

## SENSORY AND NUTRITIONAL QUALITY OF READY TO EAT PRODUCTS OF GROUNDNUT SOLD IN MARKETS OF JAIPUR CITY



### Home Science

**KEYWORDS:** groundnut, sensory quality, nutritional quality, ready to eat products

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### ABSTRACT

Ready to eat products of oilseeds are rich in nutrients like energy, fat, protein, iron, calcium, pyridoxine and magnesium. The excellent flavour of groundnut is responsible for large consumption of ready to eat products of groundnut all over India. A variety of sweets and savory ready to eat products of groundnut are available in market. A total of sixty samples, twenty each of roasted groundnut, singhdana and chikki were collected from vendors, small shops, big shops and departmental stores situated in Jaipur city. Sensory quality was assessed using composite score test. Nutritional quality was assessed by estimating moisture, crude protein, total fat, ash, crude fibre, carbohydrate, calcium and iron content by using standard methods of AOAC. The sensory quality of all the products sold at departmental stores was found best followed by small shops and vendors. Results of nutritional quality revealed that samples collected from departmental stores had higher percentage of protein, fat, calcium and iron as compared to small shops and vendors.

### INTRODUCTION

Groundnut is called "poor man's almond" as it is cheap and highly rich in protein and oil content. It is good source of energy and fat, therefore consumed in large quantities by people. Gujarat produce largest amount of groundnut and Rajasthan ranks fourth position in groundnut production. The groundnut kernels are eaten raw, whole roasted and salted or chopped in confectionaries. Groundnut laddoos and chikki are commonly used. The groundnut, being rich in nutrition (Gopalan *et al.* 1995), good flavor and aroma which has led to its use in the form of various ready to eat sweet and savory products. Since processed foods are not assessed for their quality and are consumed as such, quality assessment is therefore an important aspects depends upon its raw ingredients and the storage conditions. Groundnut is prone to aflatoxin and hence the quality of ready to eat products of groundnut were assessed.

### METHODOLOGY

The study was conducted for the quality assessment of ready to eat products of groundnut. One hundred gram of each sample of roasted groundnut, singhdana and chikki were collected from different shops situated in different markets of Jaipur. A total of 60 samples were collected from departmental stores, big shops, small shops and vendors (who are selling the products on push carts at a fixed places on roadside) located in various areas of Jaipur city. Collected samples of roasted groundnut, singhdana and chikki were assessed for their sensory quality and nutritional quality. Roasted groundnuts are prepared by roasting whole groundnuts and sold as such. Singhdana is a salted and roasted ready to eat preparation of groundnut kernels. Chikki is a preparation of groundnut kernels and jaggery in which the later is melted to this roasted coarsely splitted and made into small pieces of groundnut are added to make the product.

### Sensory quality

Sensory analysis of food relies upon evaluation through the use of our sensory organs such as odour, taste, tactile, temperature, pain, texture etc.

Sensory quality of products was assessed using a panel of 10 judges in the age group of 20-40 years selected through threshold method and trained using triangle test. Composite score test was used for evaluation of quality of all the samples (Jellineck, 1985). The panelists were given individual score cards and they were asked to give scores out of 4.

### Nutritional quality

The nutritional quality of ready to eat preparations of groundnut

samples were analyzed for moisture, ash content, crude protein, total fat, crude fiber, carbohydrates, calcium and iron using standard methods of AOAC (1995). The data were statistically analyzed for mean and standard deviations under univariate analysis.

### RESULTS

#### a) Sensory Quality

**Roasted Groundnut:** The scores for overall acceptability of the samples collected ranged from 1.69±0.20 to 4.49±0.07. The mean scores of roasted groundnut samples were 4.49±0.07, 3.25±0.30, 2.15±0.20 and 1.69±0.20 out of 5 for departmental store, big shops, small shops and vendors respectively. The sensory quality of roasted groundnut sold by departmental stores scored highest followed by big shops, small shops and vendors. There was no significant difference in the scores of samples collected from vendors and small shops except flavor. The taste of all the samples were similar, but significant difference was observed between the scores of roasted groundnuts collected from vendors and big shops and vendors and departmental stores on all attributes except taste. Significant difference in scores of small shops and departmental stores was also observed.

