Review Form 1.7

Journal Name:	**International Journal of Plant & Soil Science**
Manuscript Number:	**Ms_IJPSS_102994**
Title of the Manuscript:	**EFFECT OF CALCIUM CHLORIDE (CaCl2) AND CARBON DIOXIDE (CO2) ON POST HARVEST QUALITY OF APPLE FRUIT (Malus domestica) cv. Gala**
Type of the Article	**Original Research Article**

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This journal's peer review policy states that **NO** manuscript should be rejected only on the basis of '**lack of Novelty'**, provided the manuscript is scientifically robust and technically sound.
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PART 1: Review Comments

	Reviewer's comment	**Author's comment** *(if agreed with reviewer, correct the manuscript and highlight that part in the manuscript. It is mandatory that authors should write his/her feedback here)*
Compulsory REVISION comments **1. Is the manuscript important for scientific community?** (Please write few sentences on this manuscript) **2. Is the title of the article suitable?** (If not please suggest an alternative title) **3. Is the abstract of the article comprehensive?** **4. Are subsections and structure of the manuscript appropriate?** **5. Do you think the manuscript is scientifically correct?** **6. Are the references sufficient and recent? If you have suggestion of additional references, please mention in the review form.** **(Apart from above mentioned 6 points, reviewers are free to provide additional suggestions/comments)**		
Minor REVISION comments **1. Is language/English quality of the article suitable for scholarly communications?**	The study investigated the effects of calcium chloride (CaCl2) and carbon dioxide (CO2) on the post-harvest quality of Gala apple fruit (Malus domestica). The apples were stored under controlled refrigerated conditions for 90 days, and eight different treatment combinations were tested: 0.5% CaCl2, 1.0% CaCl2, 900ppm CO2, 1000ppm CO2, 0.5% CaCl2 + 900ppm CO2, 0.5% CaCl2 + 1000ppm CO2, 1.0% CaCl2 + 900ppm CO2, and 1.0% CaCl2 + 1000ppm CO2. Various quantity and quality parameters were evaluated throughout the experiment, including fruit weight loss, firmness, total soluble solids (TSS), pH, titratable acidity (TA), ascorbic acid, and sensory evaluation at 30, 60, and 90 days of post-harvest storage. The results demonstrated that fruit weight loss was significantly reduced in the calcium and carbon dioxide treatments compared to the control group. Furthermore, the calcium and carbon dioxide treatments led to an increase in pH and total soluble solids, while causing a decrease in firmness, titratable acidity, and ascorbic acid during the 90-day cold storage at 0 to 2°C. The findings also indicated that the calcium and carbon dioxide treatments influenced the production of ethylene compared to the control group. Overall, the experiment revealed that post-harvest calcium treatments prevented fruit softening and minimized weight losses. The application of 1.0% CaCl2 + 1000ppm CO2 showed superior results compared to other treatments, effectively controlling weight loss, maintaining firmness, and minimizing fruit decay. In conclusion, storing Gala apples under controlled atmosphere conditions with the application of calcium chloride and carbon dioxide successfully inhibited fungal growth, maintained firmness, minimized weight loss, and extended the shelf life compared to the control group. These findings have significant implications for the apple industry, as they provide a means to improve fruit quality and increase the shelf life of apples. Future research may build upon these results to refine treatment conditions, gain a deeper understanding of the underlying mechanisms, and explore the application of these techniques to other apple varieties and different fruits. Ultimately, these experimental findings have the potential to contribute to the development of practical strategies for enhancing the shelf life of apple fruits, ensuring better quality and reduced post-harvest losses - "Various quantity and quality parameters were evaluated throughout the experiment" - The word "quantity" should be replaced with "quantitative" to match the adjective form of "quality."	

