

Project Update: August 2019

Introduction

Parthenium hysterophorus (carrot weed) is an annual, procumbent, herbaceous flowering plant, which belongs to the family Asteraceae, an extremely diverse family with a cosmopolitan distribution. It has impacts on humans which are allergic rhinitis, bronchitis, dermatitis, hay fever, allergic eczematous and mental depression. Similarly, the impacts has been recorded in agriculture where sunflower (*Helianthus annuus*) and *Sorghum bicolor* grain yields have decreased by 40% and 95% when *P. hysterophorus* invasion was left uncontrolled in India while forage production has decreased by 92% in Ethiopia. This study aims at evaluating the socio economic impacts which *P. hysterophorus* has and how can it be controlled biologically (use of crude extracts and use of *Zygogramma bicolorata*).

Reconnaissance survey

Fifteen days' reconnaissance survey was done in Arumeru, Arusha Urban and Monduli districts in Arusha region to identify the level of infestation as far as *P. hysterophorus* is concern. Furthermore, the areas where beetles (*Zygogramma bicolorata*) was released were surveyed to see how they are feeding on *P. hysterophorus*.



Figure 1: Reconnaissance survey in Arusha Region.



Figure 2: Reconnaissance survey in the area where *Z. bicolorata* was released. © Warda Kanagwa, 2018.

Soil sample collection and characterization

In the 280 m² area at Tropical Pesticide Research Institute (TPRI) farms a total of five composite soil samples was collected in March 2019 and analysed to establish the initial soil fertility status. The soil samples were air dried and ground to pass through a 2 mm sieve and stored. The soil samples at The Nelson Mandela Institution of Science and Technology (NM-AIST) laboratory were analysed for soil pH, Electrical conductivity, Total carbon, Nitrogen, Potassium and Phosphorus.



Figure 3: Soil sample at Nelson Mandela Laboratory. © Warda Kanagwa.



Figure 4: Soil sample characterization at Nelson Mandela Laboratory. © Boniphace Mgassa

Land Preparation, Plots Layout and planting of *P. hysterophorus*

Twelve plots of 2 x 2 m, spaced at 1 m from each other were prepared in March 2019. *Parthenium hysterophorus* was planted and spaced at 1 cm within rows, and 1 cm between rows, making a total 25 plants per plot. Individual plots were covered with nets to ensure the beetles did not fly from one plot to another. The experiment was laid out in a completely randomized block design (CRBD), using beetles *Z. bicolorata* as a treatment at different population sizes (0, 10, 20, and 30 individuals per plot), replicated three times.



Figure 5: Land preparation and Plots layout at Tropical Pesticide Research Institute. ©Ramadhan Kilawe.

Zygomma bicolorata collection and introduction in plots

Adult *Z. bicolorata* were collected from the field on *P. hysterophorus* plants at Burka ward, about 18 km away from TPRI. Beetles were collected in April, during the rainy season, when *Z. bicolorata* were emerging after diapause. Beetles collected were placed in a plastic container (18×15 cm) along with leaves of *P. hysterophorus* and then were transported to the laboratory. Mated pairs of *Z. bicolorata* were identified then introduced in the plots.





Figure 6. Beetles collection in the field, identification in the laboratory, release and defoliation after 56 days.

Field Assessment in the area with and without Beetles

Survey was conducted in the area where *Z. bicolorata* was introduced and in the area where it was not introduced in April and May. We used transect and ten plots (3 x 3 m) was employed and a quadrant of 1 x 1 m was used and replicated four times. In the area where *Z. bicolorata* was released we recorded the number of *P. hysterophorus* eaten and its height, number of broad leaves, glasses and serge's while in the area without *Z. bicolorata* we recorded number of *P. hysterophorus* plant present and its height, number of broad leaves, glasses and serge's.



Figure 7. Field assessment in the area where beetles was released and where was not released

Powder preparation and application

Cassia auriculata leaves and barks, *Dovyalis caffra* leaves were collected from Mbuguni, King'ori, and Kikwe wards and transported at Nelson Mandela Laboratory. All samples were washed with distilled water and air dried at room temperature for 21 days, and separately ground using a mortar and pestle into powdery form. To ensure a homogenous mixture the powder obtained was sieved using 20 mesh diameter. 100 g of the crushed materials (stem barks and leaves) was soaked separately in a 1 l conical flask of distilled water for three days and filtered through Muslin cloth followed by Whatman filter paper no1.



Figure 8: *Cassia auriculata* and *Dovyalis Caffra* leaves extract and application.

Community perception and social economic impact

Four wards (Mbuguni, Murieti, Olasiti and Sepeko) were selected purposively for household interviews from April to July. It was followed by collection of introduction letter to the districts councils. Moreover, pastoralist and farmers who have lived in the area for at least 10 years were selected for interview. A semi-structured questionnaire was used to collect data that was comprise a set of open-ended and closed questions. Data were collected using ODK collect and a total of 123 farmers and 129 pastoralists were interviewed.



Figure 9: Household interview in Arusha Arumeru, Arusha Urban and Monduli districts Furthermore, I had Focus group discussion with Ward Executive Officer, Ward Agriculture Officer and Ward Veterinary Officer and other key informants.



Figure 10: Discussion with Ward Executive Officer, Ward Agricultural Officer, Ward

Veterinary Officer and other stakeholders

Challenges

Accessibility of an areas was a challenge during questionnaire data collection and due to that I decided to hire a motorcycle. Also, language barrier since to some communities especially the Maasai didn't understand Kiswahili, due to that I hired a translator.



Way forward

- Data analysis.
- Manuscript write up.
- Results dissemination in October.