



E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2018; 7(2): 818-821
Received: 26-01-2018
Accepted: 27-02-2018

Seema
Department Food and Nutrition,
Haryana Agricultural
University, Hisar, Haryana,
India

Neelam Khetarpaul
Department Food and Nutrition,
Haryana Agricultural
University, Hisar, Haryana,
India

Mean scores of organoleptic characteristics of *sag* incorporating from fresh leaves of *desi* and *kabuli* chickpea in Haryana

Seema and Neelam Khetarpaul

Abstract

In this experiment, in case of C-235 variety, *sag* having the fresh leaves (45 days after sowing) was higher than that at 60 days after sowing having 10 percent supplementation. The results for mean scores for aroma were statistically the same whether 10, 15 and 20 percent of supplementation at 30, 45 and 60 days after sowing in C-235 variety were used in the *sag*. All these scores were in the category of 'liked moderately'. The mean texture scores of *sag* containing 10, 15 and 20 percent fresh leaves collected at 30, 45 and 60 days after sowing of both the varieties of *desi* chickpea were statistically similar. All the scores were up to 'liked moderately' category. However, at 45 days after sowing, *kabuli* chickpea leaves at 20 percent supplementation level resulted in maximum mean scores for texture of *sag*. The mean scores for taste of *sag* in both the *desi* chickpea varieties with the supplementation levels of 15 and 20 percent fresh leaves (45 DAS) were found to be significantly ($p \leq 0.05$) higher than their counterparts incorporating fresh chickpea *desi* variety leaves (60 DAS). Up to 45 days after sowing, scores for taste were in the category of 'liked moderately' irrespective of the level of supplementation and these were declined to 'liked slightly' as the leaves got matured i.e. 60 days after sowing and at various levels of supplementation used in the *sag*.

Keywords: Aroma, taste, *sag*, chickpea

Introduction

Chickpea is grown in over 50 countries across the Indian subcontinent, North Africa, the Middle East, southern Europe, the Americas and Australia. Globally, chickpea is the third most important pulse crop in production, next to dry beans and field pea. During 2006-09, the global chickpea production area was about 11.3 million ha, with production of 9.6 million metric tonnes (mmt) and average yield of 849 kg. India is the largest chickpea producing country with an average production of 6.38 million MT during 2006-09, accounting for 66% of global chickpea production (FAOSTAT (2011) [2]. The other major chickpea producing countries include Pakistan, Turkey, Australia, Myanmar, Ethiopia, Iran, Mexico, Canada and USA. (Lev-Yadun *et al.*, 2000; FAOSTAT, 2011) [2, 1]. For chickpea leaves data on leaf mineral concentrations are limited, however, available reports on iron, zinc and copper suggest that this food could be a good source of these minerals. More information is needed on the concentrations of all the human essential minerals in chickpea leaves, and whether certain types and/or cultivars of chickpea might be more nutritious than others (Ibrieki *et al.*, 2003) [3]. Chickpea leaves can be used in various traditional Indian food products especially, *raitha*, *sag*, *poori* and *paratha* etc. The recipes have to be standardized according to the acceptability in the Indian conditions. It is a general perception that the leaves of the *desi* chickpea can only be used for various products like *chutney*, *sag* etc. among the rural population. In Haryana, the area under pulses decreased due to availability of irrigation facilities. In the present scenario, the importance of leaves along with grain yield has been increased due to their nutritional value. Limited work has been done on this aspect. *Desi* and *kabuli* chickpea varieties are explored due to their prominent characteristics which cover whole Haryana.

Material and methods

Sag from fresh leaves

Total thirty six different types of *sags* were prepared from different supplementation levels of chickpea leaves of *desi* and *kabuli* varieties picked up at 30, 45 and 60 days after sowing and were subjected to sensory evaluation to select the best recipe of *sag* further nutritional evaluation.