	- "The results demonstrated that fruit weight loss was significantly reduced in the calcium and carbon dioxide treatments compared to the control group." - The phrase "in the calcium and carbon dioxide treatments" should be rephrased as "in the treatments with calcium and carbon dioxide" for clarity and to maintain parallel structure. - "Furthermore, the calcium and carbon dioxide treatments led to an increase in pH and total soluble solids, while causing a decrease in firmness, titratable acidity, and ascorbic acid during the 90-day cold storage at 0 to 2°C." - The word "while" should be replaced with "and" to properly connect the two actions. - "The findings also indicated that the calcium and carbon dioxide treatments influenced the production of ethylene compared to the control group." - The phrase "compared " seems to be an error and should be removed. Overall, the grammar in the passage is mostly correct, with only a few minor errors that need attention. The Gala apple (Malus domestica) is a highly sought-after apple variety, renowned for its vibrant appearance, delightful flavor, and crisp texture. Originating in New Zealand in the 1930s, Gala apples were later introduced to the United States in the 1980s, quickly becoming a favorite worldwide. Today, they are one of the most commercially grown apple varieties, cherished for their consistent quality and versatility. One of the standout features of the Gala apple is its visually appealing appearance. With a distinct yellow to orange-red skin, often adorned with streaks of bright red, Gala apples are instantly recognizable. Their medium size and round shape make them convenient for both eating fresh and using in various culinary creations. But it is their taste that truly sets them apart. Gala apples offer a delightful balance of sweetness and tanginess, with a crisp and juicy flesh that provides a satisfying crunch with every bite. The flavor profile of Gala apples can vary slightly depending on the growing region, but they generally exhibit a refreshing sweetness with subtle notes of pear and citrus, creating a harmonious and enjoyable taste experience. Their firm texture and juiciness also make them an excellent choice for snacking. Additionally, Gala apples are popular for use in salads, pies, sauces, and other culinary delights, thanks to their exceptional flavor and texture. In India, fruit and vegetable production plays a significant role in the agricultural sector. According to the Food and Agriculture Organization (FAO) of the United Nations, India ranks second in fruit and vegetable production globally, after China. However, post-harvest losses remain a challenge, with 30-40% of the produce being lost during harvesting, handling, and storage. Apples, being highly perishable and prone to damage due to their high water content, are no exception. Calcium chloride ($CaCl_2$) has been widely studied for its potential role in maintaining the postharvest quality of fruits, including apples. Calcium plays a vital role in stabilizing cellular membranes and delaying senescence in horticultural and agronomic crops. Post-harvest calcium dips can effectively increase the calcium content in fruits without causing damage. Calcium application helps maintain cell turgor, membrane integrity, tissue firmness, and delays membrane lipid breakdown, thereby extending the storage life of fresh fruits. In the case of Gala apples, the application of calcium chloride has shown promising results in improving firmness, reducing decay, maintaining color, and enhancing nutritional value. Additionally, it can influence ethylene production and enzyme activities in the fruit. Further studies are needed to optimize the treatment conditions and assess consumer acceptance. Carbon dioxide (CO_2) also plays a crucial role in agriculture. In post-harvest processes, CO_2 is used during controlled atmosphere storage or short-term high-CO_2 treatments to maintain fruit freshness and increase shelf life. High-CO_2 treatments effectively reduce the respiration rate, fruit decay, and increase firmness. However, excessive CO_2 concentrations can cause physiological injuries such as fruit discoloration and off-flavors. The combined use of calcium chloride and carbon dioxide has been explored to enhance the shelf life and quality of apples. By leveraging the benefits of both treatments, researchers aim to maximize the preservation of fruit freshness, reduce post-harvest losses, and improve overall consumer satisfaction. The Gala apple stands out as a popular apple variety cherished for its exceptional flavor, crisp	

texture, and versatility. In India, where fruit and vegetable production is significant, postharvest losses remain a challenge. The application of calcium chloride and carbon dioxide shows promise in improving the shelf life and quality of apples, including the Gala variety. By understanding and optimizing these treatments, farmers and researchers can contribute to reducing post-harvest losses and ensuring a steady supply of fresh, high-quality apples for consumers.
Therefore, with a view of increasing the shelf life of apple and its keeping quality, the attempt of using different sources of calcium chloride and carbon dioxide on the shelf life of apple has been carried out.
MATERIAL AND METHODS
The experiment on prolonging the shelf life of apple was conducted at Post Harvest Laboratory, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology & Sciences, PRAYAGRAJ (UP) during 2022.

