



## Grapes Juice – Non Fermented Beverage

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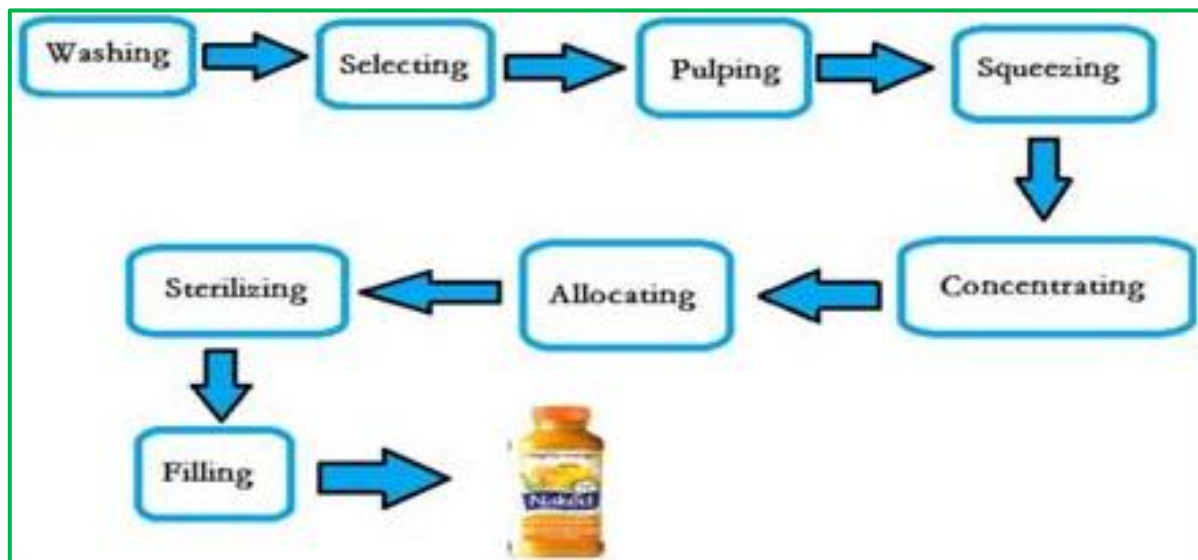
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Grapes are a significant horticultural crop worldwide, valued for their versatility in fresh consumption and processed forms (Ky, 2024). The global viticulture industry is substantial, with millions of tons of grapes harvested annually (Sharma *et al.*, 2018). However, due to their perishable nature, post-harvest losses can be significant, posing an economic challenge (Casassa and Harbertson, 2021). Global and Indian grape production trends between 2015 and 2024 show significant scale and variation in usage patterns. China leads in grape-growing area with 800,000 hectares and a production volume of 14.1 million metric tonnes (MT). Of this, 75% of the grapes are consumed fresh, while 25% go into processing. Italy follows with 700,000 hectares under grape cultivation producing 8.3 million MT, where production is evenly split between fresh use and processing (50% each). India cultivates grapes on 160,000 hectares, yielding 3.4 million MT; an overwhelming majority (92%) is consumed fresh and only about 8% is processed. The United States covers 360,000 hectares producing 7 million MT with 30% for fresh consumption and 70% destined for processing. These trends indicate regional differences in grape utilization reflective of consumer preferences and industry focus (FAO, 2023). Grapes are highly perishable; nearly 25–30% postharvest losses occur due to poor storage and handling (NHB, 2024). Hence, processing and value addition become vital to extend shelf life and enhance farmers' income.

### Grape Juice Production

Grape juice is a widely consumed, non-fermented beverage, and its quality is heavily dependent on the grape variety and processing methods employed (Ky, 2024). Sequential steps in commercial juice processing, starting from raw fruit to finished product ready for sale. The process begins with washing, where fruits are cleaned to remove dirt and contaminants. Next, the clean fruits go through selecting, which involves sorting out any defective or unsuitable pieces. Pulping breaks down the fruit to extract pulp, followed by squeezing to separate the juice from the solid pulp. The extracted juice is then sent for concentrating, which reduces water content to get the desired juice strength and volume. After concentration, the juice moves to allocating, where it is portioned according to product requirements. The next step is sterilizing, which uses heat or chemicals to kill any microbes and ensure product safety and shelf life. Finally, the sterilized juice is sent for filling, where it is packed into bottles or other containers, ready for distribution and consumption. The process for juice production involves several critical steps with specific parameters to ensure quality and shelf life. Initially, enzyme treatment uses pectinase at a concentration of 0.05 to 0.1% to break down cell walls, facilitating juice extraction. Following this, clarification is carried out through centrifugation or filtration, with stabilization at low temperatures between 5 to 10 °C to remove suspended solids and improve clarity. The juice then undergoes pasteurization using High Temperature Short Time (HTST) method at 90 °C, which effectively extends the product's shelf life to 6–8 months while maintaining quality and safety. These steps collectively guarantee stable, clear, and long-lasting juice.

Quality and Nutritional Aspects Processed grape juice retains vitamin C (20–30 mg/ 100 mL) and antioxidants (polyphenols 100–200 mg GAE/ L). Non-thermal technologies like HPP and UV-C improve retention of bioactive compounds (Garde-Cerdan and Ancin-Azpilicueta, 2007).



Processing flow chart for Grape Juice Production

### Raw Material and Preparation

The process begins with the selection of suitable grape varieties, followed by inspection, washing, destemming, and crushing to create the “must” (Sharma *et al.*, 2018).

Juice Extraction:

**Two primary methods are used for juice extraction**

**Hot Pressing:** The must is heated before pressing to increase juice yield and extract more color and flavor compounds, ideal for red and purple juices (Sharma *et al.*, 2018).

**Cold Pressing:** The must is pressed without heat, often with the aid of pectolytic enzymes to improve extraction, which is common for white grape juice (Ky, 2024).

**Clarification and Stabilization:** Raw juice contains suspended solids and tartrate crystals that need to be removed (Ky, 2024). Clarification involves enzymatic depectinization, the use of fining agents like bentonite, and cold stabilization to precipitate tartrate crystals, which are then removed by filtration (Casassa and Harbertson, 2021).

**Pasteurization and Packaging:** To ensure microbiological stability, the clarified juice is pasteurized, typically using a high-temperature, short-time (HTST) process, before being filled into sterile containers (Ky, 2024).

### References

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