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Research Article

ROLE OF IRRADIATION IN POST HARVEST STORAGE OF KAKROL (*MOMORDICA DIOICA* Roxb.)

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ABSTRACT
The fruits of kakrol were irradiated with different doses of gamma rays i.e., 0.25 kGy, 0.5 kGy, 0.75 kGy and 1.0 kGy and were stored at room temperature. The shelf life of irradiated kakrol fruits at room temperature was nine days. Among all treatments 0.25 kGy recorded lower Physiological loss in weight and spoilage percentage and higher TSS, Titrable acidity Reducing sugars, ascorbic acid content and organoleptic scoring. The physiological loss in weight ranged from 0.58 with 0.25 kGy to 0.77 with control. The spoilage ranged from 18.98 with 0.25 kGy to 35.12 with control. The TSS ranged from 4.70 with control to 5.23 with 0.25 kGy. The titrable acidity ranged from 0.077 with control to 0.083 with 0.25 kGy. The reducing sugars ranged from 1.30 per cent with control to 1.65 per cent with 0.25 kGy. The organoleptic score ranged from 5.63 with control to 8.03 with 0.25 kGy. Further the irradiation beyond 0.25 kGy decrease organoleptic score and similar trend was observed in cold storage with increase in shelf life

Keywords: *Irradiation, Physiological Loss in Weight, Kakrol, TSS, Ascorbic Acid*

INTRODUCTION
Kakrol (*Momordica dioica* Roxb.) (2n = 2x = 28) is a cucurbitaceous, dioecious perennial vegetable grown naturally in certain pockets of India but extensively in coastal belts of Andhra Pradesh. It grows naturally in bushes, along live fences and jungles. According to Gurbaksh *et al.*, (1989) about 80 species are identified as important for food systems in India. Among them, *Momordica dioica* is the most important one.

In general vegetables are highly perishable and the post harvest losses at different stages of storage in kakrol fruits are reported to be 17.1 per cent (Bidyutdeka *et al.*, 2004).Irradiation is one of the important and recent processing technology which has gained attention as an effective tool for assuring food safety by extending the shelf life of may be fruits and vegetables.

Balock *et al.*, (1956) first introduced the idea of post harvest irradiation of fruit and its potential for disinfestations and prolongation of shelf life. The major problem confronting in the post harvest life of kakrol fruit is ripening of the fruits and fungal infection. No information is available on kakrol fruits pertaining to irradiation which could delay ripening, there by extending the shelf life of fruits.

MATERIALS AND METHODS
The experiment was conducted under room temperature (22 ± 2^oC) and cold storage (16^oC) separately. The shelf life was studied at different intervals with six treatments, 3 replications using factorial Completely Randomised block design.

The treatments are as follows T_1- 0.1 kGy, T_2- 0.25 kGy, T_3-0.50kGy, T_4- 0.75 kGy, T_5- 1.0 kGy, T_6-Control. Observations recorded on Physiological loss in weight,, Percentage of spoilage ,Total soluble solids, Titrable acidity, Ascorbic acid content, Reducing sugars and Organo leptic score.

Radiation treatment was given at post harvest technology laboratory, ANGRAU, Hyderabad was used for giving the irradiation treatments. Gamma chamber 5000 is compact shelf shielded and is of approximately 5000 cc capacity.

RESULTS AND DISCUSSION

The study revealed that the shelf life of the irradiated fruits was higher in cold storage compared with those stored at room temperature irrespective of irradiation dose. The shelf life of irradiated kakrol fruits at room temperature was nine days as against 12 days in cold storage.

Physiological Loss in Weight (%)

The physiological loss in weight increased with irradiated kakrol fruits at two storage conditions. The losses being maximum under room temperature compared with cold storage. The PLW ranged from 0.58 with 0.25 kGy to 0.77 with control in fruits stored at room temperature. While it ranged from 0.031 with 0.25 kGy to 0.142 with control in cold storage. The physiological loss in weight under two storage conditions with increase in storage period is due to increased respiration and loss of water through transpiration. The lower PLW in cold storage was due to more humidity and relatively low temperature as compared to room temperature. Amina (2003) also reported reduced physiological loss in weight of tomato and amaranthus on storage with irradiation.

Among different irradiated treatments, fruits subjected to 0.25 kGy irradiation doses recorded less physiological loss in weight and maximum was recorded with control beyond 0.25kGy there was increase in PLW with increase in dose of irradiation under two temperature conditions. From the study it is clear that n25kGy optimum dose of irradiation under two conditions of storage.

