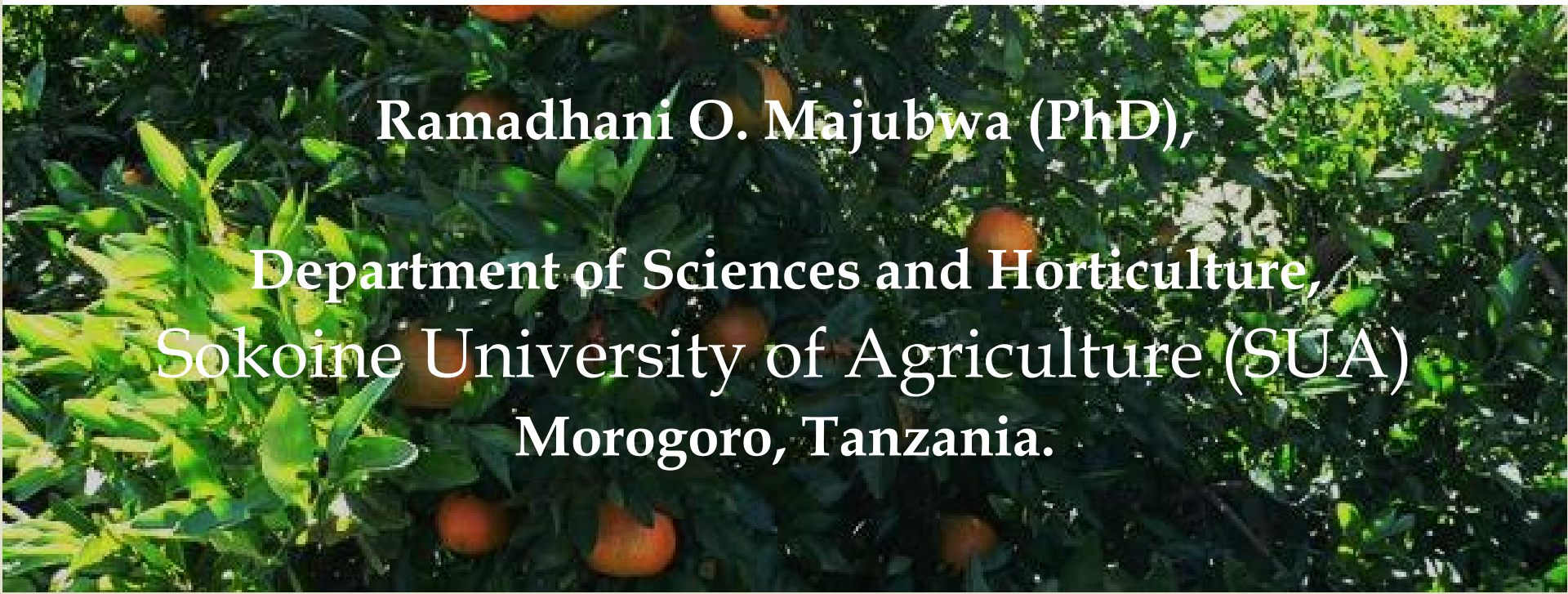




Alternative Methods for Harvesting and Field- packing of Mandarin (*Citrus reticulata* Blanco) Fruit in Tanzania

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Background

Tanzania ranks the 2nd after Kenya in citrus fruit production (FAOSTAT, 2013)

Production:
1.4 x10⁶ MT, 2000-2011
(FAOSTAT, 2013)

Postharvest loss: 20-30%

Tanga, Morogoro, Pwani regions



Harvest

Climb-Pick-Drop
(CPD) method

Field handling is by
heaping on cut grass



Packaging and handling

Mandarin and sweet oranges are packed and shipped together; bulk on truck (BULK) or in bamboo baskets (BAMB) (Lynch *et al.*, 1999; Tsa 2012)



Mishandling during harvest, packaging and transportation,
major cause of losses (Brown, 2006; Ladaniya, 2008)

Loss of 48% has been reported in sweet oranges along the value chain in Tanzania (Tsa, 2012)

In contrast to sweet orange, mandarin fruit are thin-skinned with brittle rind liable to mechanical injury (Saunt, 1990)

Hand harvest in combination with ladder and 25 kg harvesting bag (L+B) (Brown. 2006; Ladaniya. 2008)

Cutting pole with catching bag (CP), successfully used for harvesting mango fruit in Morogoro (Kimaro and Msogoya. 2012)



