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Research Article

QUALITY EVALUATION OF ORGANIC COWPEA

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ABSTRACT
This experiment was carried with the objective to study and compare the quality characteristics of organic and in organic cowpea. Cowpea variety (Jyothika) was selected for the study. Parameters like physical characteristics chemical and nutrient composition, anti nutrient profile, shelf life, sensory qualities and pesticide residues were studied. Organic cowpea got higher values for colour, pod length, pod weight and taste. Total mineral content was higher in organic cowpea. Acidity and vitamin 'C' levels were on par. Among the treatments β-carotene levels were on par, phenol content was significantly high in the organic treatment. Inorganic cowpea revealed pesticide residue.

INTRODUCTION
Both consumers and farmers are now gradually shifting back to organic farming in India, as extensive dependence on chemical farming has led to the depletion in soil fertility. In this context Tanusree (2011) opines that, organic farming, is more economical to the farmer than chemical farming as it saves the cost of external inputs and utilizes the inputs present in the farm itself.
Cowpea is a crop that occupies a prime position in Kerala, because, it is an important source of protein and hence its yield and quality are important. It is cultivated for its long green pod- as a vegetable, seed as pulses and foliage-as a vegetable and fodder.
Limited studies have systematically compared the quality of organically and conventionally produced vegetables in this state. Hence, a study was taken up to compare the quality of the above said vegetable cultivated organically, as well as conventionally.
The objectives of the study were to:

1. compare the physical characteristics of cowpea cultivated using conventional and organic methods
2. compare their sensory qualities
3. compare their shelf life
4. compare their chemical and nutritional qualities
5. asses their anti nutritional factors and
6. determine the pesticide residues present in them

MATERIALS AND METHODS
The experiment entitled 'Quality evaluation of organic cowpea' was conducted to study and compare the quality characteristics of cowpea cultivated using organic and conventional methods.
The methodology is discussed under the following heads

a. Selection of respondents
b. Selection of vegetables
c. Selection of treatments
d. Selection of quality parameters
e. Statistical analysis

a. Selection of locale
Organic samples for the experiment were collected from the organic bazaar being operated by an NGO, functioning in Thiruvananthapuram city. This is the only organic market prevalent in the whole district. This organic market is issuing the PGS certification (participatory guarantee scheme) to farmers who are totally conforming to the organic practices prescribed by the NGO.

The conventional samples were collected from local farmers of Kalliyoor panchayath, nearby the college premises.

b. Selection of vegetables

For better comparison, cowpea of the same variety namely 'Jyothika' was selected. Analysis of vegetables was done on the second day, after the harvest. Design adopted was CRD with 5 replications.

C. Selection of treatments

Three types of farming practices were identified as the treatment for the study.

T_1 – Organic cowpea – (PGS certified the cultivation area meeting all the requirements prescribed by the NGO)

T_2 – Organic input vegetables – (PGS certified – the cultivation area meeting all the requirements prescribed by the NGO, but the surrounding areas not following similar practices)

T_1 and T_2 treatments emphasized the use of organic manures, green manures and organic pest management practices. There was no use of growth regulators and chemical fertilizers.

T_3 conventionally grown vegetables (obtained from the farmers of Kalliyoor panchayath), these vegetables were grown using chemical fertilizers.

d. ***Quality parameters selected fro the study*** – Evaluation of organic vegetables with respect to the following parameters was conducted.

- d.1 Physical qualities
- d.2 Sensory qualities
- d.3 Shelf life
- d.4 Nutrient composition
- d.5 Antinutrient composition
- d.6 Pesticide residue

d.1 Physical qualities

d.1.1 Colour – Colour of cowpea was compared amongst the 3 treatments by direct observation and rated on a hedonic scale.

d.1.2 Pod length – Length of the pod was measured and expressed in centimeters. The average values of 5 pods were noted.

d.1.3 Seeds per pod – Five pods taken separately and the number of seeds in each pod was counted and the average was worked out.

d.1.4 Pod weight – Ten pods were taken after the second day harvest, weighed and expressed in grams and the average was worked out.

d.1.5 Tenderness – Tenderness of the pods were determined by direct observation and rated on a score card.

d.2 Sensory quality – Sensory quality consists of judging the quality of food using our sense organs viz, eyes, nose, mouth and skin.

