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Research Article

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Effect of 1-Methylcyclopropene on Apple Fruit Shelf Life

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Abstract Apple is the highest consuming fruit than other fruits as it is healthy and tasty. It is also considered the most profitable fruit crop because of its high consumption and medicinal values. Apple is an essential part of the rose family of the genus Malus. It is recognized as a temperate fruit, which can be grown in mild temperature regions. For good growth, the fruit requires a considerable period of dormancy, well-drained soil, careful pruning and a rigorous pest-management program. Apples can be eaten fresh or served in various ways like salad, cake etc. Apples provide vitamins A and C, carbohydrates, and fibre. The U.S, China, France, Italy, and Turkey are the most famous apple producers in the World. Among them, China is the largest apple producing country. On the other hand, India has several states involved in apple farming. Jammu and Kashmir is the state to contribute around 77.71% of the total apple production of India. The total apple production of this state is around 1808.33 tonnes whereas Himachal Pradesh covers 19.19% of apple fruit production globally.

Keywords: Shampoo, Natural Ingredients, Hair

1. Introduction

For the good growth of any crop, a suitable climate is a factor that farmers highly consider. Likewise, farmers need to understand the climate required for apple farming to get high apple production. Apple crops can grow at altitudes 1,500 m to 2,700 m. above sea level. A suitable temperature for apple growing should be around 21 °C to 24 °C. The planting method of apple farming differs according to the planting area or climate conditions. Apple fruit has a longer shelf life than other fruits so farmers can store it for 2 to 3 months after harvesting. Cold storage is the best place for storing apple fruits at a temperature of about 1.10 to 00 C and 85-90% relative humidity.

Postharvest losses of apple can occur due to improper harvesting, transportation, packaging, storage, processing/sorting, grading and marketing. The major causes of postharvest losses of apple are physiological disorder (caused due to freezing, high temperature, mechanical damage and pathological disorder.

1.1. Plant Profile

Botanical Name: Malus domestica

1.2. Taxanomical classification

Kingdom: Plantae
Order: Rosales
Family: Rosaceae
Genus: Malus
Species: M. domestica

2. Materials and Method

1-Methylcyclopropene (1-MCP) is applied as an inhibitor of ethylene action, which is widely used in postharvest technology to prolong the shelf life of many fruits. The aim of the study was to assess the possibility to apply 1-MCP treatment to maintain the quality of 'Himachal' apples (variety -Royal).

2.1. Materials and Reagents

1. Hand gloves (latex)
2. Rubber septa (for the volumetric flask)
3. Volumetric flask
4. Syringe & Needle
5. Freshly harvested Apples
6. 1-MCP powder
7. Tap water
8. Delivery Tube
9. Air Tight Barrel

2.2. Method

2.2.1. Preparation of 1-MCP gas stock (1,000 ppm or 0.1%)

a. Gently pour 1 g of 1-MCP powder into the 1,000 ml volumetric flask and close tightly with the rubber septa.
b. Inject a volume of 200 ml of water into the closed flask (20 times, 10 ml of water) and dissolve the powder to release the 1-MCP gas

2.2.2. 1-MCP treatment

a. Place the apples (It is recommended not to exceed over one third of the barrel volume) inside the barrel and close the lid tightly. You can use wrapped plastic or other solution to prevent any gas leakage. The apples and the barrel should be placed in a 20-25 °C room.
b. Pass the gas into the barrel using the delivery tube .
c. Incubate for 24 h.
d. Open the barrel and air the apples for at least 2 h to allow the apples to adjust to the atmospheric environment.
e. As a control, untreated apples should be placed in similar conditions (0-2 ^{o}C) without 1-MCP or any other gas treatment

The apples were segregate in three groups: (I) 1-MCP postharvest treatment; (II) 1-MCP postharvest treatment with Modified Atmosphere Packaging (MAP) selected gas permeability bags; and (III) control groups (with neither 1-

MCP treatment, nor dedicated packaging). Apples were subjected to storage for upto 20th week. The obtained groups were analyzed to assess firmness and total soluble solids (TSS).

3. Discussion of Comparison Result

There were differences between firmness values for control groups and those with 1-MCP applied, which were characterized by higher values of firmness. Groups with 1-MCP and MAP applied combined were characterized by lower values of TSS than control groups. It may be stated that 1-MCP is a beneficial treatment for 'Himachal' apples as it prolongs their shelf life and improves firmness.

4. Conclusion

Ethylene is a gaseous plant hormone that plays an important role in inducing the ripening process for many fruits, together with other hormones and signals. An unripe fruit generally has low levels of ethylene. As the fruit matures, ethylene is produced as a signal to induce fruit ripening. Ethylene action is inhibited by carbon dioxide and by 1-MCP.1-MCP treatment strongly inhibited physiological and biochemical indicators, ethylene production, respiration rates, MDA content, and electrolyte leakage. Ethylene production was reduced most by 1-MCP treatment.

WEEKS	DAYS	Firmness (Lbs)			
		Modified atmospheric refrigerated condition		Normal Refrigerated condition	
		Treated	Non-Treated	Treated	Non-Treated
0th Week	0	17.5	17.6	18.0	17.8
1st Week	4	17.4	17.2	17.6	17.1
	6	17.1	17.0	17.4	16.8
2nd Week	10	17.0	16.5	17.1	16.2
	14	17.0	16.2	17.0	15.8
3rd Week	16	16.8	15.6	16.4	15.0
	19	16.7	15.1	16.3	14.6
4th Week	23	16.5	14.7	16.0	13.8
	28	16.3	13.6	15.9	12.6
5th Week	31	16.3	12.8	15.4	10.3
	35	16.1	12.4	15.1	10.1
7th week	40	16.1	11.6	15.0	9.3
	45	16.0	10.5	14.8	ROTTEN
12th week	78	15.8	10.1	14.5	*
	81	15.6	9.8	14.0	*
15th week	100	15.1	9.1	13.8	*
	105	15.0	8.2	13.6	*

WEEKS	DAYS	TSS			
		Modified atmospheric refrigerated condition		Normal Refrigerated condition	
		Treated	Non-Treated	Treated	Non-Treated
0th Week	0	11.0	11.2	11.6	11.1
1st Week	4	11.3	11.3	11.7	11.4
	6	11.4	11.6	11.4	11.8
2nd Week	10	11.8	11.9	11.9	12.3
	14	11.8	12.0	11.9	12.6
3rd Week	16	11.9	12.0	12.0	12.8
	19	12.0	12.5	12.2	13.0
4th Week	23	12.0	12.8	12.2	13.5
	28	12.4	13.2	12.4	13.8
5th Week	31	12.5	13.3	12.6	14.0
	35	12.6	13.5	12.8	14.8
7th week	40	12.8	14.0	13.1	16.0
	45	13.4	14.4	13.5	ROTTEN
12th week	78	13.4	15.0	13.6	*
	81	13.6	15.1	13.8	*
15th week	100	13.6	15.2	13.9	*
	105	13.8	15.3	14.1	*

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