.57%. Similarly Khan and Chughtai [10] reported for lentil (24.0%) and Ahmad *et al.* [2] for commonly used pulses (dals) in the preparation of 'Barian'. The protein content of commercial and laboratory made samples did not appear to differ significantly although the laboratory preparations had 25% fresh beef added to them before drying which perhaps improved the quality.

The ash percentage of the commercial and laboratory samples of 'Barian' ranged from 3.25-10.80% and 6.35-10.70% respectively (Table 1). The data varied widely but laboratory 'Barian' gave higher ash values (Table 1). Tandon and Singh [13] have, however, reported an ash percentage of 3.61% in 100% 'Urd Barian', increasing to 4.14% in 70% Urd and 30% defatted soyflour 'Barian'. The high ash value for some samples may be due to the use of more salt in prepration and sometimes due to the use of baking powder i.e. ($NaHCO_3$) for raising of dal dough.

Percentage of fat in commercial 'Barian' samples ranged between 1.14-2.50% and that of laboratory samples, between 1.98-2.48% (Table 1). The fat percentages of dal mash, mung and lentil alone as tabulated by Ahmad *et al.* [1] are nearly the same range. This indicates almost no fat contribution from the meat used which was obviously very lean. The fibre content of the laboratory 'Barian' samples ranged between 1.55-2.73%. Higher values of fibre content may be due to the use of corriander and cummin seeds and red chillies etc. The work of Zahida and Chughtai [15] on decorticated and whole cooked

TABLE 1. PROXIMATE ANALYSIS OF 'BARIAN' SAMPLES.

| Chemical constituents (%) | $LC_1$ | $LC_2$ | $LC_3$ | $LC_4$ | $LC_5$ | $LC_6$ | $OC_1$ | $OC_2$ | $OC_3$ | $OC_4$ | $OC_5$ | $OC_6$ | $LB_1$ | $LB_2$ | $LB_3$ | $LB_4$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Moisture | 11.7 | 11.8 | 9.4 | 10.3 | 11.7 | 10.6 | 11.2 | 9.3 | 5.5 | 4.6 | 9.0 | 8.1 | 7.6 | 9.2 | 9.0 | 9.0 |
| Starch | 55.8 | 52.7 | 60.6 | 61.5 | 60.6 | 56.6 | 58.5 | 56.0 | 55.7 | 59.7 | 58.8 | 58.2 | 55.7 | 58.4 | 54.9 | 51.6 |
| Protein | 20.7 | 24.2 | 20.9 | 21.0 | 20.2 | 22.2 | 22.5 | 23.8 | 25.2 | 23.2 | 23.2 | 23.1 | 23.7 | 22.1 | 23.1 | 25.3 |
| Ash | 7.75 | 7.8 | 5.46 | 4.95 | 4.35 | 6.5 | 3.25 | 6.85 | 8.8 | 8.43 | 4.7 | 6.5 | 7.65 | 6.3 | 9.32 | 9.53 |
| Fat | 2.38 | 1.9 | 2.09 | 1.98 | 1.58 | 1.36 | 1.5 | 1.63 | 2.35 | 2.38 | 2.5 | 2.1 | 2.48 | 2.2 | 1.98 | 2.01 |
| Calcium | 0.14 | 0.12 | 0.14 | 0.23 | 0.33 | 0.55 | 0.48 | 0.30 | 0.28 | 0.28 | 0.34 | 0.55 | 0.38 | 0.37 | 0.38 | 0.42 |
| Fibre | 2.32 | 1.54 | 1.96 | 1.14 | 1.33 | 2.27 | 2.51 | 2.30 | 2.19 | 2.43 | 1.53 | 1.08 | 2.73 | 1.55 | 1.69 | 2.20 |
| Iron mg/ 100 gm | 19.0 | 20.0 | 10.6 | 21.0 | 13.4 | 11.8 | 11.0 | 10.5 | 49.0 | 10.0 | 11.0 | 20.3 | 13.0 | 18.0 | 17.0 | 19.6 |

LC= Lahore City samples, OC= other cities samples, LB = Laboratory samples

samples of chickpea, lentil, *Phaseolus mungo* and *Phaseolus radiata* , gave similar results in respect of fibre content.