Statistical analysis was done by using method of analysis of variance (ANOVA) for completely randomized block design (CRBD) by Panse and Sukhtme (1984). The overall significance of difference among the treatment was tested, using critical difference (C. D. at 5%) level of significance. The result were statistically analyzed with the help of a window based computed package OPSTAT (Sheoran, 2004).
RESULT AND DISCUSSSION
PHYSIOLOGICAL LOSS IN WEIGHT (%):
As revealed from the Table 1, there was a considerable loss in weight of the fruits under all the treatments but the difference among the treatments was non-significant after 30 days of storage. Whereas, the significant loss in weight was observed after 60 days of storage with maximum loss (4.30%) in T3 (fruits treated with 900 ppm CO_2) while minimum loss in weight (1.53%) was associated in T8 (fruits treated with 1.0% $CaCl_2$ + 1000 ppm CO_2), significant effect of weight loss was found after 60 and 90 days of storage. After 90 days of storage, the minimum weight loss (2.10%) was recorded in T8 (fruits treated with 1.0% $CaCl_2$ + 1000 ppm CO_2) followed by (2.28%) T2 (fruits treated with 1.0% $CaCl_2$).

- "But it is their taste that truly sets them apart." - The word "it" should be replaced with "their taste" to maintain clarity and coherence.

  "their medium size and round shape make them convenient for both eating fresh and using in various culinary creations." - The phrase "using in various culinary creations" should be rephrased as "for use in various culinary creations" to maintain parallel structure.

- "The flavor profile of Gala apples can vary slightly depending on the growing region, but they generally exhibit a refreshing sweetness with subtle notes of pear and citrus, creating a harmonious and enjoyable taste experience." - The phrase "creating a harmonious and enjoyable taste experience" should be rephrased as "which creates a harmonious and enjoyable taste experience" to maintain clarity and coherence.

- "their firm texture and juiciness also make them an excellent choice for snacking." - The phrase "an seems to be an error and should be removed.

- "Calcium chloride ($CaCl_2$) has been widely studied for its potential role in maintaining the postharvest quality of fruits, including apples." - The word "postharvest" should be written as "post-harvest" to maintain consistency.

- "In the case of Gala apples, the application of calcium chloride has shown promising results in improving firmness, reducing decay, maintaining color, and enhancing nutritional value." - The phrase "reducing decay, maintaining color" should be rephrased as "reducing decay and maintaining color" for parallel structure.

- "The combined use of calcium chloride and carbon dioxide has been explored to enhance the shelf life and quality of apples." - The phrase "enhance the shelf life and quality of apples" should be rephrased as "enhance the shelf life and improve the quality of apples" to maintain clarity and coherence.

	- "Therefore, with a view of increasing the shelf life of apple and its keeping quality, the attempt of using different sources of calcium chloride and carbon dioxide on the shelf life of apple has been carried out." - The phrase "the attempt of using" should be rephrased as "an attempt to use" for improved grammar. - "Statistical analysis was done by using method of analysis of variance (ANOVA) for completely randomized block design (CRBD) by Panse and Sukhtme (1984)." - The phrase "by using method of analysis" should be rephrased as "using the method of analysis" for proper grammar. - "The result were statistically analyzed with the help of a window-based computed package OPSTAT (Sheoran, 2004)." - The word "result" should be changed to "results" to match the plural form.	
Optional/General comments		

PART 2:

	Reviewer's comment	**Author's comment** *(if agreed with reviewer, correct the manuscript and highlight that part in the manuscript. It is mandatory that authors should write his/her feedback here)*
Are there ethical issues in this manuscript?	*(If yes, Kindly please write down the ethical issues here in details)*	

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