Nematicidal potential of extracts and milled dry leaves of some selected plants against the root-knot nematode, *Meloidogyne incognita*.

By

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INTRODUCTION – 1/2

Meloidogyne incognita

- crop production losses in cucumber
- prevalent in greenhouses.
- exhibit slow development and are stunted.
- leaves become yellowish green to yellow, tend to droop, and wilting of the plants may occur.

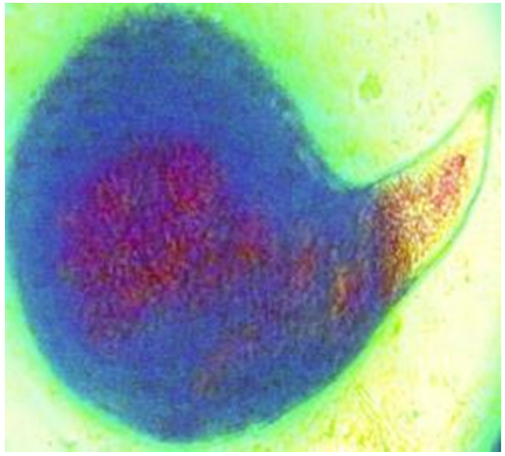


Plate 1A: Adult female of M. incognita

Plate 1B: Infected cucumber plant

Introduction -2/2

- The presence of root galls is the most characteristic symptom of root-knot nematode infection.
- Infected roots do not utilize water and fertilizers as effectively, leading to additional losses for the growers. Control of this nematode by chemical nematicides has been effective but: -they are costly to small holder farmers, causes ecological hazards and are environmentally unsafe

Plate 2a: Healthy roots

Plate 2b: Infected roots.

OBJECTIVES

- Investigate the potential of *Tithonia diversifolia* as a nematicide in comparison with other three selected plants to eggs and second stage juveniles of root-knot nematode and
- Assess the efficacy of these selected plants as alternative nematicides for root-knot nematode control in comparison with carbofuran, as a standard synethetic nematicide in cucumber.

Plate 2: The plants used A, B. C. D. *Tithonia diversifolia, Chromolaena odorata, Tagetes erecta and Occimum gratisimum*

Materials and Methods -1/5

- Experiment 1: *In vitro* studies on egg-hatch inhibition
- Root-knot nematode eggs extraction (Hussey and Barker, 1973).
- Preparation of Leaf extracts according Bharadway and Sharma (2007).
- Five concentrations (w/v) i.e 6.6, 10.0, 13.3, 16.6 and 20% each of T. *erecta, C. odorata, T. diversifolia* and *O. gratissimum.*
- 50 fresh *M. incognita* eggs were dispensed in each transparent glass block and one ml each of the concentrations of plant extracts was added.