<http://fsi.colostate.edu/wpcontent/uploads/2014/>



http://lh3.ggpht.com/_VnZ0KL08pGc/SzBk2RiNbAI/AAAAA AAAADM/Pwka4wcs3p4/fruitmit.JPG

Objective 1

Compare use of a harvesting ladder and modified commercial harvesting bag (L+B) with the local mandarin fruit harvest methods on postharvest quality in Morogoro region, Tanzania

Objective 2

Compare stackable plastic crate (SPC) packaging with the locally used packaging methods on reducing postharvest loss of mandarin fruit along the value chain in Morogoro region, Tanzania

Objective 1 - Materials and Methods

Field experiment

Evaluation of harvest methods



A). Climb Pick Drop Catch (CPD)



B). Ladder Plus Bag (L+B)



C). Cutting Pole (CP)

Field evaluations

Fruit drops

Plugging

Harvesting time



Storage experiment



Storage evaluations

- Fruit weight loss
- Cumulative decays
- SSC
- TTA
- SSC/TTA
- Ascorbic acid content

Objective 1- Results

Effect of harvest method during harvest

Harvest method	Fruit drops (%)	Plugging (%)	Harvest time (min)
CPD (Control)	6.4b ^z	0.3b	15.1b
L+B	4.4b 15.2	0.5b 6.3	13.1b 35.30
CP	19.6a	6.8a	48.5a

^zMeans within a column followed by the same letter are not significantly different according to Tukey's test ($p < 0.05$)

Objective 1 - Results

Effect of harvesting methods on fruit physical quality during 12 days storage at ambient conditions

Harvest method	Cumulative fruit weight loss (%)	Cumulative fruit decay (%)
CPD (Control)	6.5a ^y	13.7ba 1.4
L+B	7.2a	12.3b 4.0
CP	7.4a	16.3a

^z Means within a column followed by the same letter are not significant different according to Tukey's test ($p < 0.05$)

Objective 1- Results...

Harvest method had no effect on;

SSC (10.2 °Brix),

TTA (0.63%),

SSC/TTA (16.6)

Ascorbic acid content (23.2 mg 100 g⁻¹)

However, the parameters varied with storage time

Objective 2 -Materials and Methods

Fruits harvested using CPD

Mixed randomly, and sorted

Field packaging methods:

- Bamboo baskets (BAMB-old)
- Bulk on truck (BULK-old)
- Stackable plastic crates (SPC-new)





Variables evaluated

- Decays
- Weight loss
- Pulp temperature

- SSC
- TTA
- SSC/TTA
- Ascorbic acid content

Objective 2 - Results

SPC reduced fruit loss from decay by 7.9% (BAMB) and 5.1% (BULK)



SPC



BAMB



BULK

Objective 2 - Results

Effect of Package X Fruit position in the package on decay after 12 days storage

Cumulative fruit decay (%)			
Fruit position in the package	Stackable plastic crate (SPC)	Bamboo basket (BAMB)	Bulk on truck (BULK)
Top	33.0 aA ^y	31.3 aA	26.5 aA
Middle	18.1 bB	37.7 aA	32.5 aA
Bottom	22.5 bB	28.2 aBA	29.8 aA

^yMeans within a column followed by the same small letter or by the same capital letter within a row do not differ significantly according to Tukey's test ($p < 0.05$)

Objective 2 - Results

Fruit decay was higher on day 3 (13.7%) – end of simulated wholesale storage

Weight loss did not vary with packaging methods, but was highest on days 3 and 6 of retail simulation

Conclusions-Harvesting Methods

- L+B reduced fruit drops at harvest by 2% (CPD) and 15% (CP)
- L+B reduced decays during storage by 1.4 (CPD) and 4% (CP)
- L+B increased harvest efficiency by 13.6 % (CPD) and 72.8% (CP).
- L+B demonstrated to be the best harvest method

Conclusions - Packaging Methods

- SPC reduced fruit loss due to decay by 7.9% (BAMB) and 5.1% (BULK)
- Fruit decay was higher for fruit on top layer in SPC (33%), and middle layer in BAMB (37.7%) and BULK (32.5%)
- Fruit pulp temp was highest for fruits on top layer in SPC and BULK (day 3 wholesale simulation)
- Packaging methods had no effect on internal fruit quality
- SPC demonstrated to be the best packaging method

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An orchard of trees heavily laden with ripe, orange-colored fruit, likely citrus, under a bright sky. The trees are arranged in rows, and the ground is covered with green grass and some fallen fruit. The text "Thank you for listening" is overlaid in the center of the image.

Thank you for listening