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Extending the Storage Life of Onions by Gamma Radiation

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Abstract
The paper describes the possibility of extending the storage life of onions by gamma radiation, which poses a serious storage problem in the hot summer months in Pakistan. Bulbs were irradiated at a dose of 0.10 kGy and stored, alongwith unirradiated control, under ambient conditions for a period of 4 months. The weight loss varied between 15 and 23 after the storage period. It was found that losses through dehydration were less in the Desi than in the Red Variety. The rotting ranged from 6.5-9.4 percent in the irradiated onions and 12.4-12.8 percent in the unirradiated bulbs after 4 months storage. Quality evaluation tests revealed that the internal and external quality of the irradiated samples scored higher than the corresponding controls. The cost of onions irradiation was calculated to be Rs.290.00 per tonne.

Introduction
Onion is one of the most important condiments grown widely in the world. In Pakistan some 808, 900 tonnes of onions were produced during 1994-95. But of this 27,000 tonnes of onions were exported. The post-harvest management problems of onions are more severe in Pakistan. Cold storages are not used for the preservation of this vegetable in our country. There are two important onion crops in Pakistan. The kharif crop is sown between May and August and harvested from October and January. The Rabi crop is sown between October and December and harvested in April and May. These two onion crops are grown all over the country. It is estimated that about 10 percent of the onions produced are retained at the farm. About 20 percent of the onions output goes waste after harvest, about 8 percent on the farm and 12 percent in the process of marketing. These losses are occurred due to dehydration, rotting and sprouting (Laferriere *et al*., 1988). Extension of storage life can increase the earnings of the farmers and traders and hence will reduce price fluctuation to a greater extentirradiation treatment of onions has been shown to completely inhibit sprouting (Lewis and Mathur, 1963) and reduce other losses (Kalman, 1978; Thomas, 1982).

The objective of the study was to determine the optimum doses for preserving onions under the suitable storage conditions. It was desired to investigate the quality characteristics and consumers acceptability of the irradiated product and determine the cost economics of the radiation technology.

Materials and Methods
The onions (varieties: Desi and Red) were obtained from the field at the time of harvest during the month of May. It was stored for 2 weeks at ambient conditions to remove the field heat. Sound bulbs were selected for the experiment. Eight tonnes of the material was used for the experiment. Half of the onions were irradiated with a dose of 0.10 kGy in Co-60 Irradiator at N1FA, Peshawar. The material was stored for a period of 4 months at ambient conditions (temperature 15-40°C and relative humidity 60-90%). The irradiated and unirradiated samples of onions were regularly examined during storage. For core condition studies, different bulbs were cut with stainless steel knife and difference between the irradiated and unirradiated lots were noted. For the weight loss and incidence of rot and sprouting different bulbs were selected and marked. They were examined regularly during storage and the data expressed on per cent basis. The bulbs were cut and sensory evaluation performed by the panel of judges on the basis of quality and fitness for consumption.

The economics of irradiation was calculated for a source strength of 50 kGy and a throughput rate of 20 t h^{-1}. The total production of onions was considered to be 100,000 tonnes and out of this 50 percent produce was considered to be available for irradiation whereas the rest for fresh consumption.

Results and Discussion
The optimum dose for sprout inhibition in onions was determined in the preliminary experiments and was found to be 0.10 kGy. The observation on the weight loss of onions during storage at ambient conditions under the shade are given in Table 1. It was found that weight loss increased with increase in the storage period. The overall results indicated greater weight loss in the unirradiated than irradiated onions in both the varieties. Further it was found that losses due to dehydration were lesser in the Desi than the Red variety of the onions.

The effect of irradiation and storage on the percent rottage of onions was studied and the data given in Table 2.There was little rotting in onions of all samples after 2 months. The rotting increased later in storage. The rotting was relatively higher in Red variety than the Desi onions. The overall results indicated that rotting was more in the control as compared to the treated bulbs. In India higher spoilage (20-35%) has been reported when irradiated onions were stored under ambient conditions (Thomas, 1982). It could be due to higher temperature and rel. humidity are

Table 1: The effect of irradiation and storage on the weight loss in onions

Storage Period Week	Desi Variety		Red Variety	
	0	0.10 kGy	0	0.10 kGy
0	0.0	0.0	0.0	0.0
8	12.8	10.5	16.6	10.8
16	20.6	15.2	23.4	15.9

Table 2: The effect of irradiation and storage on the rotting in onions

Storage Period week	Desi Variety		Red Variety	
	0	0.10 kGy	0	0.10 kGy
0	0.0	0.0	0.0	0.0
8	3.3	3.2	6.4	5.8
16	12.4	6.5	12.8	9.4

The values are expressed in tempterature was 15-40°C and relative humidity 60-90 percent

Table 3: The effect of irradiation and storage on the consumers acceptability of onions

Storage Period week	Desi Variety		Red Variety	
	0	0.10 kGy	0	0.10 kGy
External Quality				
8	7.2	8.3	7.7	7.8
16	5.6	6.6	5.2	6.6
Internal Quality				
8	6.3	7.6	6.3	7.8
16	5.1	6.7	5.2	6.9

The values are the average of 6 judges; Hedonic scale: 9-like extremely, 1-dislike extremely

compared to the ambient conditions in N.W.F.P. of Pakistan.

There was no sprouting in the irradiated and unirradiated bulbs of both the varieties during the 4 months storage period due to high storage temperature. The initiation of sprouting started later in the storage in the unirradiated bulbs of both the varieties. The quality evaluation test was also performed and it revealed that external and internal quality of irradiated onions was better than untreated bulbs after 4 months storage (Table 3). Similar results have also been reported by Khan (1975, 1990), Khan and Wahid (1978) and Thomas (1982).

The cost economic of irradiation was calculated for a source strength of 50 KCi and throughput rate of 20 t/h. It was found that if 50,000 tonnes of onions were to be irradiated then the cost per tonne would be Rs. 290,00 or Rs. 0.29/Kg. The cost can be' still reduced if more food items are included for irradiation. Feasibility of radiation preservation of fruits and vegetable in Pakistan has been earlier reported by Khan (1990).

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