

Effects of Packaging Films on Sensory Aspects of Fresh Sweet Corn Kernels at Different Storage Conditions

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ABSTRACT: *The present study was undertaken at the department of Agricultural Process Engineering, VNMKV, Parbhani. Study was used to evaluate storability of the sweet corn kernels which packed in packaging films i.e. met pet polypack, polyethylene bag; plastic punnet, HDPE bag, LDPE bag and EPS tray under room and refrigerated storage (4°C and 90% RH) conditions. Sensory attributes of stored sweet corn kernels such as colour, texture, flavour and overall acceptability, LDPE packaging film showed better results among all packaging materials at both storage conditions.*

Keywords: *sweet corn, packaging films, storage condition, total plate count, sensory evaluation.*

Sweet corn (*Zea mays* L.) is an annual grass of the Poaceae (Grass) family. Its taste and nutritional value has made it a valued crop in all countries. In Indian Agriculture, sweet corn occupies a prominent position and each part of the sweet corn plant is put to one or the other use and nothing goes as waste. In India, over 85 per cent of the sweet corn production is used as food. Most commonly used forms are chapattis, porridges of various forms, boiled or roasted green ears, breakfast foods like corn flakes and pop corn.

Fresh-cut vegetables deteriorate faster than intact produce as a direct result of the wounding associated with processing, which leads to a number of physical and physiological changes affecting the quality of the produce (Brecht, 1995; Saltveit, 1997). Maintenance of low temperature throughout the postharvest chain plays a pivotal role in controlling microbial growth either by retarding the microbe's activity or by enhancing the produce quality by delaying ripening and senescence (Heard, 1999). Sensory attributes such as sweetness and characteristic aroma are the most important indicators of shelf life from the consumer's point of view. The challenge in fresh-cut vegetable is to maintain the taste and aroma attributes of the original whole product. As sweet corn is a very perishable product due its high respiration rate, it results in a quick loss of the sweetness (the most important characteristic of sweet corn) unless it was

rapidly cooled and stored at a low temperature (as close to 0 °C as possible).

Nowadays there is increased acceptance and demand for fresh-cut fruits and vegetables (sometimes called minimally processed or ready-to-eat produce) for many reasons such as their convenience, perceived high nutritional value, and freshness. Hence, the present work was done to assess the sensory attributes of sweet corn kernels packed in different packaging film under ambient and refrigeration conditions.

MATERIALS AND METHODS

Sample Preparation

Freshly harvested sweet corns (Var. local) were procured in the morning hours from local farmer near the Parbhani city. Fresh corns were husked and kernels were removed from sweet corn cob. Clean samples were taken for experiment and packed in different packaging materials i.e. met pet polypack, polyethylene bag; plastic punnet, HDPE bag, LDPE bag, EPS tray.

Storage of samples

Ambient (Room temperature)- The sweet corn kernels were packed in different packaging materials and were kept in laboratory for storage.

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Refrigerated (S₂): Refrigerated storage was used to store the sweet corn kernels for predetermined temperature at 4° C and 90% relative humidity for storage period of ten days (Avila *et al.*, 2007).

Sensory analysis

Sensory evaluation of the sweet corn kernel was carried out by 10 panelists on a 9 point hedonic scale for different parameters such as colour, aroma, taste, texture and overall acceptability (Shao and Li, 2011).

Statistical analysis

The sensory evaluation data was statistically analyzed using the analysis of variance (ANOVA) with significance level at p<0.05.

RESULT AND DISCUSSION

I) Effect of packaging materials on organoleptic properties of sweet corn kernels stored at refrigerated condition

Colour and Texture

From Table 1, it was observed that there was significant difference for colour and texture for all treatments. It was also observed that colour of sweet corn kernels packed in different packaging material was decreased with increase in storage period. Among the different packaging treatments, sweet corn kernels samples in treatment P₅ obtained good score for texture during storage. On 3rd day, sweet corn kernels of treatment P₇ was discarded by judges due to due to loss in moisture which results shrinkage of kernels.

