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CURING REDUCES POSTHARVEST DETERIORATION OF BIOZYME® PRODUCED POTATOES (*Solanum tuberosum* L.)

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ABSTRACT

Potato is among food crops that are heavily relied upon for food security assurance worldwide. Potato tubers are consumed in their fresh form and therefore require proper storage to prolong their life after harvest. Being succulent, massive losses result if bruised, exposed to light and low relative humidity. The present experiment was conducted to find optimal conductions that prolong the shelf-life of potato tubers grown using the biomass and succulence enhancing Biozyme®. Potatoes were grown in a split plot experiment, arranged in a randomized complete block design. The experiment was replicated three times and repeated once. Main plots were assigned to potato cultivar (Tigoni and Asante), while subplots were assigned to Biozyme® foliar feed rate (0, 125, 250, 500 and 750 ml/ha). Each subplot was planted with 28 seed potato tubers spaced at 30 cm x 70 cm in four rows. A distance of 1 m separated adjacent subplots and main plots. After harvesting, ware potato tubers, from each treatment, were divided into four groups for four postharvest handling regimes (Cured + Dark, Cured + Room, Not Cured + Dark, and Not Cured + Room Storage). Each postharvest regime had 20 tubers, replicated four times. Weight loss, shrinkage and rotting percentages increased, but firmness decreased with increase in Biozyme® rate. The deterioration was counteracted by Curing and Dark Storage of the potato tubers that reduced weight loss, shrinkage and rotting, but increased firmness. Thus, foliar-feeding potato plants with 500 ml/ha Biozyme® followed by Curing and Dark Storage of harvested tubers are recommended to ensure high potato tuber yields and effective reduction of premature postharvest deterioration of the tubers during storage.

KEYWORDS: Firmness, Rotting, Shelf-life, Shrinkage, Tuber handling, Weight loss.

INTRODUCTION

The continuous failure of maize yields leads to increased reliance on potatoes as an alternative source of staple food (Muthoni and Nyamongo, 2009). As potato growers continue to increase production, widespread use of fertilizers and other chemicals to hasten growth as well as enhance size and quality of the tubers has arisen. According to a preliminary survey, Biozyme® foliar feed was found to be widely used to hasten growth and increase the size of potato tubers. However, the rapid rotting of the harvested, large-sized potato tubers results in sellers rejecting the tubers when the supply is higher than the demand, because the Biozyme® produced potato tubers tend rot faster and do not keep well for long in the market place. The problem could be arising from poor postharvest handling of the Biozyme® produced potato tubers by the farmers. Therefore, improved potato agronomic practices such as prompt curing of the harvested, Biozyme® fed potato tubers, should be adopted to avoid adverse effects of Biozyme®.

Despite precautions taken to prevent injury to the potato tuber, some damage is likely and a curing process is necessary for any wounds to heal. The healing process is facilitated by curing, which refers to putting potato tubers in a place conducive to encourage the skin to harden and heal bruises that happen during digging (Herbert, 2003). The curing process prevents rotting of harvested tubers. Curing should be done in a dark, dry and warm location. Potato tubers should be placed at temperature of between 15ºC and 25ºC for 7 to 15 days to cure. If the potato tubers are harvested wet, they should be dried completely before storage. The room must be completely dark or the potato tubers must be covered. Darkness is important in preventing light from reaching the tubers and causing their skin to turn green (Herbert, 2003).

