

INFLUENCE OF WATER ACTIVITY ON THE STABILITY OF "DHAKKI" DATES

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ABSTRACT

The influence of water activity on the stability of "Dhakki" dates at 40°C is investigated. Sorption isotherm is constructed by relating equilibrium moisture content with water activity in the range of 0.12 to 0.97 a_w . The stability of the dates is evaluated by follow-up changes in moisture content, NEB, pH, titratable acidity and soluble solid content. The samples were also checked up for slime appearance. Samples stored at higher water activities beyond 0.75 a_w deteriorate rapidly by slime formation altering appearance. Samples stored at 0.97 a_w were no longer edible after 6 days. Slime formation did not appear in samples held at 0.75 or below a_w during storage for 35 days. Samples kept at water activity as low as 0.58 a_w retained characteristic date colour and flavour minimizing unacceptable changes. In order to maintain desired quality characteristics the fruit may be stored at around its own water activity of 0.62 a_w which would come-up the most promising one for the extended storage.

Key words: water activity; storage stability; dates fruit; Pakistan.

INTRODUCTION

Date palm (*Phoenix dactylifera* L.) has played an important role in the history of mankind ever since the birth of our planet. The importance given to this tree in Holy Quran is justified as it is the chief source of food and shelter for millions through out the world and living in deserts of the East in particular. Dates being sweet and palatable are consumed as a staple diet by people of many date producing countries. It is easily digestible, is a rich source of a number of valuable carbohydrates supplying 2500-3000 Kcal/kg of physiological energy, provides important minerals and vitamins, and is known to promote blood formation.

Pakistan is considered the fifth largest date producing country in the world. Total cultivated area of all types of dates in Pakistan exceeds 41.9 thousand hectares with its estimated annual production over 284 thousand tons, constituting about 10% of the total world production. Cultivation in N.W.F.P is over 900 hectares with 5800 tons production, which is mainly confined to Dera Ismail Khan District with 393 hectares contributing more than 50% of the total province share. A locally developed date variety known as "Dhakki" (for being originated from the village Dhakki, Dera Ismail Khan) is the most promising one and is grown on large scale. The Dhakki dates is quite popular for its large size (4-5 cm

long, 2-3 cm thick) and extra weight (over 16 g/fruit), with fine texture and delicious taste. It fetches a considerably high price in the market with ever increasing demand. It is, however, susceptible to rain damage.

During peak production period a large quantity of the fruit exceeding needs for the local consumption, is left over in the suburban areas. As a result, the local market is glutted and a large amount of the surplus produce is wasted. Such losses cannot be significantly reduced due to having little transportation and storage facilities in the areas and lack of preservation technology. Sun drying is one of the oldest methods of preservation which is still in practice for its ease. However, quality and shelf life of the product is poor. A stock of literature relating water activity to food stability is available, but it mostly deals with individual components of various food items (Rockland & Beuchat, 1987). Thus it is hard to extrapolate such results to Dhakki dates.

In order to characterize drying phenomena of the fruit remaining stable on subsequent storage, it primarily requires to find out moisture sorption attributes of the ripe fruit. Such information gathered is expected to be useful in devising a novel technique for production of

quality Dhakki dates with extended storage life and to make it available at an economical rate. This would strengthen economy of the growers beside providing them incentive for further plantation of the date palm in this region.

MATERIAL AND METHODS

Sample preparation

Dahkki dates were purchased from the local market. Mature ripe fruit of good appearance was taken while unwanted discarded. The dates were subjected to sulphite treatment in order to improve appearance and retain flavour of the dates. The material was taken in a wire-mesh basket and dipped in 0.5% potassium metabisulphite solution (1 kg/L) at 70°C for one minute. The treated dates were allowed to drain and taken on to a stainless steel tray with single loading of 6 kg/m². The samples were placed for drying in a Pak-made thermostatically controlled cabinet dehydrator equipped with hot air overflow system. The drying continued for 10 hr at 40°C. Semi-dried date samples with about 24% moisture content were taken at random, seed removed and the pulp was macerated using mortar and pestle to yield a uniform mash.

Moisture sorption adjustment

Mashed date samples were subjected to equilibration at 40°C with water activity levels to give 0.12 to 0.97 a_w range (Table 1).

Table 1. Saturated salt solutions to give required water activity at 40°C

Salt	Formula	a_w
Lithium chloride	(LiCl.H ₂ O)	0.12
Potassium acetate	(K ₂ H ₃ O ₂)	0.23
Magnesium chloride	(MgCl ₂ .6H ₂ O)	0.33
Potassium carbonate	(K ₂ CO ₃)	0.44
Magnesium nitrate	[Mg(NO ₃) ₃ .6H ₃ O]	0.52
Sodium bromide	(NaBr)	0.58
Sodium chloride	(NaCl)	0.75
Potassium chloride	(KCl)	0.85
Potassium chromate	(K ₂ CrO ₄)	0.88
Potassium nitrate	(KNO ₃)	0.94
Potassium sulphate	(K ₂ SO ₄)	0.97

(Acott *et al.*, 1976; Troller & Christian, 1978).

A 20 g sample was kept inside a desiccator containing saturated salt solution of required water activity. During equilibration, the solutions were maintained saturated by adding respective dry salt or

distilled water as need arose. The sample was weighed twice daily until attainment of a constant weight which took 5 days. Equilibrium moisture content of samples at each water activity was then determined. Sorption isotherm was constructed by plotting equilibrium moisture content (EMC) against water activity (ERH% divided by 100). Whereas water activity of the dates was calculated by MSTATC package using regression equation and constructed by Harvard Graphics software package on plotting weight gain/loss (%) for each sample against respective water activity. The water activity at the point of intersection with no change in weight was calculated to give water activity of the sample (Spiess & Wolf, 1987).

Storage studies

Date pulp homogenate (150 g) conditioned over saturated salt solutions corresponding to 0.44, 0.52, 0.58 and 0.75 a_w levels taken inside airtight desiccators were stored in an oven set at 40°C for 35 days. A representative portion from each sample was taken out weekly and analyzed for non-enzymic browning, pH, titratable acidity and total soluble solids. Moisture content was measured by method of AOAC (1984), and expressed as percentage weight loss on dry basis. Non-enzymic browning (NEB) was measured on the clarified extract by taking absorbance at 420 nm (Waqar *et al.*, 1996). A 2% mash extract was employed for pH and total soluble solids determination. Total soluble solids were estimated by refractometer, whereas pH was measured potentiometrically using digital pH meter model 3010, Jenway (England), equipped with temperature control probe. Total acidity expressed as citric acid was assessed by titration with alkaline solution. A set of duplicate samples was taken for each analysis and the mean value with less than 5% variation is reported.

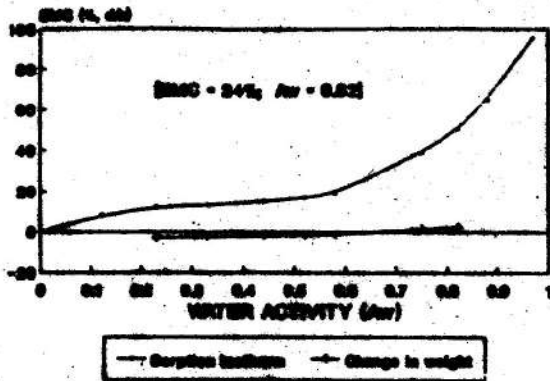
RESULTS AND DISCUSSION

Moisture sorption studies

The date samples stored at water activity of 0.58 a_w or below started losing weight until attainment of equilibrium, whereas gain in weight was observed in samples kept at water activity above 0.58 a_w . The loss or gain in weight was rapid during initial equilibration periods which leveled off after 5 days of equilibration. The EMC varied from 10.6% to 95.4% with increase in water activity level from 0.12 to 0.97 a_w respectively. A plot between EMC (%) and corresponding water activity values represents moisture sorption isotherms (Fig. 1). The figure depicts a typical sorption isotherm which is not distinctly segmented, as normally reported in

theoretical representations. Heiss (1968) and Wolf *et al.* (1973) also reported a number of isotherms of similar shape which mostly relate to fruits. Such type of isotherm is exhibited by fairly hygroscopic foods with an overlap of moisture layers from one sorption region to another. First segment of the isotherm extends to 0.25 a_w with relatively high rate of water uptake per unit change in water activity. The 2nd portion is larger in size approaching up to about 0.6 a_w and appears to be flat in shape. The last portion is enlarged one with the highest slope for water uptake. The isotherm depicts how the water activity interacts with food components and to its moisture, and allows to predict stability of the dates during storage at various water activity levels.

Fig 1. Sorption isotherm and water activity (A_w) of dates at 40°C.



Water activity of the sample at zero weight change, calculated from the point of intersection from the plot between water activity and loss or gain in weight (%), was found to be 0.62 a_w and considered as the water activity of the dates. The equilibrium moisture content corresponding to 0.62 a_w was found 24 %. This water activity is within the reported range for dehydrated semi-moist fruits (Davies *et al.*, 1976).

Storage studies

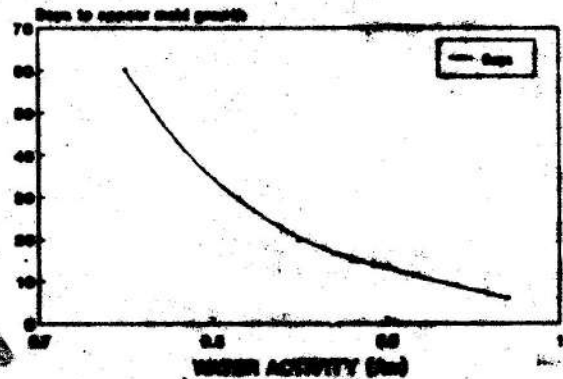
On the basis of preliminary studies only four water activity levels of 0.44, 0.52, 0.58 and 0.75 a_w were selected to further examine the effect of storage on the stability of the dates. The chosen limit of water activity covers the range of semi-dried and moist foods, and which also possibly extends to the sorption segment for multiple vapour layers intending for storage of foods at upper moisture levels. Further, a temperature of 40°C was selected for storage studies as it is the most prevalent summer temperature in this region and corresponds with the season for accelerated production

of the dates and its deterioration, and thus information was required under such storage conditions.

Microbial/physiological changes

Slime appearance was observed during the storage in those samples which were maintained at water activity levels beyond 0.75 a_w . The development of the slime became rapid as the level of water activity increased. In samples at water activity close to one, the degeneration even became visible during equilibration prior to storage. A plot of days prior to slime formation against water activity represents mould free storage life of the dates (Fig. 2). The plot gives valuable information predicting mould free shelf life for the date fruit at various water activity levels during storage at 40°C. Safe shelf life of the dates rapidly increased with decrease in water activity. The results indicate that Dhakki dates can be kept much beyond 50 days without showing sign of slime formation provided it is stored at its own safe water activity of 0.62 a_w .

Fig 2. Limiting storage life at water activity (A_w) levels



Since the level of water activity of 0.62 a_w also touches to the segment of sorption isotherm containing capillary moisture range (Fig. 1), it cannot give guarantee however, to the date fruit to remain unspoiled and safe over prolonged storage at 40°C. Deterioration of dates may occur by the osmophilic yeasts and xerophilic moulds at as low water activity as 0.62 a_w and even cause chemical degradation (Brockmann, 1973).

Chemical stability

The water activities above 0.75 a_w and below 0.44 a_w were not included for further storage studies. The reason for selecting a particular range of water activity levels was that the dates with water activity above 0.75 a_w encouraged slime formation and perished within few

days, whereas the dates below 0.44 a_w attained hard texture becoming less acceptable. Taking this into account only four water activity levels of 0.44, 0.52, 0.58 and 0.75 a_w covering intermediate moisture range were included for further study. This range also covers 0.62 a_w which is the estimated water activity of the Dhakki dates. The product was analyzed weekly for non-enzymic browning, pH, total acidity and total soluble solids.

Non-enzymic browning (NEB)

NEB in all the samples remained on the increase during storage. However, the extent of change varied with water activity levels employed (Fig. 3). Prior to storage the absorbance was 0.046, 0.046, 0.047 and 0.050 units with 0.44, 0.52, 0.58 and 0.75 a_w which increased to 0.050, 0.053, 0.054 and 0.058 units after 35 days of storage respectively. It is indicated that the colour of the samples stored over lower water activity levels was relatively less intense as compared to those kept over higher water activity levels. In order to compare precisely the effectiveness of various water activity levels the average rate of NEB development was computed. The rate was calculated by dividing overall increase in absorbance units by the period of storage (Table 2). The average NEB increase was greatest (2.3×10^{-4}) per day at 0.75 a_w and was twice as much as with sample at 0.44 a_w . Loncin *et al.* (1968) reported that non-enzymic browning strongly depended on water activity and reached a maximum rate at 0.6-0.7 a_w when milk powder was kept at 40°C for 10 days. Labuza *et al.* (1970) also had shown that browning reactions attained a maximum rate at high humidity level. The present findings are consistent with those reported above.

Fig 3. Effect of A_w on NED of dates during storage at 40°C.

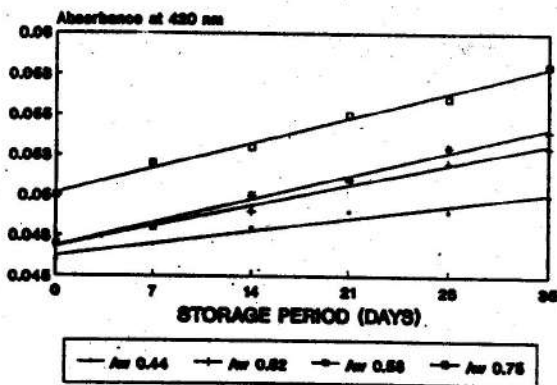


Table 2. Effect of water activity on the rate of overall change in NEB, pH, titratable acidity and total soluble solids of equilibrated date samples during storage at 40°C

A_w	Increase in NEB (unit $\times 10^{-4}$)	Decrease in pH (unit $\times 10^{-3}$)	Increase in Total Acidity (unit $\times 10^{-4}$)	Decrease in T.S.S (unit $\times 10^{-3}$)
0.44	1.1	2.6	2.9	2.9
0.52	1.7	3.1	5.5	3.1
0.58	2.0	8.9	17.0	2.9
0.75	2.3	12.3	21.9	7.1

pH and titratable acidity

The pH of the samples prior to storage ranged from 5.92 to 6.20 units, and highest value of 6.20 units was gained by the samples equilibrated at 0.44 and 0.52 a_w , while it was lowest in case of sample at 0.75 a_w . However, a gradual decline in pH was noticed throughout the storage for all the samples but drop in pH was maximum for those stored over highest water activity level (Fig. 4). After critical evaluation it also appears that the average rate of pH fall during storage was higher in samples with higher water activity level. The overall rate of pH drop was 2.6×10^{-3} , 3.1×10^{-3} , 8.9×10^{-3} and 12.3×10^{-3} units/day in samples equilibrated at water activity of 0.44, 0.52, 0.58 and 0.75 respectively (Table 2). Similarly titratable acidity increased gradually in all the samples during storage (Fig. 5). It was in the range of 25.7 to 25.8 $\times 10^{-2}$ prior to storage, which increased giving 26.7 to 33.4 $\times 10^{-2}$ acidity range at the end of storage and the acidity levels corresponded with water activity levels (Table 2). A maximum total acidity was found in samples equilibrated at highest water activity level giving highest rate of acid formation. The rate of acid formation was calculated by dividing total increase in acidity over storage period of 35 days.

The rate of acid formation at 0.44 a_w was about 7.6 times slower as compared to that at 0.75 a_w (Table 2).

Total soluble solids

Prior to storage, the soluble solids were in the range of 1.6 to 1.8%. With increase in storage period the amount of soluble solids declined in all the samples (Fig. 6). After 35 days the soluble solids decreased to 1.7, 1.69, 1.7 and 1.35% in samples with 0.44, 0.52, 0.58 and 0.75 water activity respectively and the soluble solid contents were found lower in samples with higher a_w values. It further appears that average rate of decrease in soluble solid was maximum at highest a_w .

Fig 4. Effect of A_w on pH of dates during storage at 40°C.

