Original Research Article

Performance of Packaging on Storage of Fenugreek at Different Storage Conditions in *Kharif* Season

ABSTRACT

Aims: The research work was carried out to study the effect of different packaging materials on quality of fenugreek and to study the shelf life of fenugreek at different storage conditions in *kharif* season.

Study Design: The fresh fenugreek samples were packed with 100 g weight in different polyethylene (100, 200 and 400 gauge) and butter paper bags with 2, 4 and 6 per cent vents and without vents. Sixteen treatment combinations comprising of polyethylene and butter paper bags. The experiment was laid in Completely Randomized Design (CRD) with three replications.

Place and duration of study: The present research work was carried out in the Post Harvest Technology Centre, Department of Horticulture, Mahatma Phule Krishi Vidyapeeth, Rahuri during the year 2014-2015.

Methodology: The fresh fenugreek packed samples were further stored in cold storage, zero energy cool chamber and room temperature. The effect of packaging and storage on moisture content, ascorbic acid, chlorophyll content, iron content, physiological loss in weight and rotting was studied.

Results: The findings of the present study revealed that the composition of fresh fenugreek was found to be 89.08 per cent moisture content, 393 mg/100g ascorbic acid, 62.72 per cent chlorophyll content and 52.38 mg/100g iron content in *kharif* season. All samples of fenugreek packed in different packaging materials showed decreasing trend of moisture content, ascorbic acid content, chlorophyll content and iron content. However, they showed increasing trend of rotting and physiological loss in weight.

Conclusion: It may be concluded that Fenugreek packed in 400 gauge polyethylene bags without vents were found to be the best packaging material for extending the shelf life upto 10 days in CS followed by 4 days in ZECC and upto 2 days at RT in *kharif* season.

Keywords *Fenugreek, packaging, polyethylene bags, storage, shelf life*

1. INTRODUCTION

Fenugreek (*Trigonella foenum graceum*) is one of the important leafy vegetable. India is the second largest producer of vegetables in the world next to China and accounts for about 15% of the world production of vegetables. In India, the area under vegetable production is 92.05 lakh ha with 162187 MT production and 17.62 MT/ha. productivity. Whereas in Maharashtra, the area under vegetable production is 4.00 lakh s4,74,000 ha with 8008 MT production and 14.04 MT/ha. Productivity during the year 2014-15 (Anonymous, 2014).

Leafy vegetables are rich source of vitamins, minerals and dietary fiber. Being an inexpensive source, these leaves can be used by a large population to meet their dietary requirements. However, leaves are prone to mechanical injury during handling and they lose water because of a high surface area to volume ratio, which makes them highly perishable. Their shelf life is further limited due to loss of chlorophyll, which is accelerated by water loss (Ben Yehoshua, 1987) during harvest season, a huge loss in leafy vegetables is observed mainly due to lack of adequate

storage facilities. Extension of shelf life by use of controlled or modified atmosphere storage is well known, but due to high cost, it cannot be afforded. Low cost storage can enhance availability of these vegetables due to reduction in storage cost and extension of shelf life. Fresh vegetables are inherently perishable, during the process of distribution and marketing substantial losses are incurred which range from a slight loss of quality to total spoilage. This can be avoided by giving proper pre-storage treatment such as pre-cooling, packaging, low temperature storage etc.

Therefore, it is necessary to find out the suitable method for storage of fenugreek.
Research work was carried out with a view to study the effect of different vents and gauges of polyethylene bags on quality of fenugreek and to study the shelf life of fenugreek at different storage conditions.

2. MATERIALS AND METHODS

The present research work was carried out in the Post Harvest Technology Centre, Department of Horticulture, Mahatma Phule Krishi Vidyapeeth, Rahuri during the year 2014-2015. Freshly harvested fenugreek was procured from the Horticultural Nursery, Department of Horticulture, MPKV., Rahuri. Procurement of Fenugreek, cleaning and sorting, packaging of Fenugreek in different packaging materials, storage study at room temperature, zero energy cool chamber and cool storage and chemical and sensory evaluations during storage was studied. The details of materials used, method adopted and the statistical procedures followed during the research work are described below.

