Sub-theme:

Theme 5: emerging innovations in phytosanitary systems

Title:

Evidence of Natural Attack of Fall Armyworm, *Spodoptera frugiperda* (J.E. Smith) by Parasitoids and Entomopathogens in Southeastern Kenya

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Introduction

- Maize (*Zea mays L.,*) is an important cereal crop; human food, animal feed, and source of income
- The major staple crop grown in Kenya by small scale producers; adapted to almost all agroecological zones
- Consumed in various forms; Githeri, muthokoi, ugali, porridge
- Kenya's national food security has a strong relation to production of sufficient quantities of maize to meet an increasing domestic demand arising from a growing population.

Problem Statement

- Various management strategies applied in Kenyan farming systems against FAW; push-pull technology, organic bio-pesticides and synthetic pesticides.
- Losses continue to be reported & farmers are facing continuous challenges in managing the pest
- This has caused overdependence on synthetic pesticides (Murray *et al*., 2021).
- Due to risks associated with pesticide use, there is need to develop integrated pest management (IPM) strategies
- There is also need to document information on natural enemies associated with this pest, which is not well-documented in Kenya.

Justification

- Harsh environmental conditions in South Eastern Kenya; low food productivity, elevated levels of hunger & malnutrition
- Maize is one of the major staple crops grown in South Eastern Kenya ; potential to curb hunger
- Invasion by the fall armyworm (FAW) (*Spodoptera frugiperda*) has threatened its optimal production
- Need to develop sustainable FAW management approaches to manage pesticides use associated risks
- For development of IPM programs for FAW, it is Important to determine its current distribution and magnitude of damage & to develop an inventory of indigenous natural enemies that have naturally attacked FAW

OBJECTIVES

GENERAL OBJECTIVE

To assess evidence of natural attack of fall armyworm by parasitoids and entomopathogens in South Eastern Kenya

SPECIFIC OBJECTIVES

1. To assess the level of infestation and maize damage caused by FAW in South Eastern Kenya

2. To assess the occurrence of FAW and its natural enemies in South Eastern Kenya

Methodology

Period of study: February-June, 2020

Study site description

County	GPS Record
Murang'a	-1.0025E, 37.0475N
Machakos	-1.0133E, 37.8335N

Field selection

Establishment of quadrats (5*5m) in farmer managed fields

Data collection;

- Occurrence of FAW (egg masses, larvae, pupa)
- Level of damage: infestation & damage score
- Presence of natural enemies; parasitoid cocoons & FAW cadavers

Observations: Emerging parasitoids

Identification of natural enemies

Methodology cont'

Damage score; on a scale of 1-10 (Davis and Williams [1992] ;

Scale	*Description*
0	No visible leaf damage
1	Only pinhole damage on leaves
2	Pinhole and shot hole damage to leaf
3	Small elongated lesions (5–10 mm) on 1–3 leaves
4	Midsized lesions (10–30 mm) on 4–7 leaves
5	Large elongated lesions (>30 mm) or small portions eaten on 3–5 leaves
6	Elongated lesions (>30 mm) and large portions eaten on 3–5 leaves
7	Elongated lesions (>30 cm) and 50% of leaf eaten
8	Elongated lesions (30 cm) and large portions eaten on 70% of leaves
9	Most leaves with long lesions and complete defoliation observed

Data analysis

Level of infestation ;

% FAW infestation = (Number of FAW infested plants)/ (Total number of plants observed) ×100

Results