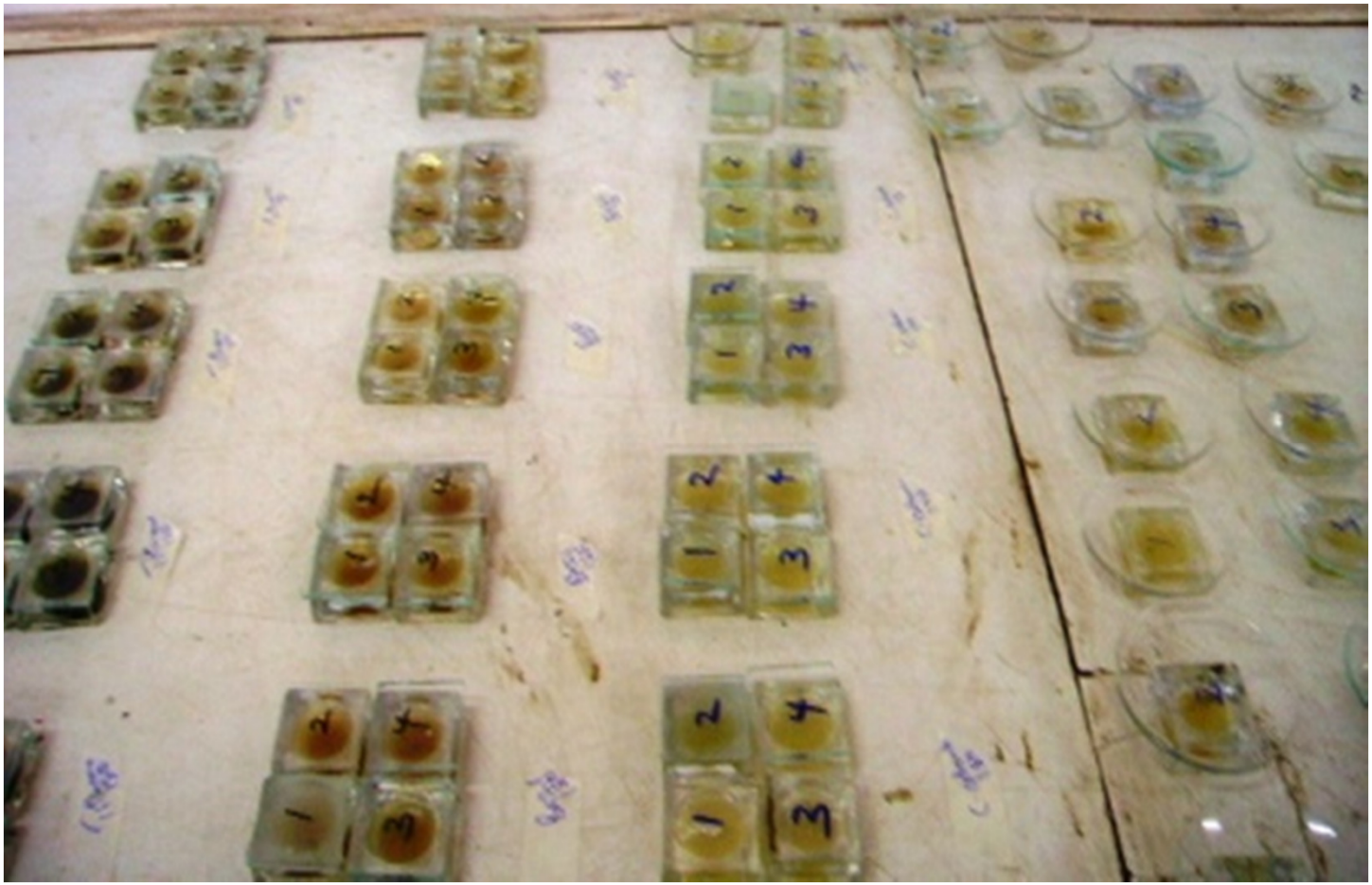


Plate 2: *In vitro* set up of the eggs hatched and Juveniles mortality

Methodology – 3/5

- Experiment 2: *In-vitro* studies on juvenile mortality.
- 50 freshly hatched *M. incognita* 2^{nd} stage juveniles were dispensed in each transparent glass block and one ml each of the various concentrations of plant extract was added.
- completely randomized with 21 treatments and four replicates.
- Lethal concentration (LC_{50}) on mortality were also determined.

Methodology – 4/5

- *In vivo* experiments
- Collection and drying of leaves
- 48 pots were each filled with 10 litre steam-sterilized soil.
- Forty (40) out of the 48 pots were treated with carbofuran at 1.5 and 2.5kg a.i/ha, and milled dry powder of each plant at 1 and 2t/ha.
- cucumber (Cv Marketmore) were sown in each of the 48 pots
- One week after germination, the seedlings were each inoculated with 10,000 *M. incognita* eggs except uninoculated control.

Data collection and Analysis

- Percentage Eggs Hatched and inhibition were recorded for ten days
- Nematodes were observed daily for eight days and the numbers of dead nematodes were recorded each day
- Gall index (GI), nematode reproduction and yield (g) were taken at the end of the trial.
- All data were analysed using ANOVA ($p=0.05$) and means were separated using Duncan multiple range test at 5% probability.