Correspondence

Seema
Department Food and Nutrition,
Haryana Agricultural
University, Hisar, Haryana,
India

Sag was prepared as per method given below:

Table A: Ingredients used for making *sag*

Ingredients	Amount		
	I	II	III
Fresh chickpea leaves (g) collected at 30, 45 and 60 days after sowing	10	15	20
Spinach (g) (cleaned, washed and chopped)	55	50	45
Onion (g)	15	15	15
Tomato (g)	15	15	15
Green chilli (g)	5	5	5
Salt (g)	2	2	2

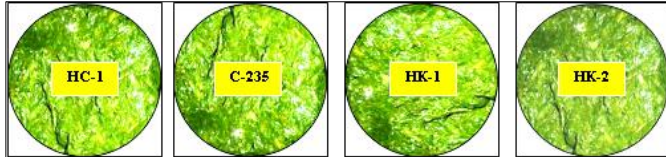


Plate A: *Sags* supplemented with leaves of *desi* and *kabuli* chickpea varieties

Method

1. Rinsed chickpea leaves and chopped.
2. Rinsed spinach leaves and chopped.
3. Added both leaves, boiled and cooked well.
4. Heated oil, added chopped onions till golden brown and then added chopped tomatoes and green chillies.
5. Added cooked *sag* and stirred.
6. Added salt and served with *roti*.

Sensory evaluation of products

Sag was prepared from the fresh leaves of *desi* (HC-1 and C-235) and *kabuli* (HK-1 and HK-2) chickpea varieties at 30, 45 and 60 days after sowing as per the standardized recipes. Developed products were evaluated for sensory parameters like colour, appearance, aroma, texture, taste and overall acceptability.

Results

Sag

Organoleptic evaluation of *sag*

Colour, appearance and aroma

The mean scores of colour and appearance of the *sag* containing 10, 15 and 20 percent fresh leaves of *desi* chickpea varieties (HC-1 and C-235) at 30, 45 and 60 days after sowing were found to be non-significant and fell in the category of 'liked moderately'. The mean scores for aroma of *sag* from the fresh chickpea leaves of HC-1 variety at 30, 45 and 60 days after sowing were statistically the same at different levels i.e. 10, 15 and 20 percent levels of supplementation. However, in case of C-235 variety, *sag* having the fresh leaves (45 days after sowing) was higher than that at 60 days after sowing having 10 percent supplementation. The results for mean scores for aroma were statistically the same whether 10, 15 and 20 percent of supplementation at 30, 45 and 60 days after sowing in C-235 variety were used in the *sag* (Table 1). All these scores were in the category of 'liked moderately' (Table 2). Mean scores for colour, appearance and aroma of *sag* containing 20 percent level of fresh leaves of *kabuli* varieties (HK-1 and HK-2) at 45 days after sowing were the maximum. These scores declined when 60 days after sowing leaves were incorporated at 10, 15 and 20 percent leaves.

Texture

The mean texture scores of *sag* containing 10, 15 and 20 percent fresh leaves collected at 30, 45 and 60 days after sowing of both the varieties of *desi* chickpea were statistically similar. The *sag* containing 15 and 20 percent fresh leaves of HC-1 and C-235 at 60 days after sowing had lower but almost similar mean scores for texture when compared to *sag* having 10, 15 and 20 percent fresh chickpea leaves (30 and 45 days after sowing) of HC-1 and C-235. At different levels of supplementation of *desi* chickpea leaves (30 and 45 days after sowing) mean texture scores were 'liked moderately' and decreased to 'liked slightly' in *sag* having *desi* chickpea leaves collected at 60 days after sowing irrespective of the supplementation level (Table 1).

Mean scores for texture were not statistically different in *sag* having fresh *kabuli* chickpea leaves collected at 30, 45 and 60 days after sowing when incorporated at 10, 15 and 20 percent levels. All the scores were up to 'liked moderately' category. However, at 45 days after sowing, *kabuli* chickpea leaves at 20 percent supplementation level resulted in maximum mean scores for texture of *sag*.

Taste

The mean scores of taste of *sag* having 10, 15 and 20 percent fresh chickpea leaves (30, 45 and 60 days after sowing) of both the *desi* chickpea varieties were non-significant. However, the mean scores for taste of *sag* in both the *desi* chickpea varieties with the supplementation levels of 15 and 20 percent fresh leaves (45 DAS) were found to be significantly ($p \leq 0.05$) higher than their counterparts incorporating fresh chickpea *desi* variety leaves (60 DAS). Up to 45 days after sowing, scores for taste were in the category of 'liked moderately' irrespective of the level of supplementation and these were declined to 'liked slightly' as the leaves got matured i.e. 60 days after sowing and at various levels of supplementation used in the *sag*.

Overall acceptability

The mean scores for overall acceptability of *sag* supplemented with 10, 15 and 20 percent fresh leaves of variety HC-1 of *desi* chickpea at 30 days after sowing did not differ significantly. The mean scores for overall acceptability for *sag* supplemented with 20 percent fresh leaves (30 days after sowing) of C-235 variety were significantly ($p \leq 0.05$) higher (7.9) over 10 percent supplementation of fresh chickpea leaves of C-235 at 30 days after sowing but at par with scores of *sag* having 15 percent supplementation of fresh *desi* chickpea leaves (Table 1).

