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The removal of pesticide residues and their effects on tomato quality using cold plasma

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INTRODUCTION

❖ Some pesticides are acknowledged to impact the environment and human health (WHO, 2019).
❖ No thermal technologies for fresh vegetables are an alternative to traditional thermal methods.
❖ Tomatoes are one of the most consumed fresh vegetables worldwide.
❖ Food quality is relevant for consumers.
❖ Cold plasma is a powerful tool for ensuring food quality and safety.
❖ Cold plasma uses the characteristics of low-temperature plasma to make contact and react with the surface of the tomato.

OBJECTIVE

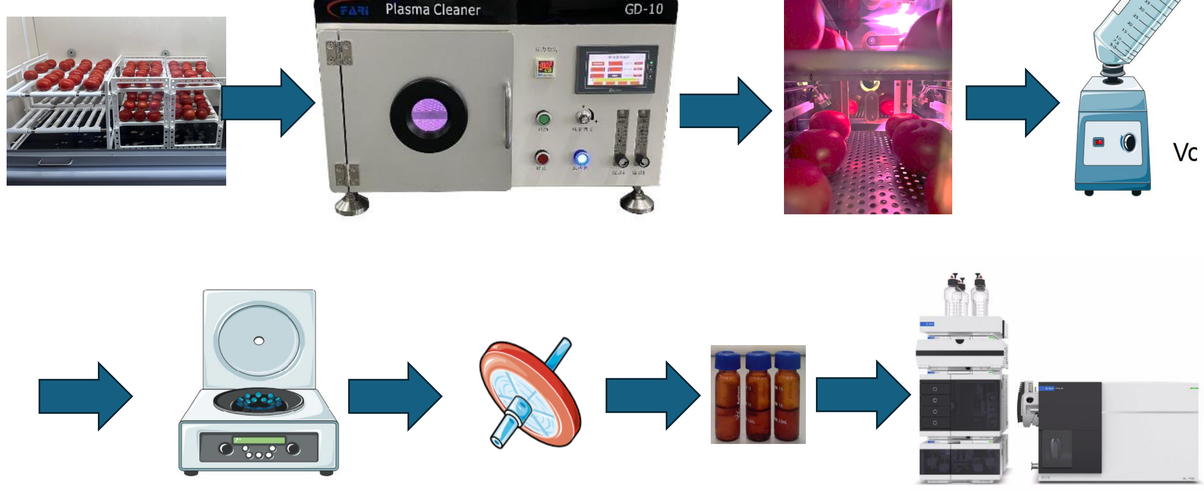
❖ The objective was to evaluate the effect of cold plasma treatments on removing pesticide residues and improving some food quality indicators in tomatoes.

METHODOLOGY

❖ The organic tomatoes were harvested and stored at 7ºC. The tomatoes were sprayed with iprodione, diazinon, and chlorothalonil at field rate and subjected to cold plasma for ten minutes. The plasma equipment model GD-1 (Shenzhen, CN), 40 KHz

❖ The treatments and controls were stored at 7ºC for 31 days. Three tomatoes were collected every ten days, and the following parameters were evaluated: pesticide degradation, soluble solids, acidity content, and phenolic content.

❖ The pesticide residues were meticulously extracted from the tomatoes using the QuEChERS method, a highly regarded and efficient technique in pesticide analysis. All the methodologies were applied under the ISO 17025:2017 certification, ensuring the highest standards of research.



❖ Pesticides were determined using liquid and gas chromatography (LC-MS/MS and GC-MS/MS). The method validation, a crucial step in our research, includes precision and accuracy. Determining pesticide residues in tomatoes was rigorously validated, and the results are based on Guideless's requirements for validation SANTE 2017, ensuring the accuracy and reliability of our findings.

❖ The pesticides analyzed in this study are the most frequently detected and used in pest management programs by growers in Chile.

METHOD VALIDATION

Pesticide	Recovery	Uncertainty k=2	LOQ (ppm)	LOD (ppm)
Chlorpyrifos	125%	7%	0.010	0.003
Iprodione	98%	15%	0.010	0.003
Diazinon	108%	16%	0.010	0.003
Chlorothalonil	123%	22%	0.010	0.003

RESULTS AND DISCUSSION

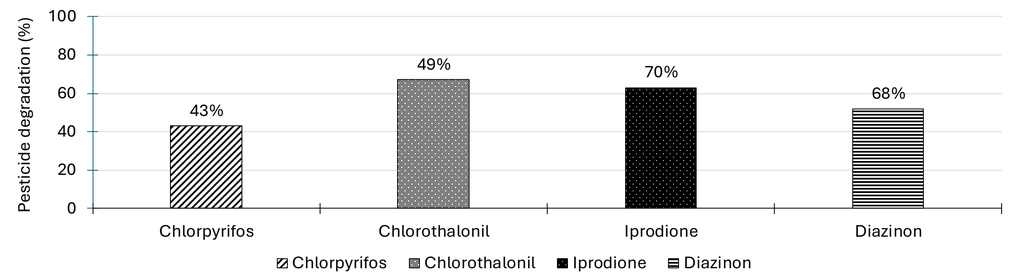


Figure 1. Pesticide degradation at day one after cold plasma treatment.

