

Research Paper :

Studies on physical properties of spinach beet (*Beta vulgaris* L).

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ABSTRACT

Physical properties of spinach beet were studied for extending shelf-life of spinach beet using precooling and storage methods. The temperature of spinach beet was reduced from 20°C to 15°C, 10°C and 5°C within 15, 30 and 90 minute in case of forced air precooling and 30, 60 and 210 minute in case of still air precooling, respectively. The pre-cooled samples were packed in different polyethylene bags (100, 200 and 300 gauge) and stored at 5°C, 10°C and 15°C temperature. The weight loss was found maximum in 100 gauge packaging followed by 200 gauge packaging. Minimum weight loss was in 300 gauge packaging (1.86%). The shelf life of pre-cooled samples ranged between 2 to 7, 3 to 10 and 4 to 14 days for different packaging stored at 15°C, 10°C and 5°C, respectively. The discolouration of sample (fresh green to dark green) was observed after 7, 10 and 14 days.

Key words : Precooling, Weight loss, Colour, Texture, Shrinkage index, Shelf life

Spinach beet (*Beta vulgaris* L.) is well known for its medicinal value. Spinach beet is rich in folate. Folate have been found to prevent neural tube birth defects and anemia. The leafy vegetables are gaining importance because of the awareness of balanced diet amongst various sections of people. India ranks second in production of vegetables with an estimated area and production of 53.35 lakh ha and 73 Mt, respectively.

The main objective is to extend shelf life of spinach beet by precooling. Shelf life is extended by dehydration in which loss of nutrients takes place. 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.

Prestorage treatment such as precooling, packaging and low temperature storage can avoid spoilage in vegetables and also helps in maintaining fresh quality of vegetables for longer time during storage and transport. Packaging preserves the quality and nutritive value of product by exclusion of oxygen and control of moisture loss. The present investigation was undertaken with the following specific objectives-to study the effect of precooling, packaging and storage temperature on the shelf life and quality of spinach beet.

METHODOLOGY

Fresh, uniform size and matured spinach beet variety local was procured from a local farmer. Sorting and grading was done manually. Cleaned and washed sample of about 500g was taken after removal of surface water for experiment. Precooling was done by still air and forced

air precooling using walk-in type precooler to achieve the temperature 5°C, 10°C, 15°C. (Hansen, 1951; Gillies, 1995; Srivastava *et al.*, 1962; Hoftun, 1993). The pre-cooled spinach beet samples were packed in three different packaging bags *viz.*, 100, 200 and 300 gauge polyethylene bags. The packed sample was further stored at 5°C, 10°C, 15°C and room temperature. Temperature of spinach beet during precooling was determined by using temperature indicator. The stored spinach beets were assessed for weight loss and quality at two days interval.

Weight loss:

Weight Loss was determined by weighing the samples before and after two days storage interval. It is calculated using equation

$$\text{Weight loss} = \frac{W_1 - W_2}{W_1} \times 100$$

where, W_1 = Weight of material before storage
 W_2 = Weight of material after each storage interval.

Sensory evaluation:

Stored spinach beet were obtained from different methods *i.e.* still air and forced air pre-cooled samples packed in 100, 200 and 300 gauge polyethylene bags stored at 5°C, 10°C and 15°C were served for sensory evaluation by a panel of 10 judges on the basis of 9 point hedonic scale (Jorwar, 2001) and the quality characteristics *viz.*, colour, texture and shrinkage was recorded.

Shelf-life:

Shelf-life of spinach beet was determined by qualitative assessment of stored samples. Weight loss limit > 10% and discolouration of cells was used to fix shelf life of the product.

Statistical analysis:

The data were analyzed for statistical significance of the treatments. Factorial Completely Randomized Design (FCRD) was used to test the significance of data (Nigam and Gupta, 1979).

RESULTS AND DISCUSSION

The findings of the present study as well as relevant discussion have been summarized under following heads:

Weight loss :

It is observed that weight loss varied between 10.87 to 51.62% during 5 days storage in case of unpacked samples whereas weight loss varied from 0.22 to 3.93% during 14 days storage in case of packed samples. The effect of precooling method, packaging and storage period on weight loss was plotted and shown in Fig.1, 2 and 3. From this it can be concluded that minimum weight loss was in case of 300 gauge packaging with forced precooling stored at 5°C(1.86%) whereas weight loss was found maximum in case of control samples stored at room temperature without packaging for 1 day (51.62%).Effect of packaging, storage temperature and period on weight loss was found statistically significant at 5 per cent level of significance.

