

Decoding the Factors Affecting Tomato Prices in India and Measures to Stabilize Fluctuating Prices

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Cover Story

The recent surge in tomato prices has gripped India, causing concern among consumers and policymakers alike. Tomatoes, a staple in the Indian diet and a vital ingredient in numerous dishes, have witnessed a sharp increase in retail prices across major cities, impacting household budgets and food choices. While tomatoes serve as an early indicator, the rise in their prices has been accompanied by an upward trajectory in the cost of other vegetables, causing distress among the masses. Retail prices for tomatoes have witnessed a steep escalation, reaching up to ₹155 per kg in major cities across the country. In metropolitan areas, tomato prices ranged from ₹58 to ₹148 per kg, with Kolkata observing the highest price at ₹148 per kg and Mumbai recording the lowest at ₹58 per kg. Delhi and Chennai reported prices at ₹110 per kg and ₹117 per kg, respectively. The consumer affairs ministry's data indicates that the average retail price nationwide stood at ₹83.29 per kg, with a modal price of ₹100 per kg. The highest recorded price of ₹155 per kg was observed in Siliguri, West Bengal. In the national capital, local vendors are currently selling tomatoes within the price range of ₹120 to ₹140 per kg, depending on the quality and locality.

Major Contributing Factors for Price Surge

The monsoon effect and supply-demand imbalance



The initial red flag indicating a rise in vegetable prices, including tomatoes, emerged due to the erratic monsoon season. The disruption of transportation caused by the monsoon adversely affected the movement of vegetables across the country. Additionally, the failure of timely rainfall in certain regions further impacted production, resulting in a decline in vegetable arrivals in the market. The subsequent supply-demand imbalance has contributed to the surge in tomato prices. While the monsoon and logistical challenges are primary factors, there are other independent factors exacerbating the situation and driving prices higher.

Seasonality of production

The fluctuation in tomato prices primarily stems from the seasonality of production and irregular shocks. Seasonality exerts upward pressure on tomato prices from July to November, with July experiencing the highest impact. Around 70% of tomato production in India occurs during the Rabi

season, while Kharif production, spanning from July to November, contributes only about 30% of the total production. This seasonal variation in production creates price pressure during the July to November period.

Infrastructure and logistical support

India is the second-largest producer of vegetables and fruits globally, boasting diverse agro-climatic conditions conducive to crop cultivation. This diversity ensures a steady supply of produce, even if one region faces crop failure. However, the lack of sufficient infrastructure and logistical support for storage and transportation poses significant challenges to efficient distribution. Cold-storage facilities, especially crucial for perishable vegetables like tomatoes, play a vital role in preventing wastage and stabilizing prices. Unfortunately, inadequate storage infrastructure leads to substantial annual wastage of vegetables and fruits, with distressing images of farmers discarding tomatoes being commonplace. Strengthening infrastructure, particularly cold-storage facilities, is crucial to address price fluctuations and reduce wastage.

Climate extremes and agricultural vulnerability

Tomatoes, being highly sensitive to climate extremes, are particularly vulnerable to adverse weather conditions. Heatwaves, unseasonal rains, and heavy downpours have significantly impacted tomato production in various regions of India. The states of Karnataka and Andhra Pradesh, as the top producers of tomatoes, have experienced the adverse effects of these weather fluctuations. The combined impact of heatwaves, unseasonal rains, and heavy downpours has disrupted crop growth and harvesting, further exacerbating price surges. Ensuring the resilience of agricultural production,

especially fruits and vegetables, in the face of weather vagaries, particularly monsoon rains, is crucial for achieving price stability.

Irregular shocks

In addition to seasonality, irregular shocks play a significant role in price fluctuations. Unseasonal rains, delayed harvesting, and crop damage due to various factors have been the main drivers of tomato price volatility. In November 2017, unseasonal rains in growing regions such as Karnataka and Madhya Pradesh, along with delayed harvesting in Maharashtra and fungus-damaged crops in Karnataka, triggered the initial uptick in prices. Supply disruptions caused by incessant rains and flood-like situations in key supplier states like Karnataka, Maharashtra, and Himachal Pradesh in May 2020 further aggravated the price surge.

