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Utilization of elite cowpea [*Vigna unguiculata* (L.) Walp] genotypes in the preparation of *Papad* and storage study

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Potential of twelve elite cowpea [*Vigna unguiculata* (L.) Walp] genotypes were studied based on their good functional properties and sensory scores five (T-2, MS-5, MS-7, MS-6, C-152 (Control)) genotypes were selected and used in the preparation of cowpea *papad*. *Papad* making were studied for quality characteristics such as, water uptake (50 ml), pressing property (soft), total yield (ten), diameter of *papad* before and after frying (from 16-27.3 cm), expansion (3-5 %) and grand weight (55-85g). The correlation co-efficient (r) between functional properties and quality of *papad* characteristics were showed significant difference. *Papad* developed out of five cowpea genotypes MS-5 showed highest scores of 8.3, 8.4, 8.0, 7.5, 8.0, and 8.0 for appearance, texture, colour, taste, flavour, and overall acceptability, respectively and statistically there was a significant difference among the genotypes in sensory attributes. Shelf life study of *Papad* was done for three best rated (sensory scores) genotypes, *viz.*, C-152, MS-5 and MS-6. Samples were drawn on zero, 30th and 60th days and analyzed for various sensory quality parameters and microbial counts *viz.*, total bacteria, yeast and fungi were estimated for two month of storage period. *Papads* were well accepted even after storage period and microbial load was within the acceptability range.

Key words : Cowpea seeds, Quality characteristics, Sensory parameters, Microbial study

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INTRODUCTION

Papad is a ready to prepare snack food item with thin wafer like product prepared from a variety of ingredients and is liked very much by population of India. Nowadays, it is gaining international recognition and is termed as India's unique contribution to international menu. Normally black gram (*Phaseolus mungo* L.) dhal is used in the preparation of *papad*. Cowpea [*Vigna unguiculata* (L.) Walp] is gaining popularity because of its good taste and high nutritional value and low cost pulse. Per hundred grams of cowpea contains, moisture (13.4g), protein (24.1g), energy (323Kcal), fat (1.0g), crude fibre (3.8g), carbohydrate (54.5g), calcium (77mg), iron (8.6mg), phosphorus (414mg), oxalic acid (9.0mg) and phytic acid (185 mg) per 100g of edible part (Gopalan *et al*., 2007). Along with the nutritive value, it is also essential to test the acceptability and culinary quality of newer varieties. Because, most of the people prefer the pulses which have shorter cooking time and better taste. Therefore, analysis of elite genotypes for their nutritional quality will provide characteristics and interactions of proteins in food systems. Their genetic variations will influence processing, preparations and quality attributes of foods. Hence, the present study was undertaken to evaluate the utilization of elite cowpea [*Vigna unguiculata* (L.) Walp] genotypes in the preparation of *papad* and storage study.

RESEARCH METHODOLOGY

Twelve elite cowpea (T-2, MS-5, IC-202778, MS-7, IC-243353, KBC-2, GC-3, IC-259084, MS-6, C-152 (Control), IC-219607, and MS-4) genotypes were procured from MRS Hebbal Bangalore and studied for functional quality. Among the twelve elite cowpea [*Vigna unguiculata* (L.) Walp] genotypes five genotypes (T-2, MS-5, MS-7, MS-6, C-152(Control)) were selected for papad making based on their sensory attributes and functional properties. These were cleaned for dust particles and milled in a commercial flour mill. The flour was passed through 60 mesh sieve and stored in air tight containers at room temperature (~28° C) until used. Refined groundnut oil, common salt, puffed rice, spices (black pepper), *Papad kara*, green chilly, and curry leaves were used.

Papad dough was prepared by mixing 80 parts of cowpea flour with 10g puffed rice, 5 parts of common salt and weighed amounts of coarsely hand-pounded spices [*Papad kara* (2.5g),

green chilly (5g), curry leaves (2.5g), and black pepper powder (1g)] and stirred into 350ml hot water (75°C) for 10min to get dough consistency. The dough was then made into *papad* by pressing through a *Papad* making machine, sun-dried to a moisture level of <6% and packed in 350 gauge polypropylene bags.

