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PHENOLICS AND PHYSICOCHEMICAL CHARACTERISTICS OF STORED PERSIMMON FRUIT

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ABSTRACT

Fresh, mature but unripe garden picked persimmon fruit was washed, sorted and stored at ambient conditions for 6 weeks. Some of phenolics determined (catechin, sinapine, total phenols, anthocynidine and procyanidine) increased while others decreased as a result of ambient storage. The weight loss increased from 5.2 (one week) to 18.2 per cent (6 weeks) and the firmness decreased from 44.6 to 33.5 newtons during the storage period under ambient conditions. The total loss of ascorbic acid in fruits recorded was 63 per cent after 6 weeks storage at ambient conditions (18-30°C). The sensoric evaluation for flavour, appearance and overall acceptability revealed the persimmon samples were acceptable after 6 weeks storage.

Key words: persimmon fruit; storage; phenolic compounds; sensory evaluation; Pakistan

INTRODUCTION

The persimmon fruit (*Diospyros kaki*) was introduced in the North West Frontier Province of Pakistan in 1940. The agroclimatic conditions of this province are very conducive for the profitable cultivation of this fruit. The Fruit and Vegetable Development Board of NWFP has introduced some new and non-astringent cultivars from Japan. The total area and production of persimmon is increasing in this province. The major production areas include: Peshawar, Mardan, Malakand and Swat valleys. This is not only a nutritious but also a tasty fruit and contains fair amount of ascorbic acid and sugars. The sugars are in the form of glucose and fructose. Besides these, it also contains a few pigments. The main problems in this fruit are its short post-harvest life and presence of astringent taste due to water soluble phenolics specially tannins. The present study was undertaken to see the effect of ambient storage conditions on the quality and phenolics of this fruit.

MATERIALS AND METHODS

The fresh, mature but unripe fruit was harvested from a garden near Nuclear Institute for Food and Agriculture (NIFA), Tarnab, Peshawar and was brought to the laboratory very carefully. The fruit was sorted, washed and dried under the fan to remove surface moisture. The fruit was kept at ambient conditions (18-30°C) without packaging. The phenolics (catechin, sinapine, total phenols, procyanidine and anthocyanidine) were extracted in methanol or water and estimated according to the methods reported earlier (Bibi, *et al.*, 1992). Weight loss, firmness, ascorbic acid and sensoric rating was done as reported by Chaudhry *et al.* (1991).

RESULTS AND DISCUSSION

Polyphenols

Table 1 shows changes in the polyphenols of persimmon during 6 weeks storage. All the phenolics decreased during storage except procyanidine which increased under the same storage conditions. The methanol and water extractable sinapine decreased from 0.21-0.06 per cent and 0.26-0.14 per cent during the entire storage period, respectively. The samples contained more methanol extractable catechin (0.85%) than water extractable ones (0.30%) and these values decreased to 0.45 and 0.07 per cent, respectively at the end of 6 weeks storage period. Both fractions (water and methanol soluble) of leucoanthocyanidine (considered responsible for the astringency) decreased and the values ranged between 4.38-11.10 and 2.60-10.1 Δ A500/g, respectively.

The values for water extractable procyanidine increased from 3.25-4.79 Δ A500/g and methanol extractable procyanidine decreased up to 2 weeks and increased at the end of 6 weeks storage interval after showing an inconsistent trend in 3-5 weeks. Phenolic compounds are very important for the quality of fresh and processed fruits. The changes in phenolics during ripening, processing and storage of persimmon and some other fruits have been widely reported (Goldstein & Swain, 1963; Pesis *et al.*, 1986). It was found that leucoanthocyanidine identified as leucodelphinidin-3-glucoside was the main component of tannins although several

Table 1. Changes in polyphenols of persimmon during storage

Polyphenols		Storage (Weeks)							Mean	Coefficient of variance
		0	1	2	3	4	5	6		
Sinapine	M*	0.24	0.21	0.19	0.16	0.16	0.13	0.06	0.15	35.64
	W*	0.28	0.26	0.27	0.28	0.26	0.20	0.14	0.24	21.71
	Mean	0.26	0.24	0.23	0.22	0.21	0.17	0.10		
	CV	10.87	15.04	24.59	38.56	33.67	29.99	56.56		
Catechin	M	0.96	0.85	2.30	0.46	-	0.55	0.45	0.92	75.86
	W	0.37	0.30	0.46	0.41	0.38	0.12	0.07	0.30	49.63
	Mean	0.66	0.58	1.38	0.43	0.38	0.34	0.26		
	CV	62.73	67.63	94.28	8.12	-	90.76	103.34		
Leucoantho-cyanidine	M	11.50	11.10	9.98	11.60	10.21	16.38	4.38	10.73	32.83
	W	10.10	9.24	3.16	2.60	6.08	-	7.32	6.41	48.10
	Mean	10.80	10.17	6.57	7.10	8.15	16.38	5.85		
	CV	9.16	12.93	73.40	89.63	35.85	-	35.53		
Procyanidine	M	3.25	-	2.60	-	7.32	4.79	-	4.49	46.73
	W	10.60	9.80	8.83	11.96	8.24	9.20	15.40	10.57	23.22
	Mean	6.92	9.80	5.72	11.96	7.78	6.99	15.40		
	CV	75.05	-	77.08	-	8.36	44.57	-		

M = Methanol extractable; W = Water extractable.

Table 2. Changes in physicochemical and sensory characteristics of persimmon during storage

Parameters	Storage (Weeks)							Mean
	0	1	2	3	4	5	6	
Weight loss (%)	-	5.2	9.2	11.5	14.3	17.1	18.2	12.58
Firmness (Newton)	44.6	38.8	37.2	36.3	34.3	30.9	23.7	33.50
Ascorbic acid (mg/100 g)	60.3	51.8	47.3	38.9	36.0	30.3	22.3	40.90

Sensory scores after 6 weeks of storage		
Appearance	Flavour	Overall acceptability
4.5	7.6	5.2

Room conditions = 18.5-30°C; Average of duplicate samples; Scoring scale = 1-9; 1 = Disliked extremely; 9 = Liked extremely.

other compounds were also found to constitute phenolics (Kawada, 1982). Loss of astringency is one of the major changes which take place during ripening of many edible fruits. It has been reported by Glodstein and Swain (1963) that some astringent fruits show reduction in tannins while others do not. The results of the present study indicate the occurrence of biochemical changes similar to the pattern reported during post-harvest storage of persimmon (Goldstein & Swain, 1963; Joslyn & Goldstein, 1964).

Physicochemical characteristics

The changes in weight loss during storage of persimmon are shown in Table 2. The weight loss increased from 5.2-18.2 per cent after 6 weeks of storage. The loss in weight of fruits is mainly due to losses of moisture through respiration/transpiration which was reflected through changes in firmness of the samples. The firmness of the fruit samples decreased from 44.6-33.5 Newtons during storage showing about 22.4 per cent loss in firmness. Persimmon fruit is a rich source of

ascorbic acid and it was found that ascorbic acid also decreased during entire storage period resulting in an overall loss of 63.0 per cent in samples (Table 2). The changes in the above constituents of persimmon fruit during storage are in agreement with those reported by other workers (Ahmad *et al.*, 1980; Farooqi *et al.*, 1983; Chaudhry *et al.*, 1991).

The sensoric evaluation of the fruit was done at the end of 6 weeks storage at ambient conditions and the flavour, appearance and overall acceptability scores were: 7.6, 4.5 and 5.2, respectively indicating that the samples were acceptable even after 6 weeks at ambient storage.

As a result of these studies, it was concluded that phenolic compounds and ascorbic acid and weight loss are markedly affected during storage of persimmon and these changes directly influenced the quality of the fruit.

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IMPACT OF GUARGUM ON THE QUALITY OF WHEAT BREAD

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ABSTRACT

Guargum was added at levels of 0.5, 0.75, 1.00 and 1.25 per cent in wheat flour of variety LU-26S for the preparation of bread. Water absorption, dough stability and resistance of dough increased with the addition of guargum. A decrease in peak viscosity was observed with the increase in the level of guargum in the flour. The volume, weight and weight to volume ratio of bread loaves were found to be higher in bread prepared from guargum added flour. Sensory evaluation of bread prepared from flour containing 1.25 per cent guargum scored significantly higher for quality characteristics when stored for 36 hours than control (without guargum).

Key words: wheat; guargum; bread; sensory evaluation; peak viscosity; rheology

INTRODUCTION

Hydrocolloids (gums) have been widely used in foods to modify texture, improve moisture retention, water mobility and maintain overall product quality during storage (Glicksman, 1974). They also raise viscosity and possess surface tension phenomena (Jones, 1971). Among them, guargum has been found useful in bakery products (Smith, 1984), frozen confections (Anonymous, 1971), jelled fish products (Schneider, 1971), mayonnaise (Gogusevic-Djakovic & Janicek-Petrovic, 1973), and ice cream (Siddique *et al.*, 1988).

In Pakistan, pan bread is being prepared at small scale by petty bakers and at large scale by various plants in most big cities. Unfortunately, the product being marketed by some of these plants lacks the desirable characteristics particularly shelf life. The present study was undertaken to explore the possibility of using guargum as a stabilizer to increase the shelf life of pan bread.

MATERIALS AND METHODS

Wheat variety LU-26S was procured from the Department of Plant Breeding and Genetics, University of Agriculture, Faisalabad and guargum was purchased from the local market. Proximate composition of grains and flours was carried out according to the methods described in AACC (1983). Wheat was cleaned manually, tempered at 14 per cent moisture in batches of 3 Kg by placing in air-tight bottles and adding calculated amount of water and allowing to rest for 48 hours for efficient separation of bran from endosperm. The wheat was milled in Quadrumat Senior Experimental Mill to collect high grade and low grade flours, shorts and bran. Straight grade flour of 70 per cent extraction rate was prepared by adding low grade flour into high grade flour. Guargum was added to the bread flour at the following levels:

Treatment	Wheat flour (%)	Guargum (%)
T1	100.00	-
T2	99.50	0.50
T3	99.25	0.75
T4	99.00	1.00
T5	98.75	1.25

Rheological studies (farinographic and amylographic) were carried according to the methods given in AACC (1983). Index of strength of flour was tested by performing baking test (AACC 1983). Dough was prepared by straight dough method. Samples of bread were characterized for their volume, weight and weight to volume ratio. Loaf volume was determined by the rape seed displacement method. Sensory analysis was performed at 3, 12, 24 and 36 hours. by a penal of 5 judges for external and internal characteristics of bread (Rehman *et al.*, 1988). Data were analyzed statistically by using 2-factors Factorial in Randomized Complete Design. The means were compared for their significance by Duncan's Multiple Range Test (Steel & Torrie, 1980).

RESULTS AND DISCUSSION

Chemical composition

The results of chemical composition of LU-26S revealed that it contained moisture 8.30 per cent, crude protein 12.75 per cent, crude fibre 3.19 per cent, crude fat 2.37 per cent and ash 1.96 per cent (Table 1). The proximate composition of this variety is in close agreement with the composition of Faisalabad 85 and Punjab 85 varieties (Ahmad, 1990).

