

SHORT COMMUNICATIONS

MANAGEMENT OF ROOT KNOT NEMATODE (*Meloidogyne* SPP) IN GUAVA (*Psidium guajava*) BY USING DIFFERENT TYPES OF PLANTING MATERIALS

M.K. THANTIRIGE, C.K.D. WELLALA, S.D.R. WANNIARACHCHI,
M.S. KARUNARATNA and R.HEWAWASAM

Fruit Crops Research and Development Centre, Horana, Sri Lanka

INTRODUCTION

Guava (*Psidium guajava*) has become one of the leading commercial fruit crops in Sri Lanka. However, a severe infestation of root-knot nematode, identified as *Meloidogyne* spp. was reported to be a major threat to the crop cultivation. Nematode infestation in guava was found at all stages of the plant growth including the nursery seedlings. The initial indication of attack is the turning of leaves to yellowish colour, which subsequently turns to purplish red colour. The symptoms are similar to that of characteristic nutrient deficiency resulting in retardation of vegetative growth and stunted plants, especially in the nursery. Gall formation in the root system and a drastic decrease of productivity in bearing plants are also symptoms of nematode damage. Due to this infestation, plants will ultimately defoliate and die. Heavy crop losses due to root knot nematode infestation have been recorded in major guava growing regions in India (Logani *et al.*, 2002), Central America (El Borai and Duncan, 2005), Cuba, Puerto Rico and South Africa (CAB International, 2001).

Nematode infestation was also observed in guava fields at the Fruit Crops Research and Development Centre, Horana, Sri Lanka. There was a variation in incidence of nematode attack among plants, propagated by different techniques such as, air layering, seedlings and patch bud grafted plants. A high rate of survival was observed in bud grafted plants over those of layered plants. It is important to study the degree of infestation of plants raised by layering, seedlings and bud grafting as the outcome could be adopted in developing effective management strategies. Therefore, a study was conducted to find the effects of different types of planting materials on the nematode infestation and its control.

MATERIALS AND METHODS

Five different experiments were conducted at the Fruit Crops Research and Development Centre, Horana, Sri Lanka to investigate the impact of different types of planting material on nematode infestation.

Nematode infestation in layered guava

Layered guava var. Horana Red was established at a spacing of 4.5 m x 4.5 m in year 2009. The experiment was laid out in a Randomized Complete Block Design (RCBD) with 3 replicates, and 16 plants were established per block. Data on plant survival was observed at 2 months intervals.

Nematode infestation on patch bud guava varieties

Uniformly grown patch bud grafted plants (45-50 cm in height) of 4 guava varieties namely, Horana Red (HR), Horana White (HW), Kanthi (Ka) and Pubudu (Pu) were established in 2002 at a spacing of 4.5 m x 5 m in 4 blocks having 12 plants per block. The guava plants for this experiment were produced by patch bud grafting using seed plants of an open pollinated guava cultivar as the rootstock.

In 2004 another experiment was laid out using 5 different grafted plants [HR, HW, Ka and Pu grafted on to kanthi (ka), and Pu grafted on to Pu] with layered Pu plant, having 2 plants per block for a period of 6 years. The experiment was arranged in a RCBD with 2 replicates. In both experiments, observations on plant survival in each variety were recorded at 6 month intervals. Dead plants were uprooted and observed for the root knot nematode infestation.

Nematode infestation on seedlings of Pubudu variety

In 2008 December, an experiment was initiated to study the effects of nematodes on guava seedlings (Pu) variety. Twelve uniformly grown seedling plants of 30-45 cm height per block were established at a spacing of 5 m x 5 m. The experiment was arranged in a RCBD with 2 replicates.

Nematode infestation on inarched vs. layered guava

Four varieties (Pu, HR, HW and Ka) of inarched guava on root stocks of Horana Red (seed plants) were established and tested for nematode infestation. The experiment was laid out in a RCBD with 2 replicates. In each block, 3 inarched plants of same variety along with one layered plant (as the control) were established in a nematodes infested field in December 2009. Observations on plant survival and yellowing of foliage in layered plants were taken at 12 months after planting (MAP) and continued at 6 month intervals using a 0 (green) to 3 (yellow) scale.

