



Low cost, high impact solutions for improving the quality and shelf-life of tomatoes in local markets

The winter tomato (*Lycopersicon esculentum Mill.*) is one of the most popular vegetables produced in SAARC countries. It is grown during the winter season under protected cultivation using nets to protect fruit from bird infestation. Winter tomatoes are cultivated by small holders and are sold on the domestic market. They are consumed in the fresh form or are used as ingredients in many cooked dishes. Winter tomatoes contribute a good source of Vitamin C, potassium, folic acid, as well as carotenoids such as lycopene and carotene in local diets.

Like other fresh vegetables, winter tomatoes are highly perishable because of their high moisture content and delicate nature. If not harvested at the correct stage of maturity and handled properly throughout the supply chain from harvest to retail, both quantitative and qualitative losses result. These losses reduce the incomes for stakeholders in the supply chain. Improper handling also shortens the shelf-life of winter tomatoes, which limits sales volumes and returns to retailers.



The importance of good post-harvest handling practice

Post-harvest begins where production ends, that is at harvest. Good practice in harvesting and in post-harvest handling is essential in maintaining quality (fresh appearance, color, flavor and nutritional value), extending shelf-life and in assuring the safety of winter tomatoes for the benefit of consumers. Post-harvest losses in winter tomatoes are the result of poor harvesting techniques, careless handling, and poor packaging and transport conditions. Thus, it is important that efforts are made to prevent or minimize these losses throughout the marketing chain, so that producers, marketers, and consumers alike can benefit.

Improving handling practice in tomato supply chains

Under the FAO Technical Cooperation Project, TCP/RAS/3502, titled, *Reduction of Post harvest Losses in Horticultural Chains in SAARC Countries*, technical improvements (Table 1) were piloted in Bangladesh with stakeholders in traditional tomato supply chains. Qualitative and quantitative losses and shelf-life were assessed.

Table 1: Traditional and improved practices in cauliflower supply chains

Operation	Traditional practice	Improved practice
Harvesting	Bamboo basket with paper liner as field container	Plastic pail as harvesting container and plastic crate as collecting container
Trimming	No trimming of fruit stem	Trimming of fruit stem close to shoulder using scissors
Cleaning	No washing of fruit	Washing fruit in 150 ppm chlorinated water
Retailing	Red mesh sack, 50 kg capacity	Plastic crate with newspaper liner on all sides, 25 kg capacity

Improvements in the traditional winter tomato supply chain: using plastic pail as harvesting container and plastic crate as collecting container (A), trimming of fruit stem (B), washing of fruit using 150 ppm chlorinated water (C), and plastic crate as bulk packaging container with newspaper liner on all sides (D).

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The results

1. Post-harvest loss reduction

Losses incurred during transportation of winter tomatoes from the collection center to wholesale markets were mainly due to mechanical damage, i.e. abrasion, compression and fruit cracks. Losses incurred in retail were largely due to quality deterioration, i.e. decay and constituted an outright loss.

On arrival at the wholesale market, 16.7 percent of tomatoes in supply chains that made use of traditional practice were cracked, constituting an outright loss. With improved practice and the use of plastic crates for transportation, no cracked fruit were found

Table 2: Losses at various stages of traditional and improved chains

Parameter	Supply chain level	Handling practice	
		Traditional	Improved
Total loss (%)	Wholesale	16.7	0
	Retail (3 days)	20.2	2.1
System loss (%)	Farm to retail	36.9	2.1