The overall acceptability scores for *sag* having fresh leaves of HC-1 and C-235 (*desi* varieties) were higher than those of *kabuli* chickpea varieties i.e. HK-1 and HK-2 at 20 percent supplementation levels of leaves collected at 30, 45 as well as 60 days after sowing (Table 1).

The mean scores of overall acceptability of *sag* supplemented with 10 and 20 percent fresh leaves of variety HC-1 at 45 days after sowing were non-significant. But the mean scores were significantly ($p \leq 0.05$) higher (8.0) with the supplementation of 20 percent fresh leaves over supplementation with 10 percent fresh leaves (7.2). It was on par with supplementation of 15 percent fresh leaves (7.5) in variety C235.

The mean scores of overall acceptability of *sag* supplemented with 10, 15 and 20 percent fresh leaves of both the varieties of *desi* chickpea at 60 days after sowing were non-significant and all in the category 'liked moderately'.

When sag was prepared from the 10 and 15 percent leaves of *desi* variety HC-1 picked at 45 days after sowing of chickpea crop, the mean scores of overall acceptability were found higher than the leaves picked at 60 days after sowing with the same supplementation levels (Table 1). The sag from the 10

and 20 percent leaves of C-235 picked at 45 days after sowing, the mean scores of overall acceptability were found significant ($p \leq 0.05$) higher than at 60 days after sowing with same levels of supplementations.

Table 1: Mean scores of organoleptic characteristics of *sag* incorporating from fresh leaves of *desi* chickpea

Days after sowing (DAS)	Supplementation level of HC-1 variety			Supplementation level of C-235 variety		
	10%	15%	20%	10%	15%	20%
Colour						
30	7.1 ^{aA} ± 0.23	7.3 ^{aA} ± 0.21	7.4 ^{aA} ± 0.22	7.2 ^{aA} ± 0.20	7.4 ^{aA} ± 0.22	7.5 ^{aA} ± 0.17
45	7.4 ^{aA} ± 0.27	7.5 ^{aA} ± 0.17	7.7 ^{aA} ± 0.15	7.3 ^{aA} ± 0.15	7.6 ^{aA} ± 0.27	7.8 ^{aA} ± 0.33
60	6.8 ^{aA} ± 0.33	6.9 ^{aA} ± 0.31	7.1 ^{aA} ± 0.28	6.9 ^{aA} ± 0.31	7.0 ^{aA} ± 0.21	7.2 ^{aA} ± 0.33
Appearance						
30	6.8 ^{aA} ± 0.30	7.1 ^{aA} ± 0.18	7.3 ^{aA} ± 0.21	6.9 ^{aA} ± 0.18	7.1 ^{aA} ± 0.10	7.4 ^{aA} ± 0.16
45	7.2 ^{aA} ± 0.13	7.5 ^{aA} ± 0.17	7.8 ^{aA} ± 0.33	7.1 ^{aA} ± 0.28	7.3 ^{aA} ± 0.15	7.7 ^{aA} ± 0.37
60	6.9 ^{aA} ± 0.31	7.0 ^{aA} ± 0.21	7.2 ^{aA} ± 0.33	6.8 ^{aA} ± 0.33	7.1 ^{aA} ± 0.28	7.4 ^{aA} ± 0.34
Aroma						
30	7.3 ^{aA} ± 0.4	7.5 ^{aA} ± 0.34	7.8 ^{aA} ± 0.25	7.2 ^{aAB} ± 0.20	7.4 ^{aA} ± 0.22	7.6 ^{aA} ± 0.13
45	7.5 ^{aA} ± 0.17	7.8 ^{aA} ± 0.33	7.9 ^{aA} ± 0.28	7.5 ^{aA} ± 0.17	7.6 ^{aA} ± 0.27	7.8 ^{aA} ± 0.33
60	6.8 ^{aA} ± 0.33	7.0 ^{aA} ± 0.21	7.1 ^{aA} ± 0.28	6.7 ^{aB} ± 0.26	7.0 ^{aA} ± 0.21	7.2 ^{aA} ± 0.33
Texture						
30	7.3 ^{aA} ± 0.4	7.4 ^{aA} ± 0.22	7.6 ^{aA} ± 0.16	7.1 ^{aA} ± 0.18	7.3 ^{aAB} ± 0.40	7.8 ^{aA} ± 0.25
45	7.2 ^{aA} ± 0.13	7.6 ^{aA} ± 0.27	7.8 ^{aA} ± 0.33	7.1 ^{aA} ± 0.28	7.5 ^{aA} ± 0.17	7.9 ^{aA} ± 0.28
60	6.8 ^{aA} ± 0.33	6.5 ^{aB} ± 0.27	6.2 ^{aB} ± 0.20	6.9 ^{aA} ± 0.23	6.6 ^{aB} ± 0.22	6.1 ^{aB} ± 0.23
Taste						
30	7.2 ^{bA} ± 0.2	7.6 ^{abA} ± 0.16	7.8 ^{abA} ± 0.25	7.4 ^{abA} ± 0.22	7.8 ^{abA} ± 0.25	8.0 ^{aA} ± 0.15
45	7.3 ^{bA} ± 0.15	7.8 ^{abA} ± 0.33	8.0 ^{abA} ± 0.26	7.6 ^{abA} ± 0.27	7.9 ^{abA} ± 0.28	8.2 ^{aA} ± 0.25
60	6.7 ^{aA} ± 0.34	6.5 ^{aB} ± 0.27	6.2 ^{aB} ± 0.20	6.5 ^{aB} ± 0.27	6.4 ^{aB} ± 0.27	6.1 ^{aB} ± 0.23
Overall acceptability						
30	7.1 ^{bA} ± 0.31	7.3 ^{abAB} ± 0.21	7.7 ^{abA} ± 0.21	7.0 ^{bA} ± 0.30	7.4 ^{abA} ± 0.16	7.9 ^{aA} ± 0.28
45	7.3 ^{abA} ± 0.15	7.6 ^{abA} ± 0.27	7.8 ^{abA} ± 0.33	7.2 ^{bA} ± 0.13	7.5 ^{abA} ± 0.17	8.0 ^{aA} ± 0.26
60	6.8 ^{aA} ± 0.33	6.7 ^{aB} ± 0.26	6.8 ^{aB} ± 0.33	6.7 ^{aA} ± 0.26	6.6 ^{aB} ± 0.22	6.9 ^{aB} ± 0.23