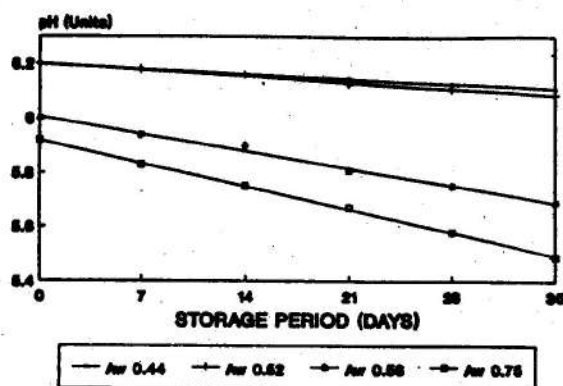


Fig 5. Effect of A_w on titratable acidity of dates during storage at 40°C.

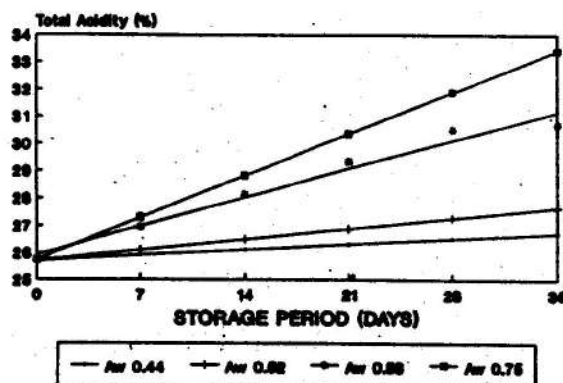
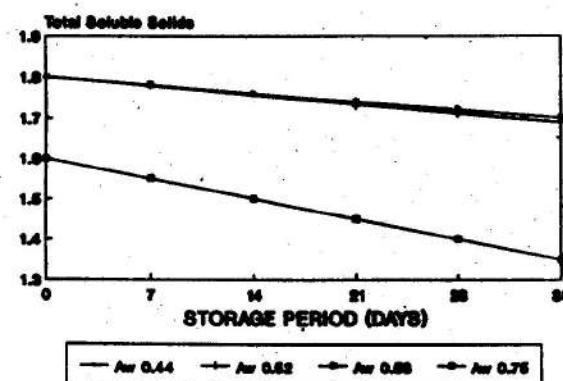


Fig 6. Effect of A_w on total soluble solids of dates during storage at 40°C.



Non-enzymic browning, pH changes, acid formation and total soluble solids appear to be the function of water activity of the samples and apparently inter-related. The samples which received increased NEB formation had also greater overall pH drop and high acidity index. Saeed (1971) also observed a gradual decrease in the pH, with concurrent increase in titratable acidity of spray-dried lemon juice powder during storage. Hodge (1953) reviewed that browning production results into formation of organic acids simultaneously. At high water content the browning is caused mainly by caramelisation, whereas at low water levels Maillard reactions predominate. In the present study, samples which were more brown also had greater amount of acidity and lower pH values. Since water activity was maintained at moisture levels close to intermediate limits, it is expected to encourage browning and other deteriorative changes which proceeded possibly through following both the mechanisms of non-enzymic browning. Since the date deteriorates chemically and encourages microbial activity by keeping at higher water activity levels, whereas its texture hardens at lower levels, it may thus preferably be stored at its own water activity of 0.62 a_w . This water activity level is considered the most promising one ensuring high quality dates with extended storage periods.

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CORRELATION OF WHEAT PROTEINS POLYPEPTIDES AND RHEOLOGICAL CHARACTERISTICS OF FLOUR

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ABSTRACT

Wheat protein profiles were determined by SDS-PAGE electrophoresis on gradient gels and quantified by scanning densitometry. Relationships between proteins and rheological properties were determined with partial least square regression (PLS2). The results revealed that tolerance index appeared to correlate positively with polypeptide 9 (gliadin) and negatively with 7 (glutenin). Dough stability and resistance to extension were positively correlated with polypeptides 5 and 7 and the latter had a negative relation with 9. Polypeptides 12 and 10 corresponding to gliadin correlated positively with dough extensibility. This suggests that polypeptides 5, 7 and 9 contribute strength, while polypeptides 12 and 10 impart weakness to the flours.

INTRODUCTION

Protein quantity and quality are important parameters in assessing the behaviour of wheat flour for its end use. When gluten proteins are separated by sodium dodecyl sulphate-polyacrylamide gel electrophoresis (SDS-PAGE), the glutenin polymers separated into about 20 different subunits that fall into two distinct groups: high molecular weight (HMW) and low molecular weight (LMW) subunits (Huebner and Wall, 1976). The modification in the total amount of the glutenin (Schofield and Booth, 1983), difference in the ratio between the HMW and the LMW subunits (Huebner and Bietz, 1985) and the quantities of groups of subunits (Sutton *et al.*, 1989) in the glutenin fraction have been related to the bread making quality.

Shewry *et al.* (1992) Wrigley (1993) and Wrigley (1994) have stated the relevance of balance between the aggregating chains of glutenin and the monomeric gliadin polypeptides in respect to rheological characteristics of flour which varied in varieties.

Efforts have been made to establish relationships between rheological properties of flour and HMW glutenin subunits (Manley *et al.*, 1992; Gupta *et al.*, 1992). More studies are needed to determine the influence of polypeptides on rheological properties of doughs. The objective of this study was to determine the influence of polypeptides on the rheological characteristics related to flour quality.

MATERIALS AND METHODS

Eight British wheat varieties namely Torfrida, Pastiche, Mercia, Fresco, Avalon, Hereward, Riband, Galahad and one commercial chapati flour were used in this study. Six varieties related to strong and two to poor rheological properties and chapati flour of good chapati making quality. The varieties were obtained from Plant Breeding International, Cambridge and chapati flour was obtained from Finedon Mills Ltd, Wellingborough.

Wheat samples were milled on a Quadrumat Junior (Mod-NR279002) Laboratory Mill. Bran and shorts were pulverised through a Cyclotec 1093 Sample Mill equipped with 1 mm sieve and mixed into white flour to prepare wholemeal flour. Flour was stored at ambient temperature in airtight containers. The protein contents of the flours and protein extracts were determined as N X 5.7 and N X 5.83, respectively after Kjeldahl digestion using Kjeltac system. The protein contents of the samples used in the experiment ranged from 11.11 to 14.81 % (dry-matter basis). Extracts were prepared according to the method given by Rehman *et al.* (1997).

SDS-PAGE

SDS-PAGE was done on vertical electrophoresis unit (Pharmacia G-2/4 LS) and the procedure was that of Payne and Cortfield (1979) with certain modifications (Rehman *et al.*, 1997). Staining and densitometric analysis was done according to procedure mentioned in previous studies (Rehman *et al.*, 1997).

Flour quality analysis

For determining the strength of flours Farinograph and Extensograph were used (AACC, 1983). Rheological properties including dough development (DD), dough stability (DS), tolerance index (TI), Resistance to extension (RES) and extensibility (EXT) of flour were determined.

Statistical analysis

Associations of rheological properties with various polypeptides were determined using Partial Least Square Regression: PLS2 (Unscrambler, 1990). The relationships between data sets were analysed by Partial Least Squares regression.

RESULTS AND DISCUSSION

Molecular pattern of proteins

Molecular weights (MW) of storage protein patterns of British cultivars Torfrida, Pastiche, Mercia, Fresco, Avalon, Hereward, Riband, Galahad and commercial chapati flour Mehrani wholemeal flour were determined using primary standard reference. Similar volumes of protein extract were loaded for each sample to the gel. Thus differences in the intensity of bands between samples reflects differences in protein contents. Typical densitometric scans of the electrophoretic pattern of each variety are shown in Fig. 1-5.

The patterns were divided into five groups of bands, A1-A5. Assignment of relative molecular weight ranges corresponding to each area was made on the basis of previous studies (Fullington *et al.*, 1987; MacRitchie *et al.*, 1991; Rehman *et al.*, 1997). The high molecular weight (HMW) glutenin subunits are clearly differentiated into group A1, $\cdot 80 \times 10^3$ (80 KD), A2 group mainly to ω -gliadin, 80 - 51 KD, A3 mainly to low-molecular-weight (LMW) glutenin subunits ranges from 50 - 41 KD (Tao and Kasarda, 1989). Certain higher molecular weight gliadins have mobilities in the A3 range (Kasarda *et al.*, 1987). Group A4 corresponded mainly the α - and β -gliadins but certain LMW appear in A4 (Tao and Kasarda, 1989). They range from 40 - 28 KD. Area A5 corresponded to LMW albumins and globulins, μ 28 KD.

A two dimensional loadings plot was generated to elucidate relationships between polypeptides and rheological parameters (Fig. 6). Variables situated far from the origin are correlated. If present on either side of origin, they are considered as negatively correlated.

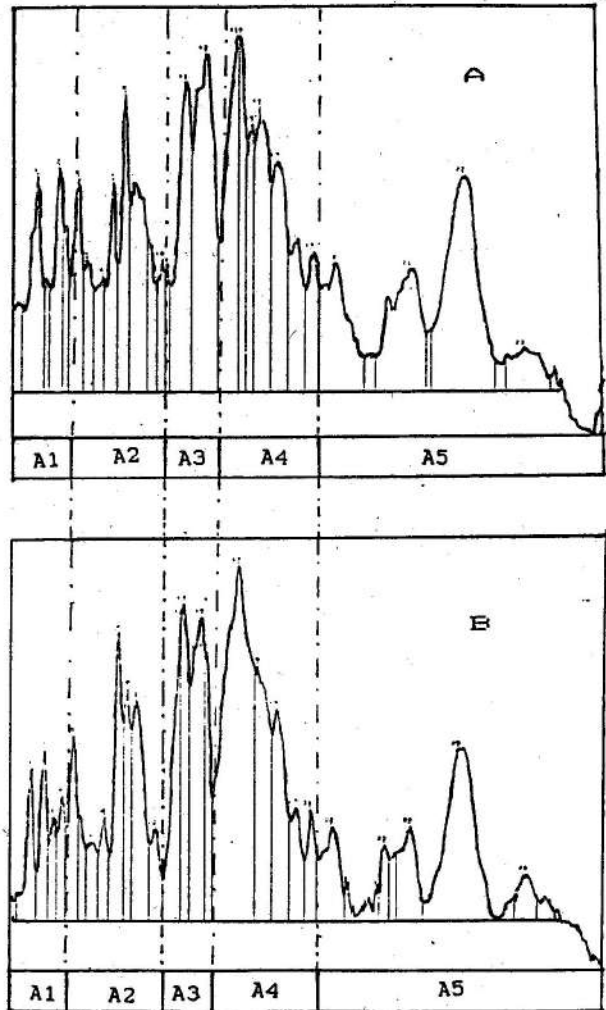


Fig. 1: Densitometric scans of SDS-PAGE gel electrophoresis pattern of wheat varieties A. Torfrida; B. Pastiche.

Correlation between rheological tests and different bands of storage proteins

After separation and quantification of storage proteins of 8 wheat cultivars and a commercial chapati flour, relationships between polypeptides and rheological data, DD, DS, TI, RES and EXT were determined. It is evident from Fig. 6 that not all the bands were positively correlated with each parameter. Moreover, certain had opposite physical influences. This related to the balance between extensibility and resistance to extensibility ($r = -0.59$). TI and RES were also inversely related ($r = 0.54$). Although, polypeptide band 12 showed two significant correlations but with different signs, the correlation between polypeptide B12 and TI was negative ($r = -0.66^*$, $P < 0.05$) and that with resistance to

extension was positive ($r = 0.067^*$, $P < 0.05$). Therefore, it appeared that content of this polypeptide was related to strength as increase in resistance to extension and decrease in tolerance index are indicative of dough strength.

found to correlate positively with polypeptide B5. It appeared from these associations that polypeptides B5, B7 and B9 were positively correlated with flour strength. Polypeptide B10 positively correlated with extensographic extensibility ($r = 0.68^*$, $P < 0.05$).

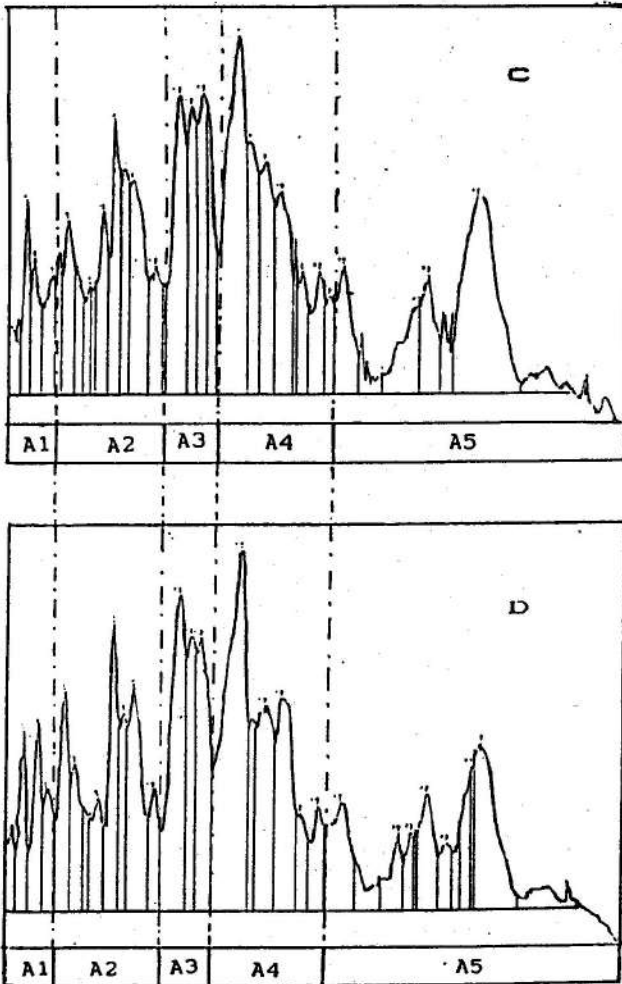


Fig. 2: Densitometric scans of SDS-PAGE gel electrophoresis pattern of wheat varieties C. Mercia; D. Fresco.

Dough development was also correlated significantly ($r = 0.67^*$, $P < 0.05$) with polypeptide B12. Tolerance index was positively correlated with polypeptide B9 and negatively with polypeptide B7 ($r = -0.77^*$). Dough stability had an inverse relationship with TI but highly significant positive correlation with polypeptide B7 ($r = 0.83^{**}$, $P < 0.01$). Resistance to extension was negatively correlated with polypeptide B9 but positively with polypeptide B7. Dough stability was

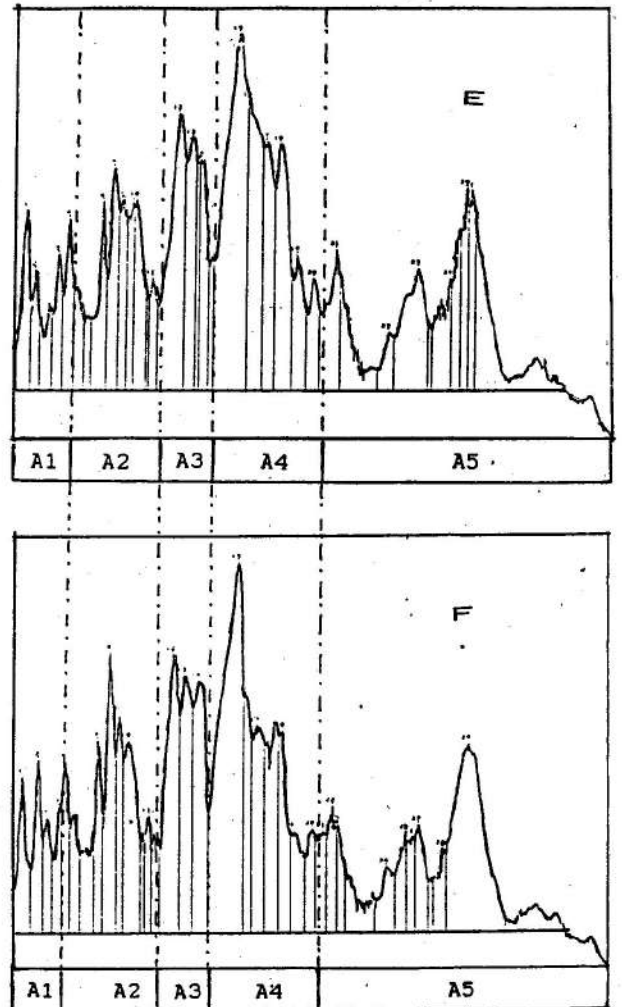


Fig. 3: Densitometric scans of SDS-PAGE gel electrophoresis pattern of wheat varieties E. Avalon; F. Hereward.