Table 1
Mean scores for sensory attribute colour and texture of sweet corn kernels

Treatment	Storage Period (Days)											
	Colour						Texture					
	0	1	2	3	4	5	0	1	2	3	4	5
P ₁	8.8	8.6	7.2	NE	NE	NE	9.0	8.5	7.1	NE	NE	NE
P ₂	8.8	8.8	8.5	7.0	NE	NE	9.0	8.7	8.4	6.9	NE	NE
P ₃	8.8	8.8	8.3	7.0	NE	NE	9.0	8.7	8.2	6.9	NE	NE
P ₄	8.8	8.8	8.6	8.3	7.0	NE	9.0	8.7	8.5	8.2	6.9	NE
P ₅	8.8	8.8	8.8	8.6	8.3	7.0	9.0	8.9	8.7	8.5	8.2	6.9
P ₆	8.8	8.8	8.8	8.6	7.0	NE	9.0	8.9	8.7	8.5	6.5	NE
P ₇	8.8	8.5	6.9	NE	NE	NE	9.0	8.4	6.8	NE	NE	NE

Analysis of variance

Source	MSS	F value	S.E.	C.D.	MSS	F value	S.E.	C.D.
Storage days	221.64	7779*	0.036	0.101	215.5	9081.4*	0.033	0.093
Packaging Materials (P)	46.33	1626*	0.039	0.110	50.8	2143.6*	0.036	0.010
D x P	14.10	495.17*	0.097	.0269	12.6	533.6*	0.088	0.246

NE : Not estimated due to loss of freshness.

* Significant at 5 % level

Where,

P₁ : Met pet polypack

P₂ :Polyethylene bag

P₃ : Plastic punnet

P₄ : HDPE bag

P₅ : LDPE bag

P₆ : EPS tray

P₇ : Without packaging

Flavour and overall acceptability

From Table 2, it was observed that there was significant difference among the scores given for different treatments during storage condition for flavour and overall acceptability. Good score for flavour was obtained by the treatment P₅ however the maximum decrease in score of flavour was in treatment P₇ followed by treatment P₁. Hence the sample of treatment P₇ was not acceptable for flavour and discarded by judges.

II) Effect of packaging materials on organoleptic properties of sweet corn kernels stored at refrigerated condition:

Colour and Texture

The sensory evaluation of colour and texture of sweet corn kernels packed in different packaging material stored at refrigerated condition is tabulated in Table 3. From table 3 it was observed that there was significant difference for colour and texture for all

Table 2
Mean scores for sensory attribute flavour and overall acceptability of sweet corn kernels

Treatment	Storage Period (Days)											
	Flavour						Overall acceptability					
	0	1	2	3	4	5	0	1	2	3	4	5
P ₁	9.0	8.5	6.9	NE	NE	NE	9.0	8.4	6.8	NE	NE	NE
P ₂	9.0	8.7	7.9	6.9	NE	NE	9.0	8.6	7.8	6.8	NE	NE
P ₃	9.0	8.8	8.0	6.8	NE	NE	9.0	8.7	7.9	6.7	NE	NE
P ₄	9.0	8.8	8.4	8.0	7.2	NE	9.0	8.7	8.3	7.9	7.1	NE
P ₅	9.0	8.8	8.6	8.5	8.0	7.4	9.0	8.7	8.5	8.4	7.9	7.3
P ₆	9.0	8.8	8.3	8.0	7.0	NE	9.0	8.7	8.2	7.9	6.9	NE
P ₇	9.0	7.9	6.8	NE	NE	NE	9.0	7.8	6.7	NE	NE	NE
Analysis of variance												
Source	MSS	F value	S.E.	C.D.	MSS	F value	S.E.	C.D.				
Storage days (D)	216.4	13172*	0.027	0.077	214.75	14020*	0.027	0.074				
Packaging	46.85	2852.8*	0.030	0.083	46.11	3010*	0.029	0.080				
Materials (P)												
D x P	13.71	834.9*	0.074	0.204	13.22	863.4*	0.071	0.197				

treatments. Among the packaging treatments, sweet corn kernels samples in treatment P₅ obtained good score for texture up to 10th day of storage. On 5th day, samples of treatment P₇ were discarded by judges due to loss in moisture which results shrinkage of kernels.

