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Consumer acceptability of the selected cowpea varieties (whole gram and dhal) products

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Abstract
Study on cooking qualities of the cowpea samples reported that cooking time, volume expansion ratio, water absorption ratio, length and breadth elongation ratio and solid loss had increased during storage in all cowpea varieties (whole and dhal) stored in glass bootless and poly ethylene bags with and without vacuum. The organoleptic evaluation scores of the cooked whole gram and dhal samples ranged between excellent and good for all the quality attributes from 0 to 180 days. Variety VCP8 had excellent puffing and frying quality and also had high scores for organoleptic attributes followed by CO6, CO4 and P152. During storage, not only quantitative and qualitative losses occur, even the cooking quality of pulses is affected, especially cooking time. The cooking time of the stored pulse generally increased. The cooking quality of cow pea they found that as the storage period increased, the cooking time of the pulses also had increases. The method of storage (bin, mutpots and jute bags) of plusses did not have any beneficial effect on the cooking time of pulses. The time required for cooking the samples treated with tri calciuam phosphate was the maximum at the end of 12 months of storage in all the four pulses when compared to the cooking time of untreated pulses. Storage changes in cooking time and water uptake of four pulses namely green gram, red gram, black gram and Bengal gram stored for one year by rural families, at three regions of Andhrapradesh have been assessed by periodical evaluation by them revealed that the green gram took least time and Bengal gram the highest time for cooking. But the maximum increase in time taken for cooking the stored pulses was observed in greengram (52%) followed by black gram (35%) Bengal gram (31%) and red gram (29%). Though a progressive decrease in water uptake was observed between percentage decrease in water uptake and percentage increase in cooking time. There was a decrease in weight and volume of raw and cooked pulses with the increase in storage period. The initial cooking time 33 min, cooked weight (218.8g) and cooked volume (299.0 ml) of green gram had increased to 37 min, 243.4 g,326.5 ml/100 g after storing for 9 months at room temperature in jute bags. Okaka and potter studied sensory, nutritional and storage properties of cowpea powders processed to reduce beany flavor. Acidified water soaking of cowpeas followed by blanching reduced the beany flavor of drum dried cowpea powders. A taste panel preferred the low beany cowpea powders in a porridge like baby food formula but not in bread where the reduction in beaniness was less apparent or in main-moin, an Affrican traditional dish, where beany flavor is desirable. In the earlier days cowpea was used only for the preparation of “sundal” and “vadai”.Recent investigations showed that the cowpea could be made use in Indian dishes eithei alone or in combination with other ingredients. Developed products from cowpea and evaluated them for their acceptability. They prepared products such as pittu, omapodi, fried cowpea balls, pancakes, dosai, and idli were highly acceptable up to 100% level. Whereas in the case of bakery products 25-30% incorporation was accepted by the judges.

Keywords: cowpea, whole gram, dhal, cooking quality, consumer acceptability, organoleptic evaluation

Introduction
Cow pea commonly known as Labia, an ancient Neolithic African crops is now grown thought the tropics and sub tropics as a pulse, a vegetable a fodder and as a cover crops. Cowpea grain contains 23.4 protein, 1.8 fat, 60.3 carbohydrate g per 100g. The amino acid pattern of cowpea is closer to that of whole egg, but it is deficient in methionine and cysteine. Cowpea flour was used to replace 10, 15 and 20 percent of the wheat flour in bread. Bread made with 10 per cent cowpea flour was acceptable, but further quantities of cowpea flour diminished the quality of dough and the finished bread. A fermented cowpea flour prepared by fermenting dehulled beans in the three volume of water at 38 0 C for 48 hr. After fermentation the beans were washed dried then ground into flour. The flour was acidic and slightly greenish white in colour. It contained 21 per cent protein, 25 percent oil 1.6 per cent ash, 66.6 percent carbohydrate, 35 IU Bea carotene, 1.28 mg ascorbic acid, 1.03 mg thiamine and mg pyridoxine. Nirogen solubility index, water absorption and viscosity became greater after fermentation. Two products (breads and chips) prepared from unfermented cowpea flour were scored higher than the ones containing fermented cowpeas flour. The possibility of preparation of papads from different dhal flours with or without the addition of black gram flour has been examined by the papads prepared from the blend of black gram, green gram and lentils (60:25:15) showed better colour, aroma, taste and texture. The nutritional quality evaluation of