The quality characteristics of the raw *Papads viz.*, water uptake (ml), pressing property, total yield, diameter of *Papad* before and after fried (cm), expansion (%) and total weight of *Papad* were assessed by ISI (1972) methods. The correlation co-efficient (r) between functional properties and quality of *Papad* characteristics were also studied. All the variables, after deep frying *Papad* in refined groundnut oil at 190° C for 10-15 sec were evaluated for sensory quality for appearance, texture, aroma, taste and overall acceptability by a descriptive procedure (Bhagirathi *et al*., 1995) using nine point hedonic scale. For shelf life study of *Papad* for three best rated (sensory scores) genotypes, *viz.*, C-152, MS-5 and MS-6 were prepared on a single lot and were divided into 150g portion, packed in polythene pouches of 350 gauze and stored at an ambient condition (30± 1 °C). Samples were drawn on zero, 30th and 60th days and analyzed for various sensory quality parameters and microbial count *viz.*, total bacteria, yeast and fungi was estimated for 2 month of storage period.

RESEARCH FINDINGS AND ANALYSIS

Water uptake for dough making was 50 ml in all the genotypes (Table 1). Water decides the plasticity of the dough in *Papad* preparation, as it is essential for rolling. The different cowpea genotypes flour used in the study did not affect the pressing property and total yield of *Papad*. However, weight of each *Papad* varied from 5.5 to 8.5 g with expansion ratio of 3.0 to 4.3 per cent. Findings of the present study were well supported by the results of Bharathi *et al*. (1995) and Vidyavathi (2001) who reported that pulse flour is incorporated in papad preparation.

Correlation co-efficient (r) between functional properties and quality parameters of *Papad* is presented in the Table 2. The results revealed that water absorption capacity was significantly positively correlated with emulsification value (r= 0.6271) and swelling capacity (r=0.7683) and there was significant positive correlation existed between fat absorption capacity with before fried *papad* diameter (r=0.7012) and diameter of *Papad* after frying (r=0.5919). Emulsification value significantly positively correlated with before fried diameter of *Papad* (r= 0.4175) and water uptake (r= 0.4233) also. The results showed that there was a significant positive correlation existed between diameter of *papad* with expansion ratio (r=0.5924).

The sensory scores of cowpea *Papad* from five cowpea genotypes are represented in the Table 3. The ratings revealed that, the product developed out of five cowpea genotypes, MS-5 showed highest scores of 8.3, 8.4, 8.0, 7.5, 8.0, and 8.0 for appearance, texture, colour, taste, flavor, and overall acceptability respectively. Statistically there was a significant difference among the genotypes in sensory attributes. 50 per cent horse gram and black gram dhal flour incorporated *Papad* were well accepted by panelists (Anwara, 2009 and Vidyavathi *et al*., 2004).

Study on shelf life of *papad*, revealed that irrespective of the genotypes *Papad* received significantly higher score for initial stage than 30 and 60 days of storage for all the sensory attributes (Table 4). Between the three genotypes, MS-5 received significantly higher score for appearance (8.6), texture (8.2), colour (8.5), flavour (8.0), taste (7.9) and overall acceptability (8.2). As the duration of storage increased there was a significant difference in the sensory parameters. Microbial count *viz.*, total bacteria, yeast and fungi was estimated by using the dilutions method and results are depicted in the Table 5. The total bacteria of cowpea *Papad* in the initial day was found to be highest in MS-6 (0.75×10^5 CFU) and least in MS-5 (0.29×10^5 CFU) but the microbial count was within the limits recommended by ISI (1972). Microbial analysis showed significant differences at different interval and genotypes but no significant difference was observed in interaction of genotype and duration.

Table 1: Mean values for cowpea *Papad* characteristics

Particulars	Genotypes				
	C-152 (Control)	MS-6	MS-7	MS-5	T-2
Water (ml)	50	50	50	50	50
Dough characteristics	Soft	Soft	Soft	Soft	Soft
Pressing property	Easy	Easy	Easy	Easy	Easy
Total no. of *Papad* (g)	10	10	10	10	10
Diameter (cm)					
Before frying	18.0	27.3	17.6	16.6	16.0
After frying	22.3	32.3	21.0	22.0	19.0
Expansion (%)	4.3	5.0	3.4	5.4	3.0
Total weight of *Papads* (g)	65.0	75.0	85.0	60.0	55.0