High humidity (95%) during the curing period is critical to prevent excessive shrinkage and to promote wound healing. The ventilation regime used during curing is determined by the cooling requirement and the need to provide fresh air (oxygen) to tubers. Ventilation should maintain the pile at the desired suberization temperature. It may be done more frequently or continuously if there is condensation on the surface of tubers. Condensation on the surface of tubers occurs when the upper tubers are cooler than those inside the pile. A small amount of free water is usually harmless, but any excess surface moisture encourages soft rot (Holley, 2003). A cut in a potato tuber undergoes two steps when it heals. Suberization is the first of these steps and involves the development of a waxy, fatty compound called suberin, which is produced by cells just below the cut surface (Van Oischot et al., 2003). This seals the wound preventing water loss and invasion by pathogens. Suberization occurs one to three days after wounding and is typically complete within four to seven days (Thompson and Kelman, 1995). Formation of a specialized tissue called wound periderm is the second step in the healing process and results in the development of a permanent, protective layer of cells that replaces the "skin" destroyed by the wound (Kim and Lee, 1993). This cork layer is a final protective coating, which prevents infection and water loss. The development of this wound periderm begins shortly after suberization and is complete within one to two weeks (Yan and Stark, 2000). During wound healing, potatoes lay down tissue barriers, which reduce disease development and water loss (Patterson and Grey, 1972; Nnodu et al., 1982). Potatoes can be left in the field during this curing process and covered with burlap or some other material to prevent sunscald. Potatoes can also be cured in a warm room. Tubers to be stored should be clean, firm and free from disease (Stark et al., 1992). Rains during the curing process inhibit healing and piles left outside should be protected from rainfall by piling the tubers under a makeshift shed roof. The piles should not be covered with a plastic sheet to allow air movement that promotes healing. A plastic sheet cuts off this necessary air supply.

Temperature, light, humidity, and air movement are the most important environmental factors affecting storability. Potato storage should have adequate insulation, outside waterproofing, inside vapour proofing, ventilation, air distribution, adequate humidification, and properly designed controls for precisely maintaining the storage atmosphere. Good storage should prevent excessive dehydration, decay, sprouting and high sugar concentrations, which result in dark-coloured fried products (Schaupmeyer, 1992). Reducing sugars (glucose and fructose) interact with amino acids, ascorbic acid and some other organic compounds during deep-frying to produce an unacceptable burned (caramelized) flavour and dark colouration (Beukema and van der Zaag, 1990). Storage temperature is determined by the intended use of potatoes. Table and processing potatoes cannot be stored at low temperature due to the undesirable physiological changes that take place (Lefort et al., 2003). Low temperatures promote conversion of starch to sugar, which can negatively affect cooking quality such as browning chips. Processing potatoes are stored at 7°C to 10°C, while table potatoes are stored at 6°C to 7°C (Liu et al., 1990).

Tubers should always be kept in the dark since very small amounts of light will gradually cause greening. Surface greening is due to chlorophyll formation and is harmless. However, its presence in potatoes is undesirable because of marketing restrictions and the fact that at times an alkaloid called solanine increases with the chlorophyll. Solanine and other glycoalkaloids cause potatoes to have a bitter, undesirable flavour (Liu et al., 1990). The present research determined the postharvest storage conditions that could prolong storage life of the harvested, Biozyme® produced ware potato tubers in the markets.