weaning foods based on malted, popped and roller dried wheat and chick peas was done. The formulation had 60 per cent wheat,30 per cent chick peas, 5 per cent skim milk powder and 5 per cent sucrose and contained about 16 per cent protein. The cooked paste viscosity of malted food, popped food with malt and roller dried food with malt was significantly lower than popped and roller dried foods at all comparable slurry concentrations. The energy density of malted and malt –added food slurries at spoon feeding consistency was 4.2 kjg-1, per (2.91), biological value (88.3) and true protein of per digestibility (87.5) values of malted food were higher than that of the other formulations. The acceptability scores were significantly higher in sandwige made from cowpea rice flour blend when compared to the traditional product.

Materials and Methods

Four cowpea varieties namely P 152,CO4,CO6 and VCP 8 selected for this study were purchase from the National pulse research station. Tamil Nadu Agricultural University, Vamban, Tamil Nadu. All the selected samples were dried for five hours in the sun, cleaned and stored in the aluminum containers. The cowpea varieties (whole gram and dhal selected for the study is shown in plate 1 and 2. Glass bottles of 500 gm capacity and polythene bags of 250 gauge (13x9 cm) were used for storing the whole gram and dhal for the study. Equipments used in the study. Bosch balance, torsion balance, hot air oven, Klett -summerson photo electric calorimeter, vacuum pump, sealing machine, mixie.

Soaking

The selected cowpea varieties were soaked in water in the ratio of 1.3 for 3h. The water was drained completely and surface dried by spreading on the filter paper for 2 min. The analysis of the ant nutritional factors and flatus compounds were done as per the procedures given in section 3.2.4

Sprouting

Cowpea (whole) seeds were soaked in water at room temperature for six h. The soaked cowpea (whole) were kept tied in a clean sterilized cloth and was allowed to sprout at room temperature in the dark (It was found that spreading of the soaked cowpea in a moist cloth did not favour good germination). The germination was continued for a period of 24 h and the development of shoot lets and the rootlets were watched visually. The cowpea (whole) was kept moist by periodical sprinkling of water. Samples of well germinated cowpea were withdrawn and were ground well into a paste in a mortar and pestle aliquot was used for the estimation of flatus compounds trypsin inhibitor activity (TIA), tannin and phytic acid.

Cooking

Each variety of the cowpea was cooked separately by boiling method 25 g in 250 ml water for 30 min similarly 25 g of cowpea in 100 ml water was cooked in the pressure cooked for 15 mm the water was completely drained from boiled and pressure cooked samples. Surface dried then the ant nutritional factors and the flatus compounds were analyzed.

Frying

The cowpea sample was soaked in the solution containing 4% sodium bicarbonate and 6% salt for at the ratio of 1:3 for 334 h. The water was completely drained, surface dried and fried in the oil for 2-234 mm at 140°C. The fried sample was ground into powder by using mortar and pestle. The ground sample was used for the analysis.

Puffing

The process developed by Subba Rao and prasannappa (1989) was adopted for puffing of Cowpea with slight modifications. The cowpea sample was soaked in 4% sodium bicarbonate and 6% salt solution at the ratio of 1:3 for 33 h. Then the excess soak solution was completely drained and surface dried. The cowpea was puffed for 231 mm in a hot sand bath of 1:3 ratio maintained at 250°C. The puffed cowpea was seived using a metal sieve 3520 and cooled. The husk was removed by rubbing manually and winnowing to obtain puffed cowpea. The puffed cowpea sample was powdered and utilized for the analysis.

Table 1: Physical Characteristics of cowpea varieties (whole gram and dhal)

Characteristics	Whole gram (w)				Dhal (D)			
	P152 (W_1)	Co4 (CW_2)	Co6 (CW_3)	VCP 8 (CW_4)	P152 (CD_1)	CO4 (CD_2)	CO6 (CD_3)	VCP 8 (CD_4)
Length (cm)	0.71	0.94	0.78	0.84	0.68	0.88	0.64	0.88
Breath (cm)	0.68	0.71	0.49	0.78	0.48	0.46	0.55	0.56
Thickness (mm)	4.64	4.63	4.62	4.0	2.50	2.62	2.40	2.61
Bulkdensity	1.06	1.07	1.06	1.05	1.5	1.05	1.05	1.51
100 grain weight (g)	12.5	10.75	9.30	13.70	5.05	8.25	4.45	8.05

The changes in the physical characteristics such. as weight, volume, bulk density and the organoleptic attributes, such as appearance, colour, texture, flavoür, taste and overall acceptability were also done for the fried and the puffed cowpea samples.

