

INFLUENCE OF VARIETAL CHARACTERISTICS AND PACKING MATERIALS ON FREEZING PRESERVATION OF VARIOUS PEA CULTIVARS

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Moisture and vitamin C content of all the four varieties namely local Bazi Khel, P-35, P-8 and H-57 decreased during storage, while alcohol insoluble solids reducing sugars, total sugars and protein content did not show any significant change. The paper board wrapped with polyethylene gave greater protection to vitamin C than polyethylene only. Colour of frozen P - 8 variety after 6 months storage was rated the highest followed by P-35 and H-57. Local Bazi Khel was ranked the poorest by the panel. Overall acceptability of H-57 after six months storage was rated the highest. P-35 and P-8 did not vary significantly and both were liked by the taste panel. However packing materials did not have any significant effect on colour and overall acceptability of all the four varieties of peas.

Key words: *Pisum sativum*, Peas freezing, Packaging.

Introduction

Peas have been used in Indo-Pak Sub-continent from time immemorial and are still one of the most widely consumed vegetable. The area under peas in Pakistan was 145000 hectare with a total production of 68000 tonnes during 1984-85 [1].

The daily per capita intake of vegetables in the rural and urban areas of the country is about 100 gm and 115 gm respectively, which is far below the minimum daily requirement of 280 gm per capita [6]. Peas contribute significant amount of protein, carbohydrates, vitamins and minerals to the diet and except for the cereal grains, leguminous vegetables are of greater importance as human food than the seeds of any other plant family [15]. The egg replacement value of pea protein which is 95% could be further raised upto 100% when supplemented with methionine [5].

The production of peas during peak harvest time is usually more than the actual demand in the market, which results in a low return to the producer at this time. The preservation of this vegetable by any known method will not only result in regularizing the market prices but also give a better return to the farmers. Moreover it will make the vegetable available throughout the year. Peas are preserved by many methods, such as dehydration, canning and freezing. Frozen peas are considered next to fresh in nutrition value [4].

The quality of the frozen product depends upon a number of factors of which variety is one of the most important factor [3].

This study was undertaken to find a variety of peas among the four commonly grown cultivars viz. Local Bazi Khel, P-35, P-8 and H-57 suitable for freezing, which will not only give a good quality product on freezing but a frozen

product which will undergo minimum nutritive loss on storage and also to confirm the results of previous studies regarding the suitability of packaging materials for frozen storage of peas.

Materials and Methods

The peas were grown at the farm of the Agricultural University, Peshawar and were harvested at optimum maturity. These were hand shelled and washed to remove any foreign material. No size grading was done and the seeds of all the sizes were mixed uniformly and blanched in boiling water for 2 mins. followed by cooling in running water [14]. These were then quality graded in 38° (10.07% salt solution) salometer brine solution [3]. The sinkers were discarded and the floaters were collected for subsequent packaging after washing to remove the adhering brine. The peas were packed in polyethylene (max width 1220 cm) bags alone and in paper board packaging of one kg wrapped with polyethylene [13]. The packages were blast frozen and stored at -10° for 6 months.

Triplicate samples of each cultivar on each analysis interval were analysed for moisture, vitamin C, alcohol insoluble solids, reducing sugars, total sugars and protein content [2] prior to processing, just after freezing and then after every two months interval for a total period of six months.

The peas after six months frozen storage were presented to a taste panel of 10 judges who evaluated these for colour and overall acceptability on a seven point hedonic scale [9].

Results and Discussion

Analysis results of the fresh peas, just after freezing and after six months frozen storage for various constituents are reported in Table 1-3 respectively.

Effect of freezing on moisture content, vitamin C, alcohol insoluble solids, reducing sugars, total sugars and protein

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TABLE 1. THE COMPOSITION* OF FOUR VARIETIES OF FRESH PEAS.

Variety	Moisture content	Vitamin C mg/100 gm	Alcohol insoluble solids	Reducing sugars	Total sugars	Protein
Local	77.1**	18.1	22.7	0.49	4.92	6.8
Bazi Khel	(± 0.18)	(± 0.34)	(± 0.45)	(± 0.80)	(± 0.14)	(± 0.17)
P - 35	78.6	21.7	18.1	0.72	6.75	5.9
	(± 0.23)	(± 0.54)	(± 0.60)	(± 0.63)	(± 0.33)	(± 0.29)
P - 8	77.8	20.2	18.8	0.68	6.33	6.3
	(± 0.47)	(± 0.42)	(± 0.64)	(± 0.18)	(± 0.28)	(± 0.30)
H - 57	77.2	18.3	21.3	0.51	5.1	6.5
	(± 0.08)	(± 0.37)	(± 0.51)	(± 0.28)	(± 0.25)	(± 0.22)

All values except vitamin C are expressed as % on fresh weight basis. * All values in the Table represent average of triplicate readings. ** Values in the parenthesis are S.Ds. for respective mean value.