Percentage Spoilage

Percentage of spoilage recorded significant differences due to irradiation treatments, days of storage and their interaction. Spoilage was found minimum in irradiated fruits over control under two storage conditions. The spoilage ranged from 18.98 with 0.25 kGy to 35.12 with control at room temperature, while it ranged from 5.82 with 0.25 kGy to 13.40 with control under cold storage. Further irradiation dose beyond 0.25kGy increased spoilage percentage under two storage conditions. The higher spoilage at room temperature was due to high respiratory rate when compared to those stored at cold storage. Among different irradiation treatment of 0.25 kGy recorded minimum spoilage irrespective of storage conditions. This might be due to decrease in microbial load and reduced respiratory rate with the irradiation.

Table 1: Effect of irradiation and days of storage on total soluble solids (°Brix) of kakrol fruit at room temperature

Treatments	Days of storage				
	3 day	**6 day**	**9 day**	**Mean**	**12 day**
T_1-0.1 kGy	4.97	5.50	4.70	5.06	3.20
T_2-0.25 kGy	5.20	5.60	4.90	5.23	3.70
T_3-0.50 kGy	5.20	5.60	4.80	5.20	3.47
T_4-0.75 kGy	5.10	5.40	4.50	5.00	3.50
T_5-1.0 kGy	5.10	5.50	4.50	5.03	-
T_6-Control	4.90	5.20	4.00	4.70	-
Mean	**5.07**	**5.47**	**4.57**	**-**	

	F-test	**S. Ed**	**CD (0.05)**
Treatments (T)	*	0.025	0.050
Days (D)	*	0.0184	0.036
T X D	*	0.045	0.087

** Significant at 5% level of significance*

Quality Parameters

Total Soluble Solids (°Brix)

The total soluble solids increased initially upto six days at room temperature and upto nine days in cold storage and later on decreased as the storage progressed both at room temperature and cold storage. Among irradiated treatments, the TSS ranged from 4.70 with control to 5.23 with 0.25 kGy at room temperature while in cold storage, the TSS ranged from 5.05 with control to 5.44 with 0.25 kGy. The increase in TSS during the initial stages may be attributed to the conversion of starches and other polysaccharides in to sugars and decrease in TSS at later stage is owing to the increased rate of respiration When fruits were irradiated with 0.25 kGy recorded 11.2 per cent increase in TSS and 7.7 per cent increase in TSS at room temperature and cold storage respectively.

Table 1A: Effect of irradiation and days of storage on total soluble solids (°Brix) of kakrol fruit in cold storage

Treatments	Days of storage					
	3 day	6 day	9 day	12 day	Mean	15 day
T_1-0.1 kGy	5.12	5.26	5.60	4.90	5.22	3.10
T_2-0.25 kGy	5.29	5.45	5.75	5.30	5.44	4.20
T_3-0.50 kGy	5.29	5.45	5.70	5.00	5.36	3.70
T_4-0.75 kGy	5.18	5.28	5.50	4.70	5.16	3.40
T_5-1.0 kGy	5.19	5.27	5.60	4.60	5.16	-
T_6-Control	5.11	5.20	5.40	4.50	5.05	-
Mean	**5.19**	**5.32**	**5.59**	**4.83**	**-**	**-**

	F-test	S. Ed	CD (0.05)
Treatments (T)	*	0.021	0.040
Days (D)	*	0.017	0.033
T X D	*	0.041	0.080

** Significant at 5% level of significance*

Titrable Acidity (%)

The titrable acidity ranged from 0.077 with control to 0.083 with 0.25 kGy at room temperature. While in cold storage, it was ranged from 0.076 with control to 0.082 with 0.25 kGy. The decrease in acidity in fruits during storage might be due to utilization of organic acids in respiration

Ascorbic Acid Content (mg/100 g of fruit pulp)

During storage under two conditions, there was a decrease in the ascorbic acid content in the irradiated fruits including control. The ascorbic acid content ranged from 19.40 with control to 24.84 with 0.25 kGy at room temperature, while in cold storage it was ranged from 21.62 with control to 24.26 with 0.25 kGy. The decrease in ascorbic acid in storage might be due to degradation of ascorbic acid to dehydro ascorbic acid by oxidative enzymes

In the present experiment, the ascorbic acid content increased upto 0.25 kGy and further increase in dose of irradiation decreased the ascorbic acid content. This could be due to sensitivity of ascorbic acid to ionizing radiation and the ascorbic acid converted to dehydro ascorbic acid which is highly unstable.

