

Original Research Article

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Studies on Effect of Different Packaging Materials and Storage Temperature on Total Chlorophyll Content of Amaranthus (*Amaranthus viridis*)

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ABSTRACT

Keywords

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Amaranthus is the most important leafy vegetables in South India. It is an excellent source of calcium, magnesium, potassium, vitamin C, vitamin B₆, folate, vitamin A, and an incredible source of vitamin K. The experiment was conducted to standardize the effect of different packaging materials and storage temperature on the chlorophyll content of Amaranthus. The present study, 100 g of freshly harvested, tender green leaves along with roots were weighed and packed in different packing materials viz., plastic crates, 200 and 300 gauge polyethylene bag without and 1 per cent perforation followed by stored under ambient storage (25°C ± 2°C and 50.33 - 73.66% RH) and Zero Energy Cool Chamber at 22.36 - 24.73°C and 92.66 - 97.36% RH. The total chlorophyll content was recorded at 1 DAS, 2 DAS, 3 DAS, and 4 DAS (Days after Storage). In general, the total chlorophyll content of amaranthus gradually decreased as the storage period increased from 1 DAS to 4 DAS. Among the different treatments, the treatment T₁ (Amaranthus packed in 200 gauge polyethylene bag without perforation and stored under ZECC) which recorded maximum total chlorophyll content even end of the 4 DAS. It was followed by amaranthus packed in 200 gauge polyethylene bag with 1 per cent perforation and stored under ZECC (T₂). While the minimum chlorophyll content was recorded in amaranthus packed in plastic crates and stored under ambient condition (T₁₀)

Introduction

Amaranthus is the most common leafy vegetable grown during summer and rainy season in India. The fresh tender leaves and stem give delicious preparation on cooking. It belongs to the family *Amaranthaceae*. Among the leafy types, *A. tricolour* L. is the main cultivated species in India. Other cultivated

species are *A. blitum* and *A. tristis* it is more popular in south India.

Amaranth leaves, rich in calcium and beta-carotene, keep bones strong and reduces one's risk of osteoporosis. Its calcium content also assists with muscle regeneration and stabilizes blood pressure. Its high vitamin C content helps the body produce collagen, which aids

in joint health and keeps skin looking beautiful. The folate in amaranth leaves decreases cardiovascular damage and also keeps the memory strong. The demand for amaranthus is increasing in India and outside the country during the offseason.

On account of the perishable nature of these vegetables, the trade faces definite post-harvest problems. Post-harvest losses start from pre harvesting stage itself followed by harvesting, handling, cleaning, transportation, storage, packing, processing, and marketing. Though amaranthus is nutritious and fetches good returns, it suffers from a very poor shelf life because of the high amount of moisture content in the leaves.

The postharvest shelf life of amaranthus was one day at ambient room temperature. Therefore, there is a need to prolong the shelf life of the amaranthus for at least one week. With this background in view, the investigation was undertaken with the effect of packaging materials and storage temperature on the total chlorophyll content of amaranthus.

Materials and Methods

The lab experiment on storage studies on amaranthus was conducted in the Under Graduate laboratory of the Department of Horticulture, Pandit Jawaharlal Nehru College of Agriculture and Research Institute, Karaikal.

The amaranthus was raised under irrigated conditions by adopting the recommended package of practices. Twenty-five days after sowing the crop was ready for harvesting. Uniform, tender mature fresh greens were harvested along with stem during morning hours.

They were immediately brought to the laboratory then washed and surface dried

leaves and used for this experiment. The experiment was laid out in a Completely Randomized Design (CRD) with ten treatments and replicated thrice.

The treatments comprising of viz., T₁: Amaranthus packed in 200 gauge polyethylene bag without perforation and stored under ZECC; T₂: Amaranthus packed in 200 gauge polyethylene bag with 1 per cent perforation and stored under ZECC; T₃: Amaranthus packed in 300 gauge polyethylene bag without perforation and stored under ZECC; T₄: Amaranthus packed in 300 gauge polyethylene bag with 1 per cent perforation and stored under ZECC; T₅: Amaranthus packed in plastic crates and stored under ZECC; T₆: Amaranthus packed in 200 gauge polyethylene bag without perforation and stored under ambient condition; T₇: Amaranthus packed in 200 gauge polyethylene bag with 1 per cent perforation and stored under ambient condition; T₈: Amaranthus packed in 300 gauge polyethylene bag without perforation and stored under ambient condition; T₉: Amaranthus packed in 300 gauge polyethylene bag with 1 per cent perforation and stored under ambient condition; T₁₀: Amaranthus packed in plastic crates and stored under ambient condition (Table 2).