RESULTS

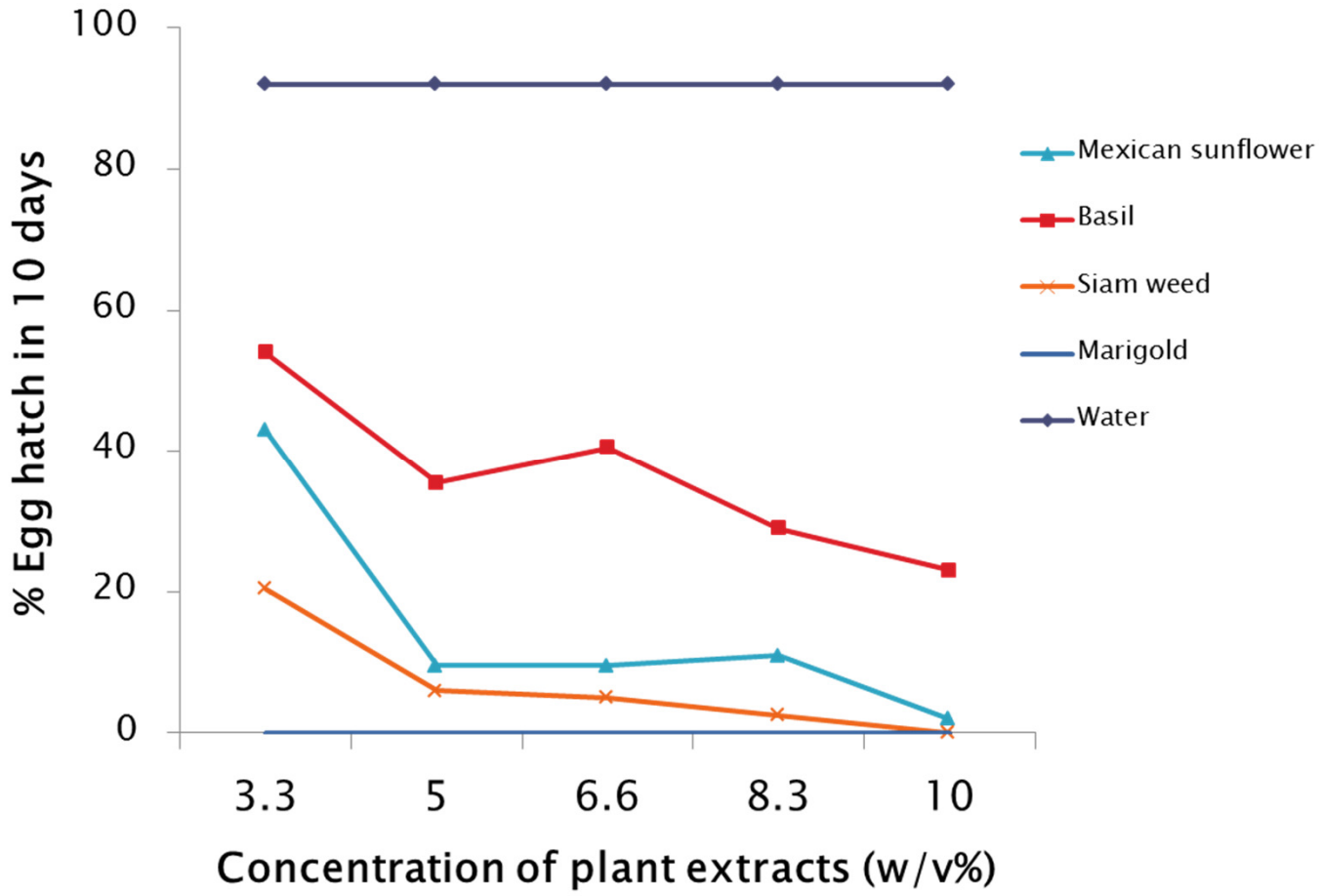


Fig 1: Egg-hatch of *M. incognita* in water extracts of Mexican sunflower, basil, Siam weed and Marigold leaves 10 day after exposure