Cooking quality

The cooking qualities such as cooking time, volume expansion ratio, length elongation ratio and solid loss were analysed before and after storage (0-180 days).

Water absorption ratio

The water absorption ratio was method described by Khan and Ali. The water absorption ratio between the weight of the cooked cowpea (whole/dhal) to the uncooked.

Length elongation ratio

It was estimated by the method described by Khan and Ali. (1985) It is the ratio between the breadth of the cooked to the uncooked cowpea (whole/dhal)

Breadth elongation Ratio

It was estimated by the method described by Khan and Ali. (1985) It is the ratio between the breadth of the cooked to the uncooked cowpea (whole/dhal).

Solids lost in the gruel

I It was estimated by the method described by by Chakrabarthy *et al* 1972. Ten gram of the sample was taken in a boiling test tube and was cooked with 60 ml of water. After cooking, the gruel was drained into a measuring cylinder and the volume was noted. Ten ml of the gruel was taken in an evaporating dish which on evaporation gave solids lost in the gruel.

Organoleptic Evaluation

The organoleptic attributes such as colour, appearance, flavor, texture, taste and over all acceptability of the cooked cowpea (whole gram and dhal) fried and puffed cowpea were evaluated. Samples were evaluated by using a panel of ten untrained judges on a four point hedonic scale for various quality attributes. The score card used fpr the study of cooked dhal and whole gram samples, puffed and fried cowpea samples are given in tables.

Results and Discussion

Cooking quality of cowpea varieties (whole gram and dhal)

The cooking qualities such as cooking time, volume expansion ratio, length elongation ratio, breadth elongation ratio, water absorption ratio and solid loss were analsed before and after storage (0-180 days) of cow pea varieties (whole gram and dhal) stored in different packaging materials, The reslts obtained are presented in table.

Cooking time

The cooking time of each coepea varieties packed in each packaging material had increased during storage. The initial cooking time of the wholegram cowpea variety were 48.5 to 49.5 min which had increased to 52.0 to 53.5 min for Ti and T3 and 52.5 to 54.0 min for T2. Similar to whole gram the cooking time of the cowpea dhal samples had also exhibited an increase after storage. The initial cooking time of the dhal samples ranged between 34.5 and 36.0 min.The corresponding values after 180 days of storage were 36.0 to 37.0 min for T1,35.5 to 37.0 min for T2 and T3.When compared to the whole gram the time required for cooking the dhal is lesser in all the cowpea varieties.

Volume expansion ratio

The cowpea varities showed an increase in the volume expansion ratio after 180 days of storage. A slight variation in the volume expansion ratio was observed between varieties packed in T1, T2 and T3. The initial volume expansion ratio of the whole gram cowpea samples were 2.0 to 2.2.The corresponding values after 180 days of storage were 3.4 to 3.5 for T1 and 3.6 to 3.7 for T2 and T3.The volume expansion ratio of dhal samples was found to be slightly higher than the whole gram cowpea samples. The initial volume expansion rato of dhal was found to be between 3.5 to 3.8.The corespnding values after 180 days of storage were between 4.2 and 4.4 for T1 and T2 and 4.3 and 4.4 for T3.

Water absorption ratio

The water absorption ratio increased during storage of cowpea varieties selected for the study (whole gram and dhal).The initial water absorption ratio was noted as 1.9 (whole gram)and 1.5 (dhal).After 180 days of storage the water absorption ratio values ranged between 2.3 and 2.4 for whole gram and 2.6 and 2.8 for dhal.

Length elongation ratio

The initial length elongation of the cowpea varities ranged 0.4-0.5 for the whole gram and for the dhal it ranged from 1.03 to 1.04. A slight increase (1.03-1.05) in length elongation ratio was noted in dhal samples after 180 days of storage. Whereas in whole gram cowpea samples stored in different packaging materials had a remarkable increase in length elongation ratio.