Thus, five polypeptides out of 35 observed as bands were clearly correlated with rheological quality parameters. Of these bands 60 % related to w-gliadins polypeptides and 40 % to HMW glutenin. In present studies, polypeptides B9, B10 and B12 corresponded to MW 70, 66.2 and 59 KD of w-gliadin. Correlations between the quantity of certain gliadin components and rheological data would require further study before casual relationships can be established. In particular, it is

known that gliadin has favourable influence upon the dough extensibility (Preston *et al.*, 1975). Finney (1971) reported that extensibility was the major quality characteristic influenced by gliadin content. Extensibility was, as predicted negatively, linked to resistance to extension but to a certain degree, extensibility contributed to the character of the dough strength (Branlard and Dardevet, 1985).

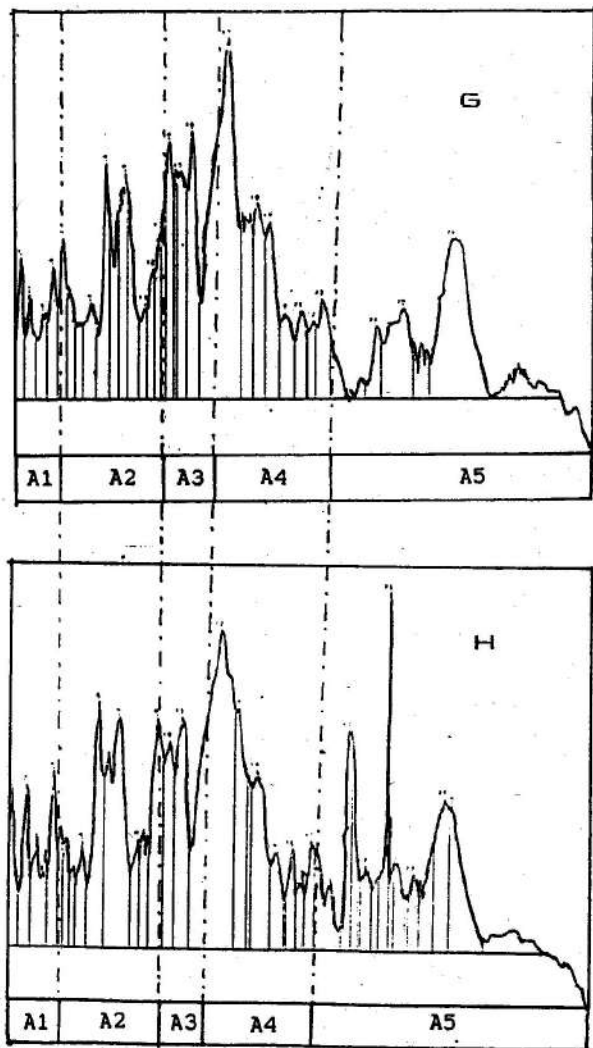


Fig. 4: Densitometric scans of SDS-PAGE gel electrophoresis pattern of wheat varieties G. Riband; H. Galahad.

Comparison of results obtained in this study with those of previous authors is difficult due to use of different electrophoresis methods (Sozinov and Properelya, 1974; Wrigley *et al.*, 1981). Moreover, information on correlations between storage proteins

polypeptides and rheological tests is limited. Comparison of the results obtained here with those of Payne *et al.* (1987) suggests that polypeptide bands 5 and 7 may be related to HMW glutenin subunits 7 and 10 respectively, known to have favourable influence on dough strength. Branlard and Dardevet (1985a) reported that high molecular glutenin subunits 2*, 5, 7, 9, and 10 were related to strength and tenacity of doughs.

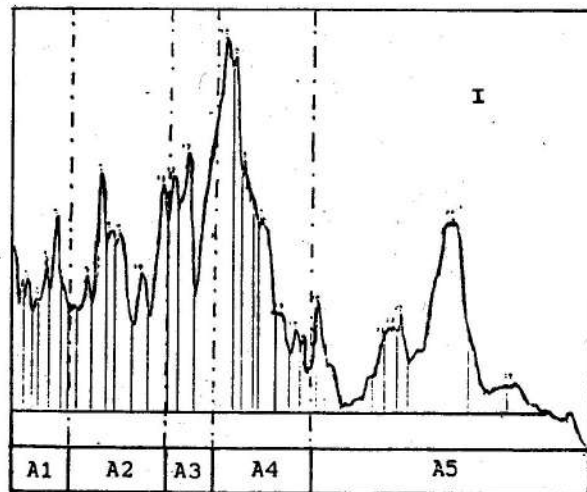


Fig. 5: Densitometric scans of SDS-PAGE gel electrophoresis pattern of wheat varieties I. Mehrani wholemeal chapati flour.

MacRitchie (1989) demonstrated that dough strength may be manipulated by varying the ratio of polymeric to monomeric proteins (i.e. glutenins to gliadin, albumins and globulins). The gliadins contribute to dough extensibility, whereas the glutenins confer strength and elasticity to dough (MacRitchie, 1984). However, Guthrie (1896) has reported that increased gliadin contents produce a weak, sticky and inelastic gluten and flours in which glutenin predominates and yield strong, tough, elastic, non-adhesive gluten.

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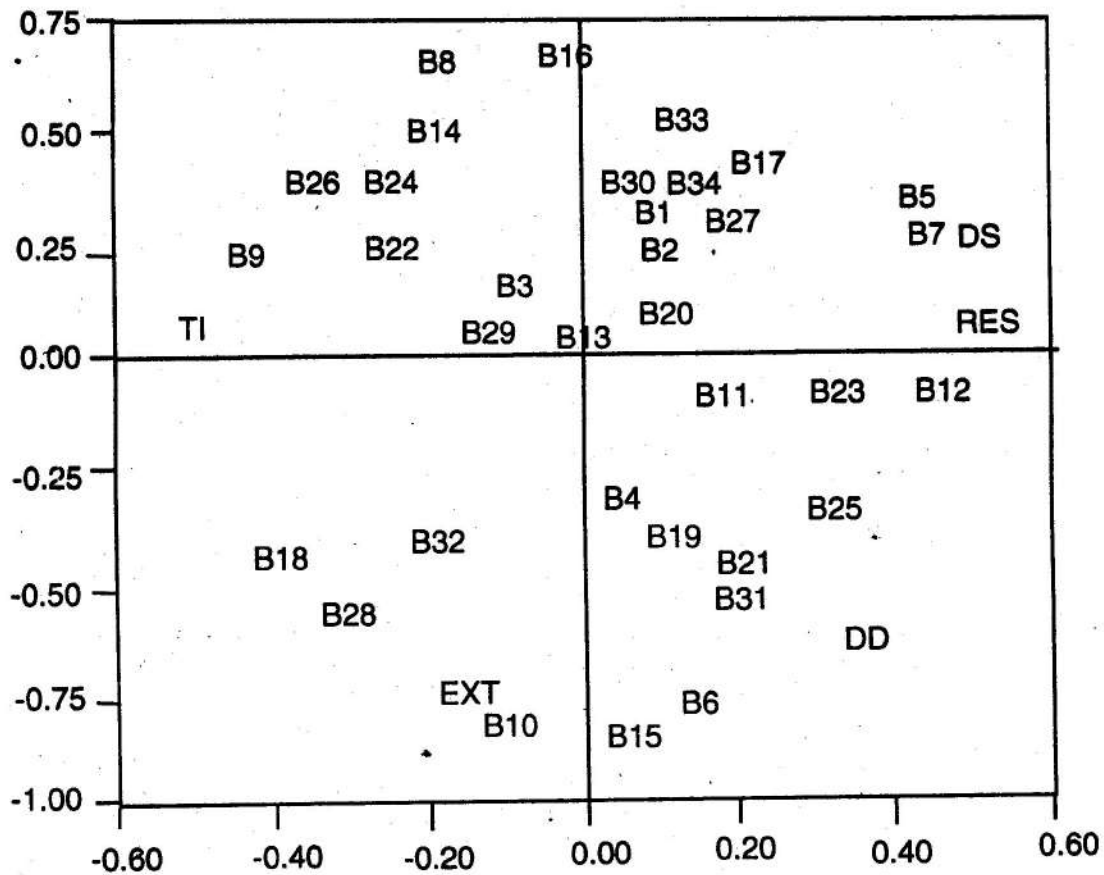


Fig. 6: Two dimensional loadings plot (Factor <1,2> <1,2>) illustrating relationships between Rheological characteristics: Dough development (DD), Dough stability (DS), Tolerance index (TI), Resistance to extension (RES), Extensibility (EXT) and storage protein polypeptides.

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UTILIZATION OF SPROUTED WHEAT FOR THE PRODUCTION OF BREAD

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ABSTRACT

Wheat variety LU-26S was subjected to sprouting for 48 hours at 30°C. Sprouted wheat flour (70% extraction) contained moisture 12.93%, protein 12.17%, fibre 0.93%, ash 0.67%, fat 0.74% and nitrogen free extract 85.49%. This was blended with sound wheat flour in various proportions (5, 10, 15, 20 and 25%). Breads were prepared from the composite flours. The volume, weight and weight to volume ratio of bread loaves prepared from composite flours were found higher than the normal flour bread. Sensory evaluation revealed that breads prepared from composite flours scored significantly higher for external and internal characteristics than control. It was concluded that breads of acceptable quality could be prepared with the addition of 15% sprouted wheat with flour from sound wheat.

Key words: Sprouting, Wheat, Bread, Sensory evaluation, Rheology, Blending.

INTRODUCTION

Sprouting is a major economic constraint in wheat producing areas where precipitation occurs frequently at harvest time. The frequency of sprout damaged wheat grains up to 44 % has been recorded in northern areas of Punjab during 1986-88, while similar damage was observed during harvesting and threshing operations in 1981-82 (Anon, 1988). Germination increases reducing sugars, diastatic activity and damaged starch, while it decreases gluten content, falling number and water absorption (Leclavathi and Haridas Rao, 1988; Kruger and Matsuo, 1982) that adversely affect the quality of bread. There is an improvement in the nutritional quality of the flour as a result of germination. This is reflected by rise in the crude protein, crude fat, thiamine and riboflavin (Linda and Barry, 1976) contents of the flour, with an improvement in the protein quality owing to increase in lysine (Dalby and Tsai, 1976; Hamad and Fields, 1979). Similarly the amount of soluble starch, amylose and amylopectin increases with germination time (Morad and Rubenthaler, 1983).

Major part of sprouted wheat, whenever conditions become favourable, is either wasted or fed to the farm animals. The millers and bakers are reluctant to use this wheat. It is, therefore, essential to find suitable uses of sprouted wheat so as to prevent economic loss to the

farmers. This project was initiated to determine the suitability of using sprouted wheat for the production of bread.

MATERIALS AND METHODS

Wheat variety LU-26S was selected for the purpose of this investigation. It was procured from the Department of Plant Breeding and Genetics, University of Agriculture, Faisalabad. The cleaned wheat was subjected to sprouting by soaking in tap water for 8 hours and allowing to germinate at 30°C for 48 hours at 80% relative humidity. The sprouted wheat was dried in the sun. The sound and sprouted wheat samples were subjected to proximate analysis according to the methods described in AACC (1983).

The sound and sprouted wheat samples were tempered in batches of 3 kg by placing in air-tight bottles and adding calculated amount of water and allowing to rest for 12 hours. They were milled in Quadrumate Senior Experimental Mill to collect high grade flour, low grade flour, shorts and bran. High grade and low grade flours were pooled up and used for the production of bread.

Composite flours were prepared by blending different proportions of sound and sprouted wheats as given in Table 1.

Table 1: Blending of sound and sprouted wheat flours.

Treatment	Sprouted wheat flour (%)	Sound wheat flour (%)
T1	0	100
T2	5	95
T3	10	90
T4	15	85
T5	20	80
T6	25	75

Rheological studies (farinographic and amylographic) were carried according to the methods given in AACC (1983). Baking tests were performed to determine baking behaviour. Dough was prepared by straight dough method (AACC, 1983). Yeast suspension was prepared by dispersing 12g active dry yeast in water and diluting to 100 mL. Salt sugar solution was made by dissolving 4g salt and 20g sugar in water and raising its volume to 100 mL. Following recipe was used:

Flour	100 g
Yeast suspension	25 mL
Salt sugar solution	25 mL
Water	Desirable to make dough of proper consistency as determined with farinograph.

Pan bread was prepared using the normal procedures. Each bread sample was characterized for its volume, weight and weight to volume ratio. Loaf volume was determined by rape-seed displacement method.

Sensory analysis was performed for external and internal characteristics of bread by a panel of 5 judges (Rehman *et al.*, 1988) for storing up to 36 hours. Data were analysed statistically by using the analysis of variance technique and Duncan's Multiple Range Test (Steel and Torrie, 1980).

RESULTS AND DISCUSSION

Proximate composition

The data obtained for proximate analyses of grain and flours is given in Table 2. Sound wheat was found to contain moisture 8.29%, crude protein 12.77%, crude fat 2.18%, crude fibre 2.36%, ash 1.97% and nitrogen free extract 80.72%. These results are within the range as reported earlier by Sajid (1984) and Ahmad (1990).

Protein content of sprouted wheat flour increased appreciably from 11.57% in sound wheat to 12.17% in sprouted wheat. This is attributed to biochemical changes

during sprouting (Leelavathi and Haridas Rao, 1988). Increase in crude fibre and ash contents is similar to the results reported by Ranhotra *et al.* (1977). Crude fat content of sprouted wheat flour decreased slightly which is in close agreement with Lukow *et al.* (1985). Nitrogen free extract also decreased. These results are similar to the findings of Linda and Barry (1976).

Table 2: Proximate composition of wheat and flours

Component	Wheat %	Sound wheat flour %	Sprouted wheat flour %
Moisture	8.29	12.45	12.93
Crude protein (db)	12.77	11.57	12.17
Crude fat (db)	2.18	0.78	0.74
Crude fibre (db)	2.36	0.57	0.93
Total ash (db)	1.97	0.50	0.67
Nitrogen free extract (NFE)	80.72	86.58	85.49

db: dry basis

Rheological Characteristics

The data revealed that water absorption, dough development time, dough stability, resistance of the dough and peak viscosity decreased, while softening increased with an increase in the levels of sprouted wheat flour in the composite flour (Table 3). The gradual decrease in peak viscosity at varying levels of sprouted wheat flours was proportionate to the level of blending. This is indicative of improvement in amylase activity in the composite flours. Leelavathi and Haridas Rao (1988) observed that the diastatic activity increases during germination. The resistance of the dough decreases due to damage in gluten quality (Kulp *et al.*, 1983). Pylar (1973) noted that too high a curve which corresponds to high viscosity of the gelatinized flour suspension gives a crumb in the finished loaf that will dry and stale rapidly. Too low a curve, which results from an excessive α -amylase activity, is normally indicative of moist soggy crumb. The best type of crumb is obtained when the curve is of medium height. Breads prepared under these studies showed optimum curve height (360 to 300 BU) with 10 and 15% sprouted wheat flours.

Baking behaviour

In this study fermentation, proofing and baking conditions were kept constant. In general, it was observed that rate of fermentation was rapid in doughs

blended with sprouted wheat flour than control (T1). Doughs with uniform and smooth surface were observed in case of composite flours. It was noted that the loaf volume was maximum for breads prepared from composite flours (Table 4). Volume and weight to volume ratio of the breads increased with increase in levels of sprouted wheat flour from 455 mL (T1) to 550 mL (T6). Similar observations have been reported by Ranhotra *et al.* (1977).

Sensory Evaluation

Sensory evaluation of the bread samples prepared from sound wheat and composite flours (Table 5) revealed that T4 containing 15% sprouted wheat flour scored highest (84.63%) followed by T3 (77.67%).

Bread prepared from sound wheat scored lowest (46.16%). Similar results were recorded by Leelavathi and Haridas Rao (1988).

The results of analyses of variance revealed that there are significant differences ($P < 0.05$) among storage means and also among treatment means (Table 5). For all the bread characteristics, bread prepared with 15% sprouted wheat flour (T4) scored highest.

Conclusion

From the results it may be concluded that bread containing 15% sprouted wheat flour has larger volume, good crumb, better texture, better taste, aroma and golden brown appearance.

Table 3: Effect of blending sprouted wheat flour on rheological characteristics of flour.