TABLE 2. THE COMPOSITION* OF FOUR VARIETIES OF PEAS JUST AFTER PROCESSING.

Variety	Packages	Moisture content	Vitamin C mg/100 gm	Alcohol insoluble solids	Reducing sugars	Total sugars	Protein
Local	Polyethylene bags	78.1**	9.6	20.9	0.39	3.41	6.6
Bazi Khel	paper board pack- age wrapped with polyethylene	(± 0.43)	(± 0.25)	(± 0.47)	(± 0.12)	(± 0.31)	(± 0.42)
		76.7	9.6	20.9	0.39	3.41	6.6
		(± 0.32)	(± 0.31)	(± 0.27)	(± 0.42)	(± 0.20)	(± 0.18)
P - 35	- do -	79.1	14.1	17.1	0.64	5.73	5.8
	- do -	(± 0.04)	(± 0.19)	(± 0.48)	(± 0.04)	(± 0.46)	(± 0.45)
		77.5	14.1	17.0	0.64	5.73	5.8
		(± 0.10)	(± 0.29)	(± 0.26)	(± 0.14)	(± 0.19)	(± 0.18)
P - 8	- do -	78.6	12.1	17.7	0.59	5.20	6.2
		(± 0.22)	(± 0.12)	(0.08)	(± 0.07)	(± 0.40)	(± 0.11)
		77.1	12.2	17.7	0.59	5.20	6.2
		(± 0.62)	(± 0.09)	(± 0.13)	(± 0.15)	(± 0.28)	(± 0.11)
H - 57	- do -	78.3	10.1	19.2	0.42	4.81	6.3
		(± 0.25)	(± 0.15)	(± 0.44)	(± 0.27)	(± 0.12)	(± 0.08)
		76.6	10.1	19.2	0.42	4.81	6.31
		(± 0.31)	(± 0.12)	(± 0.16)	(± 0.42)	(± 0.23)	(± 0.02)

All values except Vitamin C are expressed as % on fresh weight basis. * All values in the Table represent average of triplicate readings. ** Values in the parenthesis are S.Ds. for respective mean value.

TABLE 3. THE COMPOSITION* OF FOUR VARIETIES OF PEAS JUST AFTER PROCESSING.

Variety	Packages	Moisture content	Vitamin C mg/100 gm	Alcohol insoluble solids	Reducing sugars	Total sugars	Protein
Local	Polyethylene bags	77.2**	9.4	20.9	0.40	3.4	6.6
Bazi Khel	paper board pack- age wrapped with polyethylene	(± 0.28)	(± 0.19)	(± 0.28)	(± 0.02)	(± 0.13)	(± 0.08)
		75.5	9.5	20.9	0.40	3.4	6.6
		(± 0.34)	(± 0.43)	(± 0.34)	(± 0.07)	(± 0.31)	(± 0.17)
P - 35	- do -	78.0	13.9	17.1	0.64	5.71	5.7
	- do -	(± 0.24)	(± 0.12)	(± 0.04)	(± 0.01)	(± 0.09)	(± 0.22)
		76.4	14.0	17.1	0.64	5.71	5.8
		(± 0.17)	(± 0.02)	(± 0.16)	(± 0.04)	(± 0.09)	(± 0.22)
P - 8	- do -	77.3	12.0	17.7	0.60	5.18	6.2
		(± 0.06)	(± 0.40)	(± 0.24)	(± 0.03)	(± 0.20)	(± 0.12)
		75.8	12.2	17.7	0.59	5.19	6.2
		(± 0.14)	(± 0.23)	(± 0.10)	(± 0.08)	(± 0.07)	(± 0.34)
H - 57	- do -	77.3	10.0	19.3	0.42	4.78	6.3
		(± 0.20)	(± 0.13)	(± 0.23)	(± 0.01)	(± 0.84)	(± 0.14)
		75.8	10.0	19.3	0.42	4.79	6.3
		(± 0.21)	(± 0.21)	(± 0.11)	(± 0.02)	(± 0.12)	(± 0.07)

All values except Vitamin C are expressed as % on fresh weight basis. * All values in the Table represent average of triplicate readings. ** Values in the parenthesis are S.Ds. for respective mean value.

content of frozen peas at 0 month storage could not be ascertained as the peas were quality graded in brine after blanching. The floaters were frozen and the sinkers were discarded. These chemical constituents of frozen peas thus represented only a part of the fresh peas.

