

COMPARATIVE QUALITY STUDY OF TOASTED CORN AND SOYBEAN

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(Received October 13, 1988; revised January 22, 1989)

Toasted corn and soybean grains were compared for their proximate content and organoleptic characteristics when stored in polyethylene bags for 30 days at room temperature. Toasted soybean grains contained more ash, fat and protein content whereas moisture content and peroxide values were higher in toasted corn grains. Organoleptically, toasted soybean grains were superior to that of corn grains as far as appearance, texture and flavour were concerned. Results clearly suggest that by virtue of their superiority nutritionally as well as sensorily, toasted soybean grains can easily replace toasted corn grains.

Key words: Toasting, Proximate composition, Organoleptic attributes.

INTRODUCTION

Soybean is the best plant source of most of the macro and micro-nutrients needed for human nutrition [1]. Major problems associated with proper utilization of soybean are (a) antinutrient factors [2, 3] (b) grassy and beany flavour [4], and (c) bitter and astringent taste [5]. Most of the antinutrients (like phytates, trypsin inhibiting factors etc.), however, are heat labile and are automatically rendered inactive during heat processing [6-8].

Corn grains are usually toasted and sold in rural as well as urban areas of almost all parts of Pakistan. Keeping in view the nutritive value of soybean, studies were carried out to compare the nutritional and organoleptic quality of whole toasted corn and soybean grains during storage for 30 days at room conditions.

MATERIALS AND METHODS

Corn cv. Sarhad white was obtained from Cereal Crops Research Institute, Pirsabak, Nowshera, Peshawar, while soybean cv. William was procured from Agricultural Research Station, Mingora, Swat.

Properly cleaned and thoroughly washed grains of soybean were cooked for 30 min. in boiling water containing 0.5% sodium bicarbonate to remove beany flavour [9]. Soybean grains were then dried in an electric cabinet dehydrator at 60 to 80° till the moisture content was reduced to about 10%. Corn grains were also soaked in tap water and its moisture content adjusted to about 10% to avoid popping during toasting. Toasting in both the cases was done by adopting the local method on hot common table salt bed used by corn toasting vendors. Toasting was

done for 4-5 min. till the colour of grains changed to bright yellow.

After toasting both corn and soybean grains were cooled, packaged in low density polyethylene film bags (0.030 mm thick) and stored at room temperature for one month for further evaluation.

Raw as well as toasted grains of corn and soybean were analysed in triplicate for moisture, ash, fat and protein content by the methods of A.A.C.C. [10]. Peroxide value was determined by the method of IUPAC [11]. Sensory evaluation for such characteristics of toasted grains like appearance, texture and flavour was carried out by the scoring method suggested by Krum [12].

All the data were analysed statistically and means were compared using least significant difference (LSD) [13].

RESULTS AND DISCUSSION

(i) *Chemical constituents.* The chemical constituents of raw and toasted corn and soybean grains are presented in Table 1. The results clearly indicate that soybean grains contained significantly ($P < 0.01$) more ash, fat and protein than corn grains. Peroxide values of fats of both the grains were almost comparable i.e., 4.59 and 4.05 meq/kg, respectively in corn and soybean grains. There was drastic reduction (almost 50%) in moisture content of both the grains during toasting, however ash, fat and protein content of these grains remained unchanged. Peroxide value of corn as well as soybean grains increased slightly during toasting, this increase was accentuated during storage at room conditions and the values were approximately 6 times and 3 times higher than that of fresh corn and soybean grains, respectively, after one month storage period. Moisture, ash, fat, protein content and peroxide value of raw corn and

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soybean grains were 8.72%, 2.45%, 4.56%, 10.40% and 4.59 meq/kg and 5.98%, 5.34%, 18.70%, 37.58% and 4.05 meq/kg, respectively. The values changed to 4.52%, 2.95%, 4.71%, 11.11% and 24.59 meq/kg and 2.64%, 5.52%, 18.48%, 37.08% and 13.60 meq/kg respectively after 30 days storage of toasted grains at room conditions.

Results on the effect of toasting on the chemical composition of cereals and legumes are variable. Shimizu *et al.* [14] reported an increase in ether extract of barley roasted from 110 to 225°. Derise *et al.* [15] found 100% retention in proximate components of roasted peanuts, except moisture and sodium which were reduced while ash content changed to a higher value. Moisture content decreased, ash content increased whereas protein content remained unchanged as an effect of roasting of peanuts [17]. Metwelli *et al.* [16] found changes in moisture content, peroxide value and free fatty acids of roasted peanuts stored in different packaging materials. As regards soybean, protein content of toasted and raw grains were almost the same when compared on moisture free basis [18]. In case of split bengal gram, however, there was 5.7% decrease in protein content due to roasting [19].