Characteristics	T1	T2	T3	T4	T5	T6
Water absorption (%)	59.0	58.8	58.4	58.2	58.0	57.8
Dough development time (min)	3.5	3.0	3.0	3.0	3.0	2.5
Dough stability (min)	18.5	16.0	11.0	10.5	9.5	6.0
Resistance of the dough (min)	20.0	18.0	13.0	11.5	11.0	7.5
Softening of the dough (BU)	30.0	35.0	60.0	70.0	80.0	100.0
Peak Viscosity (BU)	760.0	540.0	360.0	300.0	120.0	60.0

BU: Brabender Unit min: Minutes

Table 4: Effect of blending on the volume, weight and weight to volume ratio of bread.

Treatment	Volume (mL)	Weight (g)	Weight to volume ratio
T1	455	140.4	1 : 3.24
T2	460	141.4	1 : 3.25
T3	475	139.8	1 : 3.39
T4	500	138.6	1 : 3.60
T5	520	136.8	1 : 3.80
T6	550	139.0	1 : 3.95

Table 5: Analyses of variance showing effect of blending on sensory characteristics of bread.

Characteristics	T1	T2	T3	T4	T5	T6
Volume	4.57f	4.99e	8.36b	9.10a	5.80c	5.40d
Crust colour	3.57e	6.43a	6.34a	5.98b	5.11c	4.12d
Symmetry of form	2.43f	3.26e	3.91b	4.13a	3.71c	3.43d
Evenness of bake	1.12f	1.37e	2.19b	2.43a	1.98c	1.61d
Characteristics of crust	1.50e	1.62e	3.10a	2.54b	2.17c	1.88d
Grain of bread	11.87f	12.18e	13.20b	13.44a	13.00c	12.50d
Crumb colour	4.60f	4.97e	8.52b	9.11a	5.80c	5.45d
Aroma	4.60f	5.00e	8.35b	9.10a	5.80c	5.40d
Taste	6.30f	7.10e	14.00b	17.90a	10.50c	8.00d
Texture	5.60e	5.86e	9.70b	10.90a	7.2c	6.25d

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EFFECT OF DIETARY OILS AND FATS ON DIGESTIBILITY, BLOOD AND HEPATIC CHOLESTEROL CONTENTS IN ALBINO RATS

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ABSTRACT

Biological evaluation of common fats and oils such as corn, soybean and palm oils and vanaspati ghee was carried out using male albino rats as experimental animals. The biological parameters included in this study were feed consumption, weight gain, feed to gain ratio, digestibility and blood/liver cholesterol. The results of 6 weeks experiment under ambient conditions (18-25°C) revealed that maximum blood cholesterol was in the group fed on diet containing vanaspati ghee (192.6 mg dL⁻¹) followed by palm, soybean and corn oil diets. The liver cholesterol values were also higher in the group fed on diet containing vanaspati ghee (0.59 mg g⁻¹) followed by palm, soybean and corn oil diets. Maximum feed consumption was in the diet with added palm oil and minimum in that of soybean oil. The results of weight gain were irregular. As for the digestibility, it was highest in vanaspati ghee (69.3%) followed by soybean, palm and corn oil diets. It was concluded that corn oil was better than other oils and fats in reducing the cholesterol level in albino rats.

Key words: oils; fats; cholesterol; digestibility; albino rats; Pakistan

INTRODUCTION

The role of dietary fats and oils in human nutrition is an important area of concern. The findings of nutritional investigations have wide ranging implications for consumers, healthcare personnel and nutrition educators. The information regarding the nutritional implications of dietary fats and oils can profoundly influence the consumption of various other foods and ultimately, health and physiological conditions of humans (FAO, 1993). It has been reported that saturated fats in the diet can elevate the cholesterol level in blood (Kritchevsky *et al.*, 1976). The consumption of saturated fats in the diet can elevate the cholesterol containing foods has been shown to produce hypercholesterolaemia both in animals and humans (Goldsmith *et al.*, 1978; Renaud, 1974). Further, it is generally believed that elevated serum cholesterol was an important factor in the etiology of atherosclerosis and the blood cholesterol responded to the nature of dietary fat. Some workers have sought suitable animal models for studying these phenomena (Hegsted *et al.*, 1993).

Pakistan is the largest importer of palm oil from Malaysia, which is consumed as such or after hydrogenation in admixture with other liquid oils such as cottonseed oil or sunflower oil. Soybean, corn and sunflower oils are also used as such or in mixture with palm

oil (Khan, 1997). The objective of this study was the nutritional evaluation of some edible oils and fats using rat bioassays.

MATERIALS AND METHODS

Corn oil, soybean oil and vanaspati ghee were obtained from the local market in Peshawar and palm oil from Palm Oil Research Institute of Malaysia, Kuala Lumpur. The experimental diets were prepared by mixing different ingredients along with 20 per cent of each test oil or fat. The composition of the experimental diets is shown in Table 1.

Table 1. Feed composition of experimental diets (%)

Ingredients	Corn oil diet	Soybean oil diet	Palm oil diet	Vanaspati oil diet
Dried milk	15	15	15	15
Wheat flour	28.5	28.5	28.5	28.5
Wheat bran	18.5	18.5	18.5	18.5
Fish meal	15.0	15.0	15.0	15.0
Vitamins	1.5	1.5	1.5	1.5
Corn oil	20.0	-	-	-
Soybean oil	-	20.0	-	-
Palm oil	-	-	20.0	-
Vanaspati ghee	-	-	-	20.0
Molasses	1.0	1.0	1.0	1.0
Salt	0.5	0.5	0.5	0.5

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Table 3. Effect of dietary fats and oils on biological parameters and digestibility in rats

Diets (20%) Oils/Fats	Feed consumption (g)	Weight gain (g)	Feed/Gain ratio	Digestibility (%)
Corn oil	422.70 ± 6.5	30.53 ± 5.30	14.00 ± 0.94	63.00 ± 2.30
Soybean oil	246.80 ± 6.6	18.54 ± 1.91	13.60 ± 1.59	66.90 ± 2.10
Palm oil	485.86 ± 4.8	30.30 ± 6.90	16.58 ± 4.10	64.79 ± 4.30
Vanaspati ghee	391.90 ± 5.3	12.50 ± 0.94	31.30 ± 2.30	69.31 ± 1.01

Conclusion

As a result of these studies, it was concluded that corn oil was better than other oils and fats in reducing the blood and hepatic cholesterol levels in albino rats.

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DETERMINATION OF TIME-INTENSITY CHARACTERISTICS OF ACESULFAME-K AND SUCROSE BY COMBINED SENSORY AND POTENTIOMETRIC TECHNIQUE

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ABSTRACT

Relative temporal characteristics of bulk sweetener sucrose and the intense sweetener acesulfame-K were measured by a potentiometric technique called sensory measuring unit for recording flux (SMURF). Equisweet samples at 5, 10, 20, and 30% concentration of both the sweeteners in simple aqueous system were presented to the trained panelists. Measurements by SMURF revealed a linear relationship between the rise in concentration of the sweeteners and the taste persistence time. Sucrose samples needed more time to reach maximum taste intensity response and at the same time exhibited taste persistence for longer duration as compared to acesulfame-K. The physical retention of the stimulus in oral fluid and the binding of the stimulus with greater or lesser affinity at the receptor site could be the reasons for the differences observed.

Key words: temporal characteristics; time to maximum intensity; persistence time; acesulfame-K; sucrose

INTRODUCTION

Selection of a particular method of taste evaluation depends upon the product and its inherent characteristics, probable market, and exactly what flavour components need investigation. Sucrose contributes sweetness, mouthfeel and flavour to food products. It is sweet in molar range and the intense sweeteners are sweet in millimolar ranges (Tatlock, 1995). Nutra-sweet was the first company to brand aspartame and feature it on the food and drink packaging (Hewitt, 1993). Other intense sweeteners permitted for use in food products under certain conditions of manufacture include saccharine, acesulfame-K, thaumatin and neosperidine. Acesulfame-K is a potassium salt of 6-methyl-1, 2, 3-oxathiazine-4 (3H)-1,2, 2-dioxide marketed under the trade name, Sunette. It has a sweetening power 200 times that of a 3% sucrose solution. High potency sweeteners can be used to develop reduced-calorie food products that cost less (Wiet & Beyts, 1992). All the new intense sweeteners are claimed to ferment less readily than sucrose and hence are less carcinogenic (Dodson & Wright, 1982). Sensory scores for some non-carbonated beverages containing aspartame indicated higher fruit flavour intensity than their counterparts sweetened with sucrose (Baldwin & Korschgen, 1979).

The perception of taste is merely the detection of non-volatile tastants by the tongue (Derovira, 1996). It is

best envisaged as a two-stage process. The first involves localized organized concentrations of stimulus molecules in the micro-environment of the receptor site, and the second invoking the ionophor trigger mechanism at the taste neuron (Munton & Birch, 1985). An important factor in the taste perception is the temporal quality which involves reaction time, climb to maximum intensity and then eventual decline to zero response. Some sweeteners have immediate taste perception which passes off fairly rapidly while others have a slow build up but longer persistence time (Hugill, 1980). According to Moskowitz (1981), the primary emphasis in studies on sensory intensity versus hedonic functions concerns properties relating pleasantness to physical and sensory intensities. Probably, it is the balance of temporal properties and intensity characteristics of sugars which endows them with much desirable time intensity profile. Thus, the structural determinants of both intensity and time effects in sugar molecules could be used as a foundation for predicting the taste of designed structure (Birch, 1981). Taste profile of sweeteners can be measured by line-scaling (Redlinger & Sester, 1987); category scaling (Larson-Powers & Pangborn, 1978); and magnitude estimation (Bartoshuk, 1979). Tracking sensation intensity over time is gaining popularity as a tool for sensory evaluation (Lawless & Clark, 1992). The popularity of sensory tests is due to the ease and speed with which these can be conducted for a specific pur-

pose. This research was designed to obtain more dynamic understanding of the temporal characteristics of sucrose and acesulfame-K at different sweetener concentrations. Data on time-intensity response of trained panelists on tasting the samples was collected by using a sliding scale potentiometer linked to a moving pen on a chart recorder operated by the panelists.

MATERIALS AND METHODS

Pure granulated sucrose manufactured by Tate and Lyle, Croydon, UK and acesulfame-K, made by Hoechst, Frankfurt, Germany, were the sweeteners selected to elicit time-intensity taste responses. A moving chart recording device called sensory measuring unit for recording flux (SMURF) was used to gather information about the time-intensity properties of these sweeteners. SMURF consists of a potentiometer dial box attached to an 8-channel Mingograph-800, set at a speed of 5 mm/second. The instrument has a sliding taste control system. The trained panelists imbibed the samples to be evaluated and moved the sliding control upwards from zero to record the intensity of sweetness perceived with time till maximum sweetness sensation was reached. Once this point is reached, the control is slid back as the perception starts to disappear and eventually zero response is reached. The maximum intensity is indicated by 10 on the SMURF.

In this research, four concentrations i.e., 5, 10, 20, and 30% sucrose (w/v) in simple aqueous system were evaluated. Assuming acesulfame-K to be 200 times sweeter than sucrose, solutions of equisweetness level were prepared for the time-intensity studies. Both the bulk and intense sweeteners were dissolved in distilled water and a quantity of 5 mL packed in plastic cups to be presented to the judges. At the start of each sensory testing session, 10% sucrose solution was provided as the standard for comparison. This concentration was regarded as equivalent to 3 SMURF units. In all, 10 samples of each concentration were assessed, 5 being evaluated at one session. Distilled water was used as a mouth rinse between tasting of the two samples.

RESULTS AND DISCUSSION

This investigation was conducted to measure time-intensity characteristics of acesulfame-K relative to sucrose in a simple aqueous system. The time-intensity pattern observed differed for sucrose and acesulfame-K. The time required for the sweet taste response to reach maximum intensity was less in case of acesulfame-K as compared to sucrose. The sweetness potency for both the sweeteners was concentration dependent. The time

duration needed to perceive maximum taste response became more as the concentrations of the sweeteners were increased (Table 1).

Table 1. Effect of sweetener concentration on time to maximum intensity perception

Sweetener	5%	10%	20%	30%
Sucrose	3.3 sec	6.1 sec	5.8 sec	7.4 sec
Acesulfame-K	2.1 sec	3.7 sec	4.0 sec	6.7 sec

The sensory evaluation method combined with the potentiometric device showed that the taste persistence time differed with the type of sweetener and the concentration used. Sucrose possessed longer persistence time than acesulfame-K at the equisweet levels tested. One similarity observed between the bulk and intense sweeteners was that the taste residence time increased as the concentration of the sweetener was raised. In both the cases, maximum taste persistence times were noted when the panelists were provided samples at 30% sweetness (Table 2).

Table 2. Assessment of relative sweet taste persistence time for sucrose and acesulfame-K

Sweetener	5%	10%	20%	30%
Sucrose	9.5 sec	14.6 sec	23.7 sec	25.1 sec
Acesulfame-K	6.5 sec	10.0 sec	14.2 sec	22.4 sec

Ott *et al.* (1991) compared temporal properties of sweet and bitter components of equisweet concentrations of sucrose, aspartame, and acesulfame-K using a time-intensity procedure. Acesulfame-K was shown to have a more rapid sweetness on-set than sucrose. Physical retention of stimulus in oral fluid or may be more efficient accession and binding of the stimulus at the receptor site were the reasons for the differences in taste profiles observed (Birch *et al.*, 1982). The taste perception could be affected by the difference in rate of flow of saliva due to the chemical nature of sweeteners. Research conducted by Noble and Bursick (1984) suggests that oral receptors might be able to detect relatively small differences in solution viscosity. The differences in molecular structures of sucrose and acesulfame-K and mode of molecular interaction with the receptor sites could be the reasons for the variations noticed in time to maximum intensity and the duration of response persistence of sucrose and acesulfame-K. The information about relationship between the growth in perceived sweetness intensity as a function of concentration can provide practical information about formulation for new food products.

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EXTENSION ARTICLE

FAT USES IN VARIOUS SEGMENTS IN PAKISTAN

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Fats and oils have always played a major role as the energetic food for humans as well as animals. Their consumption pattern, however, has always been variable depending not only on the geographical variations but also on the quantity and types (Khan, 1996). For instance, till very recently, the edible oil of choice for Pakistani society was butter oil (which has now been replaced by vegetable oils/vanaspati), while in the Chinese society, there has always been a preference for the seed oils of vegetable origin. In a normal diet, about 30 per cent of the total calories should be supplied by fat and this dietary fat is usually derived from the consumption of different oils, meats, cereals and dietary products. It is thus obvious that the consumption of these food items will be variable dependent on their source; also the choice will be determined not only by the availability but also by the socioeconomic acceptability of the product. In general, the human society has always consumed fats and oils of both animal and plant origin.

Classification

Fats and oils, irrespective of their plant or animal origin, are classified into solids and liquids which property determines their physical state at room temperature, respectively. Commonly, all fats and oils are triglycerides, fatty acid esters of glycerine and it is generally observed that those with more constituent saturated acids in them are normally solid, while those with more unsaturated fatty acids in their molecules are liquids. There are over 40 different types of fatty acids, making up the triglycerides and they all can be classified into three different and basic types: saturated, mono-unsaturated and polyunsaturated fatty acids (Khosla & Hyes, 1994). Another classification dependent on the chemical composition of the oils and fats is drying ($I.V > 120$), non-drying ($I.V < 100$) or semi-drying ($I.V$ 100-120).

Food uses

Fats/oils are the basic and essential raw materials both for food and industry. As dietary component, oils and fats play an important nutritional role by serving as a concentrated source of energy, acting as a carrier of fat soluble vitamins, imparting flavour and taste to foods,

providing essential fatty acids and fulfilling the requirements for normal functions of the body. One g of oil (fat) usually provides 9 kcal as compared to 4 kcal from either carbohydrates or proteins, the other major food sources.

Traditionally, edible oils are consumed in a clean and unrefined form. Apart from hydrolysis which produces free fatty acids and oxidation that causes rancidity, these oils are unaltered and any material naturally present in them remains in the product. However, processing crude oils to finished products is practised worldwide and is dictated by a number of factors:

- i. consumer preference,
- ii. flavour and stability characteristics, and
- iii. preparation of hardened products from liquid.