The fresh fenugreek samples were packed with 100 g weight in different polyethylene (100, 200 and 400 gauge) and butter paper bags with 2, 4 and 6 per cent vents and without vents in *kharif* season. Sixteen treatment combinations comprising of polyethylene and butter paper bags. The experiment was laid in Completely Randomized Design (CRD) with three replications.

The fresh fenugreek packed samples were further stored in cold storage (5±1 ºC and 90-95 % R.H.), zero energy cool chamber (14.6 to 20.3ºC and 83.59 to 91.90 % R.H.) and room temperature (25.4 to 28.2 ºC and 57.7 to 88.00 % R.H.). The stored samples were analysed for moisture content, physiological weight loss, calcium content, chlorophyll content, ascorbic acid, rotting and sensory parameters at one day interval in case of room temperature, zero energy cool chamber and cold storage. The data obtained for physical, chemical and sensory parameters was analyzed for the statistical significance according to the procedure given by Panse and Sukhatme (1985).

The treatment details are given below.

Treatments	Treatment details
T1	100 gauge polythene bag without vents
T2	100 gauge polythene bag with 2 % vent
T3	100 gauge polythene bag with 4 % vent
T4	100 gauge polythene bag with 6 % vent
T5	200 gauge polythene bag without vents

T6	200 gauge polythene bag with 2 % vent
T7	200 gauge polythene bag with 4 % vent
T8	200 gauge polythene bag with 6 % vent
T9	400 gauge polythene bag without vents
T10	400 gauge polythene bag with 2 % vent
T11	400 gauge polythene bag with 4 % vent
T12	400 gauge polythene bag with 6 % vent
T13	Butter paper bag without vent
T14	Butter paper bag with 2% vent
T15	Butter paper bag with 4% vent
T16	Butter paper bag with 6% vent

3. RESULTS AND DISCUSSION

3.1 Chemical composition of fresh fenugreek

The results for chemical composition of fresh fenugreek samples revealed that fresh fenugreek had 89.08 per cent moisture content on dry weight basis, 393 mg/100g ascorbic acid, 62.72 per cent chlorophyll content and 52.38 mg/100g iron content, respectively. Similar results were also reported by Jorwar (2001) in studies on dehydration, packaging and storage of spinach and Jagtap (1986) in the shelf life study of spinach.

The data for changes in physico-chemical composition of fenugreek samples packed in different packaging materials and stored in different storage conditions recorded that the moisture content, ascorbic acid, chlorophyll content, iron content and sensory parameters was found to be decreased whereas physiological loss in weight and rotting was found to be increased during storage period and the rate was faster under room temperature as compared to zero energy cool chamber and cold storage. The data subjected to moisture content, physiological loss in weight, rotting, ascorbic acid, chlorophyll content, iron content and sensory parameters are given below.

Moisture content (%)

At the end of storage period at RT i.e. after 2 days of storage, treatment T9 recorded highest moisture content of 84.07 per cent followed by T5 (83.84 %) while the lowest moisture content was recorded in T16 (80.62%) (Table1). At the end of 4 days of storage in ZECC, T9 recorded the highest moisture content of 84.08 per cent followed by T5 (83.85 %) while lowest moisture content was recorded in T16 (80.63%) (Table 3).
At the end of 10 days of storage in CS, T9 recorded the highest moisture content 78.90 per cent followed by T5 (78.75 %) while lowest moisture content was recorded in T16 (76.65 %) (Table 5). Samples stored in polyethylene bags without vents have more moisture retention than ventilated polyethylene bags. Moisture loss increased with increase in ventilation. This occurred because of higher permeability which influences respiration and transpiration rate. These results are comparable to the results reported by Roy and Khurdia (1986) and Koraddi (2005).