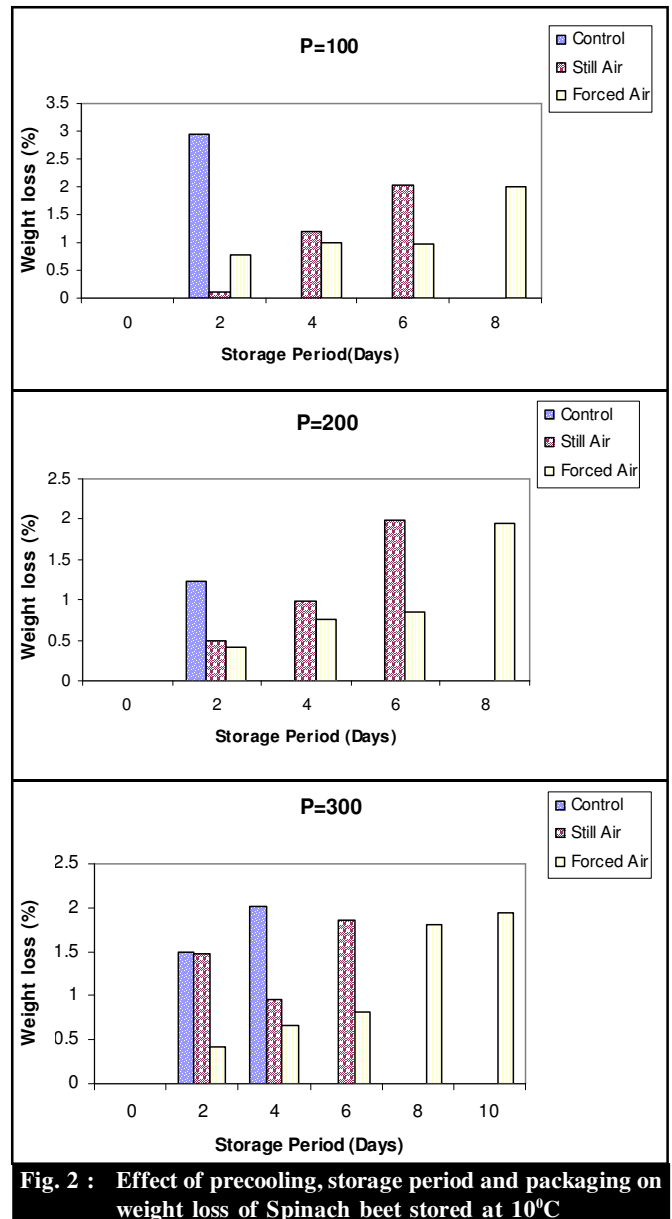
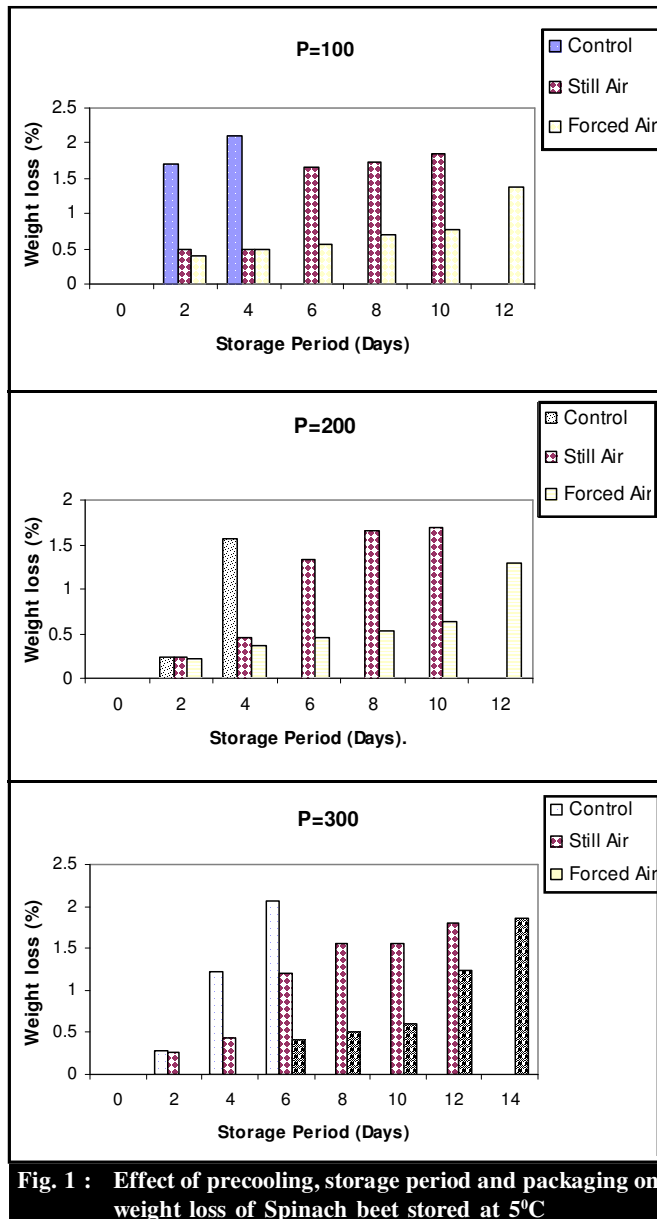
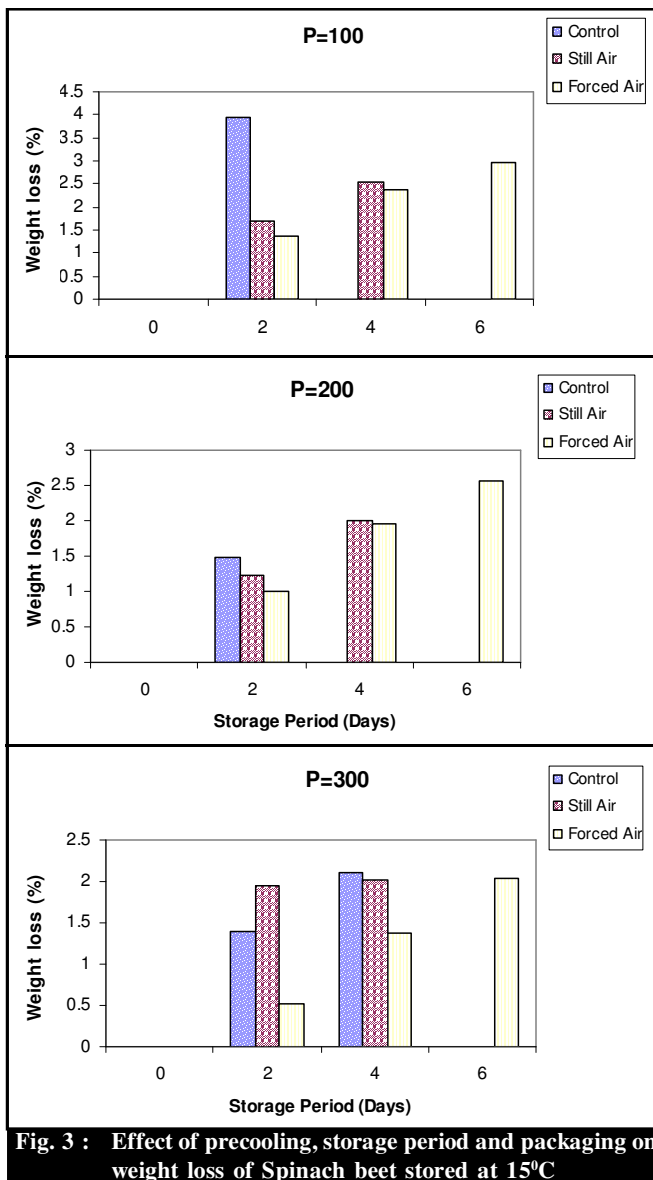