Flavour and overall acceptability

From Table 4, it was observed that there was significant difference among the scores given for different treatments during storage condition for flavour and overall acceptability. Good score for flavour was obtained by the treatment P₅. Hence the sample of treatment P₇ was not acceptable for flavour and discarded by judges. The samples were discarded by judges on 5th day. Further on 6th day, sweet corn kernels samples of treatment P₁ were also disliked by judges due to decrease in flavour. Visual observations for colour and appearance, texture, flavour and overall acceptability of treatment P₅ was found to be better packaging material in respect of highest score of overall acceptability during the storage period of 10 days.

CONCLUSION

The maximum shelf life for sweet corn kernel was observed as 5 days and 10 days when stored in LDPE

bags at ambient and refrigerated conditions, respectively

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Table 3
Mean scores for sensory attribute colour and texture of sweet corn kernels stored at refrigerated condition (S₂)

Treatment	Storage Period (Days)										
	Colour					Texture					
	0	1	2	3	4	5	6	7	8	9	10
P ₁	8.8	8.7	8.5	8.0	7.8	7.0	NE	NE	NE	NE	NE
P ₂	8.8	8.7	8.6	8.4	8.0	7.6	7.1	NE	NE	NE	NE
P ₃	8.8	8.7	8.6	8.5	8.4	8.0	7.8	7.1	NE	NE	NE
P ₄	8.8	8.8	8.6	8.5	8.4	8.3	8.2	8.0	7.4	7.2	NE
P ₅	8.8	8.8	8.6	8.5	8.4	8.3	8.2	8.1	8.1	7.8	7.4
P ₆	8.8	8.8	8.7	8.5	8.4	8.2	8.0	7.5	7.2	NE	NE
P ₇	8.8	8.7	8.7	8.6	7.0	NE	NE	NE	NE	NE	NE

Analysis of variance

Source	MSS	F value	S.E.	C.D.	MSS	F value	S.E.	C.D.
Storage days (D)	172.27	9368.2*	0.029	0.081	176.63	15000*	0.023	0.065
Packaging Materials (P)	88.45	4807.7*	0.023	0.065	89.13	7570*	0.018	0.052
D × P	14.84	806.73*	0.078	0.216	15.37	1305.8*	0.062	0.173

NE : Not estimated due to loss of freshness.

* Significant at 5 % level

Table 4
Mean scores for sensory attribute flavour and overall acceptability of sweet corn kernels stored at refrigerated condition (S₂)

Treatment	Storage Periods (Days)										
	Flavour					overall acceptability					
	0	1	2	3	4	5	6	7	8	9	10
P ₁	9.0	8.8	8.5	8.1	7.6	7.0	NE	NE	NE	NE	NE
P ₂	9.0	8.9	8.8	8.7	8.2	7.8	7.2	NE	NE	NE	NE
P ₃	9.0	8.9	8.8	8.7	8.5	8.2	7.8	7.2	NE	NE	NE
P ₄	9.0	8.9	8.8	8.7	8.6	8.5	8.3	8.0	7.7	7.4	NE
P ₅	9.0	8.9	8.8	8.7	8.7	8.6	8.5	8.4	8.2	7.9	7.6
P ₆	9.0	8.9	8.8	8.7	8.5	8.3	8.0	7.7	7.3	NE	NE
P ₇	9.0	8.7	8.3	7.5	7.0	NE	NE	NE	NE	NE	NE

Analysis of variance

Source	MSS	F value	S.E.	C.D.	MSS	F value	S.E.	C.D.
Storage days (D)	176.3	13357*	0.025	0.069	172.09	13207*	0.024	0.068
Packaging Materials (P)	97.00	7347*	0.020	0.055	95.6	7342.5*	0.019	0.054
D × P	15.01	1137.1*	0.066	0.183	14.67	1126.3*	0.065	0.182