**Table 1** Sensory Quality of Roasted Groundnut sold at different shops of Jaipur city

Types of shop	General appearance	Crispness	Taste	Flavor	After taste	Overall acceptability
Vendor	1.73±0.20	1.72±0.23	1.75±0.18	1.69±0.18	1.69±0.23	1.69±0.20
Small shop	1.83±0.15	1.79±0.05	2.27±0.14	2.19±0.13	2.09±0.22	2.15±0.20
Big shop	2.39±0.35	2.42±0.32	2.76±0.12	2.92±0.11	2.87±0.82	3.25±0.30
Departmental store	3.4±0.04	3.71±0.15	3.89±0.03	3.93±0.07	4.06±0.06	4.49±0.07

**Table 1.1** Comparative assessment of sensory quality of roasted groundnut sold by different types of shops as assessed by f test and tukey's test.

Types of shop	General appearance	Crispness	Taste	Flavor	After taste	Overall acceptability
V vs SS	NS	NS	NS	*	NS	NS
V vs BS	*	*	NS	*	*	*

V vs DS	*	*	NS	*	*	*
SS vs BS	NS	*	NS	*	*	*
SS vs DS	*	*	NS	*	*	*
BS vs DS	*	*	NS	*	*	*

**Singhdana:** The scores for overall acceptability of the samples collected ranged from 1.90±0.10 to 4.71±0.51. The mean scores of singhdana samples were 4.71±0.51, 3.25±0.30, 2.15±0.20 and 1.90±0.10 for departmental store, big shops, small shops and vendors respectively. The sensory quality of singhdana sold by departmental stores scored highest followed by big shops, small shops and vendors. There was no significant difference in the scores of samples collected from vendors and small shops except taste. Significant difference was observed between the scores of singhdana collected from vendors and big shops and vendors and departmental stores on all attributes except after taste.

**Table 2** Sensory Quality of Singhdana sold at different shops of Jaipur city

Types of shop	General appearance	Crispness	Taste	Flavor	After taste	Overall acceptability
Vendor	1.57±0.317	1.78±0.28	1.78±0.23	1.83±0.165	1.72±0.12	1.90±0.10
Small shop	1.91±0.06	1.57±0.317	2.27±0.14	1.94±0.06	2.1±0.17	2.15±0.20
Big shop	2.19±0.15	2.19±0.15	2.76±0.12	3.2±0.20	3.37±0.09	3.25±0.30
Departmental store	3.93±0.07	3.93±0.07	3.97±0.055	4.61±0.25	4.56±0.25	4.71±0.51

**Table 2.2** Comparative assessment of sensory quality of roasted groundnut sold by different types of shops as assessed by f test and tukey's test.

Types of shop	General appearance	Crispness	Taste	Flavor	After taste	Overall acceptability
V vs SS	NS	NS	*	NS	NS	*
V vs BS	*	*	*	*	NS	*
V vs DS	*	*	*	*	NS	*
SS vs BS	*	*	NS	NS	NS	*
SS vs DS	*	*	*	*	NS	*
BS vs DS	*	*	NS	*	NS	*

V: Vendor, SS: Small Shop, BS: Big Shop, DS: Departmental Store

**Chikki:** The scores for overall acceptability of the chikki samples collected ranged from 3.0±0.01 to 4.78±0.22. The mean scores of chikki samples were 4.78±0.22, 3.96±0.04, 3.99±0.01 and 3.0±0.01 for departmental store, big shops, small shops and vendors respectively. The sensory quality of chikki sold by departmental stores scored highest followed by big shops, small shops and vendors.

There was no significant difference in the scores of samples collected from small shops and big shops. There was no significant difference between the scores of chikki collected from vendors and big shops and vendors and departmental stores on all attributes except after taste whereas significant difference in scores of vendors and departmental stores on after taste was observed.