The analysis of variance showed that the effect of variety, packaging and storage was significant on moisture content. P-35 variety had the highest moisture content followed by P-8 and H-57. Local Bazi Khel had the lowest moisture content. The loss of moisture in paper board wrapped with polyethylene was more as compared to simple polyethylene packing. This was because the paper board was not waxed on the inner side and so it absorbed moisture during storage irrespective of variety. Therefore, effect of storage on moisture content was significant irrespective of variety and packaging. There was a steady decrease in moisture content of all the four varieties during storage (Fig. 1). Effect of packaging on moisture content during storage is also shown in (Fig. 2).

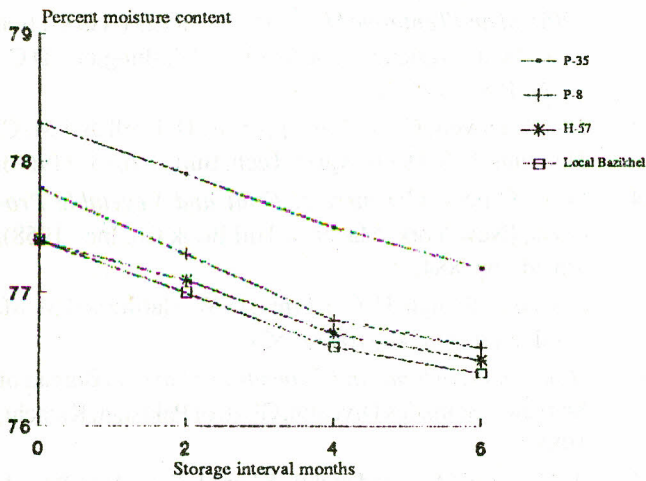


Fig. 1. Moisture content of four peas varieties at various storage intervals.

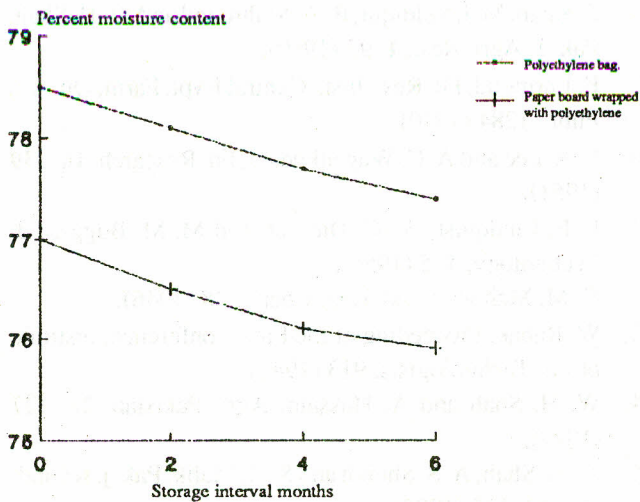


Fig. 2. Moisture retained by two packages at various storage intervals.

Effects of variety, package and storage were also significant on vitamin C content. P-35 variety retained the highest vitamin C content after six months storage at 10° irrespective of treatment (Fig. 3). This is in agreement with the findings of Mohaney *et al.* [12] who observed that the retention of ascorbic acid in frozen peas after 6 months storage varied with the variety. They further noted that an increase in storage period resulted in a decreased ascorbic acid in peas stored at 18°. Peas packaged in paper board wrapped with polyethylene retained more vitamin C than peas packed only in polyethylene bags (Fig. 4). This is in agreement with the results of earlier observations [7].

The effect of packaging and storage did not show any detectable difference in the retention of alcohol insoluble solids, reducing sugars, total sugars and protein content. These results are in agreement with the observations of Lee and Wagenknecht [10] who reported no change in reducing sugars, total sugars and protein content of frozen peas stored at 18° for

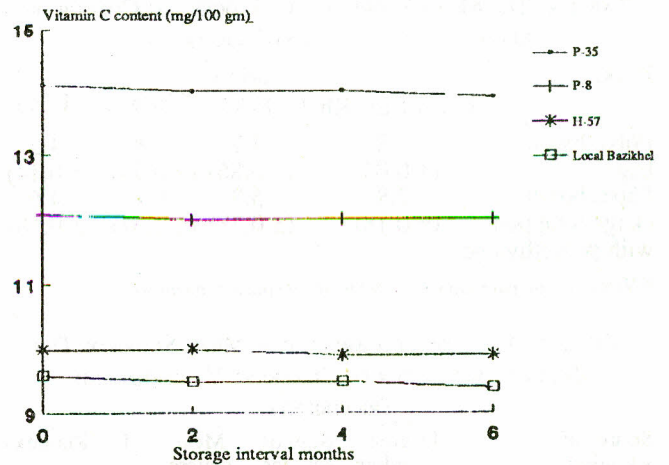


Fig. 3. Vitamin C content of four peas varieties at various storage intervals.