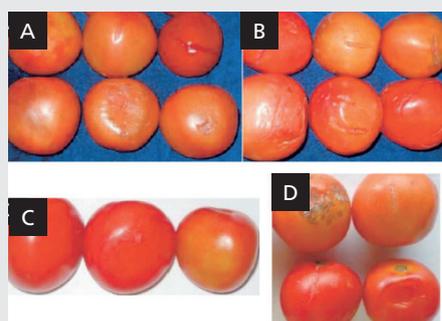
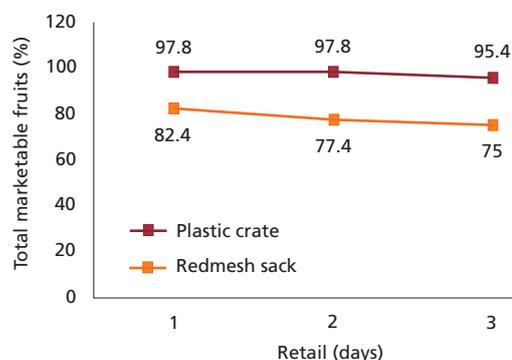
on arrival at the market. The improved bulk packaging practice, therefore, resulted in a 100 percent reduction in post-harvest loss.

At the retail level, 20.2 percent of tomatoes handled using traditional practice, manifested signs of mechanical damage after 3 days in retail. On the other hand, with improved handling practice an average loss of 2.1 percent was observed. Improvements in the traditional handling of tomatoes thus resulted in an 89 percent reduction of post-harvest loss.

For the entire post-harvest handling system (farm to retail), system loss was markedly reduced from 36.9 percent to 2.1 percent equivalent to 94 percent.

2. Shelf-life enhancement

Shelf-life is the length of time that a commodity may be stored or displayed for sale without becoming unfit for use or consumption. The quality and shelf-life of tomatoes handled using improved practice was better than that for those handled using traditional practice, based on the number of marketable fruits over a 3-day retail period. Marketable tomatoes consisted of sound fruit and fruit with slight abrasion and compression damage. With improved handling practice, the number of marketable tomatoes was 97.8 percent on the 1st and 2nd day in retail, with a slight decrease (95.4 percent) on the 3rd day of display. On the other hand, the proportion of marketable tomatoes on the 1st day of the traditionally handled



Forms of damage during 3 days of retail: abrasion (A), cracks (B), severe compression (C), and apparent decay (D).

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tomatoes in retail was 82.4 percent and decreased to 75 percent on the 3rd day. In effect, retailers can derive greater benefit in terms of increased sales volume and returns from improved handling practices.

3. Produce safety

Application of good practice in handling winter tomatoes from harvest to retail is critical in minimizing the risks of contamination posed by pathogenic microorganisms that may originate from the fruit itself and from workers who come in contact with produce during handling. With good post-harvest practice, consumers of winter tomato reduce the risk of purchasing produce that is unsafe for consumption.

Economic benefit realized

A partial budget analysis was used to determine the profitability of using plastic crates as bulk packaging containers to replace the red mesh sacks commonly used for bulk packaging in the traditional post-harvest handling of winter tomatoes. Assuming that a collector/wholesaler buys 1 000 kg of winter tomatoes and using post-harvest loss data and other relevant

Table 3: Partial budget analysis of improvements introduced at different levels of the supply chain

Cost (Tk)	
(A) Added cost:	
Depreciation	24.62
Opportunity cost of capital	23.38
(B) Reduced returns	0.00
Total cost (A + B) = Tk 48.00	
Returns (Tk)	
(C) Reduced cost:	
Savings in labor for sorting	150.00
(D) Added returns:	
Additional gross income	1 670.00
Total returns (C + D) = Tk 1 820.00	
Additional income = (C + D) - (A + B) = Tk 1 772.00	

information gathered by the project, the analysis showed the expected changes in cost and returns with the improved practices and the use of plastic crates.

Results of the profitability analysis showed that the wholesaler would benefit in terms of additional income if plastic crates are used as a bulk packaging container for the transport of winter tomatoes, in lieu of the traditional red mesh sacks.

For the retailer, increased returns would be realized from the improved shelf-life of tomatoes owing to larger quantities of marketable tomatoes for sale over an extended period of retail.

This information sheet summarizes the results of the FAO Technical Cooperation Project: TCP/RAS/3502 Reduction of post-harvest losses in Horticultural chains in SAARC Countries

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