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IMPACT OF CLARIFYING AGENTS IN PROCESSED HORTICULTURAL PRODUCTS

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Abstract

This abstract explores the various roles of clarifying agents in horticultural foods and their essential functions in formulations. These agents are crucial in the food industry for eliminating impurities, cloudiness and unwanted particles from products like fruit juices, wines and other horticultural products. By enhancing the visual appeal and quality of these products, clarifying agents improve marketability. In addition to aesthetic benefits, they play a vital role in preventing sedimentation, stabilizing formulations and preserving the natural flavours and nutraceutical value of processed horticultural products. Clarifying agents also contribute to product consistency and extend shelf life, ensuring a uniform and appealing product for consumers. This review discusses the different types of clarifying agents utilized in processing of horticulture products and their specific roles in various formulations, highlighting their significance in maintaining product integrity and addressing consumer demands for clear, visually attractive and high-quality horticultural foods.

Introduction

Clarifying agents are substances typically added during or towards the end of the brewing process for beverages like wine, beer and non-alcoholic juices. Their main aim is to remove organic compounds to improve clarity, modify flavour or affect aroma. In the clarification of fruit juices as like apple and grape juice, the process involves removal of suspended particles to make sure stability of colloids. Horticulture is a diverse scientific discipline that encompasses both ornamental as well as edible plants are constantly evolving (Lamm *et al*., 2023). A key objective of horticultural advancements is to enhance the consistency and predictability of products. The FAO reports that more than 1.3 billion tonnes of food waste are produced each year with the cashew apple being a significant byproduct of almond processing. To clarify fruit juice, an initial enzymatic treatment with pectinase is sometimes utilized, as it helps break down pectin, which is essential for the process. Compounds eliminated during clarification may include polyphenols, proteins, sulfides, copper ions or benzenoids. Spent fining agents are generally discarded along with the captured compounds unless these substances settle into a stable sediment in the final container. Various materials can serve as fining agents; traditional options favored by some producers include egg whites, blood, milk, isinglass and Irish moss. In recent years, more modern alternatives have gained popularity, such as, gelatin, bentonite, casein, carrageenan, alginate, diatomaceous earth, pectinase, pectolyase, PVPP, kieselsol (colloidal silica), copper sulfate, dried albumen (egg whites), hydrated yeast and specialized enzyme preparations designed to degrade pectin, which may also include other enzymes like diastase. For clarifying fruit juice, gelatin, albumen, methylcellulose and proteolytic enzyme preparations like papain and bromelain are particularly recommended, especially for chill-proofing beer (Dheeraj *et al*., 2023).

Methods of Juice Clarification

1) **Centrifugation:** This process uses centrifugal force to separate suspended solids from juice, improving clarity. A specialized centrifuge spins the juice,

pushing solids towards the outer wall and allowing clarified juice to collect in the center (Landbo *et al*., 2006).

2) Enzymes: In large-scale juice production, enzymes like cellulases, hemicellulases and pectinases are commonly used to break down plant carbohydrates (pectin, starch, proteins) to achieve clearer juice. These enzymes increase juice recovery by releasing suspended particles (Landbo *et al*., 2006).

3) Screening/Straining: Clarifying fruit juices is important step to remove suspended particles like broken fruit tissue, seeds, skin fragments and proteins. In small-scale production, muslin cloth or stainless-steel mesh sieves are used to filter coarse particles, improving juice quality.

4) **Decantation:** A simple method where solids settle at the bottom, allowing the clear juice to be siphoned off from the top. Low temperature enhances this process by promoting solid settling.

5) Finishing: Essential for citrus juice processing, this step separates cloudy juice from pulp, rag and seeds. A machine called a finisher, with a rotating auger inside a cylindrical screen, helps remove pulpy matter from the juice.

6) **Physical fining:** Substances like kaolin, bentonite and diatomaceous earth act as filter aids to remove particles from the juice. These agents, typically mixed at 0.5-1% with the juice, are then passed through a filter press for improved clarity (Gokmen *et al*., 2001).

7) **Chemical fining:** Gelatin and casein are often used to neutralize electrically charged particles and to form insoluble precipitate in the juice. Gelatin interacts with tannins, while casein binds to acidic components, but excessive gelatin can cause cloudiness. The juice is left to sediment for 18-24 hours, allowing the precipitate to settle before the clear juice is extracted (Dıblan *et al*., 2021).

8) Non-enzymatic Clarification of juices

Non-enzymatic clarification methods play an important role in juice processing, utilizing various agents to improve juice clarity. Common agents include:

- **Casein:** A milk protein, effective at binding with acidic juice components to clarify and stabilize juices.
- **Chitosan:** A natural polymer derived from chitin, used for its ability to flocculate and remove suspended particles.
- **Gelatin:** Widely used to bind with tannins and neutralize charged particles in juices, but must be carefully dosed to avoid cloudiness.
- **Colloidal Silica and Chitosan:** Used together for improved particle removal and clarification, ensuring a clearer final product.

Conclusion

Modern juice production employs a variety of clarification methods, including enzymatic treatment, ultrafiltration, centrifugation, earth filtration and cross-flow membrane filtration. Among these, enzymatic treatment has gained particular prominence for optimizing processes. Membrane filtration, however, offers distinct advantages over traditional methods, including shorter processing times, higher juice yields, elimination of filter aids and presses, improved product quality and reduced enzyme consumption. Reviews suggests that, combining enzymes like cellulases and pectinases with non-enzymatic methods can significantly enhance both the clarity and quality of fruit juices, offering a valuable innovation in the industry.

References

1. Dheeraj, Srivastava, A. and Mishra, A. (2023). Mitigation of cashew apple fruits astringency. *Environmental Sustainability*, 6 (3): 319-329.
2. Dıblan, S. and Özkan, M. (2021). Effects of various clarification treatments on anthocyanins, color, phenolics and antioxidant activity of red grape juice. *Food Chemistry*, 352: 129321.
3. Gokmen, V., Arik, N., Acar, J., Kahraman, N. and Poyrazoğlu, E. (2001). Effects of various clarification treatments on patulin, phenolic compound and organic acid compositions of apple juice. *European Food Research and Technology*, 213: 194-199
4. Lamm, K. W., Lamm, A. J., Davis, K., Sanders, C., Powell, A. and Park, J. (2023). Extension networks and dissemination of horticultural advancements: development and validation of a professionalization instrument. *Horticulturae*, 9(2): 245.
5. Landbo, A. K. R., Pinelo, M., Vikbjerg, A. F., Let, M. B. and Meyer, A. S. (2006). Protease assisted clarification of black currant juice: synergy with other clarifying agents and effects on the phenol content. *Journal of Agricultural and Food Chemistry*, 54(18): 6554-6563.