Table 1. Proximate composition of wheat and flour

Composition	Wheat	Flour
Moisture (%)	8.30	12.47
Crude Protein (db) (%)	12.75	11.53
Crude Fibre (db) (%)	3.19	0.99
Crude fat (db) (%)	2.37	1.12
Total ash (db) (%)	1.96	0.77
Nitrogen free extract(db) (%)	79.73	85.59

Table 2. Milling performance of wheat

Components	(%)
High grade flour	30.15
Low grade flour	39.63
Total flour	69.78
Shorts	4.43
Bran	25.15
Milling loss	0.74

The data on milling fractions i.e. high grade flour (fine), low grade flour (coarse), shorts, bran are given in Table 2. The results revealed that higher quantity of low grade flour was obtained than high grade flour. The results on total flour yield were similar to the findings reported by Mahmood (1985).

The proximate composition of 70 per cent extract rate (Table 1) revealed that it contained moisture 12.47 per cent, crude protein 11.53 per cent, crude fibre 0.99 per cent, crude fat 1.12 per cent, ash 0.77 and nitrogen free extract 65.59 per cent. The results of this study correlate with the findings of Ali (1980) and Siddique (1989).

Technological studies

The results of studies conducted on the effect of guargum as a stabilizer with special reference to changes in rheology are presented in Table 3. It is obvious from the data that water absorption capacity in control was lower than guargum added flours. Gradual rise in water absorption was observed in flour as the level of guargum increased. The increase in water absorption capacity of various levels ranged from 58.7 per cent to 64.8 per cent. Highest increase in water absorption was recorded at 1.25 per cent guargum level (T5). It was due to the improvement in moisture retention and water mobility characteristics of the gum (Glicksman, 1974). These findings correlated to the results noted by Shenizu and Araki (1969). The authors observed that the results of farinograph absorption, extensograph structural relaxation and rheological data showed remarkable increase in the water binding capacity of dough with sodium alginate as a polyelectrolyte. It was also correlated to the findings of Rao *et al.* (1985) in which water absorption of the flour was reported to increase with higher levels of guargum.

The dough development time was found to be highest in T5 (1.25% guargum) and was recorded lowest in T1-T3 (0.0-0.75% guargum). The resistance of the dough was observed the highest in T2 (0.5%) and T3 (0.75%). It was lowest in the control (T1). The softening of the dough was lowest in T2 and was found

Table 3. Effect of supplementation of guargum on the rheological characteristics of flour

Treatment	Water absorption (%)	Dough development (min)	Dough stability (min)	Resistance of dough (min)	Softening of dough (BU)	PV (BU)
T1	58.70	2.00	14.00	15.50	35	760
T2	59.20	2.00	18.50	20.00	75	650
T3	60.60	2.00	18.75	20.0	50	580
T4	62.40	3.50	16.75	18.00	35	575
T5	64.80	3.50	17.50	19.00	40	375

BU = Brabender unit; Min. = Minute; PV = Peak viscosity; T1 = 0% guargum; T2 = 0.5% guargum; T3 = 0.75% guargum; T4 = 1.00% guargum; T5 = 1.25% guargum.

highest in T3. The findings regarding dough stability are in close agreement with the results reported by Rao *et al.* (1985).

Table 4. Effect of guargum on the baking characteristics of bread

Treatment	Volume (mL)	Weight (g)	Weight to volume ratio
T1	455	140.60	1 : 3.23
T2	470	142.30	1 : 3.30
T3	480	143.00	1 : 3.35
T4	485	144.80	1 : 3.36
T5	495	146.20	1 : 3.38

are in close agreement with the findings reported by Christianson *et al.* (1981). They noted that when wheat starch was cooked in water, the cohesive forces within the swollen granule weaken to decrease the viscosity of the paste as the integrity of the granule was lost. The resultant drop in viscosity was most evident in the guar-starch paste which indicated the possible granule breakdown. The viscosity was reduced by 110 BU (T1) in comparison with 40-50 BU for the other gum starch pastes. The results are in close agreement with the findings of Christianson *et al.* (1981).

Baking characteristics

The breads were evaluated for their baking behaviour. The fermentation, proofing and baking

Table 5. Analysis of variance of effect of guargum on the sensory characteristics of bread

Characteristics	T1	T2	T3	T4	T5
Volume	7.30 d	8.00 c	8.32 b	8.42 b	8.64 a
Crust colour	5.98 d	6.25 c	6.45 b	6.48 b	6.90 a
Symmetry	3.15 d	3.34 c	3.40 c	3.92 b	4.17 a
Evenness of bake	2.05 c	2.25 b	2.25 b	2.27 b	2.45 a
Crust of bread	2.70 d	2.97 c	3.05 c	3.17 b	3.45 a
Grain of bread	11.77 d	12.10 c	12.18 c	12.38 b	12.68 a
Colour of crumb	7.50 d	7.83 c	7.92 c	8.05 b	8.32 a
Aroma	7.75 c	7.92 bc	7.95 bc	8.12 ab	8.28 a
Taste	16.45 d	16.87 c	17.00 c	17.22 b	17.52 a
Texture	12.00 d	12.34 c	12.54 b	12.60 b	13.00 a

Table 6. Effect of storage on the sensory characteristics of bread containing guargum

Characteristics	Storage period (hours)			
	3	12	24	36
Volume	8.60 a	8.51 a	8.17 b	7.68 c
Crust colour	6.70 a	6.60 a	6.41 b	5.93 c
Symmetry	3.81 a	3.71 a	3.57 b	3.28 c
Evenness of bake	2.35 a	2.31 a	2.27 a	2.10 b
Crust of bread	3.23 a	3.16 ab	3.10 b	2.83 c
Grain of bread	12.49 a	12.40 a	12.29 a	11.69 b
Colour of crumb	8.15 a	8.10 ab	7.88 b	7.57 c
Aroma	8.20 a	8.17 a	8.10 a	7.56 b
Taste	17.31 a	17.20 a	17.00 ab	16.52 b
Texture	12.88 a	12.75 a	12.45 b	11.91 c

Various levels of guargum added to wheat flour showed a variation in peak viscosity (Table 3) which decreased with increase in guargum level. These results

conditions were kept constant. In general, it was observed that rate of fermentation was rapid in doughs prepared with guargum added wheat flour as compared

to the wheat flour (control). Doughs were well proofed with uniform and smooth surface when higher doses of guargum were used. The data on volume, weight and weight to volume ratio of breads prepared from various levels of guargum is presented in Table 4. It is evident from this data that an increasing trend in volume, weight and weight to volume ratio was observed with higher level of guargum. Similar observations have been recorded by Rao *et al.* (1985). In this study, the water absorption of dough increased, ranging from 0.5 to 6.1 per cent with the addition of guargum at the levels of 0.5 to 1.25 per cent (Table 3). The increase in loaf weight from 1.2 to 4.0 per cent was observed due to retention of more water.

Sensory evaluation

The breads prepared from wheat flour (control) and various blends of guargum were evaluated for their internal and external characteristics at different storage intervals of 3, 12, 24 and 36 hours.

Statistical analyses of the data for treatments and storage periods have been given in Tables 5 and 6. It is evident from the tables that there are significant differences between storage and treatment means. The interactions between storage and treatment (S x T) for the parameters such as crust, symmetry of form, evenness of bake and aroma were non-significant, while the interactions among all other characteristics were significant. Comparison of treatment means explicited that breads prepared from 1.25 per cent guargum added wheat flour (T5) scored the highest as compared to all other treatments. It was concluded that progressively increasing concentration of guargum in wheat flours improves the desirable bread characteristics. These findings correlate with those of Rao *et al.* (1985) who found 1.50 per cent as optimum quantity of the gum to improve its baking performance. In this study that there was improvement in the crust colour from dull brown in case of control to golden brown in case of bread containing gum.

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PRESERVATION OF RAW MILK THROUGH ACTIVATION OF LACTOPEROXIDASE SYSTEM (LPS)

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ABSTRACT

Lactoperoxidase system (LPS) possesses antibacterial properties that extend the keeping quality of milk. Milk was preserved by 10, 20 and 30 ppm of H_2O_2/Na^-SCN at 30°C and 40°C. The results of quality control test indicated that milk treated with 10, 20 and 30 ppm H_2O_2/Na^- SCN and stored at 30°C remained fit for consumption up to 8, 12 and more than 16 hours, respectively as compared to untreated milk that curdled within 8 hours of milking. A higher bacterial count was observed at 30°C as compared to 40°C but increase in titratable acidity and decrease in pH was more rapid at 40°C than at 30°C.

Key words: raw milk; preservation; lactoperoxidase system; viable bacterial count; Pakistan

INTRODUCTION

Annual production of milk in Pakistan is about 19.9 million tonnes. Per capita availability of milk is 118 L annum^{-1} which is relatively higher than other Asian countries (Anonymous, 1995-96). However, consumption of milk is uneven in rural and urban areas. About 79 per cent of the milk is locally used in milk producing areas and only 21 per cent is sold in the market through different agencies (Schinzel, 1979).

The shelf-life of the milk depends upon the number of bacteria initially present and the temperature at which it is stored. Bacterial growth can be retarded by refrigeration or by the addition of chemicals to check the deterioration (Harnulv & Hamid, 1984; Athar & Tariq, 1991).

A lot of work has been carried out to increase the shelf-life of milk by the use of chemicals and lactoperoxidase system (Moorthy & Subramanian, 1978; Harnulv & Hamid, 1984). Lactoperoxidase system is a naturally occurring biochemical system in milk which helps in keeping the number of contaminating bacteria at a minimum level (Reiter, 1978). The LPS catalyses the oxidation of SCN by H_2O_2 that has an antibacterial activity. The optimal activity of LPS depends upon the concentration of SCN and H_2O_2 which is usually 8-10 ppm and 15 ppm, respectively (Harnulv & Kandasamy, 1982). The antibacterial spectrum is broad and is bacteriostatic and bactericidal for many organisms (Bjork, 1978).

This study was carried out to determine the effect of H_2O_2 and SCN by using different levels at equal proportions for the preservation of buffalo milk.

MATERIALS AND METHODS

Buffalo milk was collected from the Livestock Research Station, National Agricultural Research Center, Islamabad. The milk was treated within one hour after milking with 10, 20 and 30 ppm of H_2O_2 and 10, 20 and 30 ppm of Na^-SCN simultaneously. After the treatment, treated and untreated samples were incubated at 30°C and 40°C. The milk was evaluated after four hours interval. This experiment was replicated seven times.

Analytical methods

Total viable count was determined according to the methods of the American Public Health Association (1978). Titratable acidity and pH value was determined as described by Atherton and Newlander 91982). Clot on boiling was determined by boiling milk in a clean test tube (Clara, 1977).

RESULTS AND DISCUSSION

Total viable count

During the first four hours of the activation of LPS by the addition of H_2O_2 and Na^-SCN,, there was a sharp decrease in total viable count at 30 and 40°C (Table 1). Low level (10 ppm) seems to serve as bacteriostatic for 12 hours and started loosing its activity after 16 hours.