Breadth elongation ratio

With respect to breadth elongation ratio only a slightly increase was observed in whole gram cowpea samples and the values ranged between 0.73 and 0.74 and 0.74 and 0.75 at 0 and 180 days of storage respectively. In the dhal samples the initial breadth elongation ratio ranged from 0.60 (CD 1) to 0.64 (CD4) and after 180 days of storage the length elongation ratio had increased to 0.64 -0.67.

Solid loss

The solid loss of the whole gram cowpea samples was ranged between 1.30 and 1.35 on the initial day and the corresponding value for the dhal was 1.85 g/100g.After 180 days of storage the solid loss had increased in both whole gram and dhal samples and the values ranged between 1.95 and 2.05 (in T1), 2.00 and 2.05 (in T2) and 2.00 and 2.05 g/100g (in T2) for dhal samples. With respect to whole gram the solid loss was found similar for T1, T2 and T3.

Table 2: Changes in the cooking quality of cowpea varieties (wholegram) during storage

Characters	Glass Bottles (T_1)				Polyethylene bags with out vacuum (T_2)				Polyethylene bags with vacuum (T_3)			
	CW_1	CW_2	CW_3	CW_4	CW_1	CW_2	CW_3	CW_4	CW_1	CW_2	CW_3	CW_4
Cooking time (min)												
Zero day	49.5	48.5	49.0	49.0	49.5	48.5	49.0	49.0	49.5	48.5	49.0	49.0
180 day	53.5	52.0	53.5	52.0	53.5	52.0	53.5	52.0	53.5	52.0	53.5	52.0
Volume expansion ratio Zero day and 180 day												
Zero day	2.2	2.2	2.01	2.1	2.2	2.2	2.01	2.1	2.2	2.2	2.01	2.1
180 day	3.4	3.5	3.5	3.5	3.4	3.5	3.5	3.5	3.4	3.5	3.5	3.5
Water absorption ratio												
Zero day	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
180 day	2.3	2.3	2.4	2.3	2.3	2.3	2.4	2.3	2.3	2.3	2.4	2.3
Length elongation ratio												
Zero day	0.5	0.4	0.4	0.4	0.5	0.4	0.4	0.4	0.5	0.4	0.4	0.4
180 day	0.9	0.8	0.8	0.9	0.9	0.8	0.8	0.9	0.9	0.8	0.8	0.9
Breadth elongation												
Zero day	0.74	0.73	0.73	0.74	0.74	0.73	0.73	0.74	0.74	0.73	0.73	0.74
180 day	0.75	0.74	0.74	0.75	0.75	0.74	0.74	0.75	0.75	0.74	0.74	0.75
Solid loss in the gruel (g/100g)												
Zero day	1.35	1.30	1.35	1.35	1.30	1.35	1.35	1.30	1.35	1.35	1.30	1.35
180 day	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40

Table 3: Changes in the cooking quality of cowpea varieties (Dhal) during storage

Characters	Glass Bottles (T_1)				Polyethylene bags with out vacuum (T_2)				Polyethylene bags with vacuum (T_3)			
	CD_1	CD_2	CD_3	CD_4	CD_1	CD_2	CD_3	CD_4	CD_1	CD_2	CD_3	CD_4
Cooking time (min												
Zero day	34.5	35.5	36.0	35.0	34.5	35.5	36.0	35.0	34.5	35.5	36.0	35.0
180 day	36.5	36.5	37.0	36.0	35.5	36.5	37.0	36.0	35.5	36.5	37.0	38.0
Volume expansion ratio Zero day 180 day												
Zero day	3.8	3.7	3.5	3.8	3.8	3.7	3.5	3.8	3.8	3.7	3.5	3.8
180 day	4.4	4.3	4.2	4.4	4.4	4.2	4.4	4.4	4.3	4.3	4.4	4.4
Water absorption ratio												
Zero day	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
180 day	2.8	2.7	2.7	2.6	2.6	2.6	2.7	2.7	2.7	2.6	2.8	2.6
Length elongation ratio												
Zero day	1.03	1.03	1.03	1.04	1.03	1.03	1.03	1.04	1.03	1.03	1.03	1.04
180 day	1.04	1.04	1.04	1.5	1.04	1.04	1.04	1.5	1.04	1.04	1.04	1.5
Breadth elongation												
Zero day	0.60	0.61	0.62	0.64	0.60	0.61	0.62	0.64	0.60	0.61	0.62	0.64
180 day	0.65	0.66	0.65	0.67	0.65	0.66	0.65	0.67	0.65	0.66	0.65	0.66
Solid loss in the gruel (g/100g)												
Zero day	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85
180 day	2.05	2.05	1.95	2.00	2.05	2.05	2.05	2.05	2.00	2.05	2.05	2.05