Table 2: Effect of irradiation and days of storage on ascorbic acid content (mg/100g of fruit pulp) of kakrol fruit at room temperature

Treatments			**Days of storage**		
	3 day	**6 day**	**9 day**	**Mean**	**12 day**
T_1-0.1 kGy	26.41	23.40	17.19	22.33	15.59
T_2-0.25 kGy	27.20	26.40	20.92	24.84	19.90
T_3-0.50 kGy	26.70	25.20	17.21	23.04	15.62
T_4-0.75 kGy	25.20	22.30	17.12	21.54	15.59
T_5-1.0 kGy	25.50	21.80	17.10	21.47	-
T_6-Control	24.60	19.40	14.20	19.40	-
Mean	**25.94**	**23.08**	**17.29**	**-**	

	F-test	**S. Ed**	CD (0.05)
Treatments (T)	*	0.011	0.028
Days (D)	*	0.007	0.020
T X D	*	0.018	0.049

** Significant at 5% level of significance*

Table 2A: Effect of irradiation and days of storage on ascorbic acid content (mg/100g of fruit pulp) of kakrol fruit in cold storage

Treatments			**Days of storage**			
	3 day	**6 day**	**9 day**	**12 day**	**Mean**	**15 day**
T_1-0.1 kGy	26.74	24.66	22.32	19.98	23.43	17.10
T_2-0.25 kGy	27.84	25.98	22.31	20.92	24.26	19.84
T_3-0.50 kGy	25.82	24.58	22.32	19.88	23.15	17.19
T_4-0.75 kGy	25.82	24.59	21.80	19.84	23.01	17.19
T_5-1.0 kGy	25.73	24.60	21.80	19.84	22.99	-
T_6-Control	24.90	22.00	19.90	19.68	21.62	-
Mean	**26.14**	**24.40**	**21.74**	**20.02**	**-**	**-**

	F-test	**S. Ed**	**CD (0.05)**
Treatments (T)	*	0.011	0.021
Days (D)	*	0.008	0.017
T X D	*	0.021	0.042

** Significant at 5% level of significance*

Reducing Sugars (%)

Reducing sugars decreased as the storage period increased under both conditions of storage. The reducing sugars ranged from 1.30 per cent with control to 1.65 per cent with 0.25 kGy at room temperature while they ranged from 1.24 with control to 1.58 with 0.25 kGy in cold storage. Further the reducing sugars were higher in fruits stored in cold storage than at room temperature. The increase in reducing sugars in fruits during cold storage might be due to conversion of pectin and hemicellulose into reducing sugars.

Organoleptic Score

The organoleptic score in cold storage ranged from 5.64 with control to 8.65 with 0.25 kGy, while at room temperature it ranged from 5.63 with control to 8.03 with 0.25 kGy. Further the irradiation beyond 0.25 kGy decrease organoleptic source due to browing and also due to decrease in quality parameters. The decrease in organoleptic score during storage indicated the sensitiveness of the fruits to storage. The highest organoleptic score was observed in fruits treated with 0.25 kGy. It might be due to retention of moisture which prevented shriveling and ripening of kakrol fruits.

Conclusion

Among all treatments 0.25 kGy is best dose for irradiating kakrol fruits to increase shelf life with minimum loss of quality parameters and organoleptic score.

REFERENCES

Amina Sadiya (2003). Antioxidant activity: Effect of storage and processing in tomato and amaranth. Ph.D. Thesis submitted to Acharya N. G. Ranga Agricultural University, Rajendranagar, Hyderabad.

Balock JW, Chistenson LD and Burr GO (1956). Effect of gamma rays from cobalt 60 on immature stages of oriental fruitfly (*Dacus doralisttindel*) and possible application to commodity treatment problems. *Academy Science* 18.

Bidyut C Deka, Sanjib Sharma, Pulin Patgiri, Saikia A and Hazarika C (2004). Post harvest practices and loss assessment of some commercial horticultural crops of Assam Indian Food Packer **58**(1) 85-87.

Gurbaksh Singh, Shafi M and Azis A (1989). Forests a new source of food. *Food Systems of the World* 488-490.