Physiological loss in weight (%)

At the end of storage period at RT i.e. after 2 days of storage, treatment T9 recorded lowest PLW of 10.30 per cent followed by T5 (10.45 %) while the highest PLW recorded in T16 (12.55 %) (Table2). At the end of 4 days of storage in ZECC, T9 recorded the lowest PLW of 10.25 per cent followed by T5 (10.40 %) while highest PLW was recorded in T16 (12.50 %) (Table 4). At the end of 10 days of storage in CS, T9 recorded the lowest PLW of 10.17 per cent followed by T5 (10.32 %) while highest PLW was recorded in T16 (12.42 %) (Table 6). Samples stored at low temperature were having less PLW as compared to room temperature. Presence of vents also had a marked effect on PLW of vegetables. Samples stored in polyethylene bags without vents have less PLW than ventilated polyethylene bags. PLW increased with increase in ventilation. This occurred because of higher permeability which influences respiration and transpiration rate. The results are comparable with those reported by Roy and Khurdia (1986); Negi and Roy (2004) and Koraddi (2005) and Reddy *et al.* (2013).

Rotting (%)

At the end of storage period at RT i.e. after 2 days of storage, treatment T9 recorded lowest rotting of 6.56 per cent followed by T5 (7.23 %) while the highest rotting was recorded in T16 (16.61 %) (Table 2). At the end of 4 days of storage in ZECC, T9 recorded the lowest rotting of 6.10 per cent followed by T5 (6.76 %) while highest rotting was recorded in T16 (16.00 %) (Table 4). At the end of 10 days of storage in CS, T9 recorded the lowest rotting of 5.17 per cent followed by T5 (5.89 %) while highest rotting was recorded in T16 (15.97 %) (Table 6). Rotting may be caused by the condensation in the bag which creates aqueous focuses for the development of microorganisms. Also, low levels of oxygen favours fermentation process which might cause the formation of the acetaldehyde and off flavour compounds which may cause rotting (Kays and Kapoor 2000). The results obtained are similar with Nyanjage *et al*. (2005) for sweet pepper; Kablan *et al*. (2008) for bell pepper and Nath *et al.* (2010) for capsicum.

Ascorbic acid content (mg/100 g)

At the end of storage period at RT i.e. after 2 days of storage, treatment T9 recorded highest ascorbic acid content 229 mg/100g followed by T5 (224 mg/100g) while the lowest ascorbic acid content was recorded in T16 (154 mg/100g) (Table 1). At the end of 4 days of storage in ZECC, T9 recorded the highest ascorbic acid content of 232 mg/100g followed by T5 (227 mg/100g) while lowest ascorbic acid content was recorded in T16 (157 mg/100g) (Table 3). At the end of 10 days of storage in CS, T9 recorded the highest ascorbic acid content of 235 mg/100g followed by T5 (230 mg/100g) while lowest ascorbic acid content was recorded in T16 (160 mg/100g) (Table 5). The chief reason for losses in ascorbic acid are the solubility in water, thermic destruction and enzymatic oxidation during storage (Selmon, 1994). Similar results were also reported by Jagtap (1986); Yadav and Sehgal (1997); Negi and Roy (2004); Anguilla *et al.* (2006) and Rai *et al.* (2009).

Chlorophyll content (%)

At the end of storage period at RT i.e. after 2 days of storage, treatment T9 recorded highest chlorophyll content of 57.45 per cent followed by T5 (57.07 %) while the lowest chlorophyll

content was recorded in T16 (51.75 %) (Table 1). At the end of 4 days of storage in ZECC, T9 recorded the highest chlorophyll content 57.87 per cent followed by T5 (57.47 %) while lowest chlorophyll content was recorded in T16 (51.87 %) (Table 3).