MATERIALS AND METHODS

Experimental potatoes were grown on the Horticultural Research and Teaching farm at Egerton University, Njoro. The farm lies at 0°23' South, 35°35' East and 2238 meters above sea level. The farm normally receives 908 to 1012 mm rainfall per annum and 15.6°C to 23°C temperature. The soils on the farm are well-drained sandy loam-vintric mollic Andosols (Jaetzold and Schmidt, 1983). Grade II certified Asante and Tigoni seed potato tubers, measuring 45 to 65 mm in diameter, were obtained from the Agricultural Development Corporation Potato Project Centre in Molo, Kenya. The experimental field measured 50 m by 20.8 m. Each main plot measured 23.5 m by 7.6 m and was subdivided into sub-plots, measuring 5.6 m by 3.5 m each. A 1-m path separated adjacent main plots and subplots. Main plots were assigned to potato cultivars Tigoni and Asante. Subplots were assigned to a control [0 ml/ha] and four rates of Biozyme® foliar feed, namely: 125, 250, 500 and 750 ml/ha. Tubers were planted at a spacing of 70 cm between rows and 30 cm within rows. Each experimental unit had 28 sprouted potato tubers in four rows. Data was taken on 10 inner plants with others acting as guard plants. Land preparation involved clearing of weeds followed by ploughing, harrowing and pulverizing of soil to at least 20 cm depth. Clods were broken to obtain fine, firm and weed-free surface for planting. Raised beds (20 cm from the ground level) were constructed in the fine soil before planting the tubers. Potato tubers were stored in a humid store with diffuse light to break dormancy and start sprouting before planting in the field. Dormancy was considered broken when sprouts, measuring 1.5 - 2.5 cm long were attained. Each rate of Biozyme® foliar feed was applied twice, at the 6th - 8th leaf stage and at flowering stage of potato plants, according to manufacturer's recommendation. A polythene sheet was erected between plots on the day of foliar-feeding to prevent drift to adjacent plots. All potato tubers were planted with 200 kg/ha (0.392 kg/subplot) DAP and 2.5 t/ha (4.9 kg/subplot) farmyard manure (Kabira, 2002), according to farmers' practice. They were foliar-fed with Biozyme® as previously described. Tubers were planted at a depth of 5 to 10 cm (Lung'aho et al., 2007) with dominant sprouts facing upwards for faster and uniform emergence. After establishment potato plants were weeded regularly up to 6 weeks after planting when they could suppress weeds. Ridging was done at two and four weeks after potato flowering to prevent greening of exposed tubers, infestation by potato tuber moths, and internal brown spot caused by high soil temperature (CIP, 2000). The final ridge size was 25 cm high (Lung'aho et al., 2007). Irrigation was done using drip tubes during early and late hours of the day to reduce evaporation. Plots were irrigated to maintain moisture content at field capacity, as potatoes are very sensitive to water stress after tuber initiation which coincides with when flowering commences (Gawroska et al., 1992; Thornton et al., 1996). Spraying was done to prevent late blight (*Phytophthora infestans*) using 3 kg/ha Ridomil in a knapsack sprayer of 15-litre capacity. Spraying was repeated twice a week under wet conditions. Insecticides Dimethoate and Alphacypermethrin, at 15 g/L and 100 g/L, respectively, were added to the fungicide whenever aphids, whiteflies, mites and other harmful insects were observed.After harvest, ware potato tubers were randomly selected from each Biozyme® foliar feed level. The harvested potato from each treatment was subjected to four postharvest storage regimes in the laboratory. The regimes were: Cured + Dark Storage, Cured + Room Storage, Not Cured + Dark Storage, and Not Cured + Room Storage. The laboratory experiment was arranged in split-split-plots in a completely randomized design, with 3 replications. Asante and Tigoni cultivars were assigned to main plots, Biozyme® foliar feed to subplots and postharvest regimes to sub-subplots.Each laboratory treatment had 80 blemish-free tubers. Potato tubers were placed in crates before storage. Cured + dark storage potatoes were kept at 15ºC to 25ºC, 90±5% RH and complete darkness. Cured + room storage potatoes were kept at 15ºC to 25ºC and 90±5% RH (Herbert, 2003) under room light conditions. Not cured + dark storage potatoes were placed under room temperature and humidity conditions but in darkness. Not-cured + room storage potatoes were left under room temperature, humidity and light conditions. Percentage weight loss was obtained by taking the difference, at two weeks interval, between the current weight and initial weights divide by the initial weight multiplied by 100. The percentage of rotten/decayed tubers was based on the number of decayed tubers over the total number of tubers multiplied by 100. Percentage shrinkage of tubers was determined by measuring the diameter using a veneer calliper from start of the research at two weeks interval. The diameter reading at the start was recorded and used as the reference for the subsequent measurements. The change in diameter was used to determine the percentage shrinkage. Firmness was measured using a manually operated penetrometer (Model 62/Dr, UK) and units kg m^{-2}**.** Sampled tubers were washed and peeled and a minimum of two penetration measurements per tuber were taken**.** Postharvest data were subjected to analysis of variance and where the F-test was significant ($P<0.05$), means were separated using the Duncan's Multiple Range Test (DMRT). Regression was done to establish relationships among variables.

