

Shipment of Head Lettuce from Production Sites to the Thai Airways International Co. Ltd., Bangkok¹

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ABSTRACT

Head lettuce was harvested and left overnight in sacks at production sites. The next morning, they were trimmed and individually wrapped with proof paper either with or without plastic bag and packed in crates and ASEAN high density polyethylene (HDPE) containers. Head lettuce without trimming of wrapper leaves was also packed in crates. They were then shipped to the Royal Project Office, Chiang Mai, Province, within the same day, trimmed head lettuce in crates was transferred into 5-kg cartons and untrimmed head lettuce was unpacked, trimmed and repacked in bamboo baskets. Head lettuce was then shipped to Bangkok by truck in the same evening. Upon arrival in the next morning at Postharvest Laboratory, Department of Horticulture, Kasetsart University, Bangkok, it was found that individually wrapped head lettuce either with or without plastic bag in both cartons and ASEAN HDPE containers was in excellent condition, while head lettuce without wrapping in bamboo baskets showed a considerable weight loss and shrivel leaves had to be removed resulting more weight loss. Tipburn was found to contribute a large percentage of postharvest losses in one lot of head lettuce and this seems to be related to rapid growth of the plant. Strict practice of quality control resulted in good quality of the produce at the destination.

INTRODUCTION

It was reported in our 2 earlier articles that head lettuce produced on the highlands during cold season was of good quality in term of size, eating quality and tipburn free. The vegetable was trimmed in the packing shed nearby the farming area. They were farm fresh look when arrived to the market. The freshness was maintained up to 4 weeks. To obtain such quality of lettuce, many factors play the role. Individual head was wrapped with PE "Handy Wrap" and the outer layer with clean proof paper which served as cushion. The lettuce was 'tight-filled' packed in stackable and nestable high density polyethylene (HDPE) baskets and the commodity was shipped from farms to the market.

The transport is preferably direct, no retrimming or any other activities are required in Chiang Mai. Retrimming may be needed only in the retail stores. Retaining 4-7 wrapper leaves as conventionally practiced is not encouraged, since they increase city garbage problem. In addition, it is wasteful of energy to ship the garbage, creates

unhappy socio-economic atmosphere among farmers and the vegetable project officers. The hilltribe farmers might have thought that they were cheated, since the vegetable weight that they were paid for was less than what was taken. These leaves which are trimmed at the farm site will be directly fed to hogs normally kept by hilltribes who were pleased seeing their hogs enjoying the leaves.

There is no doubt that postharvest handling skill of the head lettuce can be properly carried out through the project and extension officers to farmers. Despite the fact that successful works of such nature had been done and demonstrated, the vegetable project and extension workers are skeptical and reluctant to follow. However, they need more confident and must be convinced of its advantage. This paper reports the packing activities which were carried out at the farms. Demonstrations and works were done shoulders to shoulders among the farmers, project and extension officers and the postharvest handling

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team members. Head lettuce quality at the farms has been emphasized that only lettuce of high quality, free of tipburn which is a physiological disorder and no sign of decay infection are shipped. Quality control practice is a must at the farm and at the wholesalers if it is necessary.

MATERIALS AND METHODS

Head lettuce (*Lactuca sativa* L. var. Great Lake) at production sites, Toong Luang, was harvested and lime paste was applied to cut area of the butt in the afternoon of July 7, 1982 and left overnight in shack with the butt up to dry the excess water from the head. On July 8, 1982 morning the lettuce was prepared and packed by hilltribe farmers, extension and project workers and the postharvest handling team in order to demonstrate them how to trim wrapper leaves, wrap and pack the head lettuce properly since head lettuce was previously shipped with intact wrapper leaves without trimming from production sites to Chiang Mai City, explanation was given to them why wrapper leaves must be removed.