At the end of 10 days of storage in CS, T9 recorded the highest chlorophyll content of 57.31 per cent followed by T5 (56.99 %) while lowest chlorophyll content was recorded in T16 (52.51 %) (Table 5). Low oxygen and high carbon dioxide concentration can prevent chlorophyll degradation. Presence of vents has failed to increase carbon dioxide concentration, thus leading to higher amount of yellowing. The principal causes of the breakdown of chlorophyll are pH changes mainly due to leakage of organic acids from the vacuole, oxidative system and chlorophyllases (Wills *et al* 1989). These results of decreasing trend of chlorophyll content with storage are similar with those reported by Bolin and Huxsoll (1991); Abe and Watada, (1991); Moretti *et al* (2000) and Rai *et al* (2009).

Iron content (mg/100g)

At the end of storage period at RT i.e. after 2 days of storage, T9 recorded highest iron content of 50.91 mg/100g followed by T5 (50.77 mg/100g) while the lowest iron content was recorded in T16 (48.81 mg/100g) (Table 1).

At the end of 4 days of storage in ZECC, T9 recorded the highest iron content 50.98 mg/100g followed by T5 (50.84 mg/100g) while lowest iron content was recorded in T16 (48.88 mg/100g) (Table 3). At the end of 10 days of storage in CS, T9 recorded the highest iron content 51.01 mg/100g followed by T5 (50.87 mg/100g) while lowest iron content was recorded in T16 (48.91 mg/100g) (Table 5). Loss of iron may be attributed to leaching of these nutrients into the water and the moisture had decreased during storage period as reported by Koraddi (2005) and Reddy *et al* (2013).

Sensory evaluation

At the end of storage period at RT i.e. after 2 days of storage, T9 recorded highest value for overall acceptability (7.50) followed by T5 (7.40) while the lowest value for overall acceptability was recorded in T16 (6.00) (Table 2). At the end of 4 days of storage in ZECC, T9 recorded the highest value for overall acceptability 7.75 followed by T5 (7.65) while lowest value for overall acceptability was recorded in T16 (6.20) (Table 4). At the end of 10 days of storage in CS, T9 recorded the highest value for overall acceptability 8.20 followed by T5 (8.10) while lowest value for overall acceptability was recorded in T16 (6.70) (Table 6). Similar findings were reported by Jagtap (1986) and Jorwar (2001) for fenugreek and Nunes *et al*. (2012) for green bell pepper.

4. CONCLUSION

The present study made it clear that fenugreek samples packed in 400 gauge polyethylene bags without vents were found superior followed by 200 and 100 gauge polyethylene bags without vents. Also, samples packed in 400 gauge polyethylene bags without vents showed more

retention of all physico-chemical characteristics than ventilated polyethylene bags in *kharif* season and were more acceptable from sensory point of view. The shelf life of fenugreek was found to be two days at room temperature, four days in zero energy cool chamber and ten days in cold storage in *kharif* season.

From the findings of present study it may be concluded that fenugreek packed in 400 gauge polyethylene bags without vents were found to be the best packaging material for extending the shelf life upto 10 days in CS followed by ZECC upto 4 days and RT upto 2 days.

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Table 1. Effect of various combinations of packaging on chemical composition of fenugreek (whole) at room temperature storage