Table 4: Organoleptic Scores" for the cowpea (wholegram) varieties

	Apearance				Colour				Flavour				Taste				Overall acceptability			
Treatment	CW_1	CW_2	CW_3	CW_4	CW_1	CW_2	CW_3	CW_4	CW_1	CW_2	CW_3	CW_4	CW_1	CW_2	CW_3	CW_4	CW_1	CW_2	CW_3	CW_4
Control	4.0	3.9	3.9	4.0	3.9	3.9	4.0	4.0	4.0	4.0	3.9	4.0	3.9	3.8	3.8	4.0	3.9	3.9	3.9	4.0
Glass bottle (T_1)	4.0	3.9	3.9	4.0	3.9	3.9	4.0	4.0	4.0	4.0	3.9	4.0	3.9	3.8	3.8	4.0	3.9	3.9	3.9	4.0
Polythylene bags without vacuum (T_2)	4.0	3.8	3.9	4.0	3.8	38	4.0	4.0	3.9	4.0	3.9	4.0	3.8	3.7	3.7	4.0	38	38	38	4.0
Polyethylene bags with vaccum (T_3)	4.0	3.9	3.9	4.0	3.9	3.9	4.0	4.0	4.0	4.0	3.9	4.0	3.9	3.8	3.8	4.0	3.9	3.9	3.9	4.0

Table 5: Organoleptic scores –for the cowpea (dhal) varieties

Treatment	Apearance				Colour				Flavour				Taste				Overall acceptability			
	Cd_1	CD_2	CD_3	CD_4	Cd_1	CD_2	CD_3	CD_4	Cd_1	CD_2	CD_3	CD_4	Cd_1	CD_2	CD_3	CD_4	Cd_1	CD_2	CD_3	CD_4
Control	4.0	3.9	3.9	4.0		3.9	3.9	4.0	4.0	3.9	3.9	4.0	3.9	3.9	3.9	4.0	3.9	3.9	3.9	4.0
Glass bottle (T_1)	4.0	3.9	3.9	4.0		3.9	3.9	4.0	4.0	3.9	3.9	4.0	3.9	3.9	3.9	4.0	3.9	4.0	3.9	4.0
Polythylene bags without vacuum (T_2)	4.0	3.8	3.9	4.0		3.8	3.9	4.0	4.0	3.9	3.9	4.0	3.8	3.8	3.9	4.0	3.9	3.8	3.9	4.0
Polyethylene bags with vaccum (T_3)	4.0	3.9	3.9	4.0		3.9	3.9	4.0	4.0	3.9	3.9	4.0	3.9	3.9	3.9	4.0	3.9	3.9	3.9	4.0

Table 6: Organoleptic Evaluation of Puffed and fried cowpea varieties (%)

Attributes	Puffied				Fried			
	CW_1	CW_2	CW_3	CW_4	CW_1	CW_2	CW_3	CW_4
Appearance	65.5	75.5	80.0	100.0	50.0	58.5	70.5	100.0
Colour	70.0	80.5	85.5	98.5	62.5	74.5	80.5	98.5
Flavour	65.0	80.5	80.5	97.5	75.0	77.5	82.5	98.0
Texture	60.5	70.5	80.0	98.5	77.5	80.0	83.5	98.5
Taste	58.5	75.0	82.5	98.0	80.0	83.0	85.5	100.0
Overall acceptability	60.5	78.5	81.0	98.0	70.0	73.5	80.0	97.0

The variety CW4 had recorded higher score values for all the organoleptic attributes for both puffed and fried samples followed by CW3, CW2 and CW 1. The variety CW1 had recorded more or less equal physical charecteristics of the rest of the varieties but its consumer acceptability scores were found to be lesser than the three varieties selected for the study. The variety CW1 may be suitable for the preparation of other types of south Indian dishes like sundal, sambar, pulikulambu and the like. The variety VCP8 was found suitable for the preparation of omapodi, ribbon pakoda, puffed and fried cowpea and dhal. These products consumer preference was noted as fried cowpea followed by ribbun pakkoda, puffed omapodi and adai.