Table 2: Correlation co-efficient (r) between functional properties and quality of *Papad* characteristics (n=5)

Sr. No.	Characteristics	1	2	3	4	5	6	7	8	9	10
1.	Bulk density	1.0000									
2.	Water absorption capacity	-0.3077	1.0000								
3.	Fat absorption capacity	-0.7084	-0.3219	1.0000							
4.	Emulsification value	-0.6924	0.6271*	0.3891	1.0000						
5.	Swelling capacity	0.2158	0.7683*	0.0704	-0.8335	1.0000					
6.	Solubility index	0.5832*	-0.8009	0.0771	-0.7685	0.6465*	1.0000				
7.	Before fried *Papad*	-0.3498	-0.4295	0.7012*	0.4175*	0.1040	-0.0091	1.0000			
8.	After fried *Papad*	-0.2374	-0.4974	0.5919*	0.3115	0.0257	0.0220	0.9842*	1.0000		
9.	Expansion ratio	0.3886	-0.5685	0.1899	0.3210	0.3433	0.1529	0.4407	0.5924*	1.0000	
10.	Water	-0.1034	-0.7182	0.2708	0.4233*	0.7837*	0.2391	0.3723	0.4656	0.6677*	1.0000

*indicates significance of value at P=0.05

Table 3 : Mean scores for sensory characteristics of cowpea *Papad*

Genotypes	Appearance	Texture	Colour	Flavour	Taste	Overall acceptability
MS-6	7.5	7.9	7.0	7.6	7.4	7.8
MS-7	6.1	6.5	6.6	6.7	6.7	6.7
MS-5	8.3	8.4	8.0	8.0	7.5	8.0
T-2	5.9	5.9	6.3	6.7	6.8	6.3
C-152 (Control)	7.5	7.0	6.9	7.3	7.5	7.3
F-value	*	*	*	*	NS	*
S.E.	0.323	0.286	0.344	0.261	0.295	0.231
C.D. (P=0.05)	0.911	0.813	0.981	0.768	-	0.683

*indicates significance of value at P=0.05 NS= Non-significant

Table 4: Mean sensory scores for shelf life studies of Elite cowpea *Papad* in polythene (350 gauze) pouches

Genotype	Duration (Days)	Appearance	Texture	Colour	Flavour	Taste	Overall acceptability
C-152 (Control)	Initial	7.4	6.6	7.6	7.4	7.4	7.5
	30	7.2	6.6	7.2	7.1	7.0	7.0
	60	6.6	6.4	6.7	6.3	5.9	5.8
MS-6	Initial	8.3	7.8	7.9	7.4	7.7	7.7
	30	7.8	7.4	7.7	7.4	7.2	7.4
	60	6.7	6.8	7.2	7.0	6.6	6.4
MS-5	Initial	8.6	8.2	8.5	8.0	7.9	8.2
	30	8.2	7.9	8.3	8.0	7.9	7.8
	60	7.7	7.6	8.0	7.8	7.4	7.6
Genotype	'F' value	*	NS	*	*	*	*
	S.E. ±	0.113	0.141	0.124	0.130	0.129	0.116
	C.D. (P=0.05)	0.326	-	0.348	0.368	0.367	0.329
Duration	'F' value	*	*	*	*	*	*
	S.E. ±	0.113	0.141	0.124	0.131	0.130	0.116
	C.D. (P=0.05)	0.326	0.394	0.348	0.368	0.368	0.329
Genotype ×Duration	'F' value	NS	*	NS	NS	NS	*
	S.E. ±	0.196	0.242	0.214	0.227	0.226	0.202
	C.D. (P=0.05)	0.552	0.683	0.603	0.638	0.637	0.570

*indicates significance of value at P=0.05 NS=Non-significant

In conclusion, it may be stated that among the twelve elite cowpea genotypes, best sensory accepted five (T-2, MS-5, MS-7, MS-6, C-152 (Control)) genotypes yielded acceptable *Papads* with good shelf life. Varietal differences of cowpea did not affect the quality characteristics of the papads. The results reveal that cowpea flour had all the desirable functional properties for making *Papads*; hence cowpea flour makes an excellent raw material for the *Papad* industry.

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