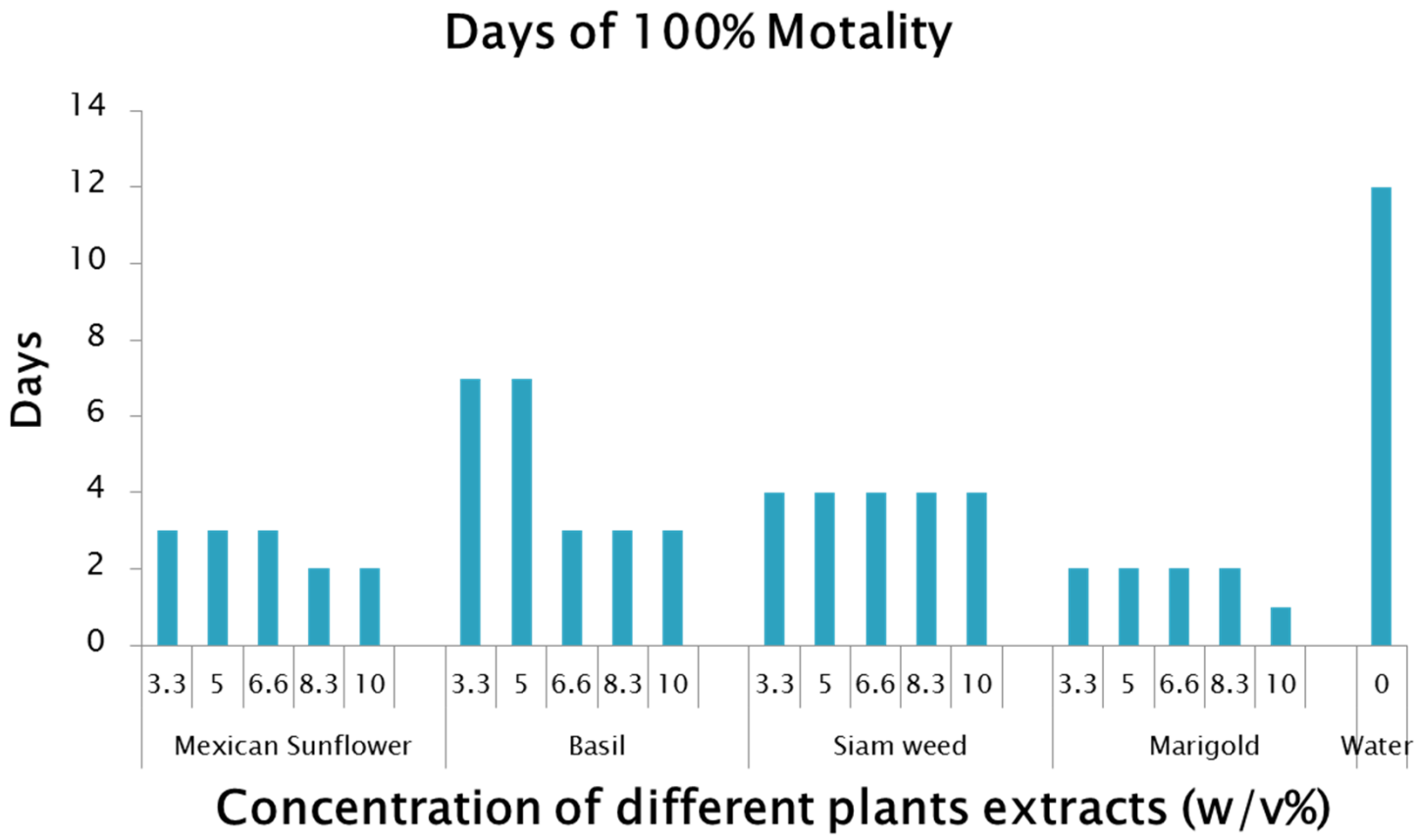
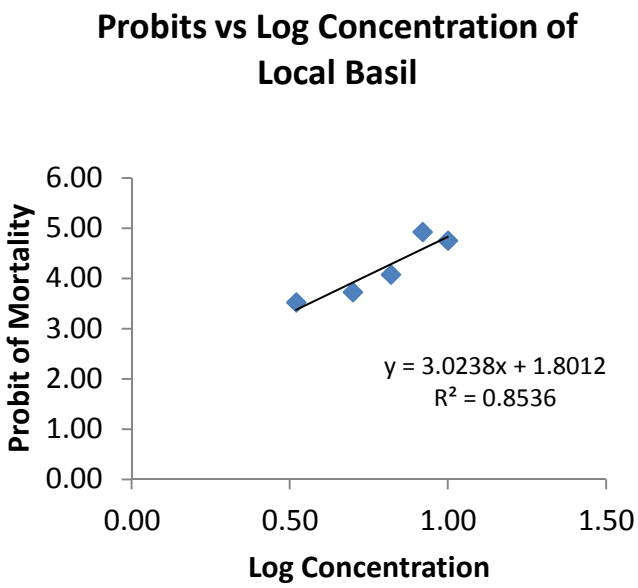