(ii) *Organoleptic characteristics.* Organoleptic characteristics of toasted corn and soybean grains studied

were appearance, texture, flavour (odour and taste) and overall acceptability. Toasted soybean grains were judged superior to that of corn grains for all the characteristic mentioned above (Table 2). There was insignificant decrease in appearance, and flavour scores of both type of grains during storage, however, texture deteriorated significantly ($P < 0.01$) during storage at room conditions. Mean overall acceptability scores (out of 10) were 6.3 and 8.2, respectively immediately after toasting in corn and soybean grains. These scores decreased to 5.8 and 7.9, respectively after 30 days of storage at room conditions.

Present results clearly demonstrate the superiority of toasted soybean over toasted corn both nutritionally and organoleptically. Toasted corns which are commonly consumed in all parts of Pakistan can be easily replaced with toasted soybean grains. It can prove as one of the cheapest way of combating protein caloric malnutrition especially in farflung under developed rural areas where most of the population is under nourished. This will have positive effect on the health of common man and will definitely improve their nutritional status. As is clear from the present studies and those of others on legumes [20, 21], simple toasting can take care of the problem of abnormal flavour and toasted products of this legume can be made acceptable for human consumption.

Table 1. Chemical Constituents of Toasted Corn and Soybean Grains During storage at room conditions.

| Storage period (days) | Moisture(%) | | Ash (%) | | Fat (%) | | Protein (%) | | Peroxide Value (meq/kg) | |
|-----------------------|-------------------|-------------------|-------------------|-------------------|-------------------|--------------------|--------------------|--------------------|-------------------------|--------------------|
| | Corn | Soybean | Corn | Soybean | Corn | Soybean | Corn | Soybean | Corn | Soybean |
| 0 | 4.08 ^a | 2.55 ^b | 2.65 ^a | 5.65 ^b | 4.23 ^a | 18.38 ^b | 10.10 ^a | 37.64 ^b | 6.62 ^a | 5.53 ^b |
| 10 | 4.19 ^a | 2.11 ^b | 2.74 ^a | 5.43 ^b | 4.76 ^a | 18.59 ^b | 10.48 ^a | 37.02 ^b | 11.07 ^a | 6.53 ^b |
| 20 | 4.49 ^a | 2.88 ^b | 2.67 ^a | 5.96 ^b | 4.57 ^a | 18.31 ^b | 10.07 ^a | 38.59 ^b | 15.06 ^a | 8.49 ^b |
| 30 | 4.52 ^a | 2.64 ^b | 2.95 ^a | 5.52 ^b | 4.71 ^a | 18.48 ^b | 11.11 ^a | 37.08 ^b | 24.59 ^a | 13.60 ^b |
| Raw (untoasted) | 8.72 ^a | 5.98 ^b | 2.45 ^a | 5.34 ^b | 4.56 ^a | 18.70 ^b | 10.40 ^a | 37.58 ^b | 4.59 ^a | 4.05 ^b |

All the values are average of triplicate determinations. Values followed by different letters are statistically different at 1% level of significance.

Table 2. Organoleptic Characteristics of Toasted Corn and Soybean Grains during storage at room conditions.

| Storage period (days) | Appearance (0-10) | | Texture (0-10) | | Flavour (0-10) | | Overall (0-10) | |
|-----------------------|-------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| | Corn | Soybean | Corn | Soybean | Corn | Soybean | Corn | Soybean |
| 0 | 6.4 ^a | 8.0 ^b | 6.0 ^a | 8.6 ^b | 6.4 ^a | 8.1 ^b | 6.3 ^a | 8.2 ^b |
| 10 | 6.7 ^a | 7.4 ^b | 5.0 ^a | 8.8 ^b | 6.7 ^a | 7.5 ^b | 6.1 ^a | 7.9 ^b |
| 20 | 6.2 ^a | 7.4 ^b | 4.9 ^a | 8.2 ^b | 6.0 ^a | 7.9 ^b | 5.7 ^a | 7.8 ^b |
| 30 | 6.2 ^a | 8.0 ^b | 5.0 ^a | 8.1 ^b | 6.2 ^a | 7.6 ^b | 5.8 ^a | 7.9 ^b |

All the scores are average of ten judgements., 0 = Disliked extremely; 10 = Liked extremely; Scores followed by different letters are statistically different at 1% level of significance.

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