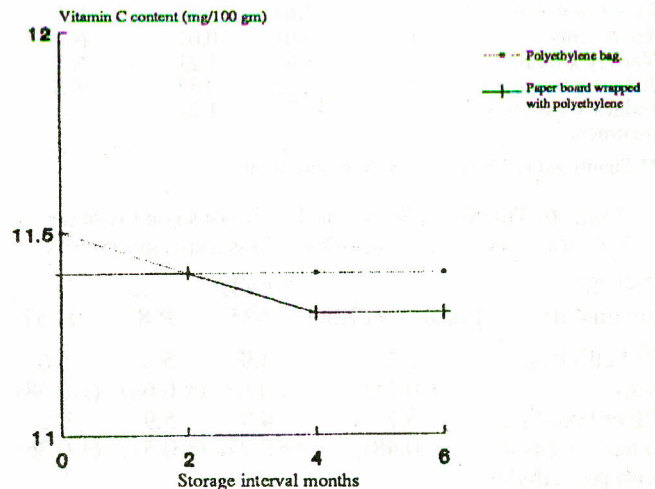


Fig. 4. Vitamin C content retained by two packages at various storage intervals.

5 years. Lindquist *et al.* [11] also pointed out that no change occurred in the alcohol insoluble solid content of peas stored at -18° for 40 weeks.

Average colour quality rating of ten judges is given in Table 4. The results of analysis of variance showed that effect of variety on the colour of frozen peas was highly significant, while the effect of packaging was non significant (Table 5). Since all the samples were rated on a seven point hedonic scale, those achieving a mean score above four were considered to be accepted by the panel. P-8 was rated the highest among the four varieties followed by P-35 and H-57. Local Bazi Khel was not liked by the panel (Table 4).

The average evaluation scores for overall acceptability are reported in Table 6. Statistical analysis of these evaluation indicated that the effect of variety on overall acceptability of frozen peas was highly significant, while the effect of treatments was non-significant (Table 7). Local Bazi Khel had a mean score below four, which indicated that it was not liked by

TABLE 4. THE MEAN SCORE OF TEN JUDGES FOR COLOUR OF DIFFERENT VARIETIES AND TREATMENTS.

Package	Variety			
	Local Bazi Khel	P-35	P-8	H-57
Polyethylene bags	2.8 (± 0.03)	4.7 (± 0.86)	6.8 (± 0.94)	4.5 (± 0.14)
Paper board package wrapped with polyethylene	2.8 (± 0.18)	5.3 (± 0.78)	6.2 (± 0.04)	4.6 (± 0.18)

* Values in the parenthesis are S.Ds. for respective mean value.

TABLE 5. ANALYSIS OF VARIANCE OF MEAN SCORE OF TEN JUDGES FOR COLOUR OF DIFFERENT VARIETIES AND TREATMENTS.

Source of variation	Degree of freedom	Sum of squares	Mean square	F	Remarks
Judges	9	17.01	1.89	—	—
Variety	3	139.24	46.41	38.5	**
Judges x variety	27	26.64	0.98	—	N.S.
Treatments	1	0.01	0.01	—	N.S.
Variety x treatment	3	3.64	1.21	—	N.S.
Judges x treatment	9	5.12	0.57	—	N.S.
Judges x variety x treatment	27	32.73	1.21	—	—

** Significant at 1% level. N.S. Non significant.

TABLE 6. THE MEAN SCORE OF TEN JUDGES FOR OVERALL ACCEPTABILITY OF DIFFERENT VARIETIES AND TREATMENTS.

Package (treatment)	Variety			
	Local Bazi Khel	P-35	P-8	H-57
Polyethylene bags	3.6* (± 0.21)	4.9 (± 0.62)	5.5 (± 0.64)	5.6 (± 0.58)
Paper board package wrapped with polyethylene	3.2 (± 0.48)	4.9 (± 0.74)	5.9 (± 0.51)	6.2 (± 0.36)

* Values in the parenthesis are S.Ds. for respective mean value.

the panel. The overall acceptability of H-57 was rated the highest followed by P-8 and P-35.

TABLE 7. ANALYSIS OF VARIANCE OF MEAN SCORE OF TEN JUDGES FOR OVERALL DESIRABILITY OF DIFFERENT VARIETIES AND TREATMENTS.

Source of variation	Degree of freedom	Sum of squares	Mean square	F	Remarks
Judges	9	9.45	1.05	—	—
Variety	3	77.35	25.78	15.34	**
Judges x variety	27	60.15	2.2	1.32	N.S.
Treatments	1	0.45	0.45	—	N.S.
Variety x treatment	3	2.95	0.98	—	N.S.
Judges x treatment	9	8.05	0.89	—	N.S.
Judges x variety x treatment	27	31.55	1.68	—	—

** Significant at 1% level; N.S. Non significant.

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