Treatments and modifications

Because of these factors, technical developments have come in where crude oils are so treated as to provide oils with modified physical characteristics having bland taste and colourless appearances. Degumming, by water acid treatment, alkali refining, bleaching and deodourization are some of the refining techniques and the refined oils are then further processed and modified by hydrogenation, interesterification and fractionation or blending for different food uses. Fractionation separates an oil into a solid and a liquid fraction, interesterification changes the positions of the constituent fatty acids in the glyceridic molecule, while hydrogenation converts an oil into a semi-solid/solid form. It is thus seen that all these transformations are intended to convert an available oil (fat) into a product of specific utilization. Each of these processes affect the nature of oils and therefore specific utilization of the processed product is pre-determined in selecting the processing parameters.

Vanaspati ghee

In many countries, however, an oil (fat) is utilized in more than one way to produce different dishes. For instance in the Indo-Pak sub-continent, the house-wives have always traditionally used the available cow/buffalo butter as a multi-purpose fat for diverse utilizations inclusive of spreads, frying (deep and shallow) as well as

for dressings of various preparations. It can, therefore, be seen that perhaps only one fat was available and it was considered advisable to utilize it for various purposes. In other words, specific fats for specific uses were not available and indirectly there was not much awareness either. In the present day world, however, specially prepared fats for diverse uses are readily available and the housewives have ample choice to select the appropriate product of special preparations. It is, therefore, not surprising that the market abounds in edible grade oils of different compositions and with different specifications for selective utilization. In Pakistan, however, this trend has not taken hold and the larger cross-section of the population still prefers semi-solid fats as their choice. As a result, therefore, the market is doing good business by selling almost 50 brands of vanaspati made from different vegetable oils with palm oil predominating and conforming to the Pakistan Standard Specifications. The vanaspati ghee manufacturing industry is a flourishing market and has become very big within the past decade or so. At present, there are about 140 such plants in the country out of which 105 are members of the Pakistan Vanaspati Manufacturer's Association (PVMA). The hydrogenation industry operates both in the public as well as the private sector although at present, the later (private sector) is stronger.

Liquid oils

In recent years, an attempt has been made to encourage the sale of refined vegetable oils along with vanaspati so that people have a choice between liquid and solid edible oils (fats). This activity, though limited, was also intended to create awareness amongst masses for selection of different oils for specific utilizations. Further, in order to minimize production cost various agencies including producers, importers, exporters and medical/nutritional experts have been active in suggesting the benefits of liquid oils in comprising to solid fats. As a result, demand for refined oils has been generated and is expected to grow in the coming years. The liquid oils sold in the market are mainly soybean oil, sunflower oil, rapeseed oil, palm olein and/or mixture of these oils. Soybean and palm olein are imported, while the other oils are mainly of local origin. Additionally, locally produced corn oil is also marketed as such and in fact this was the first oil introduced in the Pakistani market for people with heart ailments. It is estimated that about 0.01 million tonnes of these liquid oils, contributed by corn, soybean, sunflower, olein and rapeseed oils in the ratios of 3:1:3:1:2 are retailed in Pakistan.

Commercial food uses

Another survey estimates that the total Pakistani market retails about 23 per cent refined oils and 74 per cent vanaspati for edible purposes. The production of shortenings, margarines and the special deep frying oils for commercial utilization is still not as developed as the vanaspati manufacturing industry. It is, however, expected that with better awareness and more knowledge about the selective applications of specific products derived from oils/fats, the traditional food preparations will undergo such a change as to accommodate modern trends as well. In the meantime, however, vanaspati and liquid oils are the main cooking medium and the estimated consumption trends in various food segments are given in Table 1.

Table 1. Oil and fat consumption trends in various food segments

Industrial segment	Quantity (MT)
Bakery	60,000
Sweets	60,000
Confectionery	10,800
Ice cream	500
Chips	1,500
Biscuits	18,000
Bread	3,000
Hotels	51,000
Others	48,000
Total	252,800

These figures are thus illustrative of the fact that the larger consumption of oil and fat in Pakistan is in the homes. One estimates says that total production of edible oils and fats in Pakistan for 1996 was about 2.0 million tonnes. On this basis, utilization in various commercial/industrial ventures works out to be only 12.6 per cent, while the rest 87.4 per cent is consumed in the home kitchens where the preferred mode of food preparation is by shallow frying techniques. Another interesting aspect that emerges from this analysis is that Pakistan consumes about 17 kg of edible oil/fat per person per year and this figure is rather high in the region when compared to India (8 kg) and Bangladesh (5 kg). The edible oil profile of Pakistan is also interesting and currently it is largely composed of imported palm oil. It has been estimated that over 50 per cent needs are met by the import of palm oil, while the other 50 per cent is shared by locally produced oils from cottonseed, sunflower, safflower, rapeseed and imported soybean and also by the domestically produced butter oil. The total palm oil imports for the past 5 years are given in Table 2. It is clear that in the absence of any substitute

Table 2. Palm oil imports in Pakistan

Year	Quantity (MT)
1992	932,000
1993	11,41,300
1994	11,98,000
1995	10,29,585
1996	11,90,153

arrangement this situation may persist and the imports may continue to increase as has been discussed separately (Khan, 1996a). The data discussed in the referred article clearly indicates that the present situation in Pakistan is exactly the reverse of what was obtainable in 1970-71 when domestic production of edible oils (and fats) met 70 per cent of the demand, while in 1993-94 (in 25 years) this figure was reduced to only 30 per cent:

It thus strengthens the estimate that imports of edible oils may increase in future as domestic production is insufficient, population increase (3% p.a.) is continuing and competitive availability of edible oils, particularly Malaysian palm oil, is assured.

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THE VALUE OF MANAGEMENT STUDIES TO THE FOOD TECHNOLOGIST

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ABSTRACT

This paper is directed towards students, teachers and researchers alike in the food industry. The paper examines the present curriculum of Food Technology degrees at the University of Agriculture, Faisalabad and Arid Agricultural University, Rawalpindi. The practical personnel needs of the food industry (especially production and quality control departments) and Government research sector are discussed and particular discrepancies are highlighted. Management studies such as an MBA, are discussed as a practical solution to the possible misfit between skills of the products of educational institutions and needs of the organizations. The major subjects taught in these programmes viz. human resource management, total quality management, marketing, accounting, information technology, production planning, industrial engineering, corporate strategy, international business and decision making are discussed. The paper concludes that the practical applications of both technical and management skills can benefit the short and long term development of both the organization and the individual.

Food technology as a profession is undergoing a revolution. The University of Agriculture, Faisalabad and Arid Agricultural University, Rawalpindi have been awarding degrees to graduates for many years now. The products of these institutions play a major role in the development of Pakistan's food industry. Skilled personnel are a key factor which affect the industry progress. They play their role in the departments of production, quality control and research. However, the demands of organizations have been changing and thus this paper aims to point out the specific areas where improvement in training and education can be undertaken.

In the University of Agriculture, Faisalabad and Arid Agricultural University, Rawalpindi, B.Sc. (Hons.) Agri. with major in Food Technology is awarded after completion of 8 semesters in 4 years of study. M.Sc. (Hons.) Food Technology is awarded after 3 semesters of course work and 1 semester of research work and thesis write up. The technical aspects of this education are not under question at this moment, but the practical skills and capabilities of the graduate is. When a fresh graduate is interviewed for a job, there is usually evidence of poor knowledge about the business of food processing. In all practical purposes, the food technologist is expected to know a lot about running the affairs of the business. Table 1 compares the major

subjects studied in Bachelor degrees in descending credit hours. Except for one optional course in M.Sc. (Hons.) for business administration, there is no other course to fulfil this gap.

The perception of the organization has changed drastically within the past few years. Previously, it was considered to be many different departments doing their own well-defined jobs described by the top management. Little, if any, communication flowed between the different departments other than routine matters. But now, while we are near the dawn of 21st century, the borders between departments are dissolving and new management systems are evolving. In such a scenario, it is essential that technical personnel have the expertise to comprehend all the factors that contribute to the profitability of the company.

In a business, the operation of a firm is cyclical rather than one way. Information from the customers is translated into quality products that fulfil their needs and possess value. Continuous attention needs to be paid to consumer trends for future product planning. Although, it is risky to innovate, it is more risky not to do so. All this activity needs to be done economically so that the company can create a profit. The food technologist plays his/her role at three main interfaces: research and development, production and quality assurance.

The marketing department is the link with the consumer in the market. They need to convey the needs, complaints and comments of the consumers to the factory level personnel in the form of market research.

Table 1. Summary of major courses taught at Faisalabad and Rawalpindi.

Course	Credit Hours
University of Agriculture, Faisalabad	
Biochemistry	8
Unit Operations	8
Food Preservation	7
Practical Training	5
Food Processing	4
Microbiology	4
Food Analysis	4
Beverages	4
Food and Nutrition	3
Process Engineering	3
Post-harvest Physiology	3
Food Laws	3
Cereal Technology	2
Oils and Fats Processing	2
Sugar Production	2
Meat and Fish Processing	2
Poultry and Eggs Processing	2
Milk Processing	2
Arid Agricultural University, Rawalpindi	
Food Preservation	6
Practical Training	5
Research Planning	4
Food Processing	4
Food Microbiology	4
Meat, Poultry and Fish Processing	4
Oils and Fats Processing	3
Cereal Technology	3
Sugar Technology	3
Post-harvest Physiology	3
Milk Processing	3
Food Analysis	3
Process Engineering	3
Unit Operations in Processing	3
Food Chemistry	3
Food Laws	2
Food Chemistry	2
Beverages	2

They usually assist the research and development department in taste panel tests. The research and development department is concerned with research into the problems of the product and also new product

development. The issue about whether new product development should or should not rely upon market research is debatable (Ahmad, 1996). Some persons contend that extensive market research can provide the organization clues about what type of product should be formulated. Thus, food technologists concerned with research and development are expected to be aware of consumer needs. They need to be able to plan, implement and understand market analysis. This research can be utilized to determine the rate of trial, adoption and frequency of future purchase. This can lead to an estimate of sales trends. It is economically unjustifiable to work on a project in a company that has little chance for marketing. In this decade, the key to brand success is market research from the conception stage (Cramp, 1994). However, others argue that market research can only provide a false perception since response to a new product cannot be accurately measured. King (1985) provides a good summary of the issue by stating that consumer research:

"..... can tell you what people did and thought at one point in time: it can not tell you directly what they might do in a new set of circumstances."

Anyway, it can be inferred that successful research and development managers must be well aware of the issues concerning marketing and the business strategy. Food is a fast moving consumer good that is significantly affected by consumer, social and economic trends. Traditionally, research and development has been a sequential process, but now the realization has emerged that "teamwork" is the key to successful product development. Previously, a conception was communicated by the marketing department to research and development, which made the prototype of the product. After a few taste panels' approvals, the product was finalized but the production department might not have been able to produce it on a large scale. Thus, in the 1990's, the key words for product development are "quality management, integration, design and organizational synergy" (Best, 1991). In the food industry, multifunctional teams have been delegated authority to carry out this demanding task and so the food technologist has to be able to comprehend these issues to be of worth for the organization.

In the departments of quality control and quality assurance, food technologists play a key role in assessing standards, analysis of the raw materials, in process checks, final batch approval, storage and shipping of the product. Again, quality is a multidimensional aspect of the organization. The previous conception of analysis and reporting is not enough. The food technologist has to be able to seek the underlying causes for non-conformity, take corrective measures and see whether or

not desired results are being attained. Quality assurance systems such as ISO 9000 have become the need of the day. Pakistani companies are striving hard to attain this certification since it is the criteria for acceptance of a product internationally. ISO 9000 defines quality system standards, not the product. It deals with contract making procedure, design control, purchasing of raw materials, product identification and traceability, process control, inspection and testing, corrective and preventive actions, quality records, statistical techniques and other aspects that affect the final quality of the product. A food technologist should be able to understand these facets and how to set up a system on this basis for proper quality assurance. Besides this, a food scientist is also expected to be able to maintain an inventory, manage people and meet budgets.

In the production department, food technologists are expected to know a lot more than just the operation of the machines and how food is processed. They should be able to manage men, machines, materials and money. They should know how to formulate a production plan. They are expected to make decision worth lakhs of rupees for the company. Accounting practices should be clear to the managers. The difference between the Balance Sheet and Profit and Loss Account should be clear and its implications for the firm should be evident to the managers. Even at the supervisory level, the effects of minor costs (such as labour and overtime) should be clear so that company resources are adequately utilized. Table 2 provides a list of common problems faced by supervisors and managers which need to be addressed.

Table 2. Common problem areas for managers

1. Costs Utilization of standard cost plan, distribution of cost data, better use of cost information.	6. Inventory records Improvements to reduce inventory losses, correlation with sales and manufacturing data, simplification needed.
2. Decision making Adequacy of present techniques, use of latest techniques, developing skill in ascertaining alternative actions.	7. Markets Efforts to find out what buyers want, determining market potentials, finding greatest sales opportunities.
3. Employee training Sufficiency of present efforts, utilizing advanced techniques, advisability of changing supervisory training.	8. Morale Determining what employees think of their company, areas in which morale can be improved, possible improvements that can be started.
4. Financing Securing short-term loans on better terms, increasing working capital, planning future money needs.	9. Plant location Utilization of centralized or decentralized arrangement, build or rent, reduction of maintenance costs.
5. Information distribution Providing adequate and complete oral and written information to all personnel so they are fully informed and can do their respective jobs better.	10. Pricing Appraisal of present prices, probable effect on volume due to price change, competitive pricing.
	11. Production planning Determination and achievement of economic runs; maintenance of proper inventories of raw, in-process, and finished goods; increasing machines and equipment utilization.
	12. Products and services Development that meets favourably the requirements of the market and of the enterprise.
	13. Quality control Economical maintenance of higher quality standards, training personnel for this work, availability of qualified people.
	14. Recruitment and selection Finding and attracting the best prospective employees, effectiveness of interviews and tests.
	15. Reports Improvement in format and writing style, distribution and evaluation of reports, data supplied.
	16. Sales effectiveness Reducing time required for processing a sales order, establishing sales quotas, improving sales reports.
	17. Social responsibility Contributing managerial talent to projects designed to improve social relationships, better understanding among people, and satisfactory environmental conditions.
	18. Supervising Guiding and directing efforts of employees and other resources to accomplish stated work outputs.
	19. Wage and salary administration Improving equitableness of present plan, winning greater acceptance for it, adequacy of plan in the future.
	20. Waste elimination Employee awareness of waste, data on extent of waste material, means of reducing waste, effectiveness of waste companies.

Source: Terry & Franklin, 1982.

It is true that experience is the best teacher. However, we can not negate the benefit of education in giving a guiding light. In the present scenario, there is evidence of many engineers undertaking management studies, especially MBAs. This trend is due to the fact that engineers, like food technologists feel a "glass ceiling" in their career enhancement. Analysis of the career paths of top executives in the food industry reveals that the majority are from marketing, financial or legal areas, not operations (Perry, 1995). The factory level or in line executive jobs have a limit to their future scope. To break this ceiling of "Production Manager" or "Quality Assurance Manager", engineers have begun to diversify their knowledge with degrees such as MBAs. As food technologists, we should not copy other professions but it may benefit both our personal aspirations and the needs of the organizations to think towards this direction.

In MBAs, many subjects are taught but the main ones shall be discussed. Marketing is a major topic which covers market research, consumer data analysis, new product launching, product life cycle, advertising, sales enhancement techniques and international marketing. The four P's of the marketing mix, namely: product, place, pricing and promotion are elaborated. These issues are strongly linked to research and development, quality assurance and production. Corporate strategy is a topic concerned with the long term objectives and steering of the organization as a whole and gives an insight as to how chief executives plan and execute. International business discusses the trade theories and how business can be enhanced by detecting a need across borders and fulfilling it. Management decision making explores the various theories about decisions, broadly categorized into "hard systems" and "soft systems". Hard system implies that all knowledge can be attained and it is more concerned with measurement and quantification. Soft system acknowledges the uncertainty element in decision due to the fact that the human factor is not precisely predictable. In soft systems management, the reliance on pure quantitative and statistical results is not accepted. It advocates the effect of the human element in decision making. Total quality management addresses all the factors that affect quality and concepts such as ISO 9000

and Japanese management systems. Accounting and finance explore the means of attaining equity, cash flow, managing budgets, the Balance Sheet, Profit and Loss Account, and other applications. Human resource management discusses the various techniques for recruiting, training, rewarding, disciplining and controlling people in firms. Information technology is concerned with information flow in the firm and how to manage it for proper use at the right time. Many other subjects are of practical use for the food technologist and scientist.

