Study on Feasibility of Safe Packaging for Economically Important Vegetable Transportation

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Abstract

A study was carried out to determine the technical feasibility of use of safe packaging for Brinjal, Okra, Bean and Long bean transportation which are major vegetables where the harvest is handled in very large quantities. They are excluded from the law to be transported in safe packages. The study was conducted through Dedicated Economic Centre (DEC), Dambulla to Manin market, Colombo supply chain. Plastic crates and polysacks bags were used as packaging types. Vegetables transported to DEC, Dambulla then packed in polysack bags and plastic crates and transported to Colombo. Weight loss, colour change, visual quality, firmness and disease incidence of products were measured at Manin market. After two days, these parameters of vegetables transported in both packaging types were measured to determine loss occur at retailer and consumer levels. At Dambulla, damaged vegetables were observed up to certain extent. Mechanical damage was the main cause for postharvest losses in okra where over maturity in long bean caused yellow colour of the produce thus total loss was increased. At the retailer and consumer stages, bean and long bean pods were yellowish in both packages while brinjal and Okra did not show detectable colour change. Fungal infections were observed at retailer and consumer level on long bean and okra transported in both packages. Overall visual quality of vegetables was also better when transporting in plastic crates. The study revealed that postharvest losses of bean and long bean transported in polysacks and plastic crates did not show considerable difference. But transport loss of brinjal and okra can significantly be reduced using plastic crates.

Key words: Mechanical damage, Safe packaging, Vegetable transportation, Weight loss

Introduction

The postharvest loss of perishables lies between 30-40%, which could have been used in reducing poverty and hunger, malnutrition and loss of export earnings of the country (Sarananda 2000). Therefore, feeding the population is one of the major challenges that merit urgent attention. Minimization of postharvest losses of already produced food is more sustainable than increasing production to compensate for these losses.

The major cause for postharvest loss of fruits and vegetables is due to use of improper packaging during the transportation. According to the Jayathunge et al (2003) transport loss of vegetables can be reduced from 20-30% to 5-7%. In order to prevent serious post harvest losses of fruits and vegetables, Institute of Post Harvest Technology launched a development project to introduce plastic crates to fruits and vegetables supply chains at 50% and 75% subsidized prices. Furthermore, government imposed a rule that fruits and vegetables should be transported in safe packages to minimize postharvest losses and to supply quality produce for consumer. But considering objections came from farmers, wholesaler and transporters, the government limited the rule for eleven vegetables and eight fruits. But Brinjal, Okra, Bean and Long bean are four major vegetables are excluded from the rule, the harvest of thee vegetables are handled in very large quantities. Further they are available in any market throughout the year. Use of safe packaging for these crops also is a very important step to minimize the postharvest losses in the country. Therefore, this study was carried out with the objectives of studying the technical feasibility of use of safe packaging for these four economically important crops.

Methodology

Brinjal, Okra, Bean and Long bean were selected for this study considering their economic importance. The study was conducted from Dedicated Economic Centre (DEC), Dambulla to Manin market, Colombo supply chain. Dambulla DEC is the main fruit and vegetable wholesale market in Sri Lanka and it receives produce from every part of the country and

distribute too. The highest consumer demand persist in Colombo area, therefore Dambulla to Colombo supply chain was selected.

Plastic crates and conventional polysack bags were used as packaging types for the study. Vegetable samples transported to DEC, Dambulla were randomly collected. Sample size for one vegetable type was 300kg. Mechanical damages, colour and external appearance of vegetables were measured. Vegetable samples were packed in polysack bags and plastic crates separately and placed in a lorry at different layers (different heights) and then transported to Manin market at ambient condition. Vegetable samples packed in two packaging types were collected at the end. At Manin market, mechanical damages, physiological loss in weight loss and losses due to diseases of four vegetables were measured. Changes of colour and visual quality of vegetables were determined by visual observation as mentioned by Karder and Cantwell (2007). Firmness was measured using a digital fruit firmness tester with a cylindrical shaped probe of 4mm in diameter. Then vegetable samples were stored for two days at ambient conditions and all the above mentioned parameters were measured again to determine loss occur at retailer and consumer levels. Data gathered were analyzed using Analysis of Variance (ANOVA) by Statistical Analysis System (SAS 1994). Differences between treatment means were compared using Duncan's Multiple Range Test at $p<0.05$.

Results and Discussions

Postharvest losses: post harvest losses of Brinjal, Okra, Bean and Loan Bean transported in plastic crates and polysack bags are shown in Table 1. Damaged vegetables up to certain extend were found at initial stage in Dambulla. Results showed that post harvest losses of brinjal and okra transported in plastic crates are significantly lower than in polysack bags at both stages.

Physiological loss in weight (PLW)

PLW of Long bean packed in PC showed higher percentage than in PS higher while PLW of Bean was not different in both packages. But PLW of Brinjal and Okra were found higher in PS than to PC where mechanical damages were significantly higher.

Colour changes: At the retailer and consumer stage, bean slightly had become yellow colour, long bean pods were yellow colour for both packages. But brinjal and Okra did not show observable colour change. Fungal infections were observed at retailer and consumer level for long bean and okra transported in both packages.

Overall visual quality of vegetables: At Dambull DEC visual quality ratings (VQR) of bean, okra and brinjal were excellent (Excellent - Essentially no symptoms of deterioration) and was good (Good - Minor symptoms of deterioration) of long bean. At retailer and consumer stages VQR of beans and okra transported in polysacks was poor (Serious deterioration, limit of usability) and fair (Deterioration evident, but not serious, limit of salability) in plastic crates. But long bean transported in plastic crates was poor and fair in polysack. VQR was fair and slight changes of brinjal in both packages.

Firmness

Firmness is a quality attribute that is critical in determining the acceptability of vegetables. Firmness of brinjal and okra transported in polysacks were lower than to crops transported in plastic crates in Manin market and retailer/consumer stages. These results indicate that quality deterioration is higher when brinjal and okra are transported in polysacks (Istella et al 2006).

Table 1: Post harvest losses four vegetables in different packaging types

Vegetables	Manin market		Retailer /Consumer		Total	
	PS	PC	PS	PC	PS	PC
Long Bean	19.2	17.4[a]	13.8	12.7[a]	33.0	30.1[a]
Bean	17.4	15.5[a]	12.3	10.0[b]	29.0	25.5[a]
Okra	27.7	14.1[b]	15.2	5.9[b]	42.9	20.0[b]
Brinjal	21.8	13.9[b]	11.5	4.8[b]	33.3	18.7[b]

Values with same letters within same raw at one point are not significantly different

PS – Polysack bags

PC – Plastic crates

Conclusion

The study revealed that total postharvest losses of bean and long bean transported in polysacks and plastic crates were not significantly difference. Transport loss of brinjal and okra can be reduced using plastic crates and use of plastic crates reduced by 43.8 % in Brinjal and 53.4 % in Okra.

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