Head lettuce was prepared and packed for shipping as follows:

- Treatment 1. Only 1-2 wrapper leaves were left intact for each head lettuce. Their butts were recut and lime paste was applied. Individual head lettuce was wrapped with proof paper and packed in the wooden crate. Upon arrival at the Office of Highland Agricultural Project in Chiang Mai head lettuce was transferred into 5-kg cartons before shipped to Bangkok.
- Treatment 2. Head lettuce was prepared and wrapped similarly to treatment 1 but individual head lettuce was again wrapped with polyethylene bag. Then they were packed in the ASEAN high density polyethylene (HDPE) container. There was no change of container upon arrival in Chiang Mai and they were shipped to Bangkok without any additional work.
- Treatment 3. The same as in treatment 2 but they were packed in crate and transferred to 5-kg carton upon

arrival in Chiang Mai before shipped to Bangkok.

- Treatment 4. The vegetable with 4-6 wrapper leaves was packed in wooden crate. Upon arrival in Chiang Mai, 1-2 wrapper leaves were left intact for each head. They were thereafter packed in bamboo baskets and shipped to Bangkok. This method was routinely done by the Royal Project.

All of the head lettuce were shipped from Chiang Mai to Bangkok by truck in the same evening and arrived in Bangkok on July 9, 1982 morning. Upon arrival at Postharvest Laboratory, Department of Horticulture, Kasetsart University, Bangkok, each container was checked for weight loss during transport. Each head lettuce was also checked for infection, physical damage and tipburn. For tipburn, head lettuce was cut into halves to compare the external and internal tipburn symptom. High quality lettuce was stored at 1°C up to July 13, 1982. The vegetable was rechecked again and had it delivered to the kitchen of the Thai Airways International Co., Ltd.

RESULTS AND DISCUSSION

Transport of head lettuce under the Royal Project from production sites to local market in Chiang Mai or to wholesalers in Bangkok has been claimed to cause considerable losses. According to the report of marketing division, the Royal Project, postharvest losses of head lettuce were about 40% (Anonymous, 1982). This figure does not totally contribute to the real postharvest losses of head lettuce, because almost the amount of postharvest losses reported by them came from the weight reduction due to the trimming of wrapper leaves which are not the edible part of head lettuce. Weight reduction due to trimming tended to be very high especially when the size of head lettuce increased (Table 1). However, postharvest losses of head lettuce are inevitable, particularly the conditions of roads from production sites to town are very poor, but these losses mainly are due to infection, physical damage, transportation, and probably including physiological disorders. Head lettuce from Toong Luang and Mae Hae was routinely packed in cartons or crates at production sites without trimming wrapper leaves. They

Table 1. Weight of head lettuce before and after trimming of wrapper leaves at production sites.

Grower and grade	Number of head	Weight (kg)		% Reduction by trimming
		Before trimming	After trimming	
Pau Luang				
Grade A	75	47.90	33.60	31.11
Grade B	94	49.50	31.35	36.58
Nai Jue				
Grade A	88	91.00	41.30	54.62
			Average	40.77

carried the garbage from the production site to the city. They also claimed that intact wrapper leaves of head lettuce act as a cushion during transport. This was not correct. Wrapper leaves occupy more space and cost more transportation fee. In addition, wrapper leaves or oldest leaves are often with incipient infection and the most susceptible to decay, its removal at harvest may reduce postharvest loss due to diseases. Storage life of head lettuce may also be increased by removal of wrapper leaves at the time of harvest. (Ryall and Lipton, 1972)

Types of holding material and container for head lettuce must be studied and understood. Head lettuce is a perishable commodity and easily damaged by physical means. Holding material and container play a dominant role in minimizing the physical damage and transpiration during transport. Results from using different holding materials and containers (Table 2) confirm again that postharvest losses of head lettuce shipped from Chiang Mai to Bangkok can be easily reduced if one knows how to do it properly and is willing to do it. Individual wrapping of head lettuce with proof paper either with or without plastic bag can minimize weight loss and shrinkage of head lettuce. Proof paper and plastic bag also act as a cushion to prevent abrasion of head lettuce. The conditions of head lettuce individually wrapped either in cartons on ASEAN HDPE containers upon arrival at Postharvest Laboratory were excellent except those from Nai Jue's farm which tipburn contributed to almost postharvest losses in every treatment. Under dry condition and transportation head lettuce with no individual wrapping in bamboo baskets was labile to water loss due to high velocity of air movement, subsequently weight loss was

Table 2. Effect of holding materials and containers on postharvest losses of head lettuce shipped from Chiang Mai to Postharvest Laboratory, Kasetsart University, Bangkok.