All cultural practices were adopted according to the recommendations of the DOA. Soil samples of each experiment site were taken at 10-20 cm depth for testing of nematodes infestation.

RESULTS AND DISCUSSION

Nematode infestation in layered guava (Var. Horana Red)

Soils of all experiment sites were positive for nematode infestation. Out of 48 layered plants of variety HR, 2 % of the plants were infested with nematodes and died in 10 MAP (Figure 1). Root gall formation was observed on dead plants indicating that the layered plants of HR were susceptible to nematode attack.

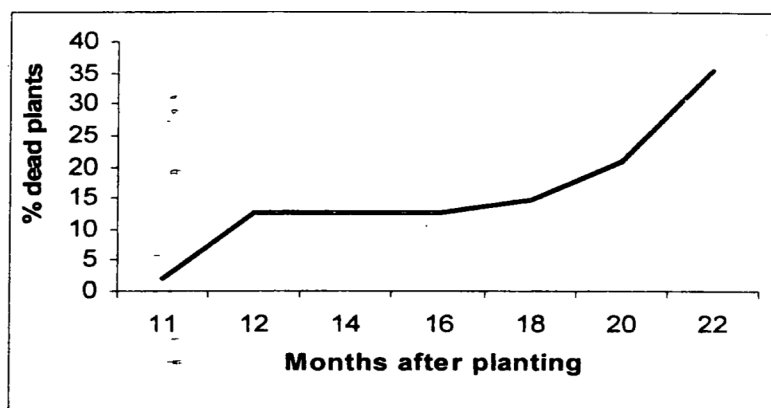


Figure 1. Percentage dead plants in layered guava (var. HR)

Nematode infestation on patch bud grafted guava

Patch bud grafted plants of HW, HR, Ka and Pu varieties with local rootstock of guava were not infected by nematodes up to 6-7 yrs after planting. Compared to the layered plants, grafts in this experiment had better longevity. Merida and Palmateer (2006) also reported that use of planting stock was the best control method for nematode in Florida. Seedling plants of Pu did not show any symptoms of nematode for 2 ½ years.

Nematode infestation on patch budded guava

Bud grafted guava plants have shown higher survival rate (50-100 %) over the layered plants (25 %) (Figure 2). Among the 2 root stocks tested, grafts on Ka seed plants were not infested by nematodes up to 6 years after planting (YAP) and thereafter only 25 % plants were infested. However, grafts on Pu seedlings were infested within 3 YAP with 50 % plant death (Figure 2). This suggests that the nematode susceptibility also differs between varieties of seed plants. However, due to cross pollination, genotypic characteristics of seed plants may vary between cultivars (Menzel, 1985).

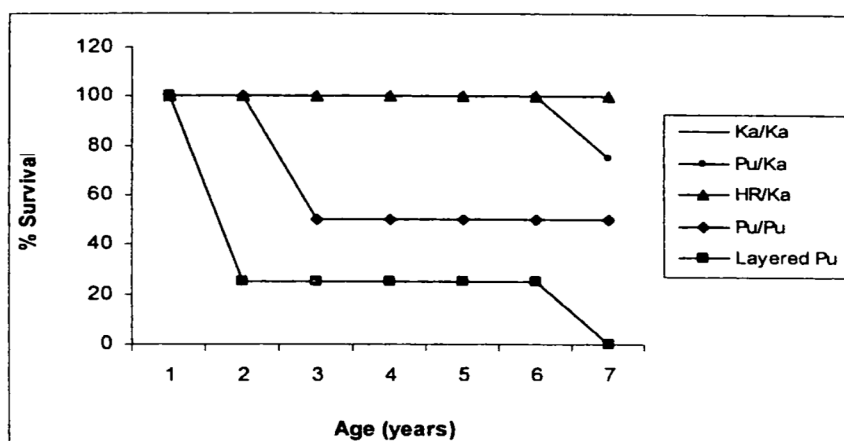


Figure 2. % survival of guava (Ka, Pu, HR and HW on Ka, Pu/Pu and Pu layers)