Both 20 ppm and 30 ppm levels were quite effective in the preservation since viable bacterial count was equal or less than the initial count. However, after 12 hours bacterial multiplication started in samples treated with 10 and 20 ppm H_2O_2 and Na^+SCN^-. A higher bacterial growth was observed at 30°C as compared to 40°C. These findings substantiate the earlier studies which suggest that LPS has antibacterial effects that increase the keeping quality of milk (Bjork, 1978).

acidity and pH of untreated and stabilized milk samples were the same. In untreated samples, after 8 hours of incubation, a considerable rise in the acidity and a fall in pH was noted. There was further increase in acidity and decrease in pH during storage in control samples, whereas the changes were small in treated samples.

A slow development of acidity and fall in pH was observed after 16 hours in samples stabilized with 30 ppm H_2O_2 and Na^+SCN^- at 30°C. This may be due to

Table 1. Effect of activation of lactoperoxidase system on bacterial growth in raw milk during storage

Period/ Treatment		0 hours	4 hours	8 hours	12 hours	16 hours
Control	30°C	8.1×10^4	1.1×10^5	7.3×10^5	2.3×10^6	-
	40°C	8.0×10^4	0.9×10^5	6.3×10^5	2.2×10^6	-
10 ppm*	30°C	7.9×10^4	4.6×10^4	3.1×10^4	8.1×10^4	1.5×10^5
	40°C	7.6×10^4	4.2×10^4	2.9×10^4	7.9×10^4	1.3×10^5
20 ppm*	30°C	7.8×10^4	3.7×10^4	1.6×10^4	1.1×10^4	7.9×10^4
	40°C	7.7×10^4	3.5×10^4	1.5×10^4	1.1×10^4	7.9×10^4
30 ppm*	30°C	7.6×10^4	2.4×10^4	1.9×10^4	0.7×10^4	2.6×10^4
	40°C	7.7×10^4	2.3×10^4	1.8×10^4	0.6×10^4	2.6×10^4

Values are expressed as average ± standard deviation (seven replicates).
*H_2O_2 and Na^+SCN^-

Table 2. Effect of activation of lactoperoxidase system on total titratable acidity (%) of raw milk during storage

Period/ Treatment		0 hours	4 hours	8 hours	12 hours	16 hours
Control	30°C	0.14 ± 0.01	0.15 ± 0.06	0.22 ± 0.06	0.34 ± 0.09	0.52 ± 0.10
	40°C	0.14 ± 0.02	0.16 ± 0.04	0.30 ± 0.03	0.45 ± 0.08	0.75 ± 0.10
10 ppm*	30°C	0.14 ± 0.01	0.14 ± 0.05	0.16 ± 0.03	0.25 ± 0.07	0.30 ± 0.08
	40°C	0.14 ± 0.03	0.15 ± 0.05	0.17 ± 0.04	0.35 ± 0.07	0.40 ± 0.08
20 ppm*	30°C	0.14 ± 0.01	0.14 ± 0.05	0.14 ± 0.02	0.17 ± 0.06	0.22 ± 0.06
	40°C	0.14 ± 0.01	0.14 ± 0.05	0.15 ± 0.02	0.16 ± 0.06	0.19 ± 0.06
30 ppm*	30°C	0.14 ± 0.01	0.14 ± 0.14	0.14 ± 0.02	0.15 ± 0.04	0.16 ± 0.05
	40°C	0.14 ± 0.02	0.14 ± 0.03	0.14 ± 0.02	0.16 ± 0.04	0.17 ± 0.05

Values are expressed as average ± standard deviation (seven replicates).
*H_2O_2 and Na^+SCN^-

Titratable acidity and pH value

The change in acidity and its corresponding pH value in milk at various intervals has been presented in Tables 2 and 3 at 30°C and 40°C. Initial total titratable

optimum activation of LPS. Similar but more rapid trend was also observed in milk samples stored at 40°C. The increase in titratable acidity with time is fully supported by the earlier findings (Gupta *et al.*, 1986).

Table 3. Effect of activation of lactoperoxidase system on pH of raw milk during storage

Period/ Treatment		0 hours	4 hours	8 hours	12 hours	16 hours
Control	30°C	6.75 ± 0.07	6.70 ± 0.11	5.90 ± 0.39	5.20 ± 0.45	5.00 ± 0.23
	40°C	6.75 ± 0.05	6.68 ± 0.09	5.20 ± 0.25	5.00 ± 0.45	4.80 ± 0.25
10 ppm*	30°C	6.75 ± 0.06	6.72 ± 0.09	6.50 ± 0.20	5.80 ± 0.41	5.20 ± 0.27
	40°C	6.75 ± 0.06	6.65 ± 0.09	6.40 ± 0.20	5.40 ± 0.41	5.00 ± 0.27
20 ppm*	30°C	6.75 ± 0.06	6.75 ± 0.08	6.73 ± 0.13	6.50 ± 0.34	6.00 ± 0.44
	40°C	6.75 ± 0.06	6.70 ± 0.05	6.65 ± 0.12	6.50 ± 0.24	5.90 ± 0.44
30 ppm*	30°C	6.75 ± 0.07	6.75 ± 0.09	6.74 ± 0.13	6.60 ± 0.20	6.40 ± 0.41
	40°C	6.75 ± 0.07	6.75 ± 0.08	6.67 ± 0.12	6.60 ± 0.20	6.50 ± 0.91

Values are expressed as average ± standard deviation (seven replicates).
*H_2O_2 and Na SCN

Clot on boiling test

Clot on boiling test results are presented in Figure 1. Milk samples stabilized with 30 ppm were acceptable up to 16 hours as compared to control which curdled within 8 hours post-milking. Furthermore, residual SCN was found under permissible limit (i.e. less than 5 ppm) and no traces of H_2O_2 detected in stabilized milk samples.

CONCLUSION

From the results of the present study, it is recommended that buffalo raw milk can be preserved by the activation of LPS with the addition of 20 ppm of H_2O_2 and 20 ppm Na SCN simultaneously. It would help in collection of high quality buffalo milk from widely scattered remote areas. This technique can also be used by the milk plants for the collection of evening milk which at present is not procured by dairy industry for processing.

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ANTIOXIDATIVE EFFECT OF NATURAL PRODUCTS IN EDIBLE OILS

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ABSTRACT

Antioxidative effect of sesame oil (0.50%), clove oil (0.02%) and BHT (0.02%) in RBD soybean and sunflower oils was compared. The treated and untreated samples were kept at ambient and under continuous fluorescent light for a period of 4 weeks. The quality parameters such as peroxide value (POV), free fatty acids (FFA) and colour of samples were determined at start of the experiment followed by weekly analysis. The results revealed ambient conditions were: 14.19 mew kg^{-1} and 0.188 per cent, respectively. The addition of BHT, sesame and clove oils to samples, reduced these values to 8.59, 13.59 and 10.91 meq kg^{-1}, while FFA to 0.132 , 0.16 and 0.18 per cent respectively. The samples exposed to light also showed similar trend. The POV of soybean oil under light conditions after 4 weeks storage was 44.51 meq kg^{-1} as compared to 24.83, 36.11 and 40.02 meq kg^{-1} in samples treated with BHT, sesame and clove oils, respectively. The overall effect of natural antioxidants was found to be almost comparable to synthetic one.

Key words: antioxidative effect; BHT; sesame and clove oils; free fatty acids; Pakistan

INTRODUCTION

The oxidative deterioration of edible oils and fats is a complex process, leading to varied decomposition products (Ahmad *et al.*, 1993). The addition of antioxidants to fats and fatty foods is one of the most efficient ways to prevent oxidation of lipids (Haig, 1986). Phenolic antioxidants such as butylated hydroxy anisole (BHT), tertiary butylated hydroxy quinone (TBHQ) and propyl gallate (PG) are used as antioxidants in foodstuffs against rancidity (Cuvelier, 1992). Also general public concern exists regarding food additives and their safety. BHA has been reported to have toxic and carcinogenic effects (Ito *et al.*, 1986) and can cause changes in rat thyroids, stimulation of DNA synthesis and induction of enzymes (Wurtzen & Olsen, 1986). Natural antioxidants are found in many fruits and vegetables such as ascorbic acid, α-tocopherol, ß-carotene, chlorogenic acids and flavonoids. In these compounds, the antioxidative activity is attributed to their action, as free radical acceptor (Larson, 1988). Some essential oils having phenolic nucleus possess antioxidant properties. The antioxidant efficacy of essential oils as natural preservatives for butter was reported (Frag *et al.*, 1990). Many components of extracts isolated from plant materials have been proven as model system to be as effective as synthetic one (Hayase & Kato, 1984; Fukuda *et al.*, 1985). Consumers are becoming increasingly conscious of nutritional value and safety of their food and its ingredients (Frag *et al.*, 1989). The objective of this study was to compare the antioxidative properties of clove and sesame oils with a common synthetic antioxidant, BHT in stability of edible oils under different storage conditions.

MATERIALS AND METHODS

The clove and sesame oils (0.02 and 0.50%, respectively) extracted by steam distillation and BHT (0.02%) were mixed separately in 250 mL refined, bleached and deodourized (RBD) soybean and sunflower oils, possessing no additives or antioxidants (according to the manufacturers). The sample without any treatment was considered as control. One set of treated samples along with control was kept at ambient conditions, while other set was exposed to continuous fluorescent light for a period of 4 weeks. The quality parameters i.e. peroxide value (POV), free fatty acids (FFA - %) and colour were determined at the start of the experiment followed by weekly analysis. The POV was determined as described in AOCS (1972). The FFA was measured according to the method of AOAC (1984) and the colour of oils was measured as absorbance at 420 nm using 50% v/v solution of oils in isooctane using UV Vis Shimadzu Spectrophotometer Model 160 (Filho *et al.*, 1986).

All the above analytical procedures were performed at least in duplicate and the values reported are the means.

