
Working Paper Series

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Improving smallholder farmer incomes through strategic market development in mango supply chains in southern Vietnam

Study: A2.3 Management of sap burn study and monitoring quality along the chain verification study

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Context

Introduction

Sap or latex burn is a leading cause of quality loss in mango in Vietnam. The acidic nature of the sap will cause a burn if it comes into contact with the skin of the fruit. This is not always apparent immediately and will often develop over time through the supply chain. Sap management techniques are designed to minimize this burning by exposing the fruit to high pH solutions that effectively neutralize the pH of the sap. Most of the damage by sap occurs in the early stages of the supply chain on farm at harvest and during transportation to the packhouse.

An initial study of sap management was conducted in 2021 which indicated that sap management treatment interventions at the farm level were able to reduce damage at the farm, packhouse and retail levels of the chain. To verify these results trials were repeated at 4 farm sites in Tien Giang and Dong Thap provinces in 2022.

Activities

Undertake sap management trial on Farm and monitor quality loss associated with sap damage along the chain.

Focus

To confirm that sap-burn management in the farm makes a significant contribution to improving the quality and value of mangoes in the supply chain.

Research questions

- What steps in the mango supply chain need to be improved to reduce postharvest losses and improve the quality and value of mangoes, thereby increasing farmer's incomes.
- Determine which step is the most important step affecting the quality of mangoes in the chain.
- Is the proposed improvement method suitable for current farmers' systems and easily applied and repeatable.

Sap-burn management trials in farms'

The trials were conducted on 4 farms, 2 farms in Tien Giang and 2 farms in Dong Thap province.

Mangoes in these farms were harvested early in the morning using traditional harvest practices using plier/ scissors and picking pole , kept in the shade, and then conducted trials according to experimental design below.

- Treatment 1: Control (no de-stemming and de-sapping). Control mangoes are treated following the current practices of the farm.
- Treatment 2: Pre wash in chlorine solution then destem into in 2.5 g/l mango de-sapping agent solution for 2 minutes.

After treatments, mangoes were drained packed into crates, before transport to destinations in the chain.

Samples were taken for evaluation at critical control points within the chain farm, packhouse, wholesale markets and retailers to assess the amount of sap related injury compared to the control fruit. Samples were transported to SIAEP laboratory in Ho Chi Minh City and allowed to ripen at 20°C for the lab evaluation.

Sap-burn damage assessment

The extent of damage due to sap-burn and other defects on each fruit was rates by the following scale 0 = nil; 1 = < 3% (1 cm²) of skin surface affected; 2 = ~ 3% (1 – 3 cm²); 3 = ~ 10% (3 – 12 cm²); 4 = 10% – 25% (12 - 25 cm²); and 5 = > 25% of skin surface affected. (Hoffman et al., 2010):

Results and discussion

Results

The fruits were harvested at the different farm sites treated and then monitored at different points in the chain Farm, packhouse and then some at a wholesaler and others at the retailer (Fig 1-4).

