Neem and Gliricidia Hedge Effects on Sweet Potato Production in the Caribbean

Andrea K. Veira and Francis B. Lopez

Department of Biological and Chemical Sciences, The University of the West Indies, Cave Hill Campus, Barbados

Introduction

SWEET POTATO IN THE CARIBBEAN : A FOOD SECURITY OPTION

- Sweet potato is commonly grown in the tropics and subtropics by small farmers (CARDI 2010).
- In the Caribbean, many varieties of sweet potato grow in varying conditions and withstand natural disasters like hurricanes. However, production levels are below potential because of high incidences of pest attack and poor agricultural practices (CARDI 2010).
- For sweet potato production regionally, Nitrogen (N), phosphorus (P) and potassium (K) are applied in an overall NPK fertilizer (CARDI 2010). Similarly, inorganic pesticides like Actara are applied.
- Excessive use of inorganic agrochemicals can be damaging to the environment and agroecological replacements are needed to safeguard the environment.
- Potentially useful plant species found throughout the countries of the Caribbean include *Azadirachta indica* A. Juss. (Neem) and *Gliricidia sepium* (Jacq.) Kunth ex Walp. (Gliricidia), which are known for insect-repelling and nitrogen-fixing properties, respectively.
- The use of Neem and Gliricidia as hedges (Fig. 1) grown with sweet potatoes (Fig. 2) can potentially reduce the need for and the quantity of inorganic fertisers and pesticides used in production.

Fig 1: Gliricidia and Neem Hedge

Fig 2: Varieties Growing In Field

Fig 3: Black Vine Variety With grub damage

Objective

- To investigate the use of *Azadirachta indica* and *Gliricidia sepium* hedges on yields, growth, tuber damage and soil components of two varieties of sweet potato.

Method

- A split-plot field study was conducted in Rivulet, St. Vincent & the Grenadines (Mar. – Oct. 2013).
- The main plots were: inorganic pesticide application(Actara, +/-) (3 reps)
- Subplots (20 m^2) of 2 sweet potato varieties (Black Vine, Lovers Name) were established on ridges at right angles to the hedges.
- Hedges were 0.5m tall and consisted of Neem and Gliricidia plants in an alternating pattern at 0.25m spacing.

Fig 4a: SPAD Meter (Spectrum Technologies Inc., USA)

Fig 4b: TDR 300 (Spectrum Technologies Inc., USA)

Fig 4c: Damaged Tuber of Lovers Name Variety

Observations

Measurements were taken during crop growth (every 2-3 weeks). These included:

- Chlorophyll Index (SPAD meter, Fig 4a (top most fully developed leaf)
- Soil moisture content (top 12 cm) measured with probe (Fig 4b.)

Measures were also taken after crop growth and harvesting:

- Final yield parameters and Tuber damage (Fig 3 and 4c)
- Soil nutrient levels (N, P, K) and organic matter content

Results

- Varietal differences in yield responses were observed in relation to distance from the Neem/Gliricidia hedge both for total (Fig. 8) and marketable yield (data not shown). Yield increased with proximity to the hedge for Black Vine but not for Lovers Name.
- The intensity of grub damage was reduced with the use of Actara and this effect increased as distance from the hedge increased (Fig. 9).
- Chlorophyll indices decreased initially and then increased with distance from the hedge with higher values observed for Actara treated plots furthest from the hedge (Fig. 10)
- Soil moisture content was reduced by the use of Actara and increased linearly with distance from the hedge (Fig. 11)
- Soil potassium levels (available) were higher in the Non-Actara treated plots (Fig. 12). There were no significant treatment effects on soil nitrogen and organic matter content for soil sampled after harvesting the crop (data not shown).
- For Non-Actara treated plots, available phosphorus levels increased with proximity to the hedge. No significant trends were seen in the Actara treated plots (Fig 13).