The size of the polyethylene bag used was 45x30 cm. Perforation was provided by punching holes on both sides of the bag to the extent of 1 per cent perforation of the total surface area.

In the present study, 100 g of freshly harvested, tender green leaves along with roots were weighed and packed in different packing materials viz., plastic crates, 200 and 300 gauge without and 1 per cent perforation followed by ambient storage (25°C ± 2°C and 50.33 - 73.66% RH) and Zero Energy Cool Chamber at 22.36 - 24.73°C and 92.66 - 97.36% RH.

The shelf life of the stored samples was studied by recording the total chlorophyll content of leaves for all the samples from 1st day to 4th day of storage (DAS). Total chlorophyll content was calculated by using the following formula and the mean was expressed as mg g⁻¹ (Yoshida *et al.*, 1971).

$$\text{Total chlorophyll} = \frac{A_{652} \times 1000 \times V \times 1}{34.5 \times 1000 \times W}$$

Results and Discussion

Effect of different packaging materials and storage temperature on Total chlorophyll content (mg/g)

In general, the total chlorophyll content of amaranthus gradually decreased as the storage period increased from 1 DAS to 4 DAS (Table 1). In the present study, it was found that the treatment T₁ (Amaranthus packed in

200 gauge polyethylene bag without perforation and stored under ZECC) which recorded the maximum total chlorophyll content even end of the 4 DAS. It was followed by amaranthus packed in 200 gauge polyethylene bag with 1 per cent perforation (T₂). While the highest physiological loss in weight and minimum total chlorophyll content was recorded in amaranthus packed in plastic crates and stored under ambient condition (T₁₀) and it was followed by the treatment T₅ (Amaranthus packed in plastic crates and stored under ZECC) at the end of 4 DAS. This may be due to the reason that leaf yellowing as characterized by a decrease in total chlorophyll content was also accelerated by water stress. Total chlorophyll content was generally not stable, partly because of the tendency for leaves to lose water rapidly and decreasing total chlorophyll content upon leaf yellowing.

Table.1 Effect of different packaging materials and storage temperature on total chlorophyll content (mg/g) of amaranthus

Treatments	1 DAS*	2 DAS	3 DAS	4 DAS
T ₁	4.10	4.03	2.76	2.15
T ₂	3.65	2.81	2.46	1.94
T ₃	3.00	2.06	2.06	1.72
T ₄	2.60	1.99	1.52	1.32
T ₅	1.40	1.32	1.16	1.02
T ₆	3.03	2.31	2.07	1.82
T ₇	2.62	2.05	1.84	1.52
T ₈	1.62	1.53	1.25	1.24
T ₉	1.48	1.40	1.17	1.09
T ₁₀	1.31	1.28	0.99	0.93
SEd	0.4724	0.3963	0.3250	0.2720
CD (0.005)	0.9854**	0.8266**	0.6780**	0.5675**

* DAS – Days After Storage

Table.2 Treatment details

T₁	Amaranthus packed in 200 gauge polyethylene bag without perforation and stored under ZECC
T₂	Amaranthus packed in 200 gauge polyethylene bag with 1 per cent perforation and stored under ZECC.
T₃	Amaranthus packed in 300 gauge polyethylene bag without perforation and stored under ZECC.
T₄	Amaranthus packed in 300 gauge polyethylene bag with 1 per cent perforation and stored under ZECC.
T₅	Amaranthus packed in plastic crates and stored under ZECC.
T₆	Amaranthus packed in 200 gauge polyethylene bag without perforation and stored under ambient condition
T₇	Amaranthus packed in 200 gauge polyethylene bag with 1 per cent perforation and stored under ambient condition
T₈	Amaranthus packed in 300 gauge polyethylene bag without perforation and stored under ambient condition
T₉	Amaranthus packed in 300 gauge polyethylene bag with 1 per cent perforation and stored under ambient condition
T₁₀	Amaranthus packed in plastic crates and stored under ambient condition.

The loss of greenness results in the loss of chlorophyll. The rate of loss depends greatly on temperature. Low temperature reduced the decrease in total chlorophyll content during the storage and the effect was more pronounced in non packed leaves than packed leaves and covering the leaves with a wet cloth (Lizan *et al.*, 1987).

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