RESULTS AND DISCUSSION

Influence of Biozyme® Rate and Postharvest Curing on Rotting of Potato Cultivars

Rotting of potato cultivars significantly increased with increase in Biozyme® foliar feed rate. The results were similar for the two seasons (Fig. 1). Averaged across cultivars and postharvest treatments, the 750 ml/ha Biozyme® had the highest rotting compared to the control treatment (0 ml/ha). Among the four postharvest treatments, Cured + Dark storage had the least percentage of rotten tubers as compared to other postharvest treatments (Fig. 2). All the three treatments showed an increase in rotting with storage time for the two seasons (Table 1). The interaction between Biozyme® rate and postharvest treatment showed an increase in rotting with increase of Biozyme® rate, while Curing And Dark Storage had the least rotten tubers in both seasons 1 and 2 (Table 2). The 750 ml/ha Biozyme® and Not Cured + Room Storage had the highest rotten tubers, while the 0 ml/ha Biozyme® and Cured + Dark Storage had the least rotten tubers in both seasons 1 and 2 (Table 2). Biozyme® increased succulence of the potato tubers as indicated by the increase in rotting with increase in Biozyme® rate. Curing + Dark Storage had the least rotten tubers in the two seasons and cultivars. The Not Cured + Room Storage regime had over 50% rotten tubers while the Cured + Dark Storage regime had less than 10% rotten tubers in the two seasons. The curing must have helped the tubers develop a barrier to rotting processes (Yan and Stark, 2000; Holley, 2003; Van Oischot et al., 2003). According to Hint (1992), it is difficult to store perishable crops under room conditions in the tropics because of high temperature and humidity that accelerate rotting processes. The high temperature and humidity provide fertile environment for spoilage microorganisms to thrive and cause rotting (Herbert, 2003; Holley, 2003). Therefore Biozyme® produced fresh potato tubers should be cured properly and stored under darkness to slow down rapid rotting (Yan and Stark, 2000; Holley, 2003; Van Oischot et al., 2003).

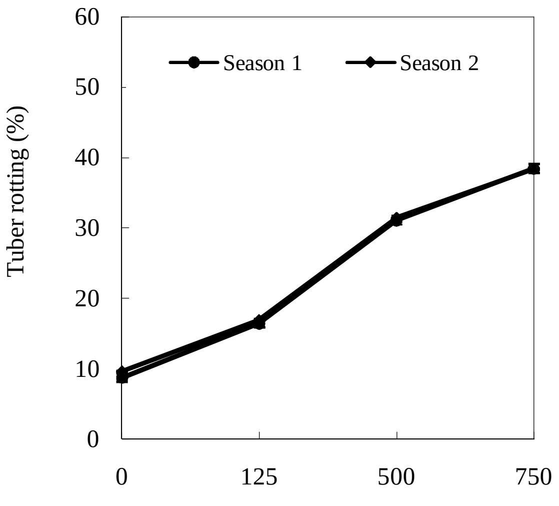

FIGURE 1: Influence of Biozyme® rate on potato tuber rotting

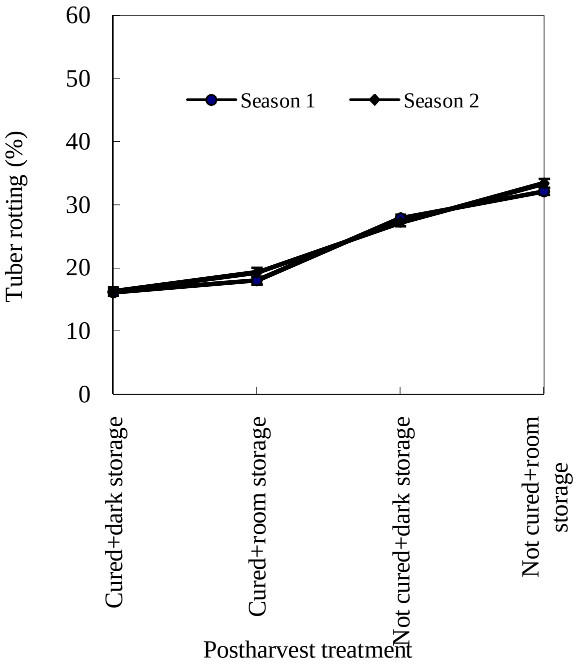

FIGURE 2: Effects of postharvest treatment on potato tuber rotting

TABLE 1: Percentage rotting of tubers across Biozyme® rates over time in storage

	Storage time (weeks)		
Season 1	2	6	10
‘Asante’	11.02c*	22.35b	39.68a
‘Tigoni’	6.38c	20.62b	40.90a
Season 2			
‘Asante’	8.32c	22.10b	45.26a
‘Tigoni’	6.52c	20.82b	41.17a

*Means followed by the same letter(s) within a season are not significantly different (P < 0.05) according to DMRT

TABLE 2: Effects of Biozyme® rate and postharvest handling on tuber rotting percentage