Values are mean ± SE of three independent determinations.

The mean values in same row with different superscripts differ significantly ($p \leq 0.05$).

Table 2: Mean scores of organoleptic characteristics of *sag* incorporating from fresh leaves of *kabuli* chickpea

Days after sowing	Supplementation level of HK-1 variety			Supplementation level of HK-2 variety		
	10%	15%	20%	10%	15%	20%
Colour						
30	6.6 ^{aA} ± 0.37	6.8 ^{aA} ± 0.20	7.0 ^{aA} ± 0.33	6.7 ^{aA} ± 0.30	6.8 ^{aA} ± 0.25	6.9 ^{aA} ± 0.23
45	7.0 ^{aA} ± 0.39	7.2 ^{aA} ± 0.13	7.4 ^{aA} ± 0.22	6.9 ^{aA} ± 0.23	7.0 ^{aA} ± 0.39	7.2 ^{aA} ± 0.42
60	6.4 ^{aA} ± 0.45	6.6 ^{aA} ± 0.42	6.8 ^{aA} ± 0.32	6.5 ^{aA} ± 0.45	6.6 ^{aA} ± 0.27	6.7 ^{aA} ± 0.40
Appearance						
30	6.7 ^{aA} ± 0.26	6.9 ^{aA} ± 0.23	7.0 ^{aA} ± 0.30	6.8 ^{aA} ± 0.20	7.0 ^{aA} ± 0.15	7.1 ^{aA} ± 0.28
45	7.0 ^{aA} ± 0.21	7.3 ^{aA} ± 0.21	7.5 ^{aA} ± 0.37	7.1 ^{aA} ± 0.28	7.3 ^{aA} ± 0.15	7.5 ^{aA} ± 0.43
60	6.8 ^{aA} ± 0.36	6.9 ^{aA} ± 0.23	7.0 ^{aA} ± 0.37	6.9 ^{aA} ± 0.38	7.0 ^{aA} ± 0.30	7.1 ^{aA} ± 0.46
Aroma						
30	6.9 ^{aA} ± 0.55	7.0 ^{aA} ± 0.45	7.1 ^{aA} ± 0.18	7.0 ^{aA} ± 0.26	7.4 ^{aA} ± 0.22	7.2 ^{aA} ± 0.29
45	7.2 ^{aA} ± 0.25	7.4 ^{aA} ± 0.40	7.5 ^{aA} ± 0.37	7.2 ^{aA} ± 0.25	7.3 ^{aA} ± 0.37	7.5 ^{aA} ± 0.22
60	6.8 ^{aA} ± 0.33	6.9 ^{aA} ± 0.23	7.0 ^{aA} ± 0.30	6.8 ^{aA} ± 0.25	7.0 ^{aA} ± 0.21	7.1 ^{aA} ± 0.35
Texture						
30	6.8 ^{aA} ± 0.53	6.9 ^{aA} ± 0.28	7.1 ^{aA} ± 0.28	6.9 ^{aA} ± 0.23	7.1 ^{aA} ± 0.48	7.2 ^{aA} ± 0.39
45	7.2 ^{aA} ± 0.13	7.4 ^{aA} ± 0.34	7.6 ^{aA} ± 0.37	7.2 ^{aA} ± 0.25	7.5 ^{aA} ± 0.17	7.7 ^{aA} ± 0.37
60	6.7 ^{aA} ± 0.37	6.8 ^{aA} ± 0.25	7.0 ^{aA} ± 0.30	6.8 ^{aA} ± 0.25	6.9 ^{aA} ± 0.18	7.1 ^{aA} ± 0.53
Taste						
30	6.7 ^{aA} ± 0.26	6.9 ^{aA} ± 0.10	7.1 ^{aA} ± 0.31	6.8 ^{aA} ± 0.25	7.0 ^{aA} ± 0.37	7.1 ^{aA} ± 0.35