**Table 3** Sensory Quality of Chikki sold at different shops of Jaipur city

Types of shop	General appearance	Crispness	Taste	Flavor	After taste	Overall acceptability
Vendor	2.72±0.41	2.77±0.20	2.78±0.16	2.92±0.08	3.13±0.36	3±0.01

Small shop	3.42±0.41	3.38±0.14	3.72±0.13	3.69±0.02	3.98±0.02	3.99±0.01
Big shop	3.89±0.03	3.49±0.07	3.57±0.15	3.96±0.04	3.93±0.07	3.96±0.04
Departmental store	4.93±0.07	4.77±0.14	4.98±0.02	4.84±0.08	4.72±0.04	4.78±0.22

**Table 3.3** Comparative assessment of sensory quality of roasted groundnut sold by different types of shops as assessed by f test and tukey's test.

Types of shop	General appearance	Crispness	Taste	Flavor	After taste	Overall acceptability
V vs SS	NS	*	*	*	NS	*
V vs BS	*	*	*	*	NS	*
V vs DS	*	*	*	*	*	*
SS vs BS	NS	NS	NS	NS	NS	NS
SS vs DS	*	*	*	*	NS	*
BS vs DS	NS	*	*	*	NS	*

V: Vendor, SS: Small Shop, BS: Big Shop, DS: Departmental Store

**a) Nutritional Quality**

**Roasted Groundnut:** The mean moisture content of roasted groundnut samples was 1.81±3.69%. The mean crude protein, total fat, ash, crude fibre, and carbohydrate were 23.80±0.19%, 36.69±0.13%, 1.66±2.15%, 2.69±0.20% and 33.24±0.15% respectively. The calcium content of roasted groundnut was 59.32.49±0.45mg/100g while mean iron content was 1.54±0.16mg/100g. The nutritional quality of roasted groundnut with departmental store was almost similar while significant difference was observed between vendors and departmental stores. There was no significant difference found among vendors, small shops, big shops and departmental stores.

**Singhdana:** The mean moisture content of singhdana samples was 1.81±0.06%. The mean crude protein, total fat, ash, crude fibre, and carbohydrate were 23.63±0.04%, 34.73±0.04%, 1.65±0.01%, 2.19±0.25% and 35.79±0.13% respectively. The calcium content of singhdana was 51.82±0.11mg/100g while mean iron content was 2.03±0.06mg/100g. The nutritional quality of singhdana with departmental store was almost similar while no significant difference was observed between vendors, small shops, big shops and departmental stores in the scores of crude fiber.

**Chikki:** The mean moisture content of chikki samples was 2.50±0.01%. The mean crude protein, total fat, ash, crude fibre, and carbohydrate were 20.96±0.08%, 25.11±0.11%, 1.92±0.08%, 2.0±0.02% and 47.46±0.09% respectively. The calcium content of chikki was 54.15±0.10g/100g while mean iron content was 2.44±0.25mg/100g. The nutritional quality of chikki with vendors and small shops was almost similar while no significant difference was observed between vendors, small shops, big shops and departmental stores in the scores of crude fiber.

**Table 4** Nutritional Composition of roasted groundnuts, singhdana and chikki sold at different shops of Jaipur city

Nutritional Quality	Roasted Groundnut	Singhdana	Chikki
Moisture %	1.81±3.69	1.81±0.06	2.50±0.01
Crude Protein %	23.80±0.19	23.63±0.04	20.96±0.08
Total Fat %	36.69±0.13	34.73±0.04	25.11±0.11
Ash %	1.66±2.15	1.65±0.01	1.92±0.08
Crude Fibre %	2.69±0.20	2.19±0.25	2.0±0.02
Carbohydrate(g)	33.24±0.15	35.79±0.13	47.46±0.09
Calcium (mg)	59.32±0.45	51.82±0.11	54.15±0.10

Iron(mg)	1.54±0.16	2.03±0.06	2.44±0.25
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**Table 5** Nutritional Quality of Roasted Groundnut sold at different shops of Jaipur city