Table 7: Physical Characteristics of cowpea varities before and after puffing and frying'

Varitety	Before processing (RAw cowpea)			After puffing			After frying		
	Weight (g)	Volume (mI)	Bulk density	Weight (gm)	Volume (mI)	Bulk density	Weight (gm)	Volume (mI)	Bulk density
CW1	100.0	145.0	0.690	95.0	175.0	0.549	96.0	165.0	0.575
CW2	100.0	150.0	0.666	93.5	175.0	0.534	98.5	170.0	0.562
CW3	100.0	145.0	0.689	96.5	189.0	0.507	97.5	183.0	0.567
CW4	100.0	140.0	0.714	97.5	190.0	0.513	98.0	1850	0.583

Summary and conclusion

Cooking quality of cowpea varieties

The cooking qualities include cooking time, volume expansion rato, length and breadth elongation ratio, water absorption ratio and solids. The cowpea varities stored in different packaging materials were analysed for their cooking quality. The cooking time increased as the storage period increased. Whole gram dhal samples exhibited an increase in cooking time after storage from 52.0 to 53.5 and from 35.5 to 38.0 min respectively. The cowpea varieties showed an increase in volume expansion ratio after 180 days of the storage. The volume expansion ratio of the whole gram cowpea samples ranged between 2.05 and 2.0 The corresponding values after 180 days of storage were 3.4 to 3.7 for T1, T2 and T3.The volume expansion of dhal samples was found to be slightly lower during storage than the whole gram cowpea samples. The water absorption ratio increased during storage of cowpea varieties. The absorption of water was more in dhal samples than that of whole gram samples. The length elongation ratio was slightly increased (1.03-1.05) after 180 days of storage in dhal samples and in whole gram samples it ranged from 0.4-0.8 with respect to breadth elongation ratio only slight increased was observed. The solid loss of the whole gram cowpea samples on the initial day ranged beween 1.30 and 35 and the corresponding values for the dhal 1.85/100g.

Organoleptic evaluation of cowpea products.

Selected varieties of whole gram and dhal were cooked initially and after 180 days of storage and organoleptically evaluated to test the consumer acceptability, using the cowpea (whole gram) of different varieties puffed and fried samples were prepared and their quality attributes like colour flavor, texure, taste and over all acceptability were noted.

Cooked whole gram and dhal of cowpea varities

The variety CW4 had the maximum acceptability score (4.0) for the quality attributes tested initially and after 180 days of storage for both whole gram and dhal. The maximum score was abtaned by the whole gram varieties of CW1, CW2, and CW3 for the quality attributes like appearance, flavor and colour. With respect to dhal variety CD1 packed in T1, T2 and T3 exhibited the maximum score values. The score value was comparatively less for the cowpea dhal samples of variety CD2 packed in poly ehelene bags without vacuum. In general the samples packed in T1 and T3 had retained the organoleptic characteristics throught the Storge periods.

Puffed and fried cowpea varieties

In general the volume, deduction in weight and bulk density are expected qualities of puffing and frying. Weight reduction after puffing and flying was observed between the varities selected for the study. Reduction in bulk density is an indication of good puffing and frying quality. The bulk density of the unprocessed samples ranged between 0.666 and 0.714 and for the puffed samples ranged from 0.50 to 0.549 and for the fried samples from 0.562 to 0.583. The organoleptic evaluation of the study revealed that the variety CW4 (VCP8) had good quality attributes for both puffing and frying followed by CW3, CW2 and CW1.It was also found that CW1 variety of cowpea may be suitable for other types of south Indian dishes. The following important conclusions were drawn from the results of the study. Storage of cowpea under vacuum packaging had a significant effect on quality retention. An increase in the cooking time, volume expansion ratio and length and breadth elongation ratio. were observed in all the cowpea varieties.(whole and dhal) after 180 days of storage. The organoleptic evaluation scores of the cooked whole gram and dhal samples ranged between excellent and good for all the quality attributes from 0 to 180 days of storage. The variety VCP8 was found to be highly suitable for puffing and frying followed by CO6 CO4 and P152.

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