Table 1 : Effect of storage methods, precooling and packaging on shelf life of beet

Storage methods	Storage life(days)								
	Control			Still air precooling			Forced air precooling		
	100	200	300	100	200	300	100	200	300
Room temperature	2	2	3	–	–	–	–	–	–
15 ⁰ c	2	3	4	5	5	5	6	6	7
10 ⁰ c	3	3	5	6	6	7	9	9	10
5 ⁰ c	4	5	7	10	11	12	13	13	14

Table 2 : Sensory evaluation of different properties of samples stored at 5⁰C

Properties	Control			Precooling methods					
				Still air			Forced air		
	100	200	300	100	200	300	100	200	300
Colour index	4.85	5.22	5.90	6.40	6.50	7.20	7.30	7.70	9.00
Texture index	4.70	5.32	6.52	5.50	6.30	7.30	6.80	7.30	8.90
Shrinkage index	4.80	5.60	6.60	5.60	6.60	7.30	6.50	7.30	9.00

**Shelf-life :**

The data on effect of precooling method, packaging and storage period on shelf-life of spinach beet are tabulated in Table 1. The shelf life of spinach beet varied between 2 to 7, 3 to 10 and 4 to 14 days stored at 15⁰C, 10⁰C and 5⁰C, respectively for all precooling methods. Maximum storage life was found for forced air precooled samples (14 days), followed by still air precooled samples (12 days) stored at 5⁰C in 300 gauge packaging whereas minimum storage life was found in case of control samples stored at 5⁰C with 300 gauge packaging (7 days).

Sensory evaluation:

The average score was calculated for individual organoleptic properties *viz.*, colour, shrinkage and texture. The colour index score varied from 4.85 to 9 for control and precooled samples stored at all temperature. Similar score was found for shrinkage index whereas in case of softness index score varied from 4.70 to 8.90. The average score of 7-9, 5-7 and below 5 were evaluated as more acceptable, acceptable and non-acceptable, respectively. The data on these organoleptic properties for 5⁰C storage is given in Table 2. Maximum score of 9 was found in 300 gauge packaging for forced air precooled samples whereas minimum score of 4.85 was found in 100 gauge packaging for control samples.

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