The sensory qualities were assessed using a score card method proposed by Swaminathan (1995). The following major quality attributes were included in the score.

- d.2.a Appearance
- d.2.b Colour
- d.2.c Flavour
- d.2.d Texture
- d.2.e Taste

Each of the above mentioned quality was assessed on a 5 point rating scale ranging from 1 to 5. The evaluation was done by a semi trained panel of 10 members.

d.3 Shelf life – a. **Physical evidence** Duration with respect to onset of visible marks of deterioration was noted on 5 units of each treatment.

b. Physiological loss of water (PLW) – the weight of the vegetables were taken daily under ambient conditions and the percentage of loss of water was noted. This procedure was continued till 25% of the total weight of the stored vegetables were lost.

PLW of vegetables were determined by using the formula – Percentage PLW (Initial weight – final weight/initial weight)

d.4 Nutrient composition – The details of nutrients are presented in the table below

Nutrient	Method followed
Moisture content	AOAC (1990)
Fibre content	Sadasivam and Manikam (1992)
Total minerals	AOAC (1984)
Acidity	Sadasivam and Manikam (1992)
Vitamin C	Srivastava and Kumar (1998)
Beta carotene	Jackson (1973)
Calcium iron	,,

d.5 Antinutrient composition – The specific particulars of anti nutrients analysed are as given below.

Anti Nutrient	Method followed
Oxalate	AOAC (1984)
Phylate	Sadasivan and Manikam (1992)
Phenol	Sharma (2004)
Tannin	Ranganna (2001)

d.6 ***Pesticide residue*** – Pesticide residue was estimated using Schimatzu gas chromatograph. (Anastassiades, 2003)

Statistical analysis – 2 factor ANOVA (CRD) was done to elicit information on the relative qualities of organic cowpea over with reference to the chemical and physical characteristics studied (Snedecor and Cochran, 1968)

for a comparative evaluation of the quality of cowpea based on sensory evaluation of scores given by 10 judges, non parametric ANOVA (Kruskal values) were done.

RESULTS AND DISCUSSION

The quality evaluation of organic cowpea and conventionally cultivated cowpea was conducted with respect to physical characteristics, sensory qualities, shelf life, nutrient composition, anti nutrient profile and pesticide residue

Physical characteristics

Consumer choice is definitely affected by physical appearance of vegetables. Hence, a comparative analysis of physical appearance of vegetables from each treatment was done. The characteristics determined for cowpea were colour, pod length, seeds per pod, pod weight and tenderness.

Table -1 represents the physical characteristics of cowpea cultivated under different farming practices. This table shows that organic cowpea (T_2) got higher values for colour, pod length, pod weight and tenderness. The values were 9.2, 44.68 cm, 12.30g and 8.8 respectively.

More or less all parameters were observed to be on par because, all the treatments were from the same variety and the day of harvest was the same.

Philip (1993) however found an increase in pod length for cowpea treated with phosphorous. Applications of phosphorous rich fertilizers were opined to increase the pod length, due to its role in cell division.

Table 1: Physical characteristics of cowpea

Treatments	Colour (ranked mean)	Pod length (cm)	Seeds per pod (no)	Pod weight	Tenderness (ranked mean)
T_1	6.70	44.34	18	12.20	8.20
T_2	9.20	44.68	18	12.30	8.8
T_3	8.1	44.3	18	11.52	7.0
Mean	8.0	44.44	18	12.0	8.0
F value	0.89_{NS}	0.11		1.10_{NS}	0.45_{NS}

Sensory evaluation of cowpea

Cowpea of all the 3 treatments showed significant difference in all the sensory characteristics like appearance, colour, flavour and taste. In the case of appearance, highest value was observed in inorganic cowpea, but in the rest of the sensory attributes like colour, flavour, texture and taste, highest values were obtained for organically cultivated cowpea.

Sensory qualities of cowpea

Attributes	Scores of different treatments			
	T_1	T_2	T_3	X^2
Appearance	16.85	9.0	20.65	10.15
Colour	23.90	14.30	8.30	17.70
Flavour	22.30	13.05	11.15	10.34
Texture	17.75	16.40	15.35	2.60
Taste	21.50	15.0	10.0	10.11

CV at 5% 5.991
CV at 1% 13.815

Smith et al., (2002) after reviewing several studies reported that organic vegetables are claimed to be better tasting and fresher. There have been many comparative studies of organoleptic quality of organic and conventional fruits and vegetables. The results consistently showed enhanced organoleptic quality in organic produce.