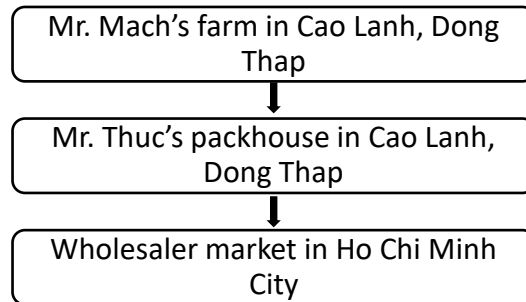


Figure 1. Sampling points from farm site 1,

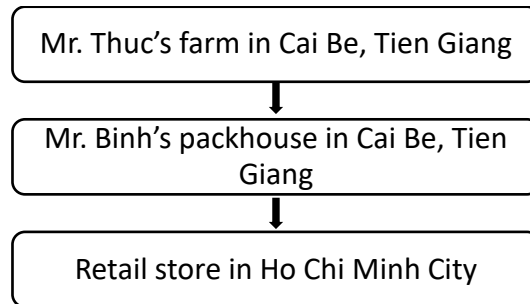


Figure 2. Sampling points from farm site 2

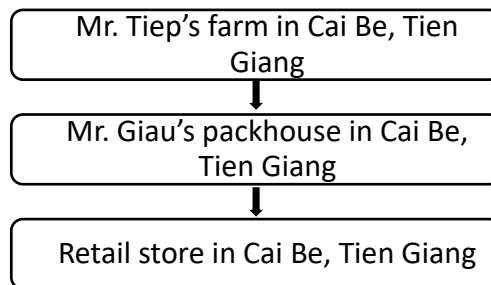


Figure 3. Sampling points from farm site 3

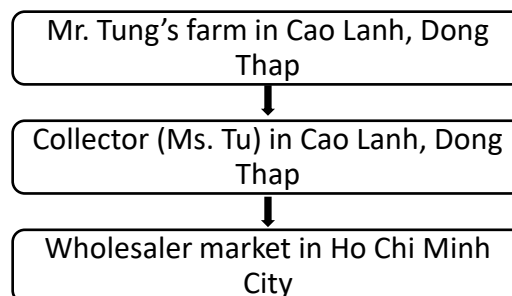
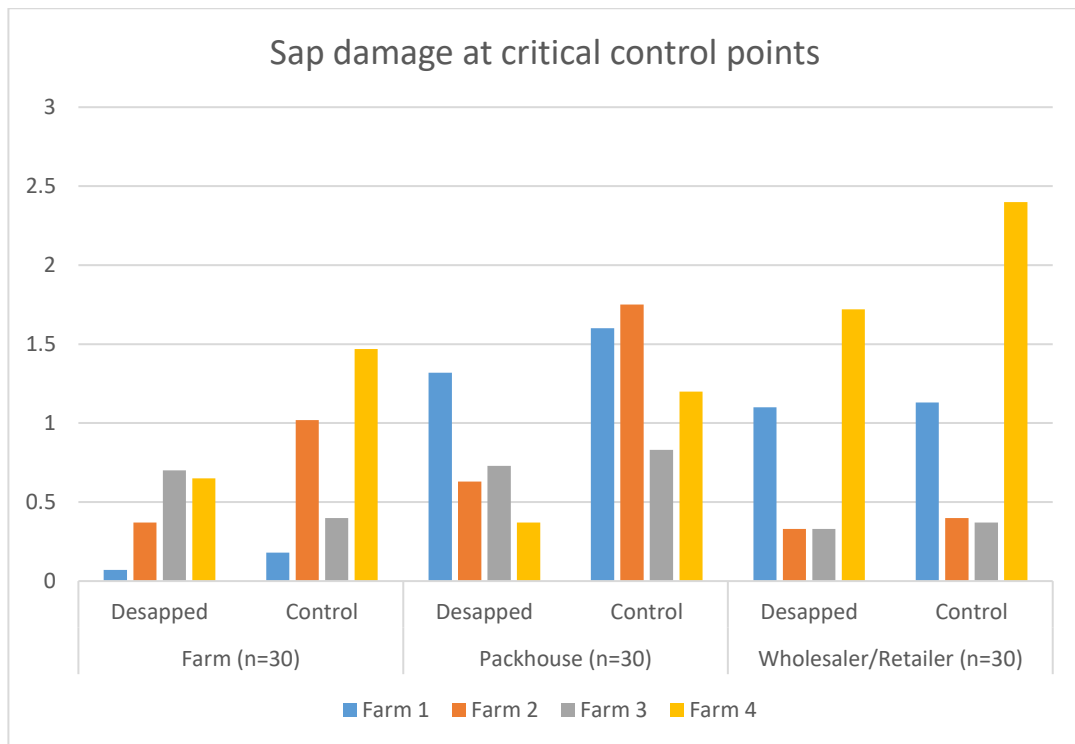


Figure 4. Sampling points from farm site 4



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Figure 5 Sap damage levels at each point in the chain.

The results presented that the sap-burn injury was lower through the chain Fig 5 with the desapping treatment, overall levels on both treatments are considered minor with most sites scoring just over 1 with the exception of farm 4 at the wholesaler. Farm levels were low as would be expected due to the burn not developing for several days. This was evident from the higher levels in the packhouse and at the wholesaler.

What is apparent is the variation of damage between the different sites Farm 4 recorded the highest level of damage particularly at the wholesaler. Whilst farm 4 the treatment appeared to have the greatest impact data recorded from farm 1 suggests minimal to no significant impact.

Farm 3 had very low levels on both treatments this farm has a very short chain and this may simply reflect the reduced time to allow the burn to develop, this farm also does leave the fruit wrapped during transportation to the packhouse which may reduce some of the sap damage related to transportation.