The attainment of an MBA demands sacrifice. Work experience is a key to the success of this manifesto. After 2-3 years job experience in a company, the individual will have to either arrange finance himself or else convince the company to pay for it. In the short term, there is a loss of earning power, time and a "back-to-school" impression. The benefit of the management study might not be evident but in the long run, it will benefit the career aspirations of the individual and the needs of the organizations. The graduate will have enhanced work skills and marketability. He will have greater job flexibility within his company and as well as the industry. The organization will have a competitive advantage in the form of managers who have an understanding of the technical aspects of processing. Both ways, it is an issue of mutual interest.

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OUR LIFESTYLE, FOOD AND HEALTH

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ABSTRACT

Man has been leading an active life from pre-historic era to almost the beginning of 20th century. During this period his diet primarily consisted of meat, fruits, vegetables, grains, etc. that were grown in the natural soils devoid of agro-chemicals. He was virtually living in an unpolluted environment. The industrial revolution that started in the beginning of this century has brought tremendous changes in the life style of man and has reduced his physical activity. This has also caused detrimental changes in the quality of food. The mechanization of agricultural production has introduced different agro-chemicals to obtain higher yields from plants and animals. Such activities have adversely affected the health of man. Furthermore, innovations in food industry such as refinements have reduced the nutrients present in natural foods. The addition of chemicals to replace nutrients or to provide other characteristics are leading to decline in human health. The human health is further degenerating due to increased environmental pollution. As a result of the changes in the life style, food and the environment, man is becoming susceptible to various diseases. It is time to recalculate our priorities so that we can live with more glorious health.

INTRODUCTION

Primitive man gathered food as early as 1,000,000 years ago. Up to the paleolithic period man hunted a variety of animals and learnt some food processing techniques. In mesolithic period hunting was still the main occupation. Life style changed from nomadic to village life during the neolithic period. Domestication of animals and plants started. Eating habits also changed from a carnivorous to a more balanced vegetable and meat diet. In the bronze period life style again changed from village to city dwelling. The iron age was accompanied by developments in agriculture with the use of heavier ploughs and reaping machines (Awan, 1995).

After passing through various periods, man stepped into the industrial revolution. Mechanization entered into his life. He invented wind mills and steam turbines. In 1884 electricity was generated that appeared as a regular source of power and brought revolutionary changes in the life of man and industry.

The period of history from 1900 to 1950 observed tremendous changes in the life of man. New innovations were brought in automation, communications, electronics, space technology, military engineering, medical sciences, food and agriculture, etc. that have brought tremendous changes in the life style of man. One of the significant innovations associated with developments is mechanized transportation. The consequence of this is noted in decreased physical

activity. Furthermore, modern food production, processing and storage require less expenditure of human energy, thus contributing to the imbalance between consumption and output. At present time energy expenditure relative to food intake is a crucial aspect of nutrition, since food habits have not changed with life style.

There has been little change in the gene pool since the appearance of *Homo Sapiens Sapiens* about 35,000 years ago. In other words, modern humans are still genetically adapted to a pre-agricultural hunter-gatherer lifestyle. The study of such a lifestyle has led to the suggestion that a number of modern chronic conditions, prominent among them obesity, may be due to a maladaptation of our lifestyle to our genome (Kern, 1996).

Rural life in Pakistan

A few decades ago rural life in Pakistan was entirely different. The farmer was an early riser who did all the work by himself with the help of simple manual machines and tools like plough, hoe, sickle and spade, etc. In the evenings he actively participated in games like *kushti*, *kabbadi*, volleyball etc. Female was also an early riser who did all the work by herself at home including milk blowing, washing cloths, etc. Besides this, she has to assist in the field work.

Food of the rural areas included milk, butter, *desi* ghee, fresh fruits and vegetables and less meat. Butter is a concentrated source of energy as it contains about 80%

fat. Butter milk is a special beverage of rural areas and provides fat, protein and minerals. It also has a cooling effect on body. Among other food items are whole wheat flour and fresh vegetables that are good sources of dietary fiber which help to reduce cholesterol level and have a laxative effect (Owen & Cotton, 1982). Eating habits of people were simple. They ate in the morning and in the evening with snacks like *gur*, roasted grains, etc. during the day. The environment in rural areas was free from pollution resulting from industrial and vehicle exhaust, and applications of pesticides and fertilizers. Similarly water was not contaminated by industrial effluents, and agricultural pollutants (excessive doses of chemical fertilizers, fungicides and pesticides).

Today, life style in rural areas has changed. Instead of bullocks driven plough the farmer uses tractor and spends almost 1/16 of the time doing the same job. He has mechanized facilities for seeding, hoeing, harvesting, etc. In the evening he prefers to watch T.V. programmes rather than participate in outdoor games or other activity. Similarly, female has got machines and does not require much hard work at home and fields.

Urban life in Pakistan

People in the urban areas have also been leading a physically active life. Bicycles was the most common mode of transportation within the city. A milkman used bicycle to fetch and distribute milk, but today he has motorcycle. Street hawkers sold their goods like fruits and vegetables in baskets carried on their heads but now they use hand or donkey carts for the same job. A housewife did her job by herself including grinding of spices, washing of cloths, cleaning of house, etc.

Food was more pure and nutritionally rich. Butter, *desi ghee*, meat, fruits and vegetables were eaten. The city dwellers took their meal at proper time and interval. Their food and eating habits were nearly according to their activities. The environment of urban areas, a few decades ago, was less polluted. There were few industries and vehicles to destroy the purity of the atmosphere. People had plenty of clean environment and potable water.

Modern life style

Presently life style has shifted from active to sedentary. In urban areas most people have got white collared jobs. Early rising and exercise have vanished in urban areas. Most of the work both in offices and houses is done mechanically and spare time is spent on watching T.V. programmes. Remote controlled inventions have made people almost idle as just by pressing one button various functions are performed without losing the chair. Similarly the telephone has reduced the distance and movements of people.

Food and eating habits

Food in the modern age is different as compared to the previous periods. Now people are provided with processed foods that are often refined and contain artificial ingredients. Eating habits of people have also changed. They prefer to take much meat and poultry products, baked goods, fried foods, gravies, foods loaded with fats and oils, fast foods, snacks, carbonated beverages, etc. Eating of such caloric foods can lead to various disorders. Hotelling has become a common practice. Food is consumed at irregular intervals, which is probably one causes of digestive disorders. Although the quality of life style and food has changed, yet common man's emphasis is still on calorifically rich diet. People still eat foods that do not match with their physical activities. This imbalance is leading to modern age diseases like obesity, cardiovascular disorders, diabetes, cirrhosis of the liver, etc. (Gori, 1979).

Food processing and health

Wheat flour

Refinement in foods is a processing technique aimed at "improving" the quality of food. In most cases processing results in nutritional losses. In flour milling, for example, it is aimed at removal of bran that gives dark color to the flour and of germ that causes rancidity during storage. Wheat grain consists of bran, germ and endosperm. The energy yielding carbohydrates are concentrated in the endosperm. The bran contains undigestible fraction, dietary fiber, mineral elements and vitamins from the B group. In modern milling system the fractions sifted out contain essential nutrients that are unavoidable for various metabolic activities and body building. Moreover, dietary fiber that has been removed during refinement possesses not only laxative effect but also lowers the cholesterol level in body. Flour thus produced lacks dietary fiber, vitamins and minerals that have resulted in various ailments. Modern milling techniques have enabled us to produce white flour having longer shelf life but at the cost of our health. The latest research recommend the use of whole wheat flour which is sure way to sound health (Awan *et al.*, 1991).

Rice polishing

Rice is another cereal which is consumed as staple diet in many countries. Rice polishing is again a refinement technique in which bran is removed to get whiter rice. Rice bran contains vitamins of group B that are lost during this process of refinement. A disease (beri beri) has been observed in those areas where polished rice is eaten as staple diet (Awan, 1995).

Beverages

The traditional drinks of this region are *lassi*, *sattu*, *sardai*, *skangebeen*, sugarcane juice, sherbets of various kinds, etc. These drinks are not only in accordance with the climatic and other conditions of this region but are also nourishing and thirst quenching. Whereas modern age beverages provide us with refined sugar syrup containing synthetic food colours, preservatives, intoxicants (nicotine, caffeine), acids and synthetic flavors. Some of these ingredients are harmful to our health and have been implicated in various diseases. Some food colours are known to be carcinogenic, while some types of plastics used in bottle caps also possess similar properties. Preservatives become very dangerous if they are not added in recommended doses (Lueck, 1980).

Technological achievements and life style have brought numerous changes in the consumption of fruits. Now mostly processed juices are consumed. Through refinement several essential nutrients are lost. In case of citrus juice, for example, dietary fiber and bitter principles are removed (Lam *et al.*, 1994). Citrus limonoids (limonin and nomilin) are responsible for bitterness in citrus juice. These bitter principles are known to induce the detoxifying enzyme system, glutathione S transferase (GST) that inhibit the forestomach tumors, lung tumors and skin carcinogenesis.

Sugar

White sugar is a product obtained from sugarbeet or sugarcane juice by the process of concentration and crystallization (Lyle, 1950). During manufacturing, the juice is treated with chemicals and boiled at elevated temperature that result in nutritional losses. Sugar, when refined and cleaned by the mills, turns into a slow poison for the human body. On the other hand, *shakkar* or *gur* contain the entire components of the raw materials that is almost in natural state except little changes which occur during boiling. White sugar contains about 99.5% sucrose after refinement, where as *gur* is composed of 48% glucose and fructose, 12.19% carbohydrates and other forms of sweetening edibles, 6.6% protein, 0.06% fat, vitamins of B group and mineral elements (Rao, Undated). Prolonged consumption of refined sugar leads to various diseases like dental caries and possibly diabetes mellitus. Consumption of *gur* is safer because of reduced calorific value. Moreover, it helps in digestion and has a mild laxative effect. Furthermore, nutritionally it is better than sucrose due to the presence of gums and other components like proteins and mineral elements.

Environmental pollution

No doubt with industrial revolution and developments the life of modern man has become easier. People are enjoying these conveniences at the cost of their health. Chemical fertilizers and pesticides are not only damaging the environment but are also causing health hazards. Poor sewerage system in cities is producing gastrointestinal diseases by mixing with drinking water. Similarly smoke and effluents from industries are causing respiratory and gastrointestinal disorders. Likewise, vehicle exhaust containing carbon monoxide, carbon dioxide and lead leads to throat irritation and lung infections (Raj & Trivedi, 1992).

Pollution is a serious cause of deterioration in health. It has increased due to large number of industries, vehicles, application of certain chemicals, lack of knowledge and reduced vegetation. Farmers are compelled to obtain higher yields from the same soil by the increasing population pressure. Various kinds of chemical fertilizers and pesticides are utilized for this purpose. Fertilizers applied in over doses accumulate in soil as well as leach down to the ground water. Excessive application of nitrogenous fertilizers result in accumulation of nitrites that have been responsible for blue baby syndrome and stomach cancer (Mishra & Mani, 1994). Pesticides are sprayed to kill various forms of life and obtain greater crop yields. These not only pollute the environment but also are a health hazard to the workers. Mistaken consumption of pesticides leads to headache, nausea, respiratory failure and ultimately death (Brown, 1956). Similarly, in urban areas industrialization and mechanization have polluted both air and water, that are the two basic necessities for survival of mankind and other forms of life. Industrial effluents containing heavy metals and inorganic acids are drained out without treatment. These leach down to the underground water and pollute it. Likewise, smoke from the industry and vehicles contribute to the environment pollution too. It poses poisonous gases that cause throat irritation and lung infections.

Diseases of technology developments

Technological developments have brought mechanization into various fields of life. This has resulted in refined foods on one hand and reduced physical activity on the other. By the refinement techniques nutritional constituents are lost and food composition is altered too. This has led to incidences of diseases that were uncommon to our ancestors.

Cardiovascular diseases

Cardiovascular diseases can be directly linked to high fat consumption. Fat increases the amount of cholesterol in the body, slowly building up plaque in the veins and reducing the supply of blood to the heart. In our diet up to 30% or less calories should be from fat of which about 7% calories should be from saturated and remaining from unsaturated fats. Meat and milk products contain more saturated fatty acids and contribute to cholesterol synthesis in the body (Hoogenkamp, 1994). High quality vegetable protein may be used as an alternative source of animal protein. However, a ratio of 2:3 (vegetable : protein) and 1:3 (animal protein) is good. Soya protein has proved an efficient protein source that can be converted into "modern life style foods".

Obesity

Obesity is a disease of technological developments that results from high intake of food and less expenditure of energy. Refined foods such as cakes, pastries, jams, artificial drinks, etc. provide more calories per unit weight due to higher amount of digestible carbohydrates. Whereas, a fiber rich diet is calorifically dilute and could be an obstacle to over eating and obesity (Theodore and Italli, 1979). Human obesity also results from an interaction between the sedentary individual and his food laden environment.

Diabetes mellitus

Diabetes mellitus is a disease associated with unbalanced glucose level in blood and urine. Glucose level in the body is controlled by insulin hormone which is secreted by pancreas. Body obtains energy by the oxidation of glucose at cellular level. Insulin concentration helps to increase or decrease the amount of glucose in the blood. When excessive digestible carbohydrates are taken as a result of refinement and are not utilized in the body due to sedentary life style, glucose level in blood increases and pancreas is required to produce more insulin to bring it back at normal condition. Such excessive practice occasionally leads to exhortation of the beta cells of the islets of langerhans, thereby resulting in diabetes mellitus (Guyton, 1981).

Cancer

Modern technology has altered many of the foods we eat, but not always proving better. The process of refinement involves removal of many nutrients that often possess regulatory functions in the body. For example, dietary fiber is removed in flour milling. This is one of the items that increases glucose tolerance, aids the peristaltic movement of the intestines, reduces blood cholesterol and absorbs bile acid residues. Lack of fiber in the diet leads to chronic disorders of digestive system

such as constipation, appendicitis, cancer of large bowel as well as risk of cardiovascular diseases.

Excessive intake of protein may exert tumorigenic action through metabolic by products such as ammonia and uric acid which may be mutagenic. Similarly, a high fat diet stimulates enhanced bile acid production thus increasing the risk of carcinogenic process. Voracious lipid consumption may also alter hormone profile that is known to encourage the likelihood of cancer development. Likewise, nutrient deficiencies, especially of the trace elements, have been linked to cancer etiology. Selenium deficiency is associated with increased cancer incidence. Chronic deficiencies of vitamins A, C and E as well as most vitamins of the B group have been shown to increase susceptibility of chemically induced tumors (Gori, 1979). Hence a well balanced diet that provides the essential nutrients in required amounts and eliminates the danger of malnutrition is the need of the day.

CONCLUSIONS

Our life style has been greatly influenced by the technological developments. We are leading a more sedentary life than our ancestors. We have left exercise necessary for health. The nature of job in most cases is such that there is little physical activity. Today we have computers, telephones, telex, fax and pagers to convey messages. Remote control system in machines has reduced our physical activity to almost zero. Our food habits have also changed. Today, we are eating refined foods, adulterated foods, acid and alkali treated foods and foods containing synthetic and probably harmful ingredients. No doubt our life style is different but our main object of eating food still remains the same. We try to eat more fatty and sweet foods. We probably do not take care of the meal times. Our food style does not match our life style. A balanced diet coupled with physical activity not only saves us from various diseases but also helps us in leading a more enjoyable life.

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PROCEEDINGS OF THE SEVENTH ALL PAKISTAN FOOD SCIENCE CONFERENCE AND ANNUAL GENERAL MEETING 1996.

Javaid Aziz Awan

Secretary,

Pakistan Society of Food Scientists and Technologists.

The Seventh All Pakistan Food Science Conference formerly called Annual General Meeting of the Pakistan Society of Food Scientists and Technologists was held on Wednesday, December 18, 1996 at the Iqbal Auditorium, University of Agriculture, Faisalabad. It was attended by more than 450 delegates from all parts of the country. 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 Mr. Muhammad Khalid followed by a Naat by Mr. Rashid Mirza.

The Secretary informed the delegates of the sad demise of Prof. Dr. Anwar-ul-Haq, Vice Chancellor of the University of Agriculture, Faisalabad and requested for Fateha Khawani for the soul of the bereaved. He then highlighted the achievements of the Society since its inception in 1990. The Secretary informed that since 1990, an annual general meeting was being held each year. To foster closer links between the members, Food Science News was published which had been upgraded to the level of Pakistan Journal of Food Sciences in 1995. Full length report appears in the next few pages of this Journal.