Table 1. Effect of natural and synthetic antioxidants on edible oils (at ambient conditions)

Oils	Weeks	Parameters: POV (meq kg^{-1})				Mean values of 4 weeks: FFA (%)				Colour (OD)			
		Cont.	BHT	Sesame oil	Clove oil	Cont.	BHT	Sesame oil	Clove oil	Cont.	BHT	Sesame oil	Clove oil
Sun-flower	0	3.00	3.00	3.00	3.00	0.041	0.041	0.041	0.041	0.170	0.170	0.170	0.170
	1	4.91	5.70	6.92	5.93	0.125	0.103	0.111	0.126	0.157	0.159	0.167	0.165
	2	10.77	7.31	10.40	7.34	0.182	0.132	0.160	0.183	0.145	0.148	0.166	0.150
	3	22.50	10.18	12.72	18.18	0.265	0.173	0.225	0.263	0.132	0.140	0.164	0.131
	4	29.82	16.79	19.92	20.41	0.331	0.215	0.301	0.331	0.119	0.136	0.161	0.130
	X	14.19	8.59	13.59	10.91	0.188	0.132	0.167	0.188	0.144	0.150	0.165	0.150
	CV	81.54	61.28	60.21	70.67	60.380	50.070	59.940	60.120	13.880	9.260	2.020	12.460
Soy-bean	0	2.35	2.35	2.35	2.35	0.031	0.031	0.031	0.031	0.140	0.140	0.140	0.140
	1	4.91	2.60	4.00	2.83	0.108	0.093	0.101	0.113	0.135	0.137	0.139	0.139
	2	10.33	8.67	10.16	8.40	0.171	0.143	0.157	0.182	0.129	0.135	0.138	0.132
	3	17.27	12.33	15.40	14.31	0.248	0.229	0.248	0.159	0.120	0.132	0.136	0.128
	4	22.16	16.41	2.53	18.37	0.324	0.306	0.315	0.305	0.112	0.128	0.133	0.125
	X	11.40	8.47	1.48	9.25	0.176	0.160	0.170	0.150	0.127	0.124	0.137	0.132
	CV	72.76	72.25	72.33	10.80	65.100	67.930	66.490	63.550	8.180	3.430	2.020	4.970

RESULTS

The effect of natural and synthetic antioxidants on POV, FFA and colour stability at ambient and continuous fluorescent light is shown (Tables 1 & 2). The results revealed that mean POV of control samples of sunflower and soybean oils (kept at ambient conditions) were 14.19 and 11.40 meq kg^{-1}, respectively. The addition of BHT, sesame and clove oils lowered the POV to 8.59, 13.59 and 10.91 meq kg^{-1} in sunflower oil, while in soybean oil, the POV lowered from 11.40 meq kg^{-1} to 8.47, 10.48 and 9.25 meq kg^{-1}, respectively. The effect of BHT, sesame and clove oils on the quality deterioration of same edible oils exposed to continuous fluorescent light also showed that the POV of BHT treated sunflower oil (36.26 meq kg^{-1}) was found to be almost identical to that of sesame oil (42.02 meq kg^{-1}) and clove oil (43.00 meq kg^{-1}) when compared with control (56.84 meq kg^{-1}). In case of soybean oil, the control sample had POV 44.51 meq kg^{-1}, while BHT, sesame and clove oil treated samples had this value 24.83, 36.11 and 40.02 meq kg^{-1}, respectively. The results regarding FFA showed that mean FFA values of untreated sunflower oil were 0.188 and 0.176 per cent, respectively. The addition of BHT, sesame and clove oils reduced these values to 0.132, 0.167 and 0.18 per cent, respectively for sunflower oil, which indicated that addition of clove oil has no profound effect on this parameter, while in case of soybean oil, the treated samples showed a decrease to 0.16, 0.17 and 0.15 per cent over control (0.176%). Similar pattern of results were observed for sunflower and soybean oils exposed to continuous fluorescent light. The FFA values were reduced from 0.27 per cent (control) to 0.25, 0.26 and 0.26 per cent for sunflower oil by the addition of BHT, sesame and clove oils, respectively and for soybean oil from 0.24 per cent to 0.22, 0.24 and 0.23 per cent, respectively.

The colour of oil is one of the important quality parameter. The photobleaching occurs with the passage of time. In case of sunflower oil, control samples showed minimum absorbance (0.141%), while BHT, sesame and clove oil treatments showed the maximum absorbance i.e. 0.147, 0.154 and 0.147 per cent, respectively indicating the stability of oil colour in treated samples. Similar trend was noted for soybean oil samples exposed to light.

DISCUSSION

The vegetable oils are very prone to deterioration by the action of oxygen, light and temperature. Generally, it is conceded that the principal route of this deterioration and possible economic loss of vegetable oil is through rancidity, resulting from oxidation which takes place at double bond in triglyceride molecule

Table 2. Effect of natural and synthetic antioxidants on edible oils (exposed to fluorescent light)

Oils	Weeks	Parameters: POV (meq kg^{-1})				Mean values of 4 weeks: FFA (%)				Colour (OD)			
		Cont.	BHT	Sesame oil	Clove oil	Cont.	BHT	Sesame oil	Clove oil	Cont.	BHT.	Sesame oil	Clove oil
Sun-	0	3.00	3.00	3 00	3.00	0.041	0.041	0.041	0.041	0.170	0.170	0.170	0.170
flower	1	26.00	20.00	28.50	26.00	0.191	0.152	0.181	0.179	0.155	0.157	0.163	0.160
	2	62.70	34.52	45.05	51.66	0.365	0.350	0.365	0.340	0.140	0.145	0.158	0.149
	3	78.72	54.52	51.20	58.47	0.372	0.365	0.371	0.350	0.128	0.138	0.149	0.138
	4	113.78	69.30	72.35	75.88	0.385	0.371	0.380	0.340	0.115	0.126	0.132	0.121
	X	56.84	36.26	42.02	43.00	0.270	0.250	0.260	0.260	0.141	0.147	0.154	0.147
	CV	76.71	72.93	60.06	66.63	55.800	58.950	56.560	56.800	15.310	11.540	9.500	12.930
Soy-	0	2.35	2.35	2.35	2.35	0.031	0.031	0.031	0.031	0.140	0.140	0.140	0.140
bean	1	15.50	15.00	14.70	32.25	0.165	0.155	0.153	0.152	0.133	0.137	0.135	0.134
	2	54.46	26.50	41.38	47.63	0.323	0.291	0.332	0.301	0.122	0.128	0.129	0.127
	3	66.22	33.14	50.00	52.70	0.341	3.310	0.345	0.330	0.115	0.122	0.123	0.121
	4	84.05	47.20	62.15	65.18	0.364	0.321	0.360	0.348	0.108	0.113	0.115	0.114
	X	44.51	24.83	36.11	40.02	0.244	0.221	0.244	0.232	0.123	0.128	0.128	0.127
	CV	77.43	68.98	64.47	60.31	58.560	56.970	59.480	58.170	10.520	8.610	7.660	8.080

(Lundberg, 1961). The action of light has long been known to cause rancidity of oils, fats and fat containing products (Sattar & Deman, 1973). This problem is becoming serious due to high intensities of light used during food display (Sattar & Deman, 1976). Production of FFA was the best predictors of fat deterioration and presence of FFA could be used to monitor the extent of oils abused (Stevenson *et al.*, 1984). In fat deterioration, the first initiating step is the formation of fatty free radicals which are susceptible to oxygen's attack in the presence of light, resulting in formation of many organic compounds and free fatty acids (Akhtar *et al.*, 1985).

Sesame oil is significantly more stable than cottonseed, soybean and peanut oils of equivalent unsaturation, particularly after hydrogenation. This high stability of sesame oil is evidently due to the presence of an antioxidant, more potent than tocopherols. Sesame oil contains about 0.3-0.5 per cent sesamol, about 0.5-1.0 per cent sesamine and depending on the processing to which it has been subjected. Sesamol is produced by hydrolysis of sesamoline which is a powerful antioxidant, used in some Asian countries as mandatory hydrogenated vegetable oil additive. Prospect for the development of sesamol as an antioxidant for oils for stabilization of carotene and vitamin A and for other biological effect have well documented (Sonntag, 1979).

The results of the present study are also supported by the findings of Frag *et al.* (1989) who evaluated the antioxidant efficacy of some essential oils and found that clove oil showed similar antioxidative effect as thyme oil in cottonseed oil. As a result of these studies, it was concluded that natural antioxidants like clove and sesame oils could be used to extend the shelf-life of edible oils. Among natural antioxidants, the sesame oil showed better protection than clove oil.

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EFFECTS OF HEAT TREATMENTS ON THE PHYTATES AND PHENOLICS IN RAPESEED

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ABSTRACT

A study was conducted to quantify the effect of different heat treatments on the phytic acid, total phenols and sinapine contents in rapeseed. Seeds of rapeseed variety Pakcheen were given dry heat (105°C) treatments for 10, 20, 30, 40, 50 and 60 minutes. Alternatively, moist heat under pressure (121°C)/15 pst) for 10, 20 and 30 minutes was applied before extraction of oil. Effects of these treatments was studied on the phytic acid content in the resultant defatted meal. In another study, effects of dry heating for different temperatures (0-250°C) was studied on the sinapine and total phenol contents in rapeseed. Results indicated that none of the heat treatments had any significant effect on phytic acid content in rapeseed. Phytic acid content was 4.23 per cent in the control sample, and ranged from 3.6 to 4.8 per cent in the dry heated samples and 4.2 to 4.5 per cent in the autoclaved samples. Increasing heating temperatures (0-250°C) caused significant decrease in sinapine (0.9-33%) and total phenols (1.21-0.71%).

Key words: heat treatment; phytates; phenolics; rapeseed; protein source; Pakistan

INTRODUCTION

Rapeseed and related cruciferous oilseeds are rich sources of oil and protein of high nutritive quality but their utilization is limited due to the presence of hazardous compounds like glucosinolates, phytic acid and phenolic compounds. The phenolic compounds consist of three groups such as benzoic acid derivatives (para-hydroxy benzoic acid, protocatechuic acid, vanilic acid and sinapic acid) and falvonid (flavonoids, flavones, flavanones, anthocyanidine and chalcones) (Rangana, 1977).

The phenolic compounds cause a number of serious problems like dark colour, bitter taste and astringency (Bate, 1951). Both condensed and hydrolyzable tannins are growth depressants (Martin *et al.*, 1977; McLeod, 1974) by interacting with proteins to form insoluble complexes (Halsam, 1981) under mild conditions. The complex formed can be dissociated by detergents, or by high pH, which ionizes the phenolic hydroxyl groups and thus destroys its hydrogen-binding ability (Haegermann & Butler, 1978; Pierpoint, 1969). Both condensed and hydrolyzable tannins are susceptible to oxidation at high pH, the oxidation products can form covalent bonds with nucleophiles including the amino or sulfhydryl groups of proteins (Pierpoint, 1969; Leatham *et al.*, 1980; Beart *et al.*, 1985). The chemical reactivity and protein-binding capacity of polyphenols and their oxidation products are responsible for their effects in biological systems i.e. rate of weight gain and efficiency of feed utilization by livestock (Mituru *et al.*, 1984).

Phytic acid is myo-inositol-1, 2, 3, 4, 5, 6-hexakis-dihydrogen phosphate. In most seeds, it serves as primary phosphorus and myo-inositol reserves. Whether directly complexed with phytic acid or through cations, the very phenomenon of protein binding leads to decreased solubility, functionality and digestibility of proteins (Maga, 1982). Binding of minerals with phytic acid also results in their reduced physiological availability (Cosgrove, 1980).

Keeping in view the broad range of biological systems affected by phytates and phenolic compounds, the present study was initiated as an attempt to remove/reduce their contents from rapeseed by the application of moist and dry heat.

MATERIALS AND METHODS

The seeds of commercially cultivated high erucic acid, high glucosinolate variety (Pakcheen) of rapeseed (*B. napus*) were obtained from Mutation Breeding Division of this Institute. These seeds were cleaned from dust, dirt and undesirable matter and given the following treatments:

Seeds were given dry heat (105°C) treatments for 10, 20, 30, 40, 50 and 60 minutes. Alternatively, moist heat under pressure (121°C/15 psi) for 10, 20 and 30 minutes was applied before extraction of oil. Effects of

these treatments was studied on the phytic acid content in the resultant defatted meal. The sample extract (with 0.2 N HCl) was heated with an acidic iron III solution of known iron content. The decrease in iron content (determined colourimetrically with 2, 2-bipyridine) in the supernatant was the measure of the phytate phosphorus (Haug & Lantzsch, 1983).