The high levels of standard error Table 1 suggests large variations in the data recorded at each site. This could be due to the sampling size not being large enough or there may have existed some level of damage prior to treatment. This often can happen as a result of poor harvesting practices.

Some levels were recorded lower at the wholesaler/retailer this might suggest that some grading has occurred at the packhouse stage as sap damage only increases with time.

Table 1 Sap damage levels at each site +/-standard error

	Farm (n=30)		Packhouse (n=30)		Wholesaler/Retailer (n=30)	
	Desapped	Control	Desapped	Control	Desapped	Control
Farm 1	0.07±0.26	0.18±0.45	1.32±0.89	1.6±1.02	1.1±0.81	1.13±0.89
Farm 2	0.37±0.89	1.02±1.19	0.63±1.2	1.75±1.26	0.33±0.59	0.4±0.83
Farm 3	0.7±0.95	0.4±0.81	0.73±0.83	0.83±0.75	0.33±0.59	0.37±0.83
Farm 4	0.65±0.76	1.47±1.47	0.37±0.6	1.2±1.56	1.72±1.1	2.4±1.56

The results highlighted a number of issues with some sites having good levels of control through the chain and others not recording much difference with standard practice. This reflects what is observed across the local industry some farms do take high levels of care for the fruit and are able to reduce sap burn levels with this alone, whilst others struggle to manage the sap burn levels this may be due handling practices but also transportation distance often can have a significant role in damage levels.

The study has identified that the desapping system can be moved to the farm and will work within the existing farm system. Its greatest impact will most likely be seen in longer chains. It has also highlighted that for full success it needs more. That comes in the form of implementation with good harvesting practice, cleaning program to avoid cross contamination and transportation practices.

Achievements

- Demonstrated that sap management practice can be moved to on farm sites and incorporated in existing systems.
- Verified that quality loss due to burn can be reduced by sap management practice applied on farm.
- Verified that quality loss is also reduced at critical point down the supply chain.

Capacity Building

- Greater awareness of causes and treatments of sap related injury along the chain by Research staff and supply chain participants.
- The work combined with the field demonstrations has created greater understanding amongst farmers on how this process can be implemented on farm.
- Development of communication channels and relationships with chain members at other points along the chain eg farmers/packhouses and retailers.

Lessons learnt

What worked well:

- The sap-burn management in the farm gives good results for mangoes at retailers and wholesale markets.
- This method is simple, easy to implement and suitable for farmers' ability.

What could be changed or improved next time:

- For the trial work; larger sampling sizes, and fruit evaluation prior to treatment will greatly enhance the quality of the results.
- There needs to be integration with sap management and other best practice procedures along the chain to deliver greater consistency in the results.

Pathway to completion

2022

Complete document Sap burn Practice (SP) Guide for farmers.

Future Opportunities

The process of sap management works well and significantly reduced quality loss along the chain in other mango industries where it has been adopted i.e. Australia. This has come about where it has been integrated into a system which has many other best practices in place. This initial study was to evaluate if the process under Vietnamese conditions be moved from the packhouse to the farm to which it has demonstrated this will work. For full adoption the process will need to be integrated with a number of other best practices, and be demand driven. The export industry and high end retailing are 2 sectors that already have high quality requirements and would be the logical areas to begin the integration and upscaling. In order to do this, there need to be a number of activities undertaken.

- Introduction of better harvesting techniques that minimise early sap contamination
- Development and implementing on farm, transportation and packhouse hygiene and cleaning procedures that will minimise cross contamination.
- Linking practices into current export high end chains via demonstration models.
- Further training and awareness exercises to upskill all chain members of the role and impact that their practices can have on quality loss.
- Improved business development skills particularly with farmer groups to raise their capacity to evaluate and understand the cost/ benefit of incorporating new technology.

Appendices



Figure 1. Sap management implemented at farm 1.



Harvesting at farm



Testing trolley into sap burn trials



Control fruit at packhouse



Control and de-sapping fruit at retailer in HCM

Figure 2. Photo of sap management trial at farm 2



Trial fruit at retailer in Cai Be, Tien Giang

Selling de-sapping fruit at retail store

Figure 3. Photo of sap management trial at farm 3



Figure 4. Photo of sap management trial at the fourth farm