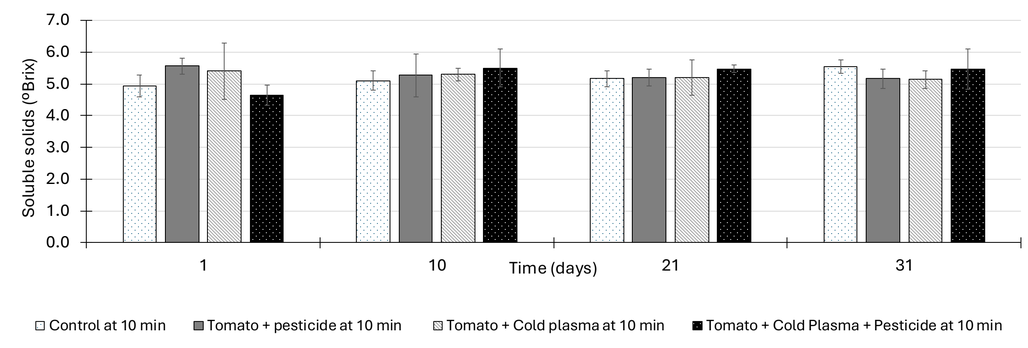


Figure 2. Soluble solids content in tomatoes under cold plasma treatment.

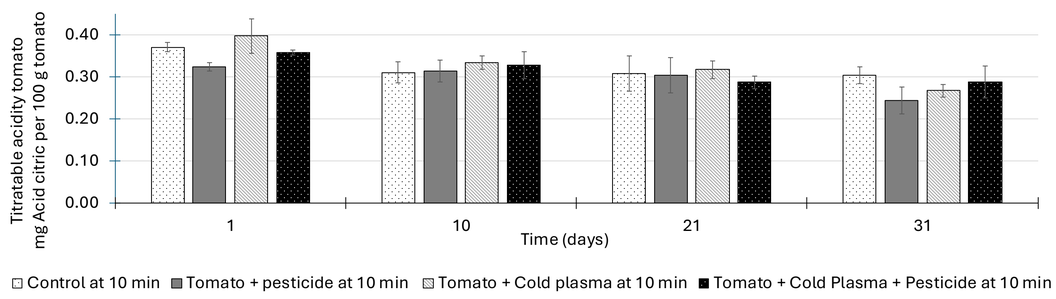


Figure 3. Titratable acidity in tomatoes under cold plasma treatment.

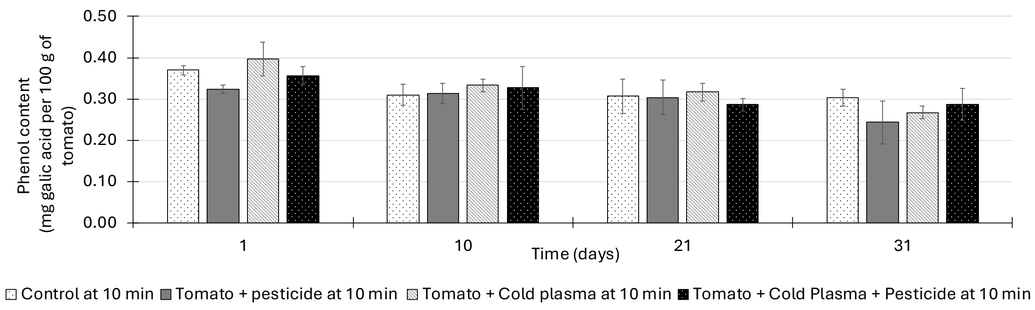


Figure 4. Phenolic levels in tomatoes under cold plasma treatments.

❖ The results showed a reduction of the pesticide residues after cold plasma treatment.

❖ The tomato quality parameters evaluated were not affected by the cold plasma.

❖ All the applied treatments differed concerning the control sample.

CONCLUSION

❖ This study demonstrated that cold plasma is highly effective, safe, and convenient for removing tomato pesticide residues.

❖ These findings provide a reassuring reference for tomato cleaning and significantly enhance dietary safety.

REFERENCE

❖ World Health Organization (WHO). 2019. Recommended classification of pesticides by hazard and guidelines to classification, 2019 Edition. Geneva: World Health Organization 2020 License CC BY-NY SA 3.0 IGO.

ACKNOWLEDGMENTS

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