In his Keynote address, Prof. Dr. Muhammad Shafiq Chaudhry, President of the Society said that we are now living through the fog end of the 96th year of the present century and are looking forward to the new century. The developments such as ISO 9000 and 14000 and formation of the World Trade Organizations require upgradation in our processes and products. He showed concern over the quality of education being imparted in the discipline in various universities. He stressed the need to orient the research towards emerging problems in the food industries.

Professor Dr. Abrar Hussain Gilani in his inaugural address pointed out towards the malnourishment being faced by the people. He showed concern over food security in the world, where maldistribution of food and widespread malnutrition in sections of the populations existed. He mentioned various figures highlighting the malnutrition in various groups of the population in the

country. Dr. Gilani stressed the need to develop and manufacture local body food to save the foreign exchange. He also said that there was an urgent need to revise the syllabi of undergraduate programmes in all the first degree courses. He hoped for the establishment of stronger links between the academic and research institutions and the industry.

In his Presidential address, Professor Dr. Ahmad Nadeem Sheri, the Vice Chancellor, University of Agriculture Faisalabad welcomed the delegates to the University. He paid tribute to his successor, Prof. Dr. Anwar ul Haq, who passed away just one week ago. Dr. Sheri 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 oils, 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

Two technical sessions were held, one immediately after the tea break and the second after lunch. Following papers were presented in the two sessions:

1. **A. K. Baloch & Shahzada Arshad Saleem Khan**
Influence of water activity on the stability of Dhakki dates
2. **Iftikhar Ahmad**
A useful modification process to enhance the food applications of palm and palm kernel oils
3. **Taufiq Ahmad, Abdus Sattar & Saeed A. Nagra**
Effect of hydrogenated and unhydrogenated fats on the cholesterol level and other growth parameters of albino rats.
4. **Tahira Firdos, Salahuddin & Wazir H. Shah**
Heavy metal load in vegetables irrigated with municipal; sewage water

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5. **Aizad Ahmad**
The value of management studies to the food technologist
6. **Hafiz Haseeb Elahi, J.A. Awan & Nuzhat Huma**
Lifestyle, food and health
7. **Zubair Farooq, Nuzhat Huma, Salim-ur-Rehman & M. Asghar**
Effect of tallow on the quality of fresh beef sausages during storage
8. **K. M. Janjua**
The cooking utensils and human health
9. **Zia ur Rehman & Wazir H. Shah**
Effect of cooking method on dietary fiber components of vegetables
10. **Aurang Zeb, Nizakat Bibi, Amal Badshah & Abdus Sattar**
Influence of different treatments on single enzyme in vitro digestibility of rapeseed protein
11. **Tahira Firdos, Sakhawat Ali & Wazir H. Shah**
Utilization of agro-industrial wastes for the production of microbial proteins.

Full length papers are being published in this and subsequent issues of the Journal.

Business Session

This session was chaired by Prof. Dr. Muhammad Shafiq Chaudhry who was assisted by the Vice President Prof. Dr. Muhammad Saeed, Dr. Javaid Aziz Awan, Secretary, Dr. Wazir Hussain Shah, Joint Secretary and Dr. Salim ur Rehman, Treasurer. The Secretary welcomed the new members who joined the Society in recent months.

The house discussed various matters regarding the expansion of the Society. It was unanimously agreed that the membership dues be increased to cope with the increasing inflation and cost of printing. The house decided to increase the membership dues for Professional and Associate Members to Rs. 200.00 per annum while the Student Membership was enhanced to Rs. 100.00 per annum.

The business session came to an end by a vote of thanks by the Secretary, Dr. Javaid Aziz Awan. He 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 seventh Annual General Meeting of PSFST and wished them a safe journey home.

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KEYNOTE ADDRESS

Prof. (Retd.) Dr. Muhammad Shafiq Chaudhry
President,
Pakistan Society of Food Scientists and Technologists.

Dr. A. N. Sheri
Vice Chancellor,
University of Agriculture, Faisalabad,

Dr. A. H. Gilani,
Director (Research),
University of Agriculture, Faisalabad,

Distinguished guests & delegates!

It is my privilege and pleasure to welcome you to the 7th All Pakistan Food Science Conference here at Faisalabad, the birthplace of the sponsoring society i.e. Pakistan Society of Food Scientists & Technologists (PSFST).

We are now living through the fog end of the 96th year of the present century and are looking forward to the new century, some with hope and promise while others with apprehension. These mixed feelings arise from the rapid developments that have taken place during the current decade and which will have profound effect on food sciences and food trade in the coming years, particularly the next century. The first such development is the adoption of ISO 9000 series of standards, followed immediately by the conclusion of decades old GATT parleys and formation of World Trade Organization. These developments will require the food processing industries to upgrade the manufacturing facilities to the levels described as low as possible so that the products can be marketed in the world in keeping with the requirements of lower tariffs as required by World Trade Organization.

More recently, a new series of standards i.e. ISO 14000 is also being evolved. The aim of this new standard is to balance environmental protection and

prevention of pollution commensurate to the socioeconomic needs. The implementation of all these standards in their true spirit will require the commitment of management and employees of all categories. It will also require extensive training, awareness and development of competence for their implementation.

In the area of food sciences, new developments by virtue of disciplines of biotechnology, bioengineering and genetic engineering, new vistas have opened up for the food technologists. We have a variety of new ingredients with unique properties for use in the development of new products and improvement of the existing ones. Recombinant rennin (chymosins) are already the mainstay of the cheese industry. A tomato with low pectin esterase activity having extended shelf-life has been approved by the Food & Drug Administration of USA. Opaque-2 Corn, high lysine corn and waxy maize, the corn containing high level of amylopectin have been known for years. There is a whole range of chemically/enzymatically modified starches with different gelatin and thermoplastic properties available for use in improving the food products. Pectin, a substance known for its jellying characteristics in jams and jellies, is now available in modified forms (by carefully changing the level of esterification) which can be used as a thickening and stabilizing agent in dairy products such as milk and *lassi*, etc. These are only a few examples of recent developments. There are many more ingredients, processes and products of recent origin which need to be studied by our food technologists working in research/development institutions and industries. This recent knowledge should make a part of the food technology curricula of our universities.

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INAUGURAL ADDRESS

Professor Dr. Abrar Hussain Gilani
*Director (Research), University of Agriculture,
Faisalabad.*

Dr. A. N. Sheri,
Vice Chancellor,
University of Agriculture, Faisalabad,

Dr. Muhammad Shafiq Chaudhry,
President,
Pakistan Society of Food Scientists & Technologists,

Learned Scientists, Technologists.

Ladies & Gentlemen!

This is indeed a rare privilege to be among galaxy of accomplished food scientists and technologists at the eve of 7th All Pakistan Food Science Conference, organized by Pakistan Society of Food Scientists & Technologists. This occasion is of great significance to me as I have been honoured to attend this Conference and address the distinguished scientists. I am thankful to the organizers of the Conference for this favour.

This is heartening to note that the Society is focusing its attention on problems concerning food so vital to the fellow human beings. You all realize that the problem of food availability for rapidly increasing population has now become a global concern. However, there is a growing awareness about the importance of food security in Pakistan. Fortunately, the food security situation is not that bad to endanger human life in the country. Nevertheless, per capita income is low and a number of people are below the poverty line. This had lead to maldistribution of food and widespread malnutrition in various sections of the population.

Although, per capita intake of calories and protein per day are above the RDA, there is widespread prevalence of malnutrition in children and women of child-bearing age, expectant and lactating mothers. It is

estimated that one out of two children under the age of 5 are malnourished and one out of four have been born malnourished. Fifty per cent women of child-bearing age and 60 per cent pregnant and lactating mothers are anaemic. According to Pakistan Demographic and Health Survey, 44.2 per cent under 5 were stunted, 10.2 per cent wasted and 37.3 per cent under-weight. There is low birth weight of infants and high infant mortality. This poses a great challenge to food scientists and nutritionists to improve the situation. I am sure specific attention will be paid to ameliorate the malnutrition existing in the country. Further, the food scientists and technologists are required to improve the food processing technologies particularly in the areas of milk, meat, egg and vegetables. This will not only make more availability of the wholesome foods but will also help in exporting the products.

Development and manufacture of local body foods would save the foreign exchange spent on the import of such foods. I am hopeful that food scientists and technologists will discuss such issues of national importance and formulate policy recommendations in this regard. There is an urgent need to make revision in food science curricula and to improve technological skills. Inclusion of introductory course in the syllabi of undergraduate programmes in all first degree courses would be another important issue for discussion in the Conference. Would the learned delegates like to discuss how a strong link could be established between academic and research institutions and the industry.

At the end, I once again thank the organizers for inviting me to the Inaugural Session. I declare the Conference open and wish it a success.

Pakistan Zindabad.

Proc. 7th All Pakistan Food Science Conference December, 1996

PRESIDENTIAL ADDRESS

Professor Dr. A. N. Sheri
*Vice Chancellor, University of Agriculture,
Faisalabad.*

President,
Pakistan Society of Food Scientists & Technologists,
Dr. Muhammad Shafiq Chaudhry,
Chief Guest Prof. Dr. Syed Abrar Hussain Gilani,
Honourable Members of the Society,
Ladies and Gentlemen,

Assalamo Alaikum!

It is indeed my pleasure to be with you on this auspicious occasion of the 7th All Pakistan Food Science Conference of the Pakistan Society of Food Scientists and Technologists. I welcome you all to this University. I am confident that the management of this occasion is looking after you and has enough to keep you busy the whole day.

Before I say something about your deliberations in this Conference, I would like to pay tribute to my predecessor, late Professor Dr. Anwar-ul-Haq, whom we lost just last week. During his period of one year as Vice Chancellor of this University, he put in everything to lift its image. He successfully uprooted the evil tradition of shortening the semester. During his tenure, for the first time after several years, we had two complete semesters; complete semesters in the sense that these were of full period without any legal or illegal break. There was complete peace at the campus. Late Prof. Dr. Anwar-ul-Haq was honest and dedicated. He wanted to uproot all the evils and make this University a real seat of learning and disseminating knowledge. In this effort, he lost his health and eventually his life.

Ladies and Gentlemen, I assure you that the good traditions of my late predecessor will be followed. It would be my utmost effort to ensure that teaching schedule are not interrupted, and justice prevails in this University. It would be my priority to uphold peace and justice in this institution.

Now coming to the deliberations of this Conference. After hearing the Secretary of the Society, I am really pleased to note the achievements of this Society. Holding a meeting every year is no small job and publishing a journal is still more difficult. There are very few societies or associations in this country that remain alive. I do wish to congratulate the Executive Council of the Society on its achievements.

The President of the Society has talked about the latest trends in the discipline of food science and technology. I would just like to give a few words of advice. The fact that the membership of this Society consists of students, teachers, research workers and the industrialists is a very healthy sign. This is a forum for closer collaboration between these groups to provide safe and nourishing foods to the community. In this regard I would like to suggest to the educational institutions, including my own, to ensure that the curriculum is geared towards the needs of the industry. The research should also be of applied nature relevant to the problems of the industry. There is a constant need to have a close liaison between the research and teaching institutions and the industry.

At the end, I would like to accede to the genuine request of Prof. Dr. M. Shafiq Chaudhry, the President of the Society. University of Agriculture, Faisalabad is the mother institution of most food technologists in this country. Therefore, there is every reason to have its Secretariat in this institution. I hereby announce that Room No. E-235 is allotted to the Society to house its Secretariat.

With these words I welcome you to this University and wish you a very happy stay here.

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SEVEN YEARS OF THE PAKISTAN SOCIETY OF FOOD SCIENTISTS AND TECHNOLOGISTS

Javaid Aziz Awan

*Associate Professor, Department of Food Technology,
University of Agriculture, Faisalabad 38040,
Pakistan.*

The subject of food preservation is as old as the human race. Primitive man gathered food as early as 1,000,000 years ago and also learnt the methods of food preservation. In the geographical region now known as Pakistan, the Indus Valley Civilization has left remarkable accounts of the preservation techniques being followed by the inhabitants of this region. Research on the preservation of fruits and vegetables had started at the Punjab Agricultural College and Research Institute, Lyallpur and the Agricultural Research Station Tarnab as early as 1930s. Food Technology emerged as a distinct discipline in 1960 in the then Punjab Agricultural College Lyallpur.

By the year 1975 when more than 300 graduates had received their B.Sc. Agric. degree with a major in Food Technology, a need was felt to form a Society and gather the food professionals on one platform. In April 1979 these efforts fruited and 30 graduates assembled in the Department of Food Technology, University of Agriculture, Faisalabad to set up an ad hoc committee to establish a Society. Draft By-Laws were prepared and sent to the professionals who had graduated from the University of Agriculture Faisalabad. The first meeting of the Society was held on November 11, 1979. The Society was registered on February 7, 1981 under No. RP/871 of 1980-81 with the Registrar Joint Stock Companies Punjab.

Owing to certain circumstances, the Society remained dormant till 1990. On the eve of the 46th Old Boys Gathering of the Alumni of Punjab Agricultural College, Lyallpur and the University of Agriculture, Faisalabad, a get-together of Food Technologists was arranged in which all the participants showed great enthusiasm for the revival of the Society. Accordingly, it was decided to call a meeting of the Food Technologists on 25th March 1990. Invitations were sent to as many Food Technologists as possible depending upon the

availability of the addresses. Over 120 professionals gathered at the University of Agriculture Faisalabad. Prof. (Retd.) Dr. M. Shafiq Chaudhry presided over the meeting. He outlined the history of the discipline and the Society in Pakistan and invited comments/suggestions from the house. The participants actively participated in the debate and expressed their opinions. The house unanimously pledged to revive the Society and agreed to elect a new Executive Council. The followings were elected as office bearers of the Society:

Prof. Dr. M. Shafiq Chaudhry	President
Dr. Mumtaz Ali	Vice President
Dr. Javaid Aziz Awan	Secretary
Mr. Muhammad Shoaib	Joint Secretary
Miss Nuzhat Huma	Treasurer

This and the subsequent Executive Councils have honoured the confidence posed in them. They have been actively contributing to the strengthening of the Society. Now the Society is not only alive to its manifesto, but is also serving as a bond between its members.

ACTIVITIES OF THE SOCIETY

1. Membership

The Society has received an excellent response from professionals working in the teaching institutes, research organizations and the industry. Besides these, others engaged in the food profession have also joined hands to promote the cause of this discipline. The students have also responded well. There are basically three categories of membership to which members are admitted: professional member, associate member and student member. The year-wise breakdown of the memberships is as follows:

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Year	Professional and Associate members	Student members
1990	63	65
1991	99	107
1992	146	73
1993	221	108
1994	294	99
1995	318	44
1996	427	133

2. Publication of the Journal

The newly elected Executive Council held a few meetings during the year 1991 and decided to bring out a publication to foster closer links with the members. This publication was named as "Food Science News". This has now been converted from the year 1996 into a full-fledged journal called "Pakistan Journal of Food Sciences". Initially it was decided to bring out this publication on quarterly basis. Owing to certain reasons, it is now being published biannually, i.e. two issues per annum. So far the number of issues published in each volume has been as follows:

Food Science News	1991	Vol 1	Nos. 1, 2, 3-4
Food Science News	1992	Vol 2	Nos. 1-2, 3-4
Food Science News	1993	Vol 3	Nos. 1-4
Food Science News	1994	Vol 4	Nos. 1-2, 3-4
Food Science News	1995	Vol 5	Nos. 1-2, 3-4
Pak. J. of Food Sciences	1996	Vol 6	Nos. 1-2, 3-4

3. Holding of Annual General Meetings

Since the revival of the Society on March 25, 1990, Annual General Meeting is being held every year in different locations as follows:

11.05.1991	University of Agriculture, Faisalabad
23.04.1992	Ayub Agricultural Research Institute, Faisalabad
29.04.1993	PCSIR Laboratories Complex, Lahore
16.12.1993	University of Agriculture, Faisalabad
22.12.1994	NWFP Agricultural University Peshawar
20.12.1995	PCSIR Laboratories Complex, Lahore
18.12.1996	University of Agriculture, Faisalabad

4. Revisions in the By-Laws/Constitution

The original By-Laws of the Society were prepared by a committee headed by Prof. (Retd.) Dr. M. Shafiq Chaudhry, the then Chairman Department of Food Technology, University of Agriculture, Faisalabad in early 1979. This was circulated to the professionals who were also invited to attend a meeting on November 11, 1979. A total of 95 members gathered and voted to adopt the By-Laws. These By-Laws were revised and approved as the Constitution of the Society by the General Body in December 1994 at Peshawar. Some amendments were approved on December 20, 1995 at the Sixth Annual General Meeting at Lahore.