Measures to stabilize tomato prices

Infrastructure Development

Governments should prioritize the development of storage and transportation infrastructure, particularly cold-storage facilities, to reduce wastage and ensure the availability of tomatoes throughout the year. Investing in modern storage, better road networks and transportation facilities, systems will improve the efficiency of distribution, reduce post-harvest losses, and stabilize prices.

Climate Resilience Measures

Agricultural practices need to be adapted to cope with climate extremes. Promoting the use of climate-resilient farming techniques, such as protected cultivation, drip irrigation, and mulching, can help mitigate the impact of heatwaves, unseasonal rains, and heavy downpours on tomato production. Providing farmers with access to

weather information and training on climate-smart practices will enhance their ability to adapt to changing weather patterns and minimize crop losses.

Crop Diversification

Encouraging farmers to diversify their crops can help reduce the impact of seasonality on tomato prices. By promoting the cultivation of alternative crops with different planting and harvesting seasons, the supply of tomatoes can be more evenly distributed throughout the year. This will alleviate the pressure on prices during the peak production months and ensure a more stable market.

Risk Management and Price Stabilization

Governments can implement risk management measures to stabilize tomato prices. This can include creating buffer stocks during periods of high production to regulate supply, implementing price controls to protect both farmers and consumers from extreme price fluctuations, and facilitating direct procurement from farmers to eliminate middlemen and ensure fair prices. By implementing these solutions, India can address the challenges posed by infrastructure limitations, climate extremes, seasonality, and irregular shocks in tomato production. A comprehensive approach involving government interventions, farmer support, and collaboration among stakeholders will be essential for achieving price stability and ensuring a sustainable tomato industry.

Optimizing Tomato Quality, Shelf-life and Preservation Techniques

During the harvest season, fresh produce is abundant, but its short postharvest life limits its edibility unless proper storage and preservation methods are employed. For centuries, storage and processing technologies have been utilized to

transform perishable fruits and vegetables, such as tomatoes, into safe, delicious, and stable products. Storage is essential to ensure a continuous supply of raw materials for processors, extend the processing season, and maintain product availability throughout different seasons.

Storing tomatoes at ambient temperatures for an extended period is challenging due to their rapid ripening, rendering them unmarketable within a short timeframe. Therefore, storage practices are typically required to maintain an uninterrupted supply of raw materials. These practices also extend the processing season and ensure continuity of product supply.

Refrigeration storage has been commonly used by tomato handlers to prolong the shelf life of tomatoes. However, tomatoes are susceptible to chilling injury if stored below their critical temperature of 10°C. Chilling injury occurs when tomatoes experience temperatures of 10°C or below for more than 14 days, or temperatures of 5°C for more than 6 to 8 days.

Evaporative cooling is a technique used to extend the storage life of tomatoes by creating low temperatures and high humidity, which are necessary for preservation. The process involves reducing heat through a change in air pressure caused by volume expansion. By employing an evaporative cooling system, the desired optimum temperature of approximately 10–15°C and 85–95% relative humidity can be achieved, providing a cost-effective solution.

Ethylene, a natural plant hormone, plays a crucial role in the ripening process of climacteric fruits like tomatoes. It triggers various physiological changes associated with ripening. However, excessive ethylene accumulation can have negative

effects. To counteract this, ethylene inhibitors are used to prevent the detrimental impact of ethylene on fruits and vegetables. Potassium permanganate ethylene is one such inhibitor reported to effectively remove exogenous ethylene from the atmosphere. This ethylene removal process absorbs and oxidizes ethylene into carbon dioxide and water, subsequently increasing the concentration of carbon dioxide and blocking the synthesis of endogenous ethylene. Controlling ethylene synthesis is vital for regulating ripening and other plant developmental processes.

Modified Atmosphere Packaging (MAP) is a packaging technique that involves using specialized materials to package products in a predetermined composition of gases, primarily oxygen (O₂) and carbon dioxide (CO₂). MAP allows for the diffusion of gases until a stable equilibrium is reached between the external and internal gases within the package.

Preservation of Tomato

It refers to the process of drying, freezing, or treating foods with substances to prevent the growth of microorganisms and delay decomposition, thereby prolonging the shelf life of the produce.

Drying: It is an ancient method of preserving tomatoes. It involves removing moisture from the fruit until decay is unlikely. This can be achieved using an oven, dehydrator, or the sun's warmth. Once dried, the produce should be stored in dry, airtight containers.