The ash of the samples was treated further for determination of calcium (Ca) and iron conetents. Calcium content of the laboratory samples was generally higher than that of the commercial samples, due to the use of beef in 'Barian'. The very high calcium content found in two of the commercial samples may be due to the addition of $CaCO_3$, that is sometimes used to whiten the product. An increase of calcium content during the drying of commercial 'Barian', due to heavy contamination by dirt and grit can not be ruled out. In the case of iron, it could be present due to the use of rusted iron pots during preparations. Sample $OC_3$ (Table 1) had an extremely high content of iron i.e. 49 mg/100 gm. This may be attributable to the incorporation of plums in this particular product, implanted in the centre of each piece of 'Barian'. Red coloured plums are known to be a good source of iron.

*Titre value.* The significance of titre-value is the presence of a certain level of acidity in the end-product which affects the organoleptic and keeping qualities of product. A part of the acidity or the titre value may accrue from the presence of uric acid accumulated as a result of end product of the infestation by different insects etc. However, generally the major part of acidity is a result of good and optimal fermentation in the wet dough.

The laboratory samples have comparatively low titre values due to the use of meat (Table 2) and the controlled fermentation in these 'Barian'. The fermentation time of dal dough for commercial 'Barian' is generally regulated by traditions and unscientific tests. During fermentation lactose and other carbohydrates oxidize to lactic acid and other acids, which increases the titre value of the samples. Sometime in commercial practice, citric acid is also added to the dough to improve the taste and to make it sour. The use of pomegranate seeds used in some commercial samples, may also cause an increase in the acidity/titre value.

*Rehydration value.* A product, which rehydrates properly, swells up to soften without breaking in a reasonable time and makes a good acceptable dish on cooking. Such an ideal rehydration was shown, by the laboratory samples and some commercial samples ($OC_1$, $OC_3$ and $LC_1$, Table 3). $OC_4$ and $OC_6$ did not rehydrate even after a soaking period of 4 hr. and remained stone hard. In such cases the coked product would be undesirable.

*Analysis of extract water (E.W.).* Rehydration water obtained after 1.0 and 4.0 hr. was analysed (Table 4) for the estimation of sugar and protein content which leached out of 'Barian' during rehydration. The protein content of liquid in general increased with increase in the time of rehydration. The protein content and rehydration values of the laboratory

TABLE 2. TITRE VALUE OF THE 'BARIAN' FLOUR.

| Lahore City | | | | | | |
|---|---|---|---|---|---|---|
| Sample | $LC_1$ | $LC_2$ | $LC_3$ | $LC_4$ | $LC_5$ | $LC_6$ |
| Titre value | 0.12 | 0.11 | 0.09 | 0.08 | 0.12 | 0.6 |
| **Other cities** | | | | | | |
| Sample | $OC_1$ | $OC_2$ | $LC_3$ | $OC_4$ | $OC_5$ | $OC_6$ |
| Titre value | 0.19 | 0.02 | 0.09 | 0.11 | 0.19 | 0.11 |
| **Laboratory sample** | | | | | | |
| Sample | $LB_1$ | $LB_2$ | $LB_3$ | $LB_4$ | | |
| Titre value | 0.05 | 0.06 | 0.07 | 0.104 | | |

(1). LB= Stands for Laboratory samples, (2). LC= Stands for Lahore city samples, (3). OC= Stands for samples of other cities.

TABLE 3. REHYDRATION VALUE OF THE 'BARIAN' SAMPLES.