In another study, effects of dry heating for different temperatures (0-250°C) was studied on the sinapine and total phenol contents in rapeseed. The seed was dried to a moisture level of about 7 per cent and ground to pass through 0.4 mm sieve. The samples were extracted (Ramanmuri *et al.*, 1985) with methanol and acidic methanol (1%). The reported results are the sum of the two extracts.

The samples were analyzed for extractable total phenols using Folin-Ciocalteu-phenol reagent (Titto, 1985) which contains sodium molybdate and sodium tungstate, 2.5 and 10 per cent, respectively. This reagent like others is non-specific for any phenolic and the colour yield depends on hydroxyl groups and their place in the molecules. The sinapine content was assayed according to the method of Blair *et al.* (1984). The sinapine content measured by this procedure includes all sinapic acid esters, plus free sinapic acid.

RESULTS AND DISCUSSION

Phytic acid

Data regarding the effects of different heat treatments and autoclaving are given in Table 1. The phytic acid content of control sample was 4.23 per cent, and ranged from 3.6 to 4.8 per cent among different heat-treated samples. The results showed that the effect of autoclaving treatment for 10, 20 and 30 minutes was also non-significant on the content of phytic acid in rapeseed meal and ranged from 4.23 (control sample) to 4.53 per cent (30 minutes autoclaved sample).

Table 1. Effects of dry heating or autoclaving time on the phytic acid content in rapeseed meal

Treatment (heating minutes)	Phytic acid (%)	
	Dry heating	Autoclaving
Control	4.23	4.23
10	3.59	4.35
20	4.29	4.25
30	3.96	4.53
40	4.83	-
50	4.00	-
60	4.15	-

The average phytic acid content of the control rapeseed meal samples was 4.23 per cent. This was well in accordance with the reported value by Anju (1977) and Nwokolo and Bragg (1977). The results of the present study indicated that neither the dry nor the moist heating caused any significant reduction in the content of phytates in rapeseed meal. Similarly, Ologhobo and Fetuga (1984) also did not found any significant reduction in phytic acid content with cooking, autoclaving and soaking of soybean. Very little work has been reported on the effect of common processing like cooking, autoclaving and microwave, etc. on the phytic acid content in rapeseed meal (Thompson, 1990). However, Niazi *et al.* (1988) have reported 83.64 per cent reduction in phytic acid content of mustard seed meal which was leached in 4 per cent NaCl solution at pH 5.0. Present results, however, get support from the fact that the normal oil extraction processing had very little effect on the structural and chemical organization of the storage protein and its phytic acid globoids (Yiu *et al.*, 1983).

Total phenols and sinapine contents

Effects of heating for 30 minutes at different temperatures on the total phenols and sinapine content or their per cent reduction is shown in Table 2. Total phenols were reduced to the minimum value (0.71%) with 200°C treatment, however, the value obtained with 150°C treatment (0.72%) was not much different from this. Reduction in the sinapine content, however, was continuous with increasing temperatures. The reduction was 6.66 per cent with 100°C, but the slope increased sharply after that point. More than 63 per cent of sinapine content was reduced at 250°C, indicating its susceptibility to higher temperatures.

Table 2. Effect of heating temperature (30 minutes) on sinapine and total phenols in rapeseed

Heating temperature (°C)	Total phenols		Sinapine	
	Per cent	Reduction (%)	Per cent	Reduction (%)
0	1.21	-	0.90	-
50	0.92	23.96	0.90	0.00
100	0.76	37.19	0.84	6.66
150	0.72	40.50	0.60	33.33
200	0.71	41.32	0.46	48.88
250	0.75	38.02	0.33	63.33

Although, the effect of heating on the phenolics of rapeseed has not been reported, yet the present results

are in line with the observation of Charlene *et al.* (1985) who found that roasting lowered the total phenolics (catechin) in mungbean seeds by 16.67 per cent. The high temperature and dry heat may change the phenolic contents by altering the chemical structure and hence reactivity. Similarly, Bressani *et al.* (1983) reported an apparent loss of 20 to 39 per cent from raw to cooked seeds when exposed at tannic acid and 61 to 98 per cent when expressed as catechin equivalent. The decrease in total polyphenols in rapeseeds with gradual increase in temperature (50-250°C) appeared to be due their removal, change in their chemical reactivity, formation of tannin-protein insoluble complexes, polymerization or degradation into smaller soluble polymers that give colour reaction to reagent. Similar observations have been reported by Laurena *et al.* (1984) and Charlene *et al.* (1985) for cowpea.

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READY-TO-EAT FOODS AS VEHICLES OF *SHIGELLA* SPECIES

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ABSTRACT

Two hundred and thirty samples of ready-to-eat foods such as `salads', `chats', `dehi-bhalay', `gol gapay', `chatneys' and their ingredients were collected from roadside vendors, restaurants, hotels and food service shops enroute from Rawalpindi to Lahore, Rawalpindi to Faisalabad and townships in Rawalpindi district. Primary isolation was carried on xylose-lysine-desoxycholate agar and MacConkey's agar. The isolates were characterized morphologically, biochemically and serologically. Culture sensitivity of the isolates was performed using 12 antimicrobial agents namely: ampicillin, amoxil, ampiclox, chloramphenicol, cefoparazone, doxycillin, erythromycin. gentamycin, penicillin, rifamycin, tetracycline and trimethoprim. One of the isolates was also colicine typed (courtesy: Dr. Sheila B. Hignette of the Public Health Laboratory, England). Out of the examined 230 samples, 5 (2.17%) were found to be positive for *Shigella sonnei*, indicating a chance of 5 outbreaks of bacillary dysentery. Of the isolated *Shigella sonnei*, one was found to be resistant to all of the antimicrobial agents, while two were sensitive to one antimicrobial agent. The remaining two isolates were sensitive to 4 and 7 antimicrobial agents, respectively.

Key words: ready-to-eat foods; vehicle; *Shigella*; diarrhoea; antimicrobial agents; Pakistan

INTRODUCTION

In Pakistan, incidence of shigellosis is significantly high. But, there are no regular records and significant data available. Mostly, disease is not diagnosed. Usually physician prescribes the medicine on the basis of symptoms only. No culture sensitivity test or any other tests are practiced. Generally, higher frequency of food poisoning incidence in Pakistan reflects the conditions of sanitation and hygiene of personnel involved. Food microbiologists and food scientists should essentially review the current status of food microflora to deal with and to overcome these problems.

The emergence of *Shigella sonnei* as the most common cause of shigellosis has been documented (Koo *et al.*, 1996). *Shigella sonnei* is more resistant and survives better in the environment than other species of *Shigella*, a difference that may explain why shigellosis dysentery has not been as readily controlled by improvements in community hygiene as the other types of bacillary dysentery. *Shigella* infections are important cause of diarrhoea in developing (Bruins *et al.*, 1995) as well as developed countries (Liu *et al.*, 1995). Children under the age of 5 years are particularly at risk (Srison & Pornpatkul, 1955; Dunn *et al.*, 1995). In tropical developing countries, shigellosis accounts for at least 500,000 deaths per year in young children (Bruins *et al.*, 1995).

Usually outbreaks of foodborne shigellosis occur throughout the year but seasonal variation also affects its occurrence. Outbreaks occur most frequently during the late spring to early fall with a peak in Jule-July (Srison & Pornpatkul, 1995). Black *et al.* (1978) reported 110 outbreaks (72 foodborne, 38 waterborne) in United States during 1961-75, of which 68 were caused by *Shigella sonnei*, 34 by *Shigella flexneri* and 8 unknown *Shigella* species. Implicated foods included salads (63%), salad-dressing and beans.

The chief contributing factor leading to foodborne shigellosis is poor personal hygiene of the food handlers i.e. failure to properly wash hands after defecating and subsequently handling of food. Marth (1985) pointed out that mostly food handlers are young and inexperienced and stay on job less than a year. Second most important cause is improper holding temperature of the prepared foods. Thus, reason of the outbreak is always a prepared or mishandled food, in food service establishments. Food prepared in homes could also be contaminated through food handlers and cooks (Ollinger-Synder & Matthews, 1996).

The purpose of this study is thus to examine the condition of sanitation and food hygiene in the Punjab province of Pakistan and to assess the incidence of *Shigella* infection in ready-to-eat foods.

MATERIALS AND METHODS

Two hundred and thirty (230) samples of ready-to-eat foods including salads and other ready-to-eat foods were randomly collected from various sources and areas in Punjab province of Pakistan. Cities included were: Faisalabad, Lahore, Murree, Rawalpindi, Islamabad, Bara Kahu, Chakwal, Taxila, Wah, Fateh Jang, Tala Gang, Kalar Sayedan and other townships and villages enroute. The samples were collected aseptically in sterile wide mouth vials. Samples were transferred to the laboratory in Gram-negative (GN) broth which covers both the requirements of enrichment and transport medium. Microbiological examination to assess the presence of *Shigella* species in these food samples was carried out as soon as they reached the laboratory.

To isolate *Shigella* from foods, 25 g of the sample was enriched in 225 mL GN broth (Hajna, 1955) and incubated at 37°C for 24 hours. Single colony was then picked and plated on other agar plates for pure culture.

RESULTS AND DISCUSSION

Incidence of *Shigella* species in foods

Five out of 230 (2.17%) samples were found to contain *Shigellae*. All the five isolates were Shigella sonnei, two of which were isolated from `chatneys', two from salads and one from `chat'. No *Shigella* was isolated from `dehi bhale', `gole gapay', `pikora', `samosa', `pan' and `pan misalah' (Table 1).

Out of the 230 samples, 5 *Shigella* isolates were gathered. Isolation of *Shigella* from food sources is reported (Anonymous, 1994; Dunn *et al.*, 1995). In the present study, only one species of *Shigella* i.e. *Shigella sonnei*, 5/230 (2.17%) was isolated. Similar high isolation rate of *Shigella sonnei* has been reported (Black *et al.*, 1978; Anonymous, 1994; Koo *et al.*, 1996). Shigellosis is responsible for considerable morbidity and mortality (Dutta *et al.*, 1995; Koo *et al.*, 1996) in both developing (Bruins *et al.*, 1995) and developed (Dunn *et al.*, 1995; Liu *et al.*, 1995) countries, particularly among children. Outbreaks of shigellosis in a population is likely to be caused by a single strain of *Shigella*.

Occurrence of *Shigella sonnei* is indicator of relatively improved hygienic conditions, since with improvement in food hygiene and better food handling reduction in infection rates due to *Shigella dysentriae* occurs. Consequently, the incidence of *Shigella sonnei* increases. The predominant species causing shigellosis in developed countries is *Shigella sonnei* (Anonymous, 1994; Liu *et al.*, 1995). In many countries, there are reports of shifting patterns of *Shigella* infections from *Shigella dysentriae* to other species especially to *Shigella sonnei* (Black *et al.*, 1978; Bennish *et al.*, 1990; Anonymous, 1994).

The salads, one hundred in number, yielded only two *Shigella sonnei* isolates. The salads are mostly produced by mixing chopped vegetables, and sometimes, dressed with cream. Cream being a milk product can itself be a source of *Shigella*. Chopped vegetables are another potential source of *Shigella* infection. Further contamination may occur during peeling, curing, chopping and manual mixing (Maxcy, 1978). Therefore, 2 per cent isolation from this group is fairly high establishing that fruit chats and salads can initiate shigellosis among consumers. Black *et al.* (1978), Saddik *et al.* (1985) and Dunn *et al.* (1995) were able to isolate *Shigella* from this group in varying numbers.