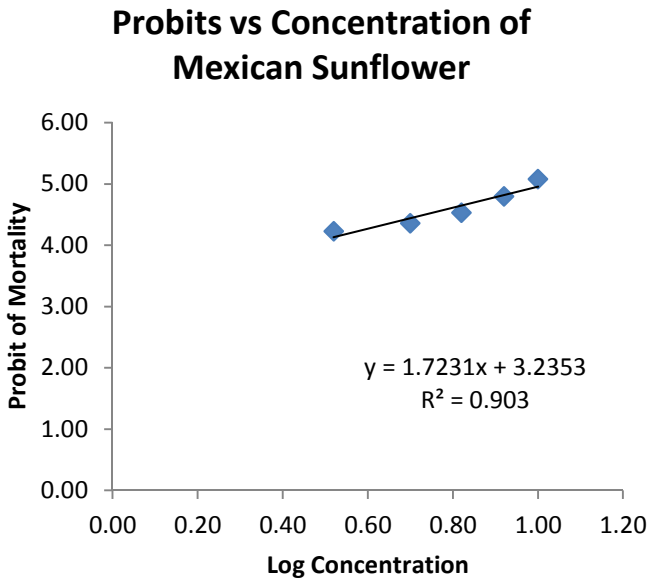
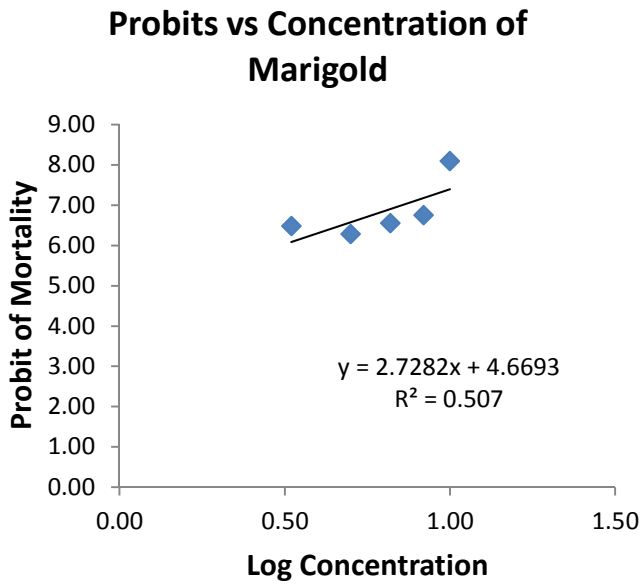