Types of shop	Energy kcal/100g	Moisture (%)	Ash (%)	Crude Protein (%)	Total Fat (%)	Crude Fiber (%)	Carbohydrate (%)	Calcium mg/100g	Iron mg/100g
Vendor	557.03	1.84 ±0.18	1.58 ±0.104	23.09 ±0.48	36.24 ±0.20	2.48 ±0.10	34.62 ±0.43	57.8 ±0.87	1.34 ±0.56
Small shop	557.75	1.83 ±0.01	1.58 ±0	23.60 ±0.01	36.55 ±0.03	2.68 ±0.02	33.60 ±0.03	58.93 ±0.17	1.44 ±0.03
Big shop	558.67	1.79 ±9.57	1.71 ±0.25	24.13 ±0.08	36.91 ±0.15	2.80 ±0.01	32.49 ±0.13	59.83 ±0.19	1.58 ±0.05
Departmental store	560.18	1.78 ±5	1.79 ±8.29	24.40 ±0.20	37.06 ±0.14	2.82 ±0.07	32.26 ±0.04	60.74 ±0.59	1.80 ±0

**Table 5.1** Comparative assessment of sensory quality of roasted groundnut sold by different types of shops as assessed by f test and tukey's test.

Types of shop	Energy kcal/100g	Moisture (%)	Ash (%)	Crude Protein	Total Fat	Crude Fiber	Carbohydrate	Calcium mg/100g	Iron mg/100g
V vs SS	NS	NS	NS	*	*	*	*	*	NS
V vs BS	NS	*	*	*	*	*	*	*	*
V vs DS	NS	*	*	*	*	*	*	*	*
SS vs BS	NS	*	*	*	*	NS	*	NS	*
SS vs DS	NS	*	*	NS	*	NS	*	*	*
BS vs DS	NS	NS	NS	*	NS	NS	NS	NS	*

V: Vendor, SS: Small Shop, BS: Big Shop, DS: Departmental Store

**Table 6** Nutritional Quality of Singhdana sold at different shops of Jaipur city

Types of shops	Energy kcal/100g	Moisture (%)	Ash (%)	Crude Protein (%)	Total Fat (%)	Crude Fiber (%)	Carbohydrate (%)	Calcium mg/100g	Iron mg/100g
Vendor	548.51	1.90 ±0.14	1.36 ±0.03	23.08 ±0.08	34.23 ±0.09	2.157 ±0.83	37.03 ±0.33	51.23 ±0.83	2.04 ±0.07
Small shop	550.69	1.81 ±0.01	1.658 ±0.08	23.55 ±0.04	34.77 ±0.03	2.18 ±0.01	35.89 ±0.07	51.70 ±0.26	1.853 ±0.05
Big shop	551.34	1.79 ±8.29	1.78 ±0.01	24.05 ±0.04	35.02 ±0.04	2.23 ±0.01	34.99 ±0.09	52.42 ±0.07	2.147 ±0.03
Departmental store	550.89	1.77 ±0.015	1.81 ±0.01	23.87 ±0.02	34.93 ±0.02	2.22 ±0.02	35.26 ±0.05	51.96 ±0.05	2.10 ±0.12

**Table 6.1** Comparative assessment of sensory quality of roasted groundnut sold by different types of shops as assessed by f test and tukey's test.

Types of shop	Energy kcal/100g	Moisture	Ash	Crude Protein	Total Fat	Crude Fiber	Carbohydrate	Calcium mg/100g	Iron mg/100g
V vs SS	*	*	*	*	*	NS	*	*	*
V vs BS	*	*	*	*	*	NS	*	*	NS