45	7.3 ^{aA} ± 0.15	7.5 ^{aA} ± 0.37	7.6 ^{aA} ± 0.37	7.2 ^{aA} ± 0.39	7.4 ^{aA} ± 0.34	7.7 ^{aA} ± 0.40
60	6.5 ^{aA} ± 0.40	6.7 ^{aA} ± 0.26	6.9 ^{aA} ± 0.18	6.6 ^{aA} ± 0.27	6.9 ^{aA} ± 0.23	7.1 ^{aA} ± 0.53
Over all acceptability						
30	6.7 ^{aA} ± 0.45	6.9 ^{aA} ± 0.31	7.0 ^{aA} ± 0.30	6.8 ^{aA} ± 0.39	7.0 ^{aA} ± 0.26	7.1 ^{aA} ± 0.59
45	7.1 ^{aA} ± 0.18	7.3 ^{aA} ± 0.37	7.5 ^{aA} ± 0.37	7.2 ^{aA} ± 0.13	7.4 ^{aA} ± 0.16	7.6 ^{aA} ± 0.40
60	6.5 ^{aA} ± 0.43	6.7 ^{aA} ± 0.26	6.8 ^{aA} ± 0.33	6.6 ^{aA} ± 0.31	6.7 ^{aA} ± 0.26	6.8 ^{aA} ± 0.30

Values are mean ± SE of three independent determinations.

The mean values in same row with different superscripts differ significantly ($p \leq 0.05$).

Discussion

Organoleptic evaluation of developed products

Sag was prepared from the leaves (10, 15 and 20% supplementation levels) of *desi* and *kabuli* chickpea varieties at 30, 45 and 60 days after sowing. *Sag* was prepared with 10, 15 and 20 percent supplementation levels of fresh leaves of *desi* and *kabuli* chickpea varieties. *Sag* having 20 percent fresh leaves of *desi* chickpea variety C-235 got the highest overall acceptability scores (8.0) followed by HC-1 (7.8), HK-2 (7.6) and HK-1 (7.5) after 45 days after sowing.

Acknowledgements

The guidelines from Dr. Neelam Khetarpaul are duly acknowledged and the funds in terms of scholarship from CCS HAU Hisar also acknowledged.

References

1. Lev-Yadun S, Gopher A, Abbo S. The cradle of agriculture. *Science*, 2000; 288:1062-1063.
2. FAOSTAT <http://faostat.fao.org/site/567/default.aspx#ancor>. (Accessed 18th July 2014), 2011.
3. Ibrieki H, Knewton JBS, Grusak AM. Chickpea leaves as a vegetable green for humans: evaluation of mineral composition. *J Sci. Food Agric.*, 2003; 83:945-950.