Particulars	Storage period (days)	Treatments																			
		T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	T16	GM	SE±	CD at 5%	CV (%)
Moisture content (%)																					
	1	83.61	82.92	82.23	81.54	83.84	83.15	82.46	81.77	84.07	83.38	82.69	82.00	81.31	81.08	80.85	80.62	82.345	0.127	0.366	0.267
	2	78.32	77.63	76.94	76.25	78.55	77.86	77.17	76.48	78.78	78.09	77.40	76.71	76.02	75.79	75.56	75.33	77.055	0.014	0.400	0.031
Ascorbic acid(mg/100g)																					
	1	305	296	287	278	308	299	290	281	311	302	293	284	275	272	269	266	288.5	0.115	0.333	0.069
	2	219	204	189	174	224	209	194	179	229	214	199	184	169	164	159	154	191.5	0.156	0.449	0.141
Chlorophyll content (%)																					
	1	58.93	58.12	57.31	56.5	59.2	58.39	57.58	56.77	59.47	58.66	57.85	57.04	56.23	55.96	55.69	55.41	57.44	0.092	0.266	0.278
	2	56.69	55.55	54.41	53.27	57.07	55.93	54.79	53.65	57.45	56.31	55.17	54.03	52.89	52.51	52.13	51.75	54.60	0.162	0.466	0.513
Iron (mg/100g)																					
	1	51.65	51.26	50.87	50.48	51.78	51.39	51.00	50.61	51.91	51.52	51.13	50.74	50.35	50.22	50.09	49.96	50.94	0.081	0.233	0.275
	2	50.63	50.21	49.79	49.37	50.77	50.35	49.93	49.51	50.91	50.49	50.07	49.65	49.23	49.09	48.95	48.81	49.86	0.092	0.266	0.321

311 **Table 2. Effect of various combinations of packaging on sensory and physical properties of fenugreek (whole) at room temperature storage**

Particulars	Storage period (days)	Treatments																		
		T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	T16	GM	SE±	CD at 5%	CV (%)
Sensory evaluation																					
	2	7.30	7.00	6.70	6.40	7.40	7.10	6.80	6.50	7.50	7.20	6.90	6.60	6.30	6.20	6.10	6.00	6.75	0.075	0.216	1.926
PLW (%)																					
	1	5.16	5.61	6.06	6.51	5.01	5.46	5.91	6.36	4.86	5.31	5.76	6.21	6.66	6.81	6.96	7.11	5.985	0.110	0.316	3.175
	2	10.6	11.05	11.50	11.95	10.45	10.9	11.35	11.8	10.3	10.75	11.20	11.65	12.1	12.25	12.4	12.55	11.425	0.121	0.349	1.838
Rotting (%)																					
	1	6.91	8.62	10.33	12.04	6.34	8.05	9.76	11.47	5.77	7.48	9.19	10.90	12.61	13.18	13.75	14.32	10.045	0.115	0.333	1.991
	2	7.90	9.91	11.92	13.93	7.23	9.24	11.25	13.26	6.56	8.57	10.58	12.59	14.6	15.27	15.94	16.61	11.585	0.087	0.249	1.295

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Table 3. Effect of various combinations of packaging on chemical composition of fenugreek (whole) at zero energy cool chamber storage

Particulars	Storage period (days)	Treatments																			
		T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	T16	GM	SE±	CD at 5%	CV (%)
Moisture content (%)																					
	2	83.62	82.93	82.24	81.55	83.85	83.16	82.47	81.78	84.08	83.39	82.70	82.01	81.32	81.09	80.86	80.63	82.355	0.115	0.333	0.243
	4	78.37	77.68	76.99	76.30	78.60	77.91	77.22	76.53	78.83	78.14	77.45	76.76	76.07	75.84	75.61	75.38	77.105	0.012	0.035	0.027
Ascorbic Acid (mg/100gm)																					
	2	309	303	297	291	311	305	299	293	313	307	301	295	289	287	285	283	298.0	0.064	0.183	0.037
	4	222	207	192	177	227	212	197	182	232	217	202	187	172	167	162	157	194.5	0.075056	0.216	0.067
Chlorophyll content (%)																					
	2	59.13	58.02	56.91	55.80	59.50	58.39	57.28	56.17	59.87	58.76	57.65	56.54	55.43	55.06	54.69	54.32	57.095	0.104	0.299	0.315
	4	57.07	55.87	54.67	53.47	57.47	56.27	55.07	53.87	57.87	56.67	55.47	54.27	53.07	52.67	52.27	51.87	54.870	0.110	0.316	0.346
Iron content (mg/100g)																					
	2	51.71	51.32	50.93	50.54	51.84	51.45	51.06	50.67	51.97	51.58	51.19	50.8	50.41	50.28	50.15	50.02	50.995	0.144	0.416	0.490
	4	50.70	50.28	49.86	49.44	50.84	50.42	50.00	49.58	50.98	50.56	50.14	49.72	49.30	49.16	49.02	48.88	49.93	0.156	0.4505	0.541