In the present study, one *Shigella* isolate from chats and two from `chatneys' were isolated. Since chats and miscellaneous foods are ready-to-eat, thus, these pose high risk of infection for consumers. Special attention

Table 1. Incidence of *Shigella* species in chats, salads and other similar ready-to-eat foods

Kind of food	Number of samples examined	Species of *Shigella*			
		dysentriae	*flexneri*	*boydii*	*sonnei*
Salads	100	0	0	0	2
Chat	38	0	0	0	1
Dehi bhaley	34	0	0	0	0
Chatney/Raita	20	0	0	0	2
Others	13	0	0	0	0
Samosa/Pikora misalah	8	0	0	0	0
Pan misalah	5	0	0	0	0
Gole gapey	5	0	0	0	0
Total	230	0	0	0	5

should be directed to determine the safety of these foods and their subsequent contamination (Kazmi & Bari, 1992). Usually infection is through mishandling where human carriers add infection to the foods which are ready-to-eat. Another reason of high contamination rate in this food group may be the cross contamination which too is due to bad hygiene of food handlers and effective methods of food preparation and storage (Ollinger-Synder & Matthews, 1996). Shigellosis is associated with eating contaminated foods procured from street vendors and public restaurants (Ollinger-Synder & Matthews, 1996).

The remaining miscellaneous foods did not yield any *Shigella* isolate, since these were mostly moisture free, or had high acidity or were sampled as very hot materials.

Flies usually play a very important role in the transmission of *Shigella* (Curtis, 1994). Cream which is separated from raw milk usually is unpasteurized. Besides this cream may also get contaminated through food handlers who may be *Shigella* carriers.

to *Shigella sonnei* proving relatively better food hygiene as compared to other developing countries.

In the present study, *Shigella sonnei* is more resistant and survives better in the environment than other species of *Shigella*, a difference that may explain why *sonnie* dysentery has not been as readily controlled by improvements in community hygiene as the other types of bacillary dysentery.

In the present research, the maximum percentage of *Shigella* isolation is from salad group which contains raw vegetables and species. To avoid contamination of raw vegetables with *Shigella* species, control measures for prevention of contamination during the production, processing and catering be undertaken (Kazmi & Bari, 1992). Although, cooking can kill bacterial flora on vegetables, but many vegetables are eaten raw as salads and as such are potential threat to human health. Level of contamination may be decreased by thorough washing and disinfection, but, by this way, complete eradication/elimination of the pathogens is not possible (Kazmi, 1992). It is recommended that washing of

Table 2. Resistance patterns of individual isolates

Source of isolate	Antibiotic sensitivity	
	Resistant	Susceptible
Salad	Ampicillin, Ampiclox, Amoxil, Cefoperazone, Doxycycline, Erythromycin, Gentamycin, Penicillin, Rifamycin, Tetracycline, Trimethoprim	Chloramphenicol
Chat	Ampicillin, Ampiclox, Amoxil, Chloramphenicol, Doxycycline, Erythromcyin, Gentamycin, Penicillin, Rifamycin, Tetracycline, Trimethoprim	Cefoperazone
Chatney	Ampicillin, Ampiclox, Amoxil, Chloramphenicol, Cefoperazone, Doxycyclin, Erythromycin, Gentamycin, Penicillin, Rifamycin, Tetracycline, Trimethoprim	-
Salad	Ampicillin, Cefoperazone, Doxycycline, Erythromycin, Penicillin, Rifamycin, Tetracycline, Trimethoprim	Ampiclox, Amoxil, Chloramphenicol, Gentamycin
Chatney	Doxycycline, Penicillin, Rifamycin, Tetracycline, Trimethoprim	Ampicillin, Ampiclox, Amoxil, Chloramphenicol, Cefoperazone, Erythromycin, Gentamycin

On the basis of these studies, it can be claimed that while comparing food hygiene in Pakistan, with some other countries like India, Bangladesh and Sri Lanka, our disease trend has changed from *Shigella dysentriae* vegetables be done immediately after harvesting and then as close to the serving time as possible because some microorganisms that survive time do multiply in the presence of increased moisture level on the chopped

vegetables (Saddik *et al.*, 1985). If possible, vegetables should be dipped for 30 seconds in boiling water to kill the surface microflora (Kazmi, 1992).

Culture sensitivity test

Names of the various antimicrobial agents used, their concentration and the behaviour of *Shigella* isolates towards these antimicrobial agents is given in Table 2. As could be seen from this Table, all the *Shigella* species were resistant to ampicillin, doxycyclin, penicillin, rifamycin, tetracycline and trimethoprim. *Shigella sonnei* strain 3 was resistant to all the 12 antimicrobial agents tried. None of the antibiotics was capable of ceasing the growth of this *Shigella* isolate. Two isolates were sensitive to only one antibiotic i.e. strain 1 to chloramphenicol and strain 2 to cefoperazone. *Shigella sonnei* strain 4 was resistant to ampicillin, cefoperazone, doxycyclin, erythromycin, penicillin, rifamycin, tetracycline and trimethoprim while strain 5 was resistant to ampicillin, cefoperazone, doxycyclin, erythromycin, penicillin, rifamycin, tetracycline and trimethoprim.

In the present study, the tested *Shigella sonnei* isolates were generally resistant to five or more used antimicrobial drugs used. One isolate was found to be resistant to all the antimicrobial agents, while two were sensitive to only one. The remaining two isolates were sensitive to four and seven antimicrobial agents, respectively. All the five isolates were uniformly resistant to doxycyclin, penicillin, rifamycin, tetracycline and trimethoprim while only two were susceptible to ampiclox, amoxil and erythromycin while only two were susceptible to cefoperazone and ampicillin. Multiple drug resistance of *Shigella* has been reported from many countries (Zaman *et al.*, 1991; Araj *et al.*, 1994).

The resistance of bacterial strains to one or more commonly used antibacterial agents has become a problem in clinical medicine. The reason of increase of isolation rate of antibiotic resistant *Shigella* strains is the increased use of antibiotics all over the world and this multiple drug resistance among *Shigella* is increasing with the passage of time (Zaman *et al.*, 1991). The high density of population is also a contributing factor in the resistance of antibiotics.

In Britain, ampicillin resistance was firstly noted in 1966 (Rowe, 1990) and in London. By 1969, 94 per cent *Shigella sonnei* were resistant to ampicillin, 83 per cent to sulfonamide, 70 per cent to streptomycin, 42 per cent to tetracycline, 34 per cent to a number of antibiotics (Rowe, 1990).

Colicin typing

Colicin typing of one *Shigella sonnei* isolate is presented in Table 3 (Courtesy: Public Health Laboratory, England).

Table 3. Colicin typing of *Shigella sonnei*

Strain No.	Their reference	Colicin typing
2	C 91/836	6/11

The ability to produce a particular colicin is fairly stable character and results of colicin typing are, therefore, of value in epidemiological studies. Probably, no single factor could be attributed to be responsible for increased *Shigella* infections. One of the contributing factors in transmission of this infection may be the rapid growth of population, since by increasing the number of susceptible persons and the density of the population the infection rate increases. Other factors include: extensive environmental pollution of water supplies, severe climatic and seasonal conditions, primitive sanitation essentially unchanged for decades and the known virulence and communicability especially of *Shigella dysentriae* (Rowe & Gross, 1981).

Diarrhoea is a reflection of the general level of sanitation in the community. If the hygiene of food and beverage industries is improved, many complications for both the travellers and the community would subside (Ollinger-Synder & Matthews, 1996). Furthermore, reduction in the spread of these organisms can be achieved by the improvement in living conditions (housing, personal and environmental sanitation and nutrition, etc.). Hand washing can also contribute as a preventive measure in the spread of shigellosis (Kazmi & Bari, 1992; Ollinger-Synder & Matthews, 1996).

It is the general thought that species of *Shigella* are highly communicable, characteristically showing a person to person mode of transmission (Kazmi & Bari, 1992). The factor responsible for the high infectivity by *Shigella* is a low ingestion dose response for person exposed to the organisms (Dupont *et al.*, 1989). This incidence of *Shigella sonnei* appears to be quite high to generate a public health hazard, through the consumption of the vended ready-to-eat foods.

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PROCEEDINGS OF THE
SIXTH ANNUAL GENERAL MEETING 1995

The Sixth Annual General Meeting of the Pakistan Society of Food Scientists and Technologists was held on Wednesday, December 20, 1995 at PCSIR auditorium, Lahore. Dr. Javaid Aziz Awan, the Secretary of the Society, welcomed the participants and invited the dignitaries on the stage. The proceedings were started with recitation from the Holy Quran by Hafiz Sameer Ahmed of the PCSIR Laboratories, Lahore.

Prof. Dr. Muhammad Saeed, Vice President of the Society in his address said that the singular achievement of this Society had been in bringing research scientists, university teachers, food industry people and almost every body concerned with food production, distribution and marketing on a common platform. He showed concern over the quality of education being imparted in the discipline in various universities. Dr. Saeed stressed the need to orient the research towards emerging problems in the food industries. He also laid emphasis on the environmental hazards.

Dr. Ehsan Ali, Director General, PCSIR Laboratories, Lahore, the Chief Guest, welcomed the delegates and pointed out that despite the vitality of the agricultural sector there are glaring failures. The food supply is short of the demand resulting in the import of wheat, milk powder, edible oil, tea and other commodities. He also discussed the problem of malnutrition that is facing the people. He stressed the need to disseminate knowledge on food hygiene, safety and processing to the people.

Technical Session

The first Technical Session that followed the tea break was chaired by Syed Mohammed Mohsin, Chairman, Mitchell's Fruit Farms, Renala Khurd. Mr. Mohsin was assisted by Mr. Tahir Ahmed, General Manager, Shezan international Ltd., Lahore and Dr. Mumtaz Hussain, former Principal Research Officer and Officer Incharge, Food and Nutrition Wing, Central ITD Laboratories, Chaklala. Following papers were delivered in this session:

1. Production of enhanced nutritional value savoury chapaties using response surface methodology by Dr. Saleem-ur-Rehman, Food Technology Dept., University of Agriculture, Faisalabad.
2. Raw milk preservation through activation of lactoperoxidase system (LPC) by Mr. Izhar H. Athar, Dairy Technology Laboratory, National Agricultural Research Center, Islamabad.
3. Impact of guar gum on the quality of wheat bread by Dr. Salim ur Rehman, Food Technology Department, University of Agriculture, Faisalabad.
4. Disease cure with food by Dr. Khalid M. Janjua, PCSIR Laboratories, Lahore.
5. Effect of storage conditions and packaging on the phenolics and physico-chemical characteristics of persimmon by Mr. M. A. Chaudhry, Nuclear Institute for Food and Agriculture, Peshawar.
6. Effect of different heat treatments on the phytate and phenolics of rapeseed by Mr. Aurang Zeb, Nuclear Institute for Food and Agriculture, Peshawar.
7. Chocolate by Mr. Zubair Ahmad, Mitchell's Fruit Farms Renala-Khurd.