Chemical preservatives: It can prevent the growth of microorganisms and aid in preserving tomatoes. Various types of chemical preservatives, such as sodium benzoate, sodium metabisulphite, sulphur dioxide, sodium chloride (common salt), and citric acid, are commonly used in food processing. For

example, sulphur dioxide is effective against molds or bacteria and also slows down browning or darkening of certain products.

Boiling: It is an effective preservation method as heat can kill the majority of harmful pathogens. Heating food to temperatures near the boiling point of water is comparable to freezing in terms of food preservation, but it is more effective. Many other forms of food preservation, especially those involving packaging, often involve a preliminary step of heating the food to sufficiently high temperatures to destroy pathogens.

Pasteurization: It is also known as post-heat treatment, can be used to pasteurize tomato paste in bottles using hot water. It is crucial to maintain the same temperature for both the product and water to prevent the bottles from bursting. Filled bottles with closed lids are placed in a larger pan of boiling water and heated for at least 45 minutes before being cooled.

Freezing: It is another preservation method for tomatoes, where they can be frozen whole, sliced, chopped, or as puree. Tomatoes can be frozen raw or cooked. Firm, ripe tomatoes are selected for freezing and do not require blanching. Freezing at reduced temperatures inhibits the growth of pathogens responsible for food decay.

Curing: A practice recognized for centuries, involves adding salt or sugar to foods as a preservative. Salt acts as a dehydrating agent by binding with water molecules, while sugar has a similar preservative effect. Curing, along with the use of other natural materials, helps prevent spoilage of food. Salt or sugar solutions in appropriate concentrations effectively preserve various products, providing a pleasant flavor as a desirable side effect.

Value Addition of Tomatoes

Tomato juice production involves washing and trimming fully ripe tomatoes, which are then steamed, crushed, and heated until softened. The heated tomatoes are passed through a pulping machine to separate the juice from seeds and skin. Sugar and salt are added, and the juice is filled into bottles, sealed, pasteurized in boiling water for around 30 minutes, and cooled.

Tomato pastes production entails concentrating tomato pulp or juice to a desired soluble solids concentration of 14-15%. This concentration is achieved through open pans and vacuum pans. The paste is then packed in pre-sterilized bottles while still hot. Large-scale processing units may employ vacuum evaporators and utilize tin cans or bulk aseptic packages. Different types of tomato paste, such as Hot Break (HB) and Cold Break (CB), are used for various end products.

Tomato puree production involves vacuum concentration of pulp to approximately 9-12% total solids, resulting in a tomato puree. The scalded product is mashed to a puree by passing it through a sieve to remove skins, seeds, and fibrous substances. The liquid in the pulp is evaporated by heating until the desired consistency is achieved. The puree is then filled into bottles, crown-corked, processed in boiling water for 30 minutes, and cooled.

Tomato powder production involves dehydration, which removes moisture from tomatoes to inhibit the growth of mold and bacteria. Ripe tomatoes are sorted, cleaned, sliced, blanched,

and dried using an oven, dehydrator, or sunlight. The dried tomatoes are then cooled, milled, and appropriately packaged to create tomato powder.

Conclusion

The recent surge in tomato prices in India is driven by irregular shocks, seasonal production, infrastructure challenges, climate extremes, and supply-demand imbalances. To stabilize prices and ensure a sustainable tomato industry, investments in storage and transportation infrastructure, promotion of climate resilience strategies, crop diversification, and risk management measures are essential. Government interventions, farmer support, and collaboration among stakeholders are necessary to overcome these challenges and achieve price stability. By addressing these factors, India can create a resilient tomato market that benefits both farmers and consumers. Furthermore, Proper postharvest handling practices and treatments are crucial for extending the limited shelf life of highly perishable tomatoes. Failure to adhere to these practices leads to significant losses, especially in developing countries. Employing appropriate storage, processing, and preservation methods like refrigeration, modified atmosphere packaging, drying, chemical preservation, boiling, pasteurization, and freezing helps maintain tomato quality and significantly extends their shelf life. This addresses the challenge of postharvest losses faced by tomato handlers, particularly in developing countries, and ensures the availability of high-quality tomatoes for a longer duration.

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