Fig 2: **: Days to 100% Mortality of 2nd stage juveniles of M. incognita after exposure to different concentrations of Mexican sunflower, Basil, Siam weed and Marigold leaves extract.**







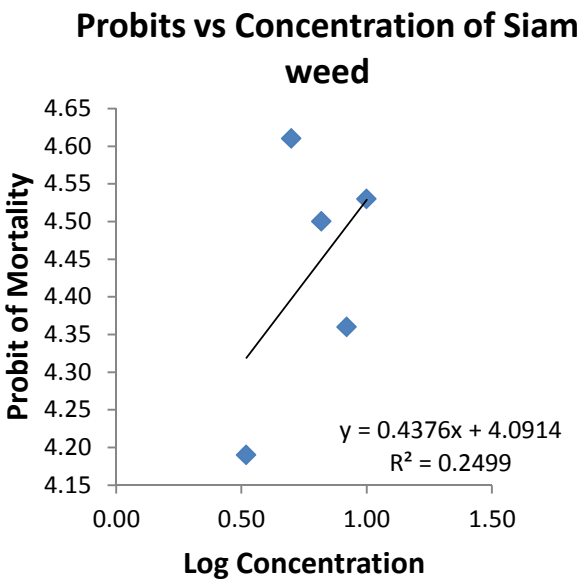


Fig 3: Probits vs Log concentration of the four plant extracts

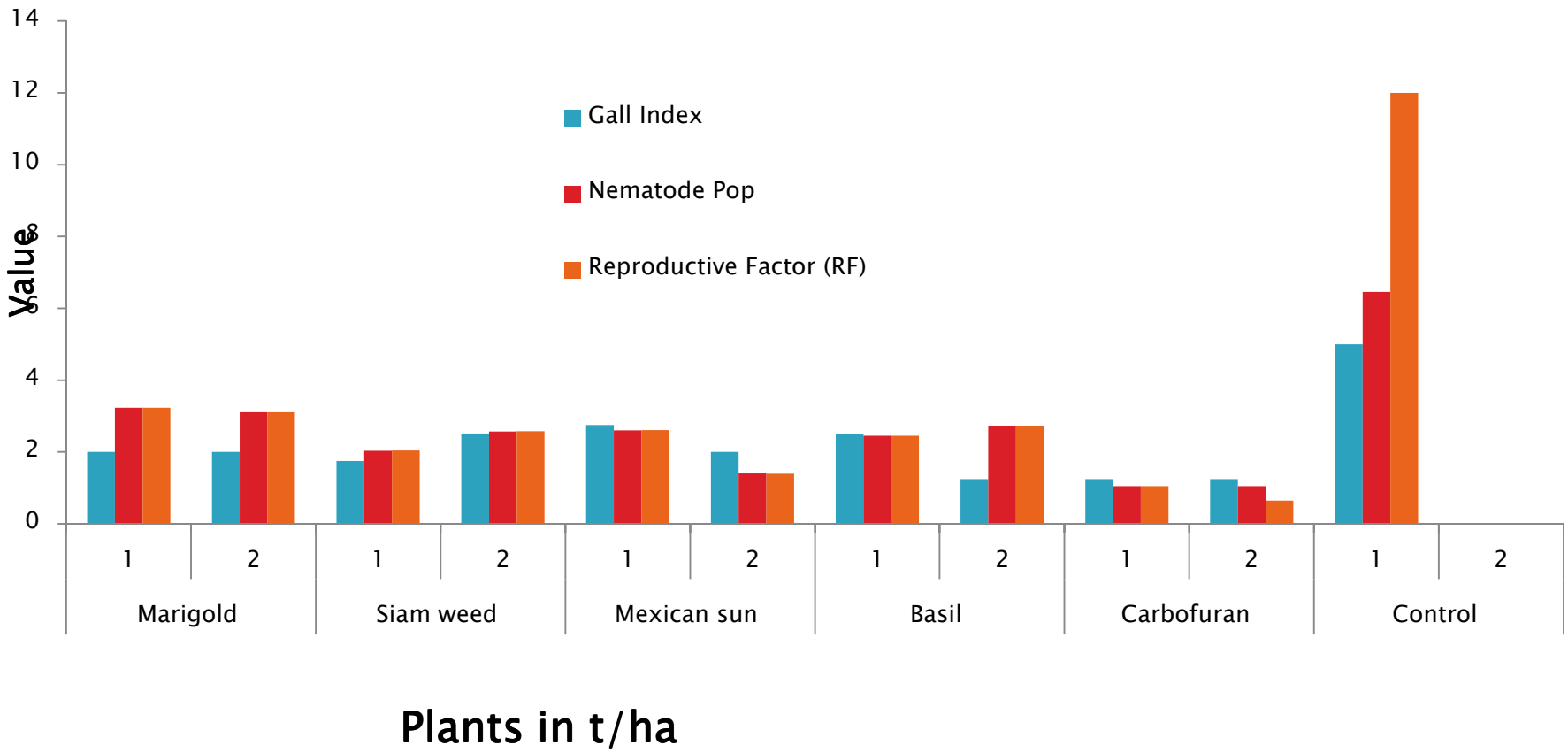


Fig 4: **: Effects of carbofuran, Mexican sunflower, Basil, Siam weed and Marigold on plant root damage and nematode reproduction on cucumber infected with *M. incognita***

