Intercropping legumes for weed management and nitrogen fixation in organic papaya in Costa Rica

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Introduction

Papaya (*Carica papaya*) plantations on the Atlantic low lands of Costa Rica are affected by high humidity and temperature all year long, and several pesticide applications per month are required to control multiple pests, pathogens and weeds that thrive in such environment. The difficulty to control these organisms is highest in organic plantations and therefore new strategies are needed.

We carried out an experiment to evaluate the effect of cover crops on weed control, nutrient release and competition with papaya plants.

Methods

The study was carried out in 2014 in Limón, CR. Five week old papaya plants were transplanted into the field and a plastic mulch was used to control weeds for six weeks. Three legumes, *Vigna radiata, Crotalaria spectabilis* and *Pueraria phaseoloides*, were sown one week after the mulch was recovered. The control treatment consisted of the usual weed slashing implemented on the farm. A randomized complete blocks experimental design with two replicates was established, and five fixed sampling points were marked in each plot. Biweekly evaluations of percent cover of legumes and weeds, and papaya plants height, stem diameter, number of leaves and number of fruits were performed. Legumes were mowed 10 weeks after planting and foliar nutrient content, and legume and weed dry biomass were determined at that time.





Results

- *V. radiata* and C. *spectabilis* percent cover was 85% and 90%, respectively, 10 weeks after the cover crops were seeded (Fig 1)

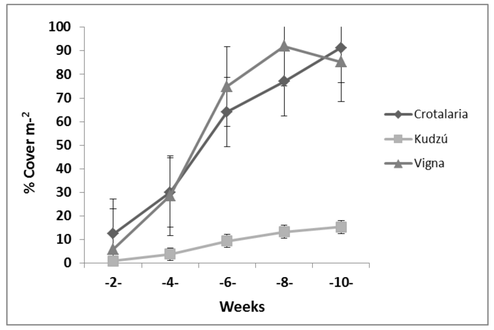


Fig 1. Percent cover of three legumes intercropped with papaya plants over a period of 10 weeks after planting.

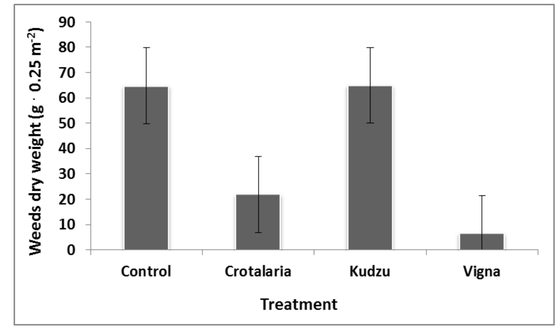


Fig 2. Mean dry weight of weeds in plots planted with one of three legumes and in the control plots.

- Weed aboveground biomass was 90% and 66% lower in the V. *radiata* and C. *spectabilis* plots, respectively, compared to the control (Fig 2).
- There were no differences among treatments of papaya plants height, stem diameter, number of leaves and number of fruits (Fig 3).

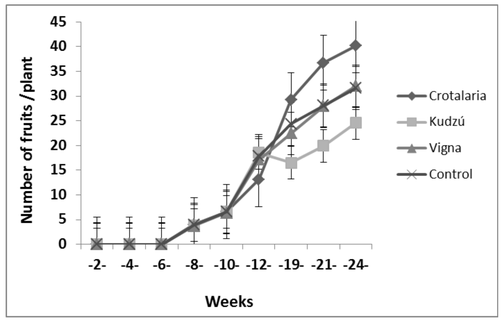


Fig 3. Number of papaya fruits per plant over a period of 24 weeks after legumes were planted (31 weeks after papaya plants were transplanted).

- Dry matter of V. *radiata* and C. *spectabilis* contained 3.1% and 4.9% N, which represented an estimated contribution of 70 and 181 kg N ha^{-1}, respectively.