V vs DS	*	*	*	*	*	NS	*	*	NS
SS vs BS	*	NS	*	*	*	NS	*	*	*
SS vs DS	*	*	*	*	*	NS	*	NS	*
BS vs DS	NS	NS	NS	*	NS	NS	NS	NS	NS

V: Vendor, SS: Small Shop, BS: Big Shop, DS: Departmental Store

**Table 7** Nutritional Quality of Chikki sold at different shops of Jaipur city

Types of shops	Energy kcal/100g	Moisture (%)	Ash (%)	Crude Protein (%)	Total Fat (%)	Crude Fiber	Carbohydrate (%)	Calcium mg/100g	Iron mg/100g
Vendor	493.74	2.65 ±0.02	1.77 ±0.09	20.51 ±0.16	23.86 ±0.13	1.83 ±0.02	49.24 ±0.01	53.08 ±0.22	2.26 ±0.76
Small shop	494.61	2.52 ±0.02	1.83 ±0.02	20.81 ±0.01	24.05 ±0.06	1.902 ±0.01	48.73 ±0.09	53.67 ±0.06	2.37 ±0.15
Big shop	495.38	2.45 ±0.01	1.95 ±0.04	21.04 ±0.07	24.26 ±0.05	1.945 ±0.03	48.22 ±0.12	54.12 ±0.10	2.45 ±0.06
Departmental store	506.34	2.40 ±0.02	2.145 ±0.17	21.49 ±0.11	28.3 ±0.22	2.36 ±0.03	43.67 ±0.17	55.76 ±0.04	2.71 ±0.05

**Table 7.1** Comparative assessment of sensory quality of roasted groundnut sold by different types of shops as assessed by f test and tukey's test.

Types of shop	Energy kcal/100g	Moisture	Ash	Crude Protein	Total Fat	Crude Fiber	Carbohydrate	Calcium mg/100g	Iron mg/100g
V vs SS	*	*	*	*	*	NS	*	*	*
V vs BS	*	*	*	*	*	NS	*	*	NS
V vs DS	*	*	*	*	*	NS	*	*	NS
SS vs BS	*	NS	*	*	*	NS	*	*	*
SS vs DS	*	*	*	*	*	NS	*	NS	*
BS vs DS	NS	NS	NS	*	NS	NS	NS	NS	NS

V: Vendor, SS: Small Shop, BS: Big Shop, DS: Departmental Store

**DISCUSSION**

The quality of any ready to eat food product depends on quality, quantity and variety of raw ingredients used, procedure for preparation followed, maintenance of hygiene during preparation and packaging material used. The mean scores for sensory as well as nutritional quality of roasted groundnuts, singhdana and chikki sold at departmental stores and big shops were better than small shops and vendors. These products sold at departmental stores or big shops were sold costlier than those at small shops and vendors. The vendors use raw material of lower quality as well as there is no packaging cost because ready to eat products of groundnut sold by vendors are not packaged properly rather they kept open in big pan which adversely affect the quality. They serve the clientele who wish to afford low cost which ultimately decreases the quality of these ready to eat products of groundnut. On the contrary the departmental stores and the big shops have the number of clientele having good purchasing capacity. They have higher cost of these ready to eat products because of maintaining the good storage and packing facility. The microbial quality of these ready to eat product was reported to be lowest for vendors followed by small shops, big shops and departmental stores (Agrawal et al. 2010)

Roasted groundnuts involve only roasting of groundnuts which does not alter much its nutritional composition.

Chikki prepared with groundnut kernels in jaggery which being hygroscopic in nature absorbs moisture easily and thus gets contaminated easily. Also the quality may be deteriorated if the products are not prepared in hygienic conditions. Usually it is seen that the ready to eat products like chikki, singhdana etc. are prepared on a small scale and thus general rules of food sanitation, safety and hygiene are not followed. The procedure for preparation of chikki is peculiar and crude and thus contaminated by microorganisms. The equipments which are used for preparations of these products on the environment itself may harbor microorganisms. The prepared products can be contaminated by microorganisms and poor storage conditions on long duration of storage before consumption.

The products sold at departmental stores have good storage conditions and are packed finely.

Due to poor environmental, poor storage conditions and the poor nutritional quality of the raw ingredients used leads to microbial deterioration especially fungi. Many crop pathogenic as well as saprophytic fungi adversely affect the nutritional quality of food products. They reduce the oil content, fibre content, insoluble carbohydrate such as starch and sometimes protein content (Agrawal et al, 2001)

### CONCLUSION

The sensory and nutritional quality of ready to eat products of groundnut i.e. of roasted groundnut, singhdana and chikki samples brought from departmental stores was better as compared to the samples collected from vendors, small shops and big shops. The nutritional scores of departmental store for the roasted groundnut, singhdana and chikki were highest among the vendors, small shops and big shops. There was not much difference in the scores of sensory quality assessed for roasted groundnut, singhdana and chikki between vendor and small shops.

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