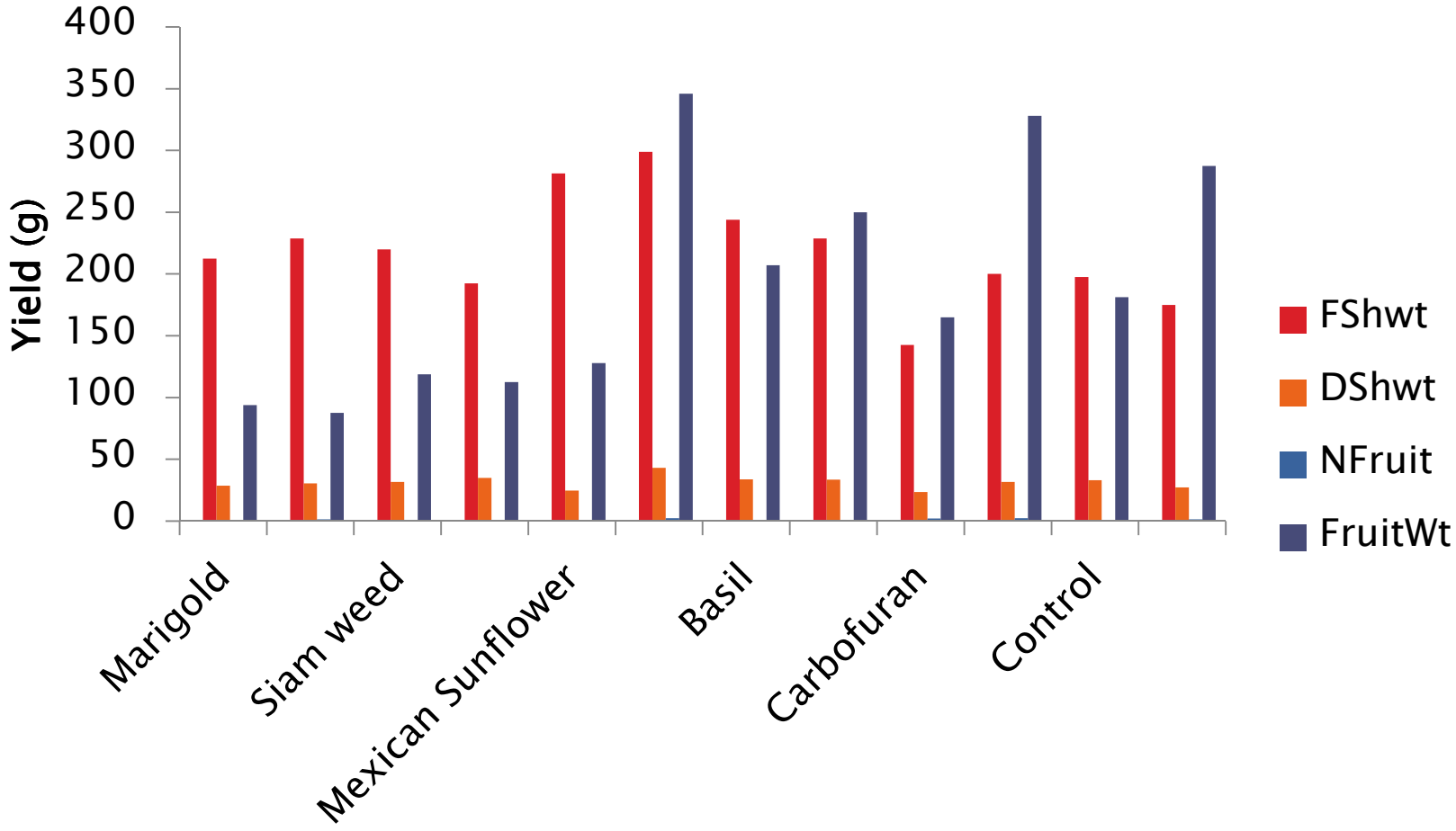


Fig 5: Effects of carbofuran, Mexican sunflower, Basil, Siam weed and Marigold on Yield of cucumber infected with *Meloidogyne incognita*

Discussion

- The extracts of all the plants tested were effective in inhibiting egg-hatch of *M. incognita* and survival of second-stage juveniles of the nematode at all the concentrations tested. Extract of marigold leaves was the most effective of all the plant extracts tested followed by Mexican sunflower, siam weed and tree basil.

Discussion Cont'd

- Effectiveness might be due to the presence of terpenoids, polythienyls, terthienyl and pyrethrins in marigold[1]

- Others include benzamide and ketones including benzylethanone[2].

Source: 1. Vasudevan *et al.*, 1997; Mya *et al.*, 2002; 2. Fatoki and Fawole (2000)

Discussion Cont'd

- The use of milled dry leaves of plants used showed a significant increase in yield of cucumber plants which was found to be associated with the increase in rate of application of milled dry leaves plants could possibly be due to reduction in nematode population. The plants also act as compost to the soil.

Conclusion

- Carbofuran and the plant parts were effective in reducing nematode population as well as root-knot infection. Marigold, Mexican sunflower and Siam weed competed effectively with this synthetic nematicide.

Conclusion

- In view of the above findings, farmers are encouraged to avail themselves of the opportunities offered by the nematicidal potentials of these botanicals in addressing nematode problem on their farm. These plants are found in abundance during the raining season, their leaves can be harvested, air dried and kept until they are needed. However, more studies are still required to translate these results to the field.

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