5. Establishment of the Chapters

So far Chapters have been established in Lahore, Faisalabad and Rawalpindi/Islamabad. Only the Lahore Chapter has been active and has organised a number of professional and recreational activities.

6. Award of Commemorative Shields

The Society honours prominent food technologists and industries for their contributions in the field by presenting commemorative shields to them at the Annual General Meetings.

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CONGRATULATIONS



Dr. Wazir Hussain Shah, Joint Secretary, Pakistan Society of Food Scientists & Technologists has recently been promoted to the rank of Chief Scientific Officer (CSO) in the Biotechnology & Food Research Centre, PCSIR Laboratories Complex, Lahore. Dr. Shah is a well-known food scientist in Pakistan due to his immense research work on various aspects of food processing in Pakistan, especially in the field of postharvest technologies, food preservation and poultry feeds. He has potential to improve the rural food scenario of Pakistan as he himself hails from rural background near Multan.

After doing his B.Sc. Agri. (F.T.) and M.Sc. Agri. (FT) in first divisions from University of Agriculture Faisalabad, Dr. Shah served for about one year in his *alma mater* on a purely research assignment. In between, he had the chance to serve the food industry for a short span of time. In 1967, Dr. Shah was selected on a Colombo Plan Scholarship on behalf of PCSIR for higher studies at the School of Food Technology, University of New South Wales in Australia. He obtained M.Sc. degree in Food Technology from there in 1970. He also worked at Australian CSIRO for a period of 9 months. He returned to Pakistan to serve PCSIR Laboratories, Peshawar as Research Officer. Later on, Dr. Shah was transferred to the Food Technology & Fermentation Division at PCSIR Laboratories, Lahore where he worked under the supervision of Dr. F.H. Shah, another known name in this field. During his service at PCSIR Laboratories, Lahore, Dr. Shah was promoted as Senior Scientific Officer in 1974 and also enrolled for Ph.D. degree which he obtained from University of Agriculture, Faisalabad in 1985. At PCSIR Laboratories, Lahore, Dr. Shah's work was mainly on

dehydration of foods, in which field he has contributed a chapter on "Dehydration of Vegetables" in the book "Commercial Vegetable Processing", edited by B.S. Luh and G.J. Woodroof, published by Avi Publishing, USA in 1988. In 1989, Dr. Shah was promoted as Principal Scientific Officer (PSO) and his present promotion leads him to the height of his scientific carrier in PCSIR.

Dr. Shah has participated in about 2 dozen national and international conferences/seminars/workshops. He has published about 6 dozen papers and reports in the field of food science and technology. He is known for his highly informative lectures to various NGOs and Government department's in-service personnels. Outside Pakistan, he has travelled to Australia, Korea, Indonesia, Philippines, Malaysia, Thailand, Hong Kong and Singapore for official and study visits. He is a professional member of the Institute of Food Technologists (USA), Australian Institute of Food Technologists, Pakistan Association for the Advancement of Science, and Pakistan Association of Scientists and Scientific Profession.

The members of Pakistan Society of Food Scientists & Technologists (PSFST) congratulate him and wish him further success in his career and life.

HONOURED



Dr. Abdus Sattar has been awarded a Gold Medal and a Certificate in an impressive ceremony by the National Book Foundation, Ministry of Education, Government of Pakistan on November 15, 1997 for being *Scientist of the Year-1990* in recognition of his services in science. Dr. Abdus Sattar presently Chief Scientific Officer and Head Food Sciences Division at the Nuclear Institute for Food and Agriculture (NIFA)

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Peshawar of the Pakistan Atomic Energy Commission, was born in District Hoshiarpur in 1941. After partition of the subcontinent, his family settled in a village Jatri-Old, Tehsil and District Sheikhpura. He had 35 years of post-graduate research experience in food science. He completed his B.Sc. in 1962 and M.Sc. in 1966 from Agricultural University Faisalabad in the subject of Food Technology and later M.Sc. and Ph.D. in Food Science and Nutrition from the University of Guelph, Canada in 1975. He possesses throughout first class academic career and had been the recipient of merit scholarships, Fellow of the University of Agriculture, Faisalabad, as well as Canadian Commonwealth and International Atomic Energy Agency Fellowships. He has been member of several international/national scientific societies and principal investigator of a number of national/international research projects. Dr. Sattar has attended several meetings, participated in many national/international conferences/meetings and visited countries such as USA, Canada, UK, Germany, Saudi Arabia, Turkey, Iran, China, S. Korea, and Malaysia.

Dr. Abdus Sattar is a versatile scientist who has supervised 10 Ph.D., 6 M.Phil., and 27 M.Sc. students from various universities for their thesis research in his laboratories. He has over 275 publications including 125 international, published in 22 countries of the world. His major research achievements are in the fields of Radiation Chemistry and Photochemical Reactions in Foods. He is a pioneer and an expert in Food Irradiation Technology in Pakistan. On the basis of his research achievements, he has been honoured with the Scientist of the Year-1990 Award.

PROMOTIONS

Mr. Asadullah Haider Bhatti, Vice Chairman, Pakistan Society of Food Scientists & Technologists has recently been appointed on new position as Project Engineer, M/s Bunny's (Pvt) Ltd., Lahore. Mr. Bhatti has been assigned new project to produce different snack foods from nuts. The activity is part of the expansion programme of M/s Bunny's Lahore.

Previously, Mr. Bhatti has served as Factory Manager, M/s Triple Em (Pvt) Ltd., Lahore and produced potato chips and nuts as snack foods. Basically a Marine Engineer and automobile and diesel engineer by profession, Mr. Bhatti has also worked as Maintenance Manager with Linear Pak Gelatin Ltd., Kala Shah Kaku, Lahore. Mr. Bhatti has travelled a lot around the world during his services with merchant navy as Marine Engineer.

AGROENVIRON 98: International Symposium on:

“AGRO-ENVIRONMENTAL ISSUES AND FUTURE STRATEGIES: TOWARDS 21ST CENTURY”

*May 25-30, 1998 at the University of Agriculture,
Faisalabad, Pakistan.*

This symposium is being organized by the Department of Structures & Environmental Engineering, University of Agriculture, Faisalabad, Pakistan in collaboration with AKRSP (Sweden), CIRDAP (Bangladesh), CIGR (Belgium), IEF (Canada), NRC (Egypt), RNAM (Thailand), PEA (Palestine), WAITRO (Denmark), AARI, CEWRE, DRIP, IEP, IWASRI, PARC, PCRWR, PSF, PSAE, UGC, WRI, and WWF (Pakistan).

The "Agro-enviro 98" would highlight agro-environmental issues and facilitate the exchange of scientific information. It would help policy makers recognize the impact of agricultural practices on agro-ecosystem. It would also suggest agro-environmental abatement strategies. Areas for paper presentation are: Agro-chemicals and groundwater contamination; Agricultural machinery related noise pollution, soil compaction, erosion etc; Agro-industrial pollution and control; Acid rains and air pollution; Agro-environmental impact assessment and legislation; Industrial/sewage irrigation and soil pollution; Modeling agro-environmental systems; Farm wastes, recycling and energy generation; Mountainous deforestation and management.

Contributors are invited to submit three camera-ready copies of their articles. Type within the frame of 8.5" x 11" (standard size A₄ paper) with 1 inch margins on all four sides. Paper format is:

Title (capitalized), Author's name, Address, Abstract, Introduction, Methodology, Results and Discussion, Conclusions, Recommendations and References.

Center all the titles and do not indent. The text should be single spaced and double spaced between paragraphs and the headings. Use 11 point Times or equivalent font size for text and 13 point bold Times for the titles. The graphs and figures may be drawn using any graphic packages available and embedded in the text body at suitable place. However, graphs or figures drawn by hand (using black India Ink) should be submitted in original along with their Xerox copies at respective places in the hard copies. The captions of the

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figures and tables should be numbered in Arabic numerals. The length of the paper should not exceed six pages. Please include an IBM compatible disk (3.5") with the paper using WORDPERFECT or MS WORD or an ASCII file. This is very much desired for inclusion of your paper in the proceedings of the Symposium. The papers will be selected by the Review Committee.

Papers sent before **February 15, 1998** will be published in the Agroenviron 98 Proceedings.

CONTACT FOR FURTHER INFORMATION:

Prof. Dr. Jehangir Khan Sial

(Symposium Director)

Dept. of Structures & Environmental Engineering,

Faculty of Agricultural Engineering & Technology,

University of Agriculture, Faisalabad, Pakistan.

Tel: (041) 30281-89/Ext. 434

Fax: (041) 647846/30679

NEWS FROM QUETTA

4th Annual Apple Show

4th Annual Apple Show was organized by the Export Promotion Bureau in collaboration with Department of Agriculture and Area Development Programme Balochistan (UNDP-GOBal) from 13-15 October, 1997 at Quetta Serena Hotel. In this show, 17 varieties of apples were displayed by growers. This show was inaugurated by Muhammad Ishaq Dar, Federal Minister for Commerce and Investment on October 13. The show was witnessed by 5,000 people of all walks of life.

Apple Export Workshop

On the occasion of 4th Annual Apple Show, an Export Workshop was also organized to assess the present status and future needs of apple industry to put this valuable fruit on export list. Three groups involved in apple production and trade viz., growers, traders/exporters and allied agencies like firms dealing with processing plant, wax emulsion and packaging were asked to present their views. Experts from the Department of Agriculture and UNDP facilitated the discussion through their technical input. All these presentations (15 - 20 minutes each) were made in morning and afternoon sessions which were presided by Mr. Muhammad Ali Jogazai, President, Quetta Chamber of Commerce and Industry and Dr. Abdul Hameed

Bajoi, Director General Agriculture, Balochistan. One hundred and ten participants were from Balochistan as well as other parts of the country like Sindh, Punjab, NWFP, and Azad Kashmir. Dr. Waseem A. Farooqi, UNDP Expert was the Programme Coordinator.

EPB Seminar on Export Policy

To discuss the benefits of new export policy and how an exporter could utilize these facilities to boost up export, one day seminar was held at Quetta Serena Hotel on November 5, 1997. The seminar was presided by Mr. Muhammad Ali Jogazai, President, Quetta Chamber of Commerce and Industry. In this seminar, 3 eminent speakers were invited to present their view. Syed Haseen-ud-Din Ahmad, Director General, EPB Karachi explained the eminent features of new policy and its benefits to the exports and invited them to join hands and boost up export so that more foreign exchange could be earned for development. The second speaker Mr. Azam Mohammad, Director, EPB Quetta described the facilities local office could provide to those who wanted to enter export business. The third speaker was UNDP Expert Dr. Wasim A. Farooqi who emphasized on the need of using scientific principles in fruit production in order to increase yield per unit area and improve quality of the fruit. He said we need to improve harvesting, post-harvest handling and marketing through the input of technology without which we cannot compete in the international markets for profitable trade.

WID Training Courses in Food Processing

Three short courses of 2-3 day duration were organized by ADBP in collaboration with the Department of Agriculture under Women in Development Programme (WID). The main theme was to train women in the skill to prepare fruit and vegetable products at home level so as to utilize the 'cull' fruit, prepare products during glut season at cheaper rates and use at home not only to save money but also to improve nutritional status of family members. If some women in a village or town could organize a working group, they could establish a cottage industry for income generation and community development. These courses were held in September, October, and November in Quetta in which 18, 19, and 30 ladies participated, respectively. These ladies were house wives as well as professionals from Government Department and NGOs. WID training courses were convened by Dr. Wasim A. Farooqi, Postharvest Expert.

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CHANGE OF TELEPHONE NOS.

Telephone/Fax Nos. and Telex Nos. of Ms. Standard Manufacturing Company (Pvt.) Limited has changed as follows:

1. **Karachi Office:**
Tel: (021) 453 9963, 453 9964
Telex: 21377 CHEMO PK.
2. **Lahore Office:**
Tel: (042) 724 3973, 712 2558-60
Fax: (042) 723 3479
Telex: 44477 PRFUM PK.
3. **Factory:**
Tel: (042) 797 0691-3
Fax: (042) 797 0696

PEPSI COLA INTERNATIONAL RELOCATES TO ITS NEW OFFICES

Pepsi Cola International (Pvt.) Limited is relocating to its new offices December 15, 1997. The new address and contact numbers are as follows:

Pepsi Cola International
22-Zaman Park, Upper Mall,
P.O. Box 3111,
Lahore, Pakistan.
Tel: (042) 111 724 725 (UAN)
(042) 636 8727-32 (PABX)
Fax: (042) 636 9375

All correspondence addressed to Pepsi Cola International (Pvt.) Ltd. Pakistan may please be made on the above address.

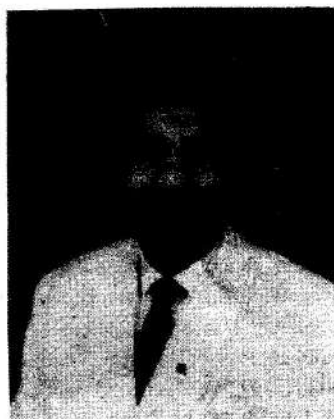
CHANGE OF ADDRESS

Ms. Far Eastern Impex have moved to the new address as follows:

Far Eastern Impex
G-3, Central Commercial Area,
K.C.H.S.U.,
Karachi-75350, Pakistan.
Tel: (Temporary; effective 30-4-1997)
(021) 453 8221, 453 9877, 454 3722
Fax: (021) 454 7323
e-mail: info@feimpex.khi.sdnpk.undp.org

It may, however, be please noted well that all the old telephone numbers of Far Eastern Impex will shortly be transferred to their new address.

ZAHID IQBAL ZIA MOVES TO S.M.C. FROM DANISH FOODS



Mr. Zahid Iqbal Zia, Production Manager, Danish Foods (Pvt.) Ltd. has taken over as Manager Technical Assistance in Standard Manufacturing Company (Pvt.) Ltd., Lahore. He may be contacted at the following address:

Zahid Iqbal Zia
Manager Technical Assistance
Standard Manufacturing Company (Pvt.) Ltd.,
4-Dayal Singh Mension,
Shahrah-e-Quaid-e-Azam,
Lahore, 54000.
Tel: (042) 724 3973, 712 2558-60
Fax: (042) 723 3479
Telex: 44477 PRFUM PK.

Ms. TECHWORTH IMPEX INTERNATIONAL APPOINTED AS SUPPLIERS OF FILLING MACHINES

Ms. Techworth Impex International (Regd.), manufacturer, stockists, importers, exporters, indentors, and representatives have been appointed as suppliers of food products packaging machines under the supervision of foreign experts. They are now able to supply a complete turnkey production line from 6-120 filling heads for output rates varying from 1,000 to 90,000 containers per hour. For further information/technical assistance on these systems and spare parts, please do not hesitate to contact:

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Ms. Techworth Impex International (Regd.)
Plot-33, Street-10, I-9, Industrial Area,
Islamabad, Pakistan.
Tel: (051) 440 756
Fax: (051) 427 618
Telex: TECHWORTH-ISLAMABAD

SULTAN MAHMOOD MIGRATES TO U.S.A.



Mr. Muhammad Sultan Mahmood, a very enthusiastic and devoted member of Pakistan Society of Food Scientists and Technologists has migrated to United States of America after rendering more than 20 years of excellence and valuable services for the profession and private sector in general and for the society in particular. His contributions will be long remembered. Mr. Mahmood can be contacted at his new address given as under:

Muhammad Sultan Mahmood
3027, Marston Way,
San Jose,
CA 95148,
USA.

Tel: (Res) 408-270-6343
Fax: 408-270-0505
408-729-7570

E-mail: nchad1@ix.netcom.com

The PSFST wishes all the success to Mr. Mahmood in America.

Ms. SAKHAWAT ESSENCE MART ADD NEW PRODUCTS

Ms. Sakhawat Essence Mart, importers, suppliers, and dealers of essences, essential oils, sweeteners, crown corks, bottles, glucose, food colours, pharmaceuticals, and chemicals for all kinds of food industries, perfumery, flavours, and fragrances have added some new variety of very special liquid and powder flavours to their existing list. For further inquiry, sample or product information, please contact:

Sakhawat Essence Mart,
26, Nabha Road,
Lahore-4, Pakistan.
Tel: (042) 214 872, 214 975, 323 641
Fax: (042) 214 942