Table 4 . Effect of various combinations of packaging on sensory and physical properties of fenugreek (whole) at zero energy cool chamber storage

Particulars	Storage period (days)	Treatments																		
		T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	T16	GM	SE±	CD at 5%	CV (%)
Sensory evaluation																					
	4	7.55	7.25	6.95	6.65	7.65	7.35	7.05	6.75	7.75	7.45	7.15	6.80	6.50	6.40	6.30	6.20	6.984	0.098	0.283	2.434
PLW (%)																					
	2	5.30	5.75	6.20	6.65	5.15	5.60	6.05	6.50	5.00	5.45	5.90	6.35	6.80	6.95	7.10	7.25	6.125	0.098	0.283	2.776
	4	10.55	11.00	11.45	11.90	10.40	10.85	11.30	11.75	10.25	10.70	11.15	11.60	12.05	12.20	12.35	12.50	11.375	0.127	0.366	1.934
Rotting (%)																					
	2	5.35	7.21	9.07	10.93	4.73	6.59	8.45	10.31	4.11	5.97	7.83	9.69	11.55	12.17	12.79	13.41	8.76	0.098	0.283	1.941
	4	7.42	9.40	11.38	13.36	6.76	8.74	10.72	12.70	6.10	8.08	10.06	12.04	14.02	14.68	15.34	16.00	11.05	0.115	0.333	1.810

352 **Table 5.Effect of various combinations of packaging on chemical composition of fenugreek (whole) in cold storage**

Particulars	Storage period (days)	Treatments																		
		T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	T16	GM	SE±	CD at 5%	CV (%)
Moisture																					
	2	86.52	85.83	85.14	84.45	86.75	86.06	85.37	84.68	86.98	86.29	85.6	84.91	84.22	83.99	83.76	83.53	85.255	0.133	0.383	0.270
	4	84.97	84.28	83.59	82.90	85.20	84.51	83.82	83.13	85.43	84.74	84.05	83.36	82.67	82.44	82.21	81.98	83.705	0.013	0.037	0.026
	6	83.07	82.38	81.69	81.00	83.30	82.61	81.92	81.23	83.53	82.84	82.15	81.46	80.77	80.54	80.31	80.08	81.805	0.156	0.450	0.330
	8	80.83	80.38	79.93	79.48	80.98	80.53	80.08	79.63	81.13	80.68	80.23	79.78	79.33	79.18	79.03	78.88	80.005	0.162	0.466	0.350
	10	78.60	78.15	77.70	77.25	78.75	78.30	77.85	77.40	78.90	78.45	78.00	77.55	77.10	76.95	76.80	76.65	77.775	0.167	0.482	0.373
Ascorbic Acid mg/100gm																					
	2	343	337	331	325	345	339	333	327	347	341	335	329	323	321	319	317	332	0.121	0.350	0.063
	4	305	297	290	282	307	300	292	285	310	302	295	287	280	277	275	272	291	0.173	0.499	0.103
	6	247	238	229	220	250	241	232	223	253	244	235	226	217	214	211	208	230.5	0.202	0.582	0.152
	8	239	227	215	203	243	231	219	207	247	235	223	211	199	195	191	187	217	0.208	0.599	0.166
	10	225	210	195	180	230	215	200	185	235	220	205	190	175	170	165	160	197.5	0.214	0.615	0.187
Chlorophyll content																					
	2	61.01	60.47	59.93	59.39	61.19	60.65	60.11	59.57	61.37	60.83	60.29	59.75	59.21	59.03	58.85	58.67	60.02	0.115	0.333	0.333
	4	59.66	58.97	58.28	57.59	59.89	59.20	58.51	57.82	60.12	59.43	58.74	58.05	57.36	57.13	56.9	56.67	58.395	0.144	0.416	0.428
	6	58.75	57.91	57.07	56.23	59.03	58.19	57.35	56.51	59.31	58.47	57.63	56.79	55.95	55.67	55.39	55.11	57.21	0.150	0.432	0.454
	8	57.54	56.70	55.86	55.02	57.82	56.98	56.14	55.30	58.10	57.26	56.42	55.58	54.74	54.46	54.18	53.90	56.00	0.156	0.449	0.482
	10	56.67	55.71	54.75	53.79	56.99	56.03	55.07	54.11	57.31	56.35	55.39	54.43	53.47	53.15	52.83	52.51	54.91	0.162	0.466	0.510
Iron (mg/100g)																					
	2	51.78	51.39	51.00	50.61	51.91	51.52	51.13	50.74	52.04	51.65	51.26	50.87	50.48	50.35	50.22	50.09	51.065	0.115	0.333	0.392
	4	51.61	51.22	50.83	50.44	51.74	51.35	50.96	50.57	51.87	51.48	51.09	50.70	50.31	50.18	50.05	49.92	50.895	0.139	0.399	0.472
	6	51.40	51.01	50.62	50.23	51.53	51.14	50.75	50.36	51.66	51.27	50.88	50.49	50.10	49.97	49.84	49.71	50.685	0.144	0.416	0.493
	8	51.07	50.68	50.29	49.90	51.20	50.81	50.42	50.03	51.33	50.94	50.55	50.16	49.77	49.64	49.51	49.38	50.355	0.150	0.432	0.516
	10	50.73	50.31	49.89	49.47	50.87	50.45	50.03	49.61	51.01	50.59	50.17	49.75	49.33	49.19	49.05	48.91	49.96	0.156	0.449	0.540