GRAPHS

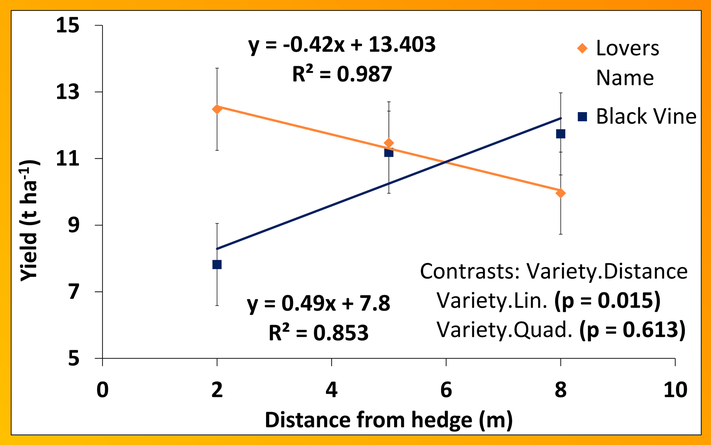

Fig. 8: Total Yields Of Black Vine and Lovers Name Tubers After Harvest

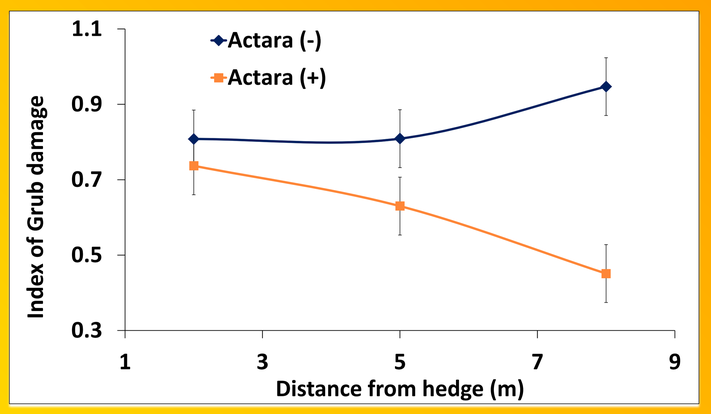

Fig. 9: Intensity of Grub Damage For Both Varieties

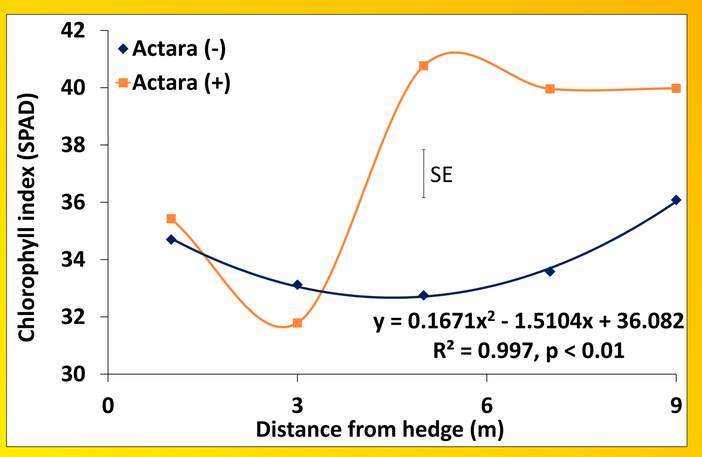

Fig. 10: Chlorophyll Indices For Lovers Name

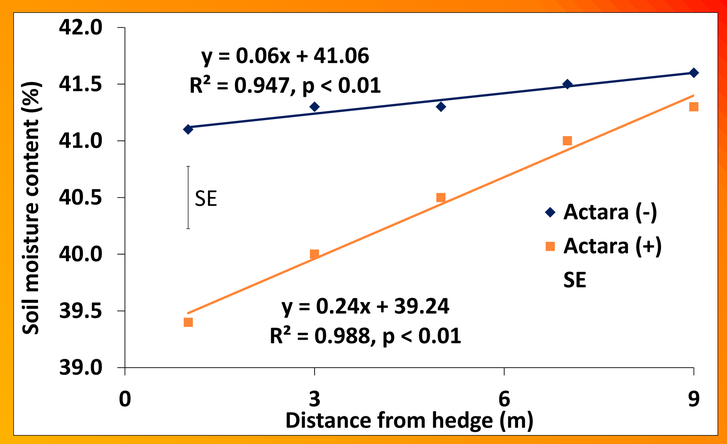

Fig. 11: Soil Moisture At 14.3 Weeks After Planting

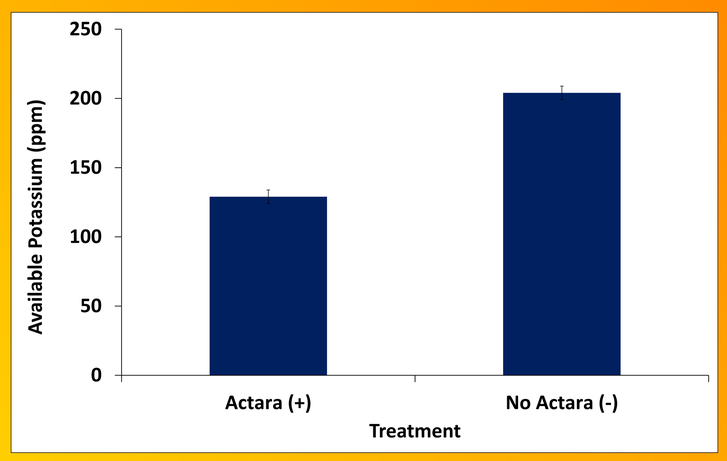

Fig. 12: Soil Potassium Levels (After Harvest)

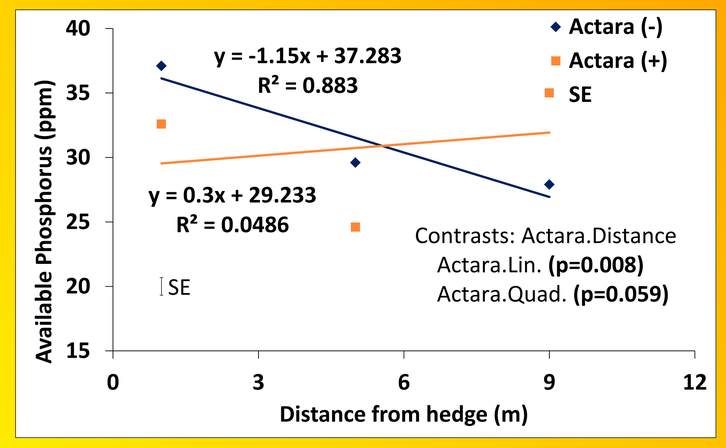

Fig. 13: Soil Phosphorus Levels (After Harvest)

CONCLUSION

- Varietal differences were observed in yield responses in relation to distance from the Gliricidia-Neem hedge. Yields were higher in close proximity to the hedge for Lovers Name but lower for Black Vine.
- At increasing distances from the hedge, Actara reduced the intensity of grub damage to tubers and increased leaf chlorophyll index.
- Soil moisture content was reduced by proximity to the hedge and was higher in non-Actara treated plots.
- Soil nutrient levels appear to have been affected by the use of Actara and distance from the hedge. Further work is needed to investigate these interactions.

REFERENCE

CARDI. 2010. Sweet potato technical manual: CARDI root and tuber commodity group. CTA, The Netherlands