Grower and grade	Treatment ¹	Number of head	% Weight losses at		%
			Chiang Mai ²	Bangkok	
Pau Luang					
Grade A	1	24	—	0.53 ⁴	0
	2	18	—	0.81 ⁴	0
	3	18	—	0.53 ⁴	0
	4	15	25.65	14.34 ³	0
Grade B	1	27	—	0 ⁴	0
	2	24	—	0.41 ⁴	4.17
	3	27	—	0.62 ⁴	3.47
	4	16	26.48	14.08 ³	0
Nai Jue					
Grade A	1	22	—	0.36 ⁴	4.54
	2	20	—	0.58 ⁴	5.00
	3	28	—	0.39 ⁴	7.14
	4	17	25.19	18.03 ³	0

¹ treatment numbers correspond to treatments in materials and methods.

² removal of wrapper leaves and other losses.

³ removal of shrivel leaves.

⁴ mainly transpiration loss.

high and head lettuce became shrivel (Table 2). Upon arrival at Postharvest Laboratory, shrivel leaves of head lettuce in bamboo baskets were removed resulting in an unsightly head.

Weight loss of head lettuce from cartons or ASEAN HDPE containers was not much different. However, upon arrival at the Laboratory, many cartons were deformed. This indicated mishandling and/or cartons had no mechanical strength. In contrast to ASEAN HDPE containers, they have mechanical strength which is unaffected by moisture from produce or high relative humidity. It is stackable, nestable and returnable container. This type of container is not only used for head lettuce but may be also for other commodities. Regardless with types of container, the desirable packing for most fruits and vegetables is in which the package is tightly filled without bulging or overfilling, so that the package but not the produce bears the stacking load.

Tipburn is a serious problem of head lettuce production. It seems that the lettuce from Nai Jue's farm tended to have more tipburn damage than those from Pau Luang's farm (Table 3). Tipburn is a physiological disorder related to many factors initiated before harvest (Collier and

Table 3. Tipburn of head lettuce upon checking at Postharvest Laboratory, Department of Horticulture, Kasetsart University, Bangkok.

Grower and Grade	Weight per Head (kg) ^a	% Tipburn
Pau Luang		
Grade A	0.64	2
Grade B	0.53	2
Nai Jue		
Grade A	1.11	80

^a averaged from weight before trimming and number of head in Table 1.

Tibbitts). It is encouraged by conditions that favor rapid growth of head lettuce and/or unequal distribution of water in the head or leaves. High temperature and excess or insufficient moisture during growth are particularly conducive to tipburn. One of these reasons may be applicable to the difference in severity of tipburn between lettuce from Pau Luang's and Nai Jue's farm. Head lettuce from the latter's farm had obviously larger size than that from the first farm indicating that the lettuce of the latter's farm grew more rapidly than that of the first one. Subsequently the head lettuce met the above mentioned conditions which favored for tipburn. At production sites as well as the packing area every head lettuce must be carefully checked for tipburn before packing but initially merely specks might become dark during transport. The presence of small sign of tipburn will reduce quality of harvested head lettuce in the market. Therefore, tipburn must be controlled and head lettuce must be high in quality and free from tipburn in order to reduce

postharvest losses otherwise they should not be packed and shipped to the market. It wastes time, money and labor.

Tipburn symptom of outer leaves indicates positive tipburn within the head. The severity corresponds between the external and internal leaves. The shipment of head lettuce delivered to the kitchen of the Thai Airways International Co. Ltd. was received without any complaint about damage or quality problem.

CONCLUSION

Based on the results from our repeated experiments we strongly recommend again that head lettuce from Toong Luang and Mae Hae should be trimmed for the removal of wrapper leaves at production sites and individually wrapped with proof paper either with or without plastic bag and packed in the carton or ASEAN HDPE container. Then they must be shipped to Bangkok as soon as possible.

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