| Sample code | 1.00 hr. | 1 1/2 hr. | 2.00 hr. | 2 1/2 hr. | 4.00 hr. |
|---|---|---|---|---|---|
| $LC_1$ | 1.50 | 1.50 | 1.52 | 1.53 | 1.67 |
| $LC_2$ | 1.20 | 1.20 | 1.24 | 1.43 | 1.77 |
| $LC_3$ | 1.70 | 1.76 | 1.88 | 1.92 | 1.97 |
| $LC_4$ | 1.80 | 1.25 | Broken down | – | – |
| $LC_5$ | 2.00 | 2.07 | 2.08 | 2.10 | 2.12 |
| $LC_6$ | 1.20 | 1.20 | 1.42 | 1.51 | 1.99 |
| $OC_1$ | 1.90 | 1.90 | 2.01 | 2.02 | 2.02 |
| $OC_2$ | 2.20 | Broken down | – | – | – |
| $OC_3$ | 2.0 | 2.01 | 2.04 | 2.10 | 2.14 |
| $OC_4$ | 1.60 | 1.67 | 2.73 | Broken down | – |
| $OC_5$ | 1.50 | 1.90 | 1.90 | 1.26 | 1.47 |
| $OC_6$ | 1.30 | 1.31 | 1.36 | Broken down | – |
| $LB_1$ | 2.50 | 2.50 | 2.54 | 2.55 | Broken down |
| $LB_2$ | 2.20 | Broken down | – | – | – |
| $LB_3$ | 1.80 | 2.07 | 2.24 | 2.26 | 2.26 |
| $LB_4$ | 2.10 | 2.14 | 2.40 | 2.41 | 2.41 |

(1). LB : Stands for laboratory samples; (2). LC : Stands for Lahore city samples; (3). OC : Stands for samples of other cities.
* An ideal rehydration value is indicated by increased hydration with time without damaging the shape of the product.

TABLE 4. ANALYSIS OF REHYDRATION-WATER OBTAINED AFTER SOAKING OF 'BARIAN'.

| Sample | Protein% | | Sugar% | | pH value | |
|---|---|---|---|---|---|---|
| code | 1.0 hr | 4.0 hr | 1.0 hr | 4.0 hr | 1.0 hr | 4.0 hr |
| $LC_1$ | 2.22 | 2.65 | 1.08 | 1.19 | 5.83 | 5.92 |
| $LC_2$ | 1.06 | 1.93 | 0.94 | 1.04 | 5.21 | 4.82 |
| $LC_3$ | 2.78 | 2.95 | 2.18 | 2.78 | 4.58 | 4.55 |
| $LC_4$ | 2.53 | 2.93 | 2.05 | 2.81 | 4.64 | 5.77 |
| $LC_5$ | 2.26 | 2.33 | 2.22 | 2.28 | 4.23 | 4.22 |
| $LC_6$ | 1.10 | 1.69 | 1.47 | 1.57 | 4.86 | 5.08 |
| $OC_1$ | 2.26 | 3.07 | 1.57 | 1.86 | 4.28 | 4.33 |
| $OC_2$ | 2.87 | 3.74 | 3.13 | 4.96 | 5.91 | 5.89 |
| $OC_3$ | 1.56 | 1.96 | 0.77 | 0.96 | 5.78 | 5.71 |
| $OC_4$ | 0.87 | 1.53 | 1.47 | 2.13 | 5.70 | 5.62 |
| $OC_5$ | 2.13 | 3.69 | 1.91 | 3.22 | 4.32 | 4.34 |
| $OC_6$ | 1.73 | 1.91 | 0.53 | 0.89 | 4.79 | 4.86 |
| $LB_1$ | 3.42 | 3.52 | 1.24 | 2.46 | 6.20 | 5.88 |
| $LB_2$ | 3.86 | 3.46 | 2.40 | 1.16 | 5.98 | 5.73 |
| $LB_3$ | 3.66 | 2.38 | 1.61 | 2.02 | 6.27 | 5.77 |
| $LB_4$ | 2.10 | 1.44 | 1.17 | 1.70 | 5.94 | 5.72 |

(1). LB : Stands for laboratory samples; (2). LC : Stands for Lahore city samples; (3). OC : Stands for samples of other cities.

samples were comparatively higher than others, reflecting their requisite soft nature. Similar patterns were obtained for sugar in E.W. perhaps due to the same reason. In laboratory samples controlled fermentation was allowed which results in near neutral pH-value of the rehydrated water. Such controlled fermentation is not practicable and is not practiced in case of commercial production. We are also not aware of the background and quite a few other traditional manipulation exercised in the preparation of market samples.

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