Shelf life – Greater vegetables is a need for the farmer to avoid economic loss. Shelf life of the vegetables were determined with respect to 2 parameters namely, duration with respect to onset of visible marks of deterioration and physiological loss of water (PLW)

Shelf life period was determined by noting the number of days the vegetables kept fresh without showing any signs of wilting or disease.

Physiological loss of water was determined by taking the weight of the sample daily and the percentage of loss of water was calculated. The results are depicted in table -3.

Table 3: Shelf life parameters of cowpea

Parameters	Cowpea of different treatments		
	T_1	T_2	T_3
No. of days kept without physical determination	6	6	6
PLW	44.21	40.56	43.21

Results showed that on an average all treatments of cowpea kept well for 6 days. The physiological loss of water (percentage) was highest for organically treated cowpea (44.21%) although the differences among treatments were not very high.

Krishna (2005) found that shelf life of pods was significantly influenced by the different sources of nutrition and the lower shelf life was observed for inorganic cowpea. Kampkar (1993) also reported better keeping quality of vegetables in vermi compost applied plots compared to fertilizer application. This indicates that there are other factors besides cultivation practices that affects shelf life, like the water - dry matter interaction, interrelation between nutrients and metabolites.

Nutrient composition

Nutrient analysed under the experiment were moisture content, fibre content, total minerals, acidity, vitamin C, β-carotene and minerals like calcium and iron. The results are presented in the following table.

Table 4: Nutrient analysis of cowpea

Nutrients	**Treatments**			
	T_1	T_2	T_3	CD (0.05)
Moisture (%)	92.22	91.72	92.3	-
Fibre (%)	0.96	1.04	0.92	-
Total mineral (%)	3.36	2.1	2.98	0.30
Acidity (%)	3.64	3.86	3.86	-
Vitamin C (mg)	15.58	15.56	15.56	-
β-carotene	870.78	881.9	816.2	46.05
Calcium (mg)	76.4	78	80	1.33
Iron (mg)	1.04	1.2	1.08	-

('-' indicates the ratio was not seen to be significant even at p=0.05)

Moisture and fibre content of all the treatments were found to be on par. Whereas mineral content was higher in organic cowpea and this difference was statistically higher than the other treatments. Acidity values and vitamin 'C' content were seen to be on par among all treatments. The β-carotene level of organic cowpea was seen to be significantly higher in organic cowpea, while for calcium content, inorganic cowpea showed significantly higher levels. Iron content did not show much variation (statistically) among the treatments.

Ahenkora etal (1998) too observed higher mineral content in organically cultivated cowpea. Singh (2008) reported that organic produce recorded higher β-carotene content than inorganically cultivated ones

Ant nutrients – Availability of nutrients is affected by the presence of ant nutrients. Oxalates, phytates, phenols and tannins were the ant nutrients analyzed under the experiment. The results are depicted in the table below.

Table 5: Anti nutrient profile of cowpea

Anti Nutrients	**T_1**	**T_2**	**T_3**	**CD (0.05)**
Oxalate (%)	0.28	0.26	0.3	0.02
Phylate (%)	0.16	0.19	0.17	
Phenol (mg)	6.2	7.0	6.58	
Tannin (mg)	18.92	21.92	22.36	

The results did not show much difference among the treatments

Pesticide residue – Pesticide residue analysis reported that, a pesticide named malathion at 007 ppm concentration in T_3 of cowpea.

Bourn and Pree Cott (2002) found after an extensive survey on vegetables that 17-50 percent of conventional vegetables contained pesticide residues. However in a similar study by Tassio Poulou etal(2007) concluded that 97.4 percent of organic farming products were devoid of detectable pesticide.

This study concludes that organic cultivation does affect the sensory qualities of produce, with respect to appearance. Colour, flavour, texture and taste, thus endearing it more among consumers. Nutrient wise, β-

carotene and total mineral content were seen to be significantly higher in organic treatments. Many of the physical & chemical features were on par amongst the treatments. However in this era where food safety is the prime concern of the universe at large, a pesticide free produce is a blessing for the health of mankind.

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