The afternoon technical session was chaired by Dr. Saeed Iqbal Zafar, Head, Biotechnology and Food Research Center, PCSIR Laboratories Lahore. He was assisted by Mr. Muhammad Bashir Khamisa, Director, Khamisa Enterprises, Ali Akbar Street, Juna Market, Karachi and Mr. Muhammad Haroon, Director, Standard Manufacturing Co. (Pvt) Ltd., 4-Dayal Singh Mansion, The Mall, Lahore. Following papers were presented:

1. Application of extrusion technology in food industry by Mian Nadeem Riaz, Assistant Research Scientist, Food Protein Research and Development Center, Texas A & M University, College Station, TX 77843-2476, USA.
2. Ready to eat foods as vehicles of Shigella species by Syeda Sabahat Kazmi, Qaid-e-Azam University, Islamabad.
3. Antioxidative effect of normal products in edible oils by Mr. Taufiq Ahmad, Nuclear Institute for Food and Agriculture, Peshawar.
4. Effect of Gamma irradiation doses and storage on chemiluminescence value of dried fruits and plant nuts by Mr. Anwar Ahmad, Nuclear Institute for Food and Agriculture, Peshawar.

5. Effect of different soaking treatments on tannin contents and protein digestibility of legumes by Dr. Wazir Hussain Shah, PCSIR Laboratories, Lahore.

6. The potential of microalgal polysaccharides in food industry, by Dr. Muhammad Iqbal, PCSIR Laboratories, Lahore.

7. Equipment for quality control of cereals and flour by Dr. Iqtedar Mehmood, Managing Director, Techworth Impex Intl., Plot 33, St. 10, I-9 Industrial Area Islamabad.

8. The legal aspects relating to food colours in Pakistan by Mr. Abdul Hameed Blund, Technical Director, Rainbow Dyetech (Pvt) Ltd., Mandi Baha-ud-Din.

9. Impact of science and technology on dairying by S. Tafazzal Hussain, Associate Professor, Department of Food Technology, University of Agriculture, Faisalabad.

Business Session

This session was chaired by Prof. Dr. Muhammad Saeed who was assisted by Dr. Javaid Aziz Awan, Secretary and Dr. Wazir Hussain Shah, Joint Secretary. The Secretary welcomed the new members who joined the Society in recent months. "Fatcha" was offered for souls of the departed members who passed away since holding the last Annual General Meeting in December 1994 at Peshawar.

Annual Report of the Lahore Chapter

Annual report of Lahore Charter for the year 1995 was presented by Mr. Muhammad Sultan Mahmood, Secretary. This was accepted by the house. The house commended the efforts of the Chapter and hoped that other Chapters would follow their footsteps.

Amendments in the Constitution

Approval of the house was sought for some amendments in the Constitution. The house unanimously approved the amendments. The approved related Articles are as follows:

1. Article IV.2.c. a person who holds a Bachelor's degree and has had a minimum of 5 years experience in food processing industry and holds a responsible position therein, or

2. Article IV.2.d. a person who in the opinion of the Committee on Qualifications, can be accepted as a member by virtue of experience, specialized training, or contribution in the field of food science and technology.

3. Article IV.3. Associate member - A person who holds a diploma in the field of food science and technology or is engaged in food processing but not classified as professional member.

4. Article IV.8. Applications - An application for membership must be made on the official application form and sent to the Secretary.

5. Article V.1.a. President - The President shall be the executive head of the Society. He shall preside over all meetings of the Council. He shall have the powers to sanction all expenditure and operate accounts of the Society jointly with the Treasurer.

6. Article V.1.b. Vice President - The Vice President shall assist the President in performance of his duties and shall preside over the Council meetings in the absence of the President. He shall also enjoy the financial powers of the President in his absence.

7. Article V.1.c. Secretary - The Secretary shall keep all record of the Society including minutes of all the meetings of the Society and the Council. He shall keep a roll of the members and such other books of record and accounts as the Council may desire. He shall have the financial powers to approve expenditure upto Rs. 2000/- at a time.

8. Article V.1.d. Joint Secretary - The Joint Secretary shall assist the Secretary in performance of his duties. He shall perform the same duties and enjoy all the powers of the Secretary in his absence.

9. Article V.1.e. Treasurer - The Treasurer shall have supervision over the funds, securities, receipts and disbursements of the Society funds and shall submit a statement of cash accounts to the Council as may be required. He shall deposit all funds of the Society to the credit of the Society in a bank selected by the Council. He shall operate the Society funds jointly with the President.

10. Article VI.3. Student Counsellors - Every Chairman of the Student Chapter shall be member of the Executive Council.

11. Article VI.4. Vacancies - Vacancies occurring among the Officers of the Society shall be filled by the President with the consultation of the Council. Those occurring in the Chapters shall be filled in a similar manner by the respective Chapter Chairmen.

12. Article IX.2. The Council shall appoint three Professional members of the Society on the Publications Committee. The Chairman of this Committee shall be the Editor-in-Chief of the

Society's Journal. The Committee shall be responsible for undertaking all publications of the Society.

13. Article IX.4. Qualifications Committee - The Committee shall consist of the President, Secretary and one other member. It shall determine the eligibility of the candidates applying for membership of the Society.

14. Article XI.5. Add clause e - to sanction all expenditure and operate the Chapter accounts jointly with the Chapter Treasurer.

15. Article XI.10. Add clause c. The Chapter Chairman or Secretary shall present the report in the Annual General Meeting of the Society

16. Articles XI, XII and XIII be renumbered as Articles XII, XIII, and XIV respectively.

17. Article XI (new) Student Chapter - Not less than 15 students pursuing a degree course in food science and technology from any institution in the country may make an application to the Council to organize a Student Chapter. This Student Chapter shall be governed by the same by laws as Local Chapters (Article X) and shall have the same office bearers as the Local Chapters. It shall be designated as "Student Chapter, PSFST ---------- (name of the Institution). The annual dues shall be 50 per cent of the student annual dues of the Society. Each Chairman of the Student Chapter shall be a member of the Executive Council.

Award of Commemorative Shields

In order to recognize personalities and organizations who have contributed towards developments in the the field of food sciene and technology in the country, special commemorative sheilds were presented. The receipients were:

1. Dr. Abdus Sattar, Principal Scientific Officer, Nuclear Institute for Food and Agriculture, Peshawar.
2. Prof. Dr. A. K. Baloch, Dean Faculty of Agriculture, Gomal University, D.I. Khan.
3. Dr. Mumtaz Hussain, former Principal Research Officer and Officer Incharge, Food and Nutrition Wing, Central ITD Laboratories, Chaklala.
4. Lahore Chapter.
5. Shezan International Ltd, Bund Road, Lahore.
6. Cargill Cit-Russ Ltd., Sargodha.

Elections of the Office Bearers of the Executive Council

The most important item on the agenda was the result of the elections of the office bearers of the Executive Council for the next two years (1996 and 1997). The Executive Council in its meeting held on July 20, 1995 had decided to invite proposals from the members for the election of the members of the Executive Council. In accordance with the decision the proposals for nominations were invited by the Secretary. The following members were elected unopposed:

1.	President	Prof. Dr. M. Shafiq Chaudhry
2.	Vice president	Prof. Dr. Muhammad Saeed
3.	Secretary	Dr. Javaid Aziz Awan
4.	Joint Secretary	Dr. Wazir Hussain Shah
5.	Treasurer	Dr. Salim-ur-Rehman

Lucky Draws

Lucky draws were carried out to turn the end of the day into an interesting event. This event was sponsored by Standard Manufacturing Company, Lahore. The lucky winner were Dr. Faqir Muhammad Anjum, Mr. Tahir Zahoor, Dr. Javaid Aziz Awan,

Dr. Javaid Aziz Awan, the present and the newly elected Secretary, thanked the house for the confidence the members had shown in the Executive Council. At the end, Dr. Awan thanked various food industries for their financial support and putting up the exhibition of their products. He also thanked the members of the Society for actively participating in the deliberations of the Sixth Annual General Meeting of PSFST and wished them a safe journey home.

KEYNOTE ADDRESS

Prof. Dr. Muhammad Saeed
Dean, Faculty of Nutrition Sciences,
NWFP Agricultural University, Peshawar &
Vice President,
Pakistan Society of Food Scientists & Technologists

I have been asked by Professor Dr. Muhammad Shafiq Chaudhry, President, Pakistan Society of Food Scientists and Technologists to present the keynote address. He is not feeling well at the moment. We wish him a speedy recovery to lead this Society as he is the real driving force behind it.

It is somewhat difficult to present a comprehensive address on a subject so vast. Allow me, ladies and gentlemen, to point out that the singular achievement of this Society has been in bringing research scientists, university teachers, food industries peoples and almost every body concerned with food production, distribution and marketing, etc. on one common platform to address the many problems of the food industry. The Motto of the Society is to improve the quality of life of common man by preserving what would otherwise go waste and making a variety of food items available throughout the year.

Much has been said about the challenges and opportunities of the fellow scientists and industrialists in our previous meetings. The challenges and opportunities are many but one major challenge to my mind is the quality of education specifically in food science and technology in various colleges and universities of the country. Courses at B.Sc. level are offered at University of Agriculture, Faisalabad, Sind Agricultural University Tandojam, NWFP Agricultural University Peshawar, Gomal University D.I. Khan, Arid Agricultural University Rawalpindi, University of Karachi Karachi and College of Agriculture Rawalakot. Besides, courses leading to M.Sc and Ph.D degrees are offered at Faisalabad, Peshawar, Tandojam and even at D.I. Khan. Graduates from these institutions have found responsible positions in the food industry, research and teaching institutes. The courses and facilities available for training these graduates in terms of qualified staff, laboratory and pilot plant facilities are far from satisfactory. The industry is often reluctant to accept these graduates for lack of proper training. There is a need for these universities and colleges to train students specifically tailored to the needs of the industry. Fortunately a mechanism now exists for solving this problem to some extent. There is now a Curriculum Committee at the University Grants Commission level to make critical evaluation of various courses offered at the university level and to determine their relevance and suggest remedial measures. I would urge the representatives of various universities and colleges to utilize this unique opportunity for making the courses offered in their institutions practical oriented suited to the needs of the food industries. My request to the universities and colleges offering postgraduate degrees where research is a part of the requirement to base their research on existing and emerging problems of the food industries. Again, it will be in the interest of the fellow industrialists to support meaningful research. The R&D organizations such as PCSIR have made a remarkable progress in helping solve the problems of food industries, yet there is an ample room for further improvement.

The second important issue to my mind is that technologies at work in various food industries or for that matter the technologies evolved, beside being economically feasible, must now also be environmentally appropriate. Due to modern communication links the world is turning into a global village and the society at large is becoming conscious of environmental hazards, pollution and adulteration. The Environmental Protection Agency is now much more active. I believe that some laws, if appropriately applied, will render some food industries uneconomical. It is, therefore, a challenge and an opportunity for all of you fellow scientists and industrialists to prove your worth by coming up with new technologies that are environmentally friendly.

With these words I conclude my address and I welcome you all to Lahore and wish you a happy stay here.