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355 **Table 6. Effect of various combinations of packaging on sensory and physical properties of fenugreek (whole) in cold storage**
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Particulars	Storage period (days)	Treatments																			
		T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	T16	GM	SE±	CD at 5%	CV (%)
Sensory evaluation																					
	10	8.00	7.70	7.40	7.10	8.10	7.80	7.50	7.20	8.20	7.90	7.60	7.30	7.00	6.90	6.80	6.70	7.45	0.156	0.45	3.624
PLW (%)																					
	2	2.39	2.84	3.29	3.74	2.24	2.69	3.14	3.59	2.09	2.54	2.99	3.44	3.89	4.04	4.19	4.34	3.215	0.069	0.199	3.732
	4	3.94	4.39	4.84	5.29	3.79	4.24	4.69	5.14	3.64	4.09	4.54	4.99	5.44	5.59	5.74	5.89	4.765	0.139	0.399	5.037
	6	5.84	6.29	6.74	7.19	5.69	6.14	6.59	7.04	5.54	5.99	6.44	6.89	7.34	7.49	7.69	7.79	6.668	0.150	0.432	3.90
	8	8.24	8.69	9.14	9.59	8.09	8.54	8.99	9.44	7.94	8.39	8.84	9.29	9.74	9.89	10.04	10.19	9.065	0.156	0.449	2.978
	10	10.47	10.92	11.37	11.82	10.32	10.77	11.22	11.67	10.17	10.62	11.07	11.52	11.97	12.12	12.27	12.42	11.295	0.162	0.466	2.479
Rotting (%)																					
	8	3.77	5.42	7.07	8.72	3.22	4.87	6.52	8.17	2.67	4.32	5.97	7.62	9.27	9.82	10.37	10.92	6.795	0.104	0.299	2.649
	10	6.61	8.77	10.93	13.09	5.89	8.05	10.21	12.37	5.17	7.33	9.49	11.65	13.81	14.53	15.25	15.97	10.57	0.069	0.199	1.135

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