Layered plants were susceptible to nematodes from the initial stages of plant establishment (Figure 1). High susceptibility of layers may be due to its surface spread adventitious root system. It is reported that majority of nematode population concentrates on top 10-30 cm in the root zone. Density of nematodes decreases with increasing soil depth (<http://new.dpi.vic.gov.au>). Therefore, layers have a higher tendency to infest over the grafts, where the stock of the grafted plant has well developed deep tap root system. Therefore, grafts have a better chance of surviving than those of layers. Milan (2007) showed that guava propagated by seeds were less susceptible to nematode attack compared to vegetatively propagated layered guava.

Nematode infestation on inarched vs. layered guava

At 6 MAP, a significant yellowing of foliage along with nutrient deficient symptoms of purplish red color were observed in layered plants over the inarched plants (Table 1).

Table 1. Score for foliage yellowing of inarched & layered plants of 4 guava varieties (mean of 4 plants)

<i>Variety</i>	<i>Inarched plants</i>	<i>Layered plants</i>
HW	0.1	1.5
HR	0.1	1.1
Ka	0	0
Pu	0.1	1

Either layered plants of var. Ka or Ka grafted on to HR have not shown any leaf yellowing symptom. This may be a specific varietal characteristic (Table 1).

Guava propagated by inarching are still surviving with no plant death but 50 % plant died due to nematodes at 15 MAP (Figure 3). The root systems of the dead plants were damaged due to severe knot formation by nematodes.

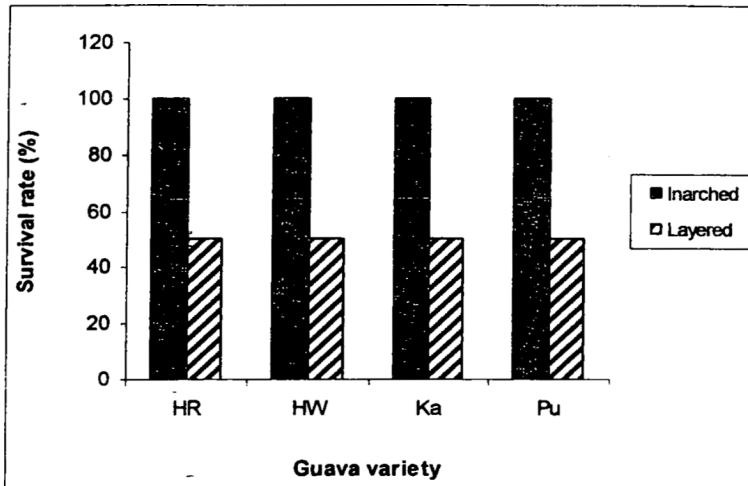


Figure 3. Survival rate of inarched and layered of 4 guava varieties

As well grown root stock plants of 13-15 months old (stem diameter 1.2-1.8 cm) were used for inarching, inarched plants grows well and get established earlier over those of bud grafts. Therefore, it may also be possible to overcome root knot nematode infestation in guava by using inarched plants as planting materials.

CONCLUSIONS

Irrespective of the variety of guava (Pu, Ka, HR and HW), the layered plants showed higher susceptibility to root-knot nematode infestation resulting in short life span of 1-1.5 years. However, seed plants were tolerant to root knot nematode infestation for a period of 2.5 years. There could be a varietal difference in guava for tolerance to root not nematode infestation. Bud grafted plants on any seed stock material exhibited high tolerance to nematode and survived long periods (7-10 yrs). Root knot nematode infestation in guava may be overcome by using inarched plants as planting materials. The grafted plants and seed plants having deep root systems may be used to minimize the widespread root knot nematode threat in guava.

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