Post-harvest treatment of taro corms to minimise biosecurity risks from plant-parasitic nematodes

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INTRODUCTION

Taro (*Colocasia esculenta*) is an important export crop for the Fijian economy and a source of income for people living in rural areas. Currently Fiji exports ~ 10 000 tonnes of taro annually to markets in Australia, New Zealand, and USA. Most of the taro is produced on small to medium sized farms and is sourced by suppliers who clean and pack the produce for export.

Soil dwelling and plant-parasitic nematodes (PPN) are often intercepted with fresh taro exports and can result in: mandatory fumigation; reshipment; or destruction of the consignment (1). Fumigation increases the costs and reduces the shelf life of the produce. The detection of nematodes in a taro consignment also increases the biosecurity clearance times which further reduces the shelf life and causes delays or disruptions in the supply chain.

In this study we evaluate the effectiveness of a commonly used postharvest treatment to minimise the biosecurity risks from nematodes on fresh taro.

MATERIALS AND METHODS

Fresh taro corms destined for export were sourced at a commercial cleaning and packaging house and the postharvest treatment experiments were conducted onsite. The corms were cleaned by hand, removing root, petiole, periderm (dark brown) layer and any propagative buds. The corms were washed in tap water to remove any soil on surface and placed in plastic baskets ready for packing (currently used treatment). **Dip treatment**: The cleaned corms were transferred to a 500 L plastic tub with 400 L of water mixed with 840 mL of 10% Sodium hypochlorite (NaOCl) to achieve 200 ppm available chlorine concentration (pH ~ 6-7). The corms were dipped in the solution for 5, 10, 15, 20, 25 and 30 minutes. The pH and available chlorine concentrations were monitored throughout the experiment. Random samples (N=100) were taken pre dip treatment and post dip treatment from the cortex layer of the corms and observed for the presence of nematodes. The number and type of nematodes recovered were recorded and data analysed using one way ANOVA. **Effect of Sodium hypochlorite on taro:** Taro samples pre dip treatment (N=10) and post treatment (N= 10) were stored at 10 ˚C for one week (similar to storage conditions for export) and evaluated for appearance, taste and aroma (2). **Effect of Sodium hypochlorite on nematodes (In-vitro):** Living PPN extracted from fresh taro corms were placed in glass cavity blocks containing NaOCl solution (200 ppm) and the effect on nematodes was recorded.

RESULTS

The number of nematodes recovered from taro corms subjected to NaOCl dip treatment was significantly lower than untreated corms. There was no significant difference in the average number of nematodes recovered after 5 and 10 minutes dip treatments (Table 1). After cooking, there was no difference in taste and aroma of treated and untreated taro. A slight bleaching effect was noted in the corms dipped for 15, 20, 25 and 30 minutes. There was no apparent difference in color of untreated corms and those dipped for 5 and 10 minutes.

Table 1. Effect of Sodium hypochlorite dip treatment on number of nematodes recovered from taro corms

Exposure time (min)	Number of nematodes (mean ±SE)
pre treatment	0.11 ± 0.04
5	0.04 ± 0.02
10	0.02 ± 0.01
15	0
20	0
25	0
30	0

The nematodes extracted included free living (37%), plant parasitic genera (34%), and bacterial feeding (29%). PPN exposed to NaOCl in-vitro, died after 1 to 17 minutes. Juveniles died within 1-2 minutes and were not recognisable after 5 minutes while vermiform adults died after 10-17 minutes.

DISCUSSION

The removal of periderm layer of taro corms followed by washing and dipping in NaOCl (200ppm) for 5 minutes, is an effective method for disinfecting ecto-parasitic nematodes associated with taro corms. Removing the taro periderm layer partly removes ecto-parasitic nematodes. Some nematodes still remain attached with soil sticking to the corms in small crevices therefore washing the corms after cleaning further reduces the numbers of nematodes. The removal of soil and surface debris, increases the efficacy of the subsequent NaOCl dip treatment. NaOCl is a strong oxidising agent, acts on nematodes present on the surface, rupturing their cuticle and causing death. The effect on endo-parasitic nematodes is yet to be studied however majority of the nematodes associated were ecto-parasitic or juvenile stages of endo-parasitic genera. NaOCl dip effectively reduces the number of nematodes and is widely used on fresh fruits and vegetables postharvest, to reduce the number of other microorganisms e.g. bacteria and fungi, reducing rot thus extending shelf life of produce (3). It is cost effective and can be adopted by taro packaging house to minimise biosecurity risks.

REFERENCES

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