SHORT COMMUNICATION

Investigation of shelf life of strawberry from Cameron Highlands through gamma irradiation

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Abstract:

This study was an experimental study to investigate the shelf life extension of strawberry from Cameron Highlands through the different exposure doses of gamma irradiation. The strawberries were divided into four groups. Each group was irradiated by gamma irradiation and had their own specific gamma dose. The strawberries were divided into four groups by labelling A - 0.0 kGy (controlled) B1 - 0.4 kGy, B2 - 0.8 kGy and B3 - 1.2 kGy. The shelf life group calculated the weight loss and the decay rate of the strawberries from samples A, B1, B2, and B3. Findings from the percentage of weight loss showed that there was no consistency in weight loss to the differences in irradiation dose of the strawberry. From the findings of the decay rate, it can be concluded that the higher the dose of irradiation, the lower the time taken for the strawberries to decay.

Keywords: Strawberry**,** gamma irradiation, food irradiation

1. INTRODUCTION

The strawberry fruits have a very short shelf life due to high decayable process and easily affected by external injury [1]. The shelf life of fresh-produced strawberry can long last up to 1-3 days only at the room temperature due to its decay of high respiration rate, environmental stresses and infectious attacks [2].

Food irradiation is the process in which a product is exposed to ionizing radiation to improve its safety and to maintain its quality. The doses for irradiation depend on its purpose. The doses for irradiation can be classified into three groups. There are low dose level which is below 3kGy, medium level which is between 3kGy and 10kGy, and high dose level which is above 10kGy that can be used for delaying the ripening of fruits, disinfestations, restriction of germination, shelf life extension, termination of microorganism and sterilization [3].

2. MATERIALS AND METHODS

2.1 Sample and Populations

20 fresh strawberries from Cameron Highland of the same batch were used in this experiment. The strawberries were divided into 4 groups in which, 1 group non-irradiated (controlled) and other 3 groups were irradiated (Table 1).

Table 1: Strawberry samples

Dose (kGy)	A (0.0)	B1 (0.4)	B3 (0.8)	B2 (1.2)
Strawberries used	5	5	5	5

2.2 Methods for Data Collection

2.2.1 Weight loss

The weight loss of each group of strawberries was recorded on 1st, 5th, 7th, 14th & 21st day after irradiated

$$\text{Weight loss \%} = \frac{\text{Initial weight} - \text{final weight}}{\text{Initial weight}} \times 100$$

2.2.2 Decay rate

A strawberry with infection by *Botrytis cinerea*, visible brown spot and the softened area was regarded as decayed and results were expressed as the percentage of decayed fruits.

$$\text{Decay \%} = \frac{\text{Total number of decayed strawberry}}{\text{Total number of strawberry samples}} \times 100$$

3. RESULTS AND DISCUSSION

3.1 Weight Loss

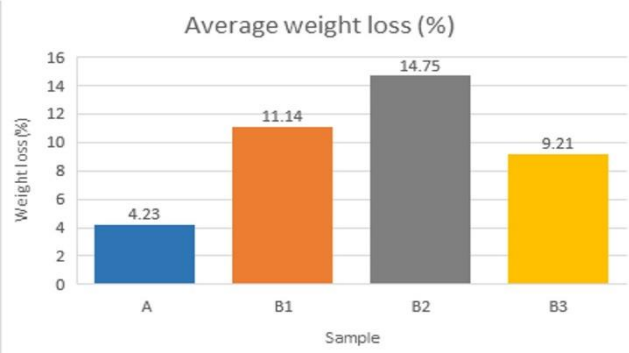

Figure 1: Histogram of average weight loss of each sample group

Table 2**:** Pearson correlation between dose of irradiation and weight loss of strawberry samples

		Gamma Dose	Weight Loss
Gamma Dose	Pearson Correlation	1	.546
	p (2-tailed)		.454
	N	4	4
Weight Loss	Pearson Correlation	.546	1
	p (2-tailed)	.454	
	N	4	4

Figure 1 shows the average weight loss. There was no consistency of weight loss to the irradiation dose. The correlation between weight loss and irradiation dose were discussed in Table 2 where the Pearson's r is 0.546 and the *p*-value of correlation is 0.454. The Pearson's r was positive showing that the irradiation dose and weight loss was moving in the same direction. The higher the irradiation dose, the higher the weight loss. The *p*-value of correlation also did not show a significant correlation between the variables (p>0.01).

The results achieved are contrary with the previous study [2], that shows the higher the irradiation dose, the less the weight loss of the strawberry sample. It was due to limitation during storage and handling which may affect quality and shelf-life of strawberry [4].

3.2 Decay Rate

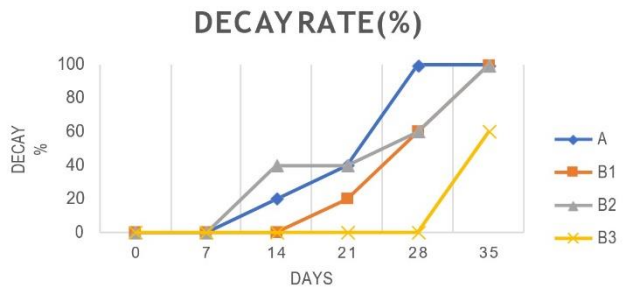

Figure 2: Histogram of decay rate of each sample group

Table 3: Pearson Correlation between dose of irradiation and decay rate of strawberry samples

		Gamma dose	Decay rate
Gamma dose	Pearson Correlation	1	-.939
	p (2-tailed)		.061
	N	4	4
Decay rate	Pearson Correlation	-.939	1
	p (2-tailed)	.061	
	N	4	4

Figure 2 shows the decay rate of the strawberry. There was consistency of decay to the irradiation dose. The correlation between weight loss and irradiation dose were discussed in Table 3 where the Pearson's r is -.939 and the *p*-value is 0.061. The Pearson's r value is closed to 1 showing that the irradiation dose and the decay rate of the strawberry have an excellent strength of correlation. Since the value is negative, the correlation between the two variables is negative correlation. We can conclude that the higher the irradiation dose to the strawberry sample, the lower the decay rate. The *p*-value is 0.061 (p>0.01) meaning that there is no statistically significant correlation between the irradiation dose and the decay rate of the strawberry.

The results achieved were the usual pattern from the previous study. This evidence was supported by [1] where the controlled group decayed first after 7 days rather than the irradiated one. Thus, this study had proved experimentally, as the higher radiation dose, the lower the decay rate, and the lower the weight loss, even though the relationship is not very strong.

4. CONCLUSIONS

Findings from the percentage of weight loss showed that there was no consistency in weight loss to the differences in irradiation dose. For the findings of the decay rate, it can be concluded that the higher the dose of irradiation, the lower the time taken for the strawberries to decay.

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