		Postharvest treatment			
Season 1	Biozyme® rate (ml/ha)	Cured + dark storage	Cured + room storage	Not cured + dark storage	Not cured + room storage
‘Asante’	0	6.33ef	7.11d	12.56fg	12.78de
	125	12.22cdef	13.33bcd	21.67def	23.89cde
	250	16.56bcde	19.00abcd	29.67cd	25.78cd
	500	23.56abc	21.67abc	40.11ab	44.44ab
	750	29.22a	26.00ab	46.44a	55.22a
‘Tigoni’	0	4.89f	6.22d	9.44g	10.33e
	125	7.78def	12.11cd	17.78efg	22.78cde
	250	16.78bcde	18.89abcd	26.67cde	28.89bc
	500	18.89abcde	23.56abc	33.44bc	42.78ab
	750	24.89a	31.89a	40.67ab	53.00a
Season 2					
‘Asante’	0	8.33e*	9.44ef	13.44d	14.33cd
	125	10.78de	14.89def	21.11cd	26.67b
	250	19.11bc	19.67cde	27.78bc	32.56b
	500	20.56abc	26.33abc	35.33ab	48.78a
	750	27.78a	34.67a	43.00a	50.00a
‘Tigoni’	0	5.78e	5.00f	10.00d	10.56d
	125	8.56e	11.56ef	18.11cd	23.44
	250	17.00cd	16.78def	27.89bc	30.44b
	500	18.78bc	22.89bcd	34.78ab	43.78a
	750	25.67ab	31.33ab	41.00a	53.33a

*Means followed by the same letter(s) are not significantly different (P < 0.05) according to DMRT.

Potato Tuber Firmness as Influenced by Biozyme® Rate and Postharvest Treatment

Average potato tuber firmness was significantly (*P*<0.05) decreased by Biozyme® foliar feed rate in seasons 1 and 2 (Fig. 3). The 750 ml/ha foliar feed had the lowest firmness, compared to control. When the firmness of the two cultivars was compared for postharvest treatments, a significant difference in firmness was observed, when averaged across cultivars and Biozyme® foliar feed rate (Fig. 4). The Cured+ Darkness Storage regime had higher firmness as compared to not Cured+ Room Storage regime (Figure 4). Tuber firmness decreased significantly over storage time in both cultivars and seasons (Table 3).

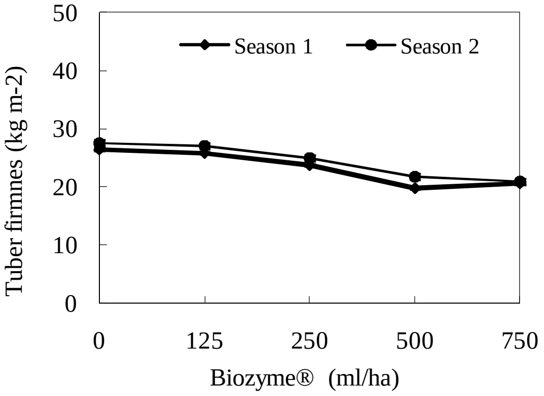

FIGURE 3: Effects of Biozyme® rate on potato tuber firmness

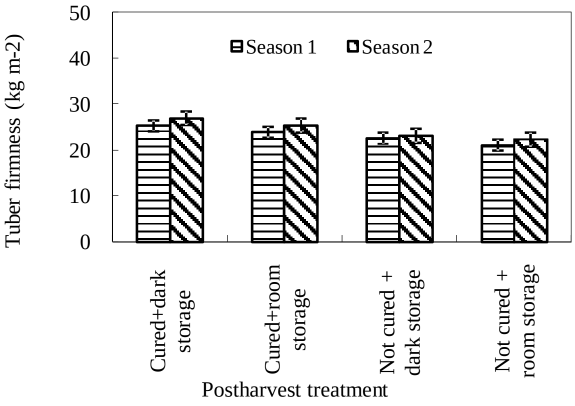

FIGURE 4: Potato tuber firmness as affected by postharvest treatments

TABLE 3: Firmness (kg m^{-2}) of tubers across Biozyme® rates at different storage times

	Storage period (weeks)	
Season 1	6	10
'Asante'	23.73b*	20.04d
'Tigoni'	26.44a	22.82c
Season 2		
'Asante'	24.86b	21.17c
'Tigoni'	27.67a	24.14b

*Means followed by the same letter(s) within each season are not significantly different ($P < 0.05$) according to the DMRT

The interaction between Biozyme® foliar feed rate and postharvest treatments indicated that when cured and stored in the dark Tigoni had the highest firmness as compared to under Not Cured + Room Storage regime, which had the least firmness in the same cultivar in both seasons (Table 4). Firmness was maintained by curing and storing potato tubers under darkness. Storage of potato tubers under room conditions probably resulted in excessive breakdown of dry matter, water loss and high respiration. These catabolic processes probably culminated in starch conversion into simple sugars thereby reducing firmness of tubers (Beukema and van der Zaag, 1990; Liu et al., 1990; Schaupmeyer, 1992; Yosuke et al., 2000; Lefort et al., 2003).

TABLE 4: Biozyme® rate and postharvest treatment effects on tuber firmness (kg m^{-2})

Season 1	Biozyme® rate (ml/ha)	Cured + dark storage	Cured + room storage	Not cured + dark storage	Not cured + room storage
'Asante'	0	27.23cd*	25.68b	23.22bc	21.58b
	125	25.83d	26.23b	23.68b	20.88b
	250	23.45e	20.18c	19.20d	17.83c
	500	22.5ef	20.78c	19.78d	18.75bc
	750	21.95ef	20.75c	19.23d	18.91bc
'Tigoni'	0	30.63a	29.17a	26.97a	27.00a
	125	29.08ab	27.50ab	26.70a	26.70a
	250	28.31bc	27.50ab	27.67a	25.93a
	500	21.05f	20.48c	18.82d	16.31c
	750	23.45e	21.25c	20.73cd	17.41c
Season 2					
'Asante'	0	27.58b*	26.32cd	23.02c	24.85
	125	26.63bc	26.38cd	25.33bc	23.85a
	250	24.48cd	24.13de	20.53d	16.93b
	500	23.35cd	22.36efg	19.67d	18.90b
	750	24.25cd	21.50fg	20.47	19.97b
'Tigoni'	0	32.50a	30.93a	28.08a	27.13a
	125	32.08a	29.13ab	27.08ab	26.37a
	250	31.07a	28.48bc	27.48ab	26.67a
	500	26.21bc	23.65ef	20.28d	19.07b
	750	21.88d	21.17g	19.25d	19.90b

*Means followed by the same letter(s) are not significantly different ($P < 0.05$) according to DMRT

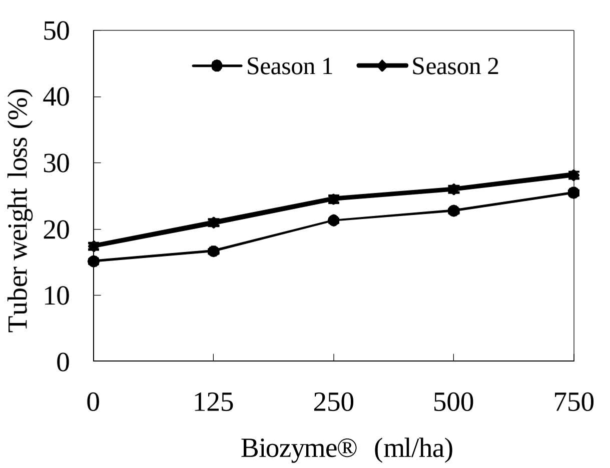

FIGURE 5: Percent weight loss of potato tubers as affected by Biozyme® rate

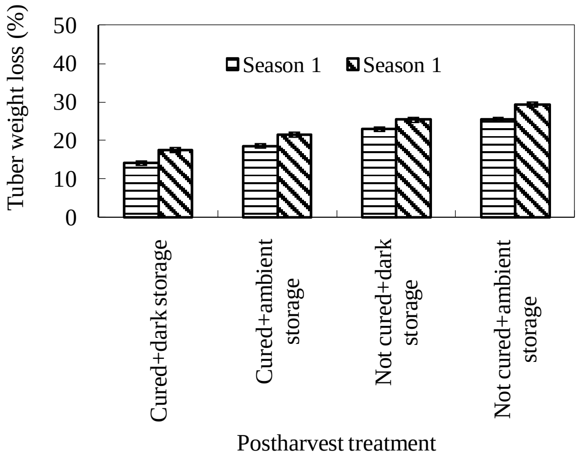

FIGURE 6: Effects of postharvest treatment on tuber weight loss percentage

Effects of Biozyme® Rate and Postharvest Treatment on Weight Loss of Potato Tubers

Potato tubers average percentage weight loss was significantly (P<0.05) increased by Biozyme® rate during storage. Seasons 1 and 2 had higher weight loss for 750 ml/ha Biozyme® rate compared to control (Fig. 5). Postharvest treatment significantly (P<0.05) affected the percentage reduction of weight of potato tubers during storage period. Cured + Dark Storage had the least weight loss, while Not Cured +Room Storage had the highest weight loss in the two seasons (Fig. 6). Comparing individual interaction between cultivar and postharvest treatment, Cured + Dark Storage had the least weight loss in the two seasons (Table 5). Weight loss was significantly different between cured and non-cured potato tubers. Beukema and Van der Zaag (1979) attributed stored potato tuber weight decrease to dry matter loss through respiration, water loss through evaporation, and rotting through fungal and bacterial infection. The present study agreed with that of Suhag et al. (2006), which indicated that loss of weight in potato tubers stored under room conditions without curing occurred due to respiration of the tubers.

Effects of Biozyme® Rate and Postharvest Treatment on Percent Shrinkage of Tubers

Average shrinkage of potato cultivars was significantly (P<0.05) increased by Biozyme® rate in seasons 1 and 2. When averaged across cultivars and postharvest treatments, the 750 ml/ha Biozyme® foliar feed resulted in the highest percentage shrinkage of 25.49 % and 28.18% in seasons 1 and 2, respectively (Fig. 7). Shrinkage significantly (P<0.05) increased with increase in storage time in both seasons 1 and 2 (Fig. 8). Percentage shrinkage was significantly (P<0.05) affected by the interaction between Biozyme® rate and postharvest treatment regime (Table 6).

TABLE 5: Effects of Biozyme® rate and postharvest treatment on percent tuber weight loss

	Postharvest	Biozyme® foliar feed rate (ml/ha)				
Season 1	treatment	0	125	250	500	750
‘Asante’	Cured + dark storage	9.02b*	10.38e	11.19cd	12.38c	14.60bc
	Cured + room storage	10.75b	12.42c	12.51bc	16.62b	17.11ab
	Not cured + dark storage	11.85b	12.34cd	14.38ab	21.66a	17.18ab
	Not cured + room storage	17.35a	15.93a	15.62a	16.10b	18.05a
‘Tigoni’	Cured + dark storage	8.46b	9.07f	8.92e	7.12d	11.08d
	Cured + room storage	10.14b	11.11de	10.25de	11.36c	13.60cd
	Not cured + dark storage	11.23b	11.04e	12.11cd	16.40b	13.67cd
	Not cured + room storage	16.73a	14.62b	13.35bc	10.84c	14.54bc
Season 2						
‘Asante’	Cured + dark storage	10.53de*	9.69de	10.01ef	8.71e	13.85de
	Cured + room storage	12.38abcd	9.97de	12.51abcd	15.61c	15.39cd
	Not cured + dark storage	13.74abc	15.13bc	14.72ab	20.76ab	20.78a
	Not cured + room storage	15.72a	20.12a	15.98a	20.80a	19.89ab
‘Tigoni’	Cured + dark storage	10.00e	8.05e	8.92g	7.12d	11.02f
	Cured + room storage	11.84cde	8.32e	11.04e	10.98de	12.55ef
	Not cured + dark storage	13.21abbc	13.49cd	12.11bc	16.15c	17.95bc
	Not cured + room storage	15.19ab	18.47ab	13.35	16.18bc	17.06cd

*Means followed by the same letter(s) within a column are not significantly different (P < 0.05) according to DMRT

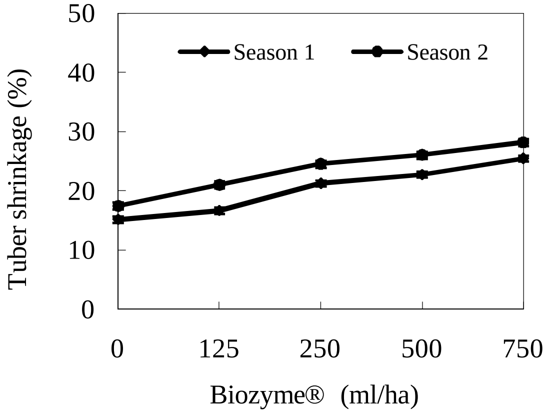

FIGURE 7: Potato tuber shrinkage as affected by Biozyme® rate

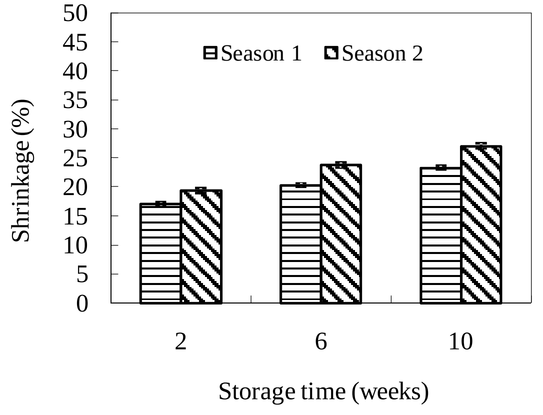

FIGURE 8: Effects of storage time on tuber shrinkage percentage

TABLE 6: Effects of Biozyme® rate and postharvest treatment on tuber percent shrinkage

		Biozyme® foliar feed rate (ml/ha)				
Season 1	Postharvest treatment	0	125	250	500	750
'Asante'	Cured + dark storage	10.37e*	9.69de	11.19cd	12.38c	14.59bc
	Cured + room storage	12.42c	9.97de	12.51bc	16.62b	17.11ab
	Not cured + dark storage	12.34cd	14.38ab	14.72ab	21.66a	17.18ab
	Not cured + room storage	15.93a	15.61a	15.98a	16.01b	18.51a
'Tigoni'	Cured + dark storage	9.07f	8.05e	8.92e	7.12d	11.08d
	Cured + room storage	11.11de	8.32e	10.25de	11.36c	12.55ef
	Not cured + dark storage	11.04e	13.49cd	12.11cd	16.39b	13.40cd
	Not cured + room storage	14.61b	18.47ab	13.35bc	10.84c	14.54bc
Season 2						
'Asante'	Cured + dark storage	14.05b*	17.82ab	23.13bc	20.37d	19.94d
	Cured + room storage	20.62a	23.34ab	21.11c	28.56abc	27.79bc
	Not cured + dark storage	20.88a	26.04a	28.76b	21.66a	37.44a
	Not cured + room storage	22.15a	24.70ab	40.79	30.09ab	41.01a
'Tigoni'	Cured + dark storage	9.04b	16.56b	10.49d	19.95d	11.08d
	Cured + room storage	11.24b	18.35ab	20.57c	22.43cd	21.65d
	Not cured + dark storage	20.43a	19.54ab	24.19bc	24.15bcd	23.05cd
	Not cured + room storage	21.14a	21.56ab	27.70bc	33.06a	31.38b

*Means followed by the same letter(s) are not significantly different ($P < 0.05$) according to DMRT

Cured +Dark Storage tubers had the least percentage shrinkage in both seasons and cultivars across all Biozyme® rates. Not Cured +Room Storage tubers had the highest percentage shrinkage in both seasons and cultivars across Biozyme® rates (Table 6). The interaction between Biozyme® foliar feed rate and postharvest treatment showed a decrease in percent shrinkage of potato tubers for the highest rate of Biozyme® subjected to curing and dark storage regime. Thus curing under high relative humidity was able to counteract rapid shrinkage in the otherwise highly succulent potato tubers for the highest rate of Biozyme®. Holley (2003) reported that high humidity (95%) during curing period is critical to prevent excessive shrinkage and to promote wound healing. This study has revealed that all the quality deterioration attributes (rotting, weight loss, shrinkage) of potato tubers were increased, while firmness decreased by the increase in Biozyme® rate. The deterioration was slowed down by curing the tubers and storing in the dark. The present study has revealed that curing at 15ºC to 25ºC and 90±5% RH of Biozyme® produced potato tubers is an important treatment before storage or marketing. Since curing and storing of the potato tubers under darkness results in minimal tuber rotting, weight loss and shrinkage by the 10th week in storage, we recommend farmers to cure and store the potato tubers under darkness to slow down premature deterioration.

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