INAUGURAL ADDRESS

Dr. Ehsan Ali

Director General, PCSIR Laboratories Complex, Lahore.

Asslam-o-Alaikum,

It is a great privilege for me to address such a big gathering of country's food scientists and technologists working in research, universities and industry. Food is a basic necessity of life all over the world. But we still lag behind in meeting the target of this basic requirement for our people. This lag can be due to the short falls in production, mishandling of harvested foods, inefficiencies or deficiencies in the distribution systems or inadequacies in storage and processing. Whatever be the cause, Pakistan is an agricultural country and dominantly with an agrarian culture and society, has no excuse to be insufficient in food for its people. It is said that necessity is the mother of invention and why this motherly attitude has not occurred in Pakistan in the food sector is a big question.

The agriculture sector (including food) is the most vital sector of the country's economy. Over the years, the structural changes and adjustments have brought down its share of GDP to 24 per cent from 53 per cent between 1949 and 1994. However, it is still the leading sector followed by 18 per cent of the industrial sector in our GDP. Despite its vitality, the agriculture sector has glaring failures. We have not been able to achieve autarky in food supplies and according to a reliable estimate the country will have to import about 2.5 million tons of wheat. We have started importing even chillies, tomatoes, potatoes, lentils and lately even dal mash, etc. Already, the import of milk powder, edible oil and tea is taking a sizeable chunk of our foreign earnings. The bitter consequences of this negligence is that the 50 per cent of our labour force attached with the agriculture economy, are characterized by poverty, malnutrition, rural indebtness, backwardness, low literacy rate, poor medical facilities, inadequate potable water and acute shortage of electricity and roads.

Malnutrition is one of the many maladies of underdeveloped world. According to UN figures, 786 million people of the developing countries are suffering from general malnutrition. About 370 million women (15-49 years) are anaemic because of deficiency of iron in their diet. In Pakistan, percentage of such women is estimated at 40 per cent. Two main reasons for this high figure are repeated pregnancies and taboos against eating beef. Beef is one of the richest source of assimilable iron and its price is also within the reach of a large segment of vulnerable population. But a poor family, because of prejudice, will rather go meatless than eat beef. Deficiency of iodine and vitamin A are also important and afflict a sizeable portion of our poor nation. Iodine deficiency elimination has been given serious consideration and a countrywide campaign for fortification of table salt is going with the active support of FAO. FAO is carrying out about a dozen programmes to eliminate micronutrient deficiencies in many parts of the world, main beneficiaries being China, India, Ethiopia, Guatemala and Kazkhistan.

I do not wish to pre-empt, what is to be discussed in details during the technical session to follow. Therefore, I leave it to the experts on food and nutrition to bring out in detail methodologies which can be adopted to enhance food availability, preservation, storage and keeping quality. Our people mainly consume home made foods. It is very important, therefore, that the knowledge about hygiene, safety, processing of food and complimentary role of various foods may be investigated and disseminated properly and widely.

Food received for processing is full of bacteria and residual pesticides. No system exists in the country to standardize or control this menace. I do hope that the recommendations that are likely to emerge from the technical session, will be given due consideration at appropriate policy making levels. Their implementation will be the only yardstick to measure the success and purposefulness of holding the present meeting.

Having entrusted the job of pointing out the factors that affect food and nutrition sectors and their remedial measures to the safe hands of technical experts, it is hoped that support from the concerned Government agencies will be enlisted in their implementation.

Please, allow me a few more minutes to speak about PCSIR Laboratories, its strong points and the problems that confront us in our research and development efforts. The Lahore Laboratories of PCSIR

comprise Biotechnology and Food Research, to which quite a number of participants here belong to and the Research Centers of Applied Chemistry, Mineral and Metallurgy, Glass and Ceramics and Applied Physics and Computer. In addition, there are fully functional Research Industrialization Division, General Service Division and Environmental Pollution and Control Research Section. These Centers, Divisions and the Sections are pursuing research and development projects on conventional as well as high-tech areas. By way of developing hundreds of few processes and technologies, the laboratories have been rendering assistance to the national industrial base, both in the public and the private sectors. These sectors have been further benefitting from the expertise available in the PCSIR, through advisory and analytical services. PCSIR has also made contribution to the education towards Masters and the Doctorate Degrees in different universities. To maintain and improve these nation building activities, we pay special attention to the needs, expertise level and the research and development facilities all of which must commensurate with the continuously advancing frontiers of science and technology.

Ladies & Gentlemen! You must be aware of a recent move by the Government to restructure PCSIR to run it on a business plan. Let us not be taken away by the catchy words of the West, IMF or World Bank which do not fit our socioeconomic fabric. We must bring changes gradually with continuous monitoring and evaluation of their rampant implications on our whole science and technology system. In this way, we can avoid pitfalls and arrest our follies there and then.

These are just pointers towards the problems we anticipate in the future so that you as devoted national scientist in the discipline of food science can thoroughly look into them and come up with solutions and alternatives. With this, I thank Pakistan Society of Food Scientists and Technologists to ask me to chair the function as a Chief Guest and wish you all success in the deliberation today.

N E W S

M/s Techworth appointed as Sole Representatives for Royal Society of Chemistry

Royal Society of Chemistry (UK) has appointed M/s Techworth Impex International (Regd) as their Sole Representatives in Pakistan for the sale of their publications. Any books, journals, computer-based products and teaching aids published by the Royal Society Of Chemistry can be made available through M/s Techworth at the following address:

M/s Techworth Impex Interational (Regd)
Plot # 33, Street # 10, I-9,
Industrial Area, Islamabad.
Phone: ()51) 440756 Fax: (051) 427618

Ph.D. degrees Awarded

Mrs. Shaista Jabeen, Senior Scientific Officer, Biotechnology & Food Research Centre, PCSIR Laboratories Complex, Lahore has been awarded Ph.D. degree in the subject of Chemistry by University of the Punjab, Lahore after the approval of her thesis entitled "Effect of organic and inorganic nutrients and hormones on growth and development of tissue explants from local Pistachio cultivars cultured *in vitro*". She completed her research work under the supervision of Dr. Muhammad Zafar Iqbal, Director, Institute of Chemistry and Late Dr. F.H. Shah, Ex Director General, PCSIR Laboratories Complex, Lahore.

Mr. A.D. Khan, Senior Scientific Officer, Biotechnology & Food Research Centre, PCSIR Laboratories Complex, Lahore has been awarded Ph.D. degree from the Department of Animal Nutrition, University of Agriculture, Faisalabad. The title of his research was "Nutritional evaluation of berseem (*Trifolium alexanrium*) protein concentrate and residue". Dr. Khan is working in the Food Quality Control Section, Presently, he is evaluating poultry feedstuffs of Pakistan for their digestibility, digestible amino acids and metabolisable energy. This project is being funded by American Soybean Association.

Mr. Rauf Ahmad, Technical Officer, Biotechnology & Food Research Centre, PCSIR Laboratories Complex, Lahore has also been awarded Ph.D. degree from the Department of Zoology, University of the Punjab, Lahore. The title of his research work was "Studies on the development of biotechnological process for beta-amylase by mutant strain of *Bacillus polymyxa*". The young scientist applied modern techniques for the conversion of agro-industrial wastes into useful products during his research work. He is actively engaged in Pakistan type culture collection (PTCC) for biotechnology, lactic/citric acid fermentation and micrbial evaluation of water, food and related products.

Mrs. Naheed Abdullah, Senior Scientific Officer, Biotechnology & Food Research Centre, PCSIR Laboratories Complex, Lahore has also been awarded Ph.D. degree. The topic of her research studies was "Investigation into the nature of solid state fermentation of lignin and cellulose".

Change of address

Mr. Zahid Iqbal Zia, Quality Control Manager, Danish Feeds (Pvt) Ltd. may now be contacted at a new address:

5-Faisal Street, Ithad Colony,
Multan Road, Lahore.
Tel. (042) 7596900-02
Fax: (042) 7590910

Change of Telephone Numbers

The telephone numbers of M/s Standard Manufacturing Company (Pvt) Ltd have been changed. The new numbers are as follows:

Karachi Office:

Phone:	(021) 4539963-4539964
Fax:	0092-21-4535701
Telex:	21377 CHEMO PK.

Factory:

Phone:	(021) 7970691-3
Fax:	0092-21-7970696

Whereas Lahore Office's Telephone, Fax and Telex Numbers remain unchanged.

REPORT OF THE LAHORE CHAPTER

Mr. Hamid Ahmad
Chairman, PSFST, Lahore Chapter.

Mr. President, Members and Ladies & Gentlemen!

Asslam-o-Alaikum,

The 6th Annual General Meeting and the technical session today has been a great success in terms of participation, papers presented and various exhibitions arranged on the occasion. I am sure we will all agree that starting from our First Annual General Meeting at Faisalabad in 1990, there has been a gradual all round improvement in the activities of PSFST over the years. Similarly, Inshallah it was and it will be our motto (I mean the Executive Committee of the Lahore Chapter) to enhance quality as well as quantity in our future deliberations. As a Local Chapter, Lahore has the largest number of members and it warrants and deserves more active and broad based arrangements.

Now coming to the actual report, the Chapter was born on January 24, 1995 through a general meeting of the local members in which elections were held for the Executive Committee. Soon after its formations, the Chapter availed of the opportunity of the visit of world-known German scientist, Dr. Lothar Leistner to Pakistan in February, 1995 who had come for a conference at Karachi. Professor Leistner spoke on concept of Hurdle Technology in Food Preservation and a worldwide review of intermediate moisture meats. His lectures spread over three hours were very much appreciated by the participants from the industry, research and academic institutions.

At the end of June, a big seminar on `Fortification of Foods' was organized by the Chapter, with leading cooperation from the `Dawn' Fortified Bread. UNICEF, PCSIR and industry fully participated in this well-attended seminar. There was a rousing debate on the fortification of salt with iodine, widely propagated by the UNICEF. As a consequence, it is now understood that the UNICEF has acknowledged the consultation of Pakistan Society of Food Scientists and Technologists in their future programmes in Pakistan in the areas of food and fortification of foods. Dr. Sabir Ali, Country Representative of the Malaysian Palm Oil Promotion Council and its Director, Dr. Ahmad Ibrahim of Malaysia, also participated in the seminar.

The third activity of the running year 1995, was arranged on September 28, with a General Meeting and Lectures Programme. The main topic in these lectures was pollution aspects of the food industry and plastics as food pollutants. Two well-known experts in the area made extensive deliberations on the subject. As Vice Chairman, Lahore Chapter, Mr. Assadullah H. Bhatti of Triple-M was also elected against the vacant post, in the General Body Meeting.

I must thank all my colleagues in the Executive Committee who wholeheartedly worked as a team, in organizing our activities. Local industry is our biggest asset, as they always help us to overcome financial aspects. Last but not least, PCSIR Lahore's excellent facilities and support were always available to us through the kind courtesy of Dr. Ehsan Ali, Director General. He has always supported such forums/seminars/ workshops where scientific interaction takes place and cause of research and development is furthered. Our members from Lahore Chapter uplift our spirit to achieve more and more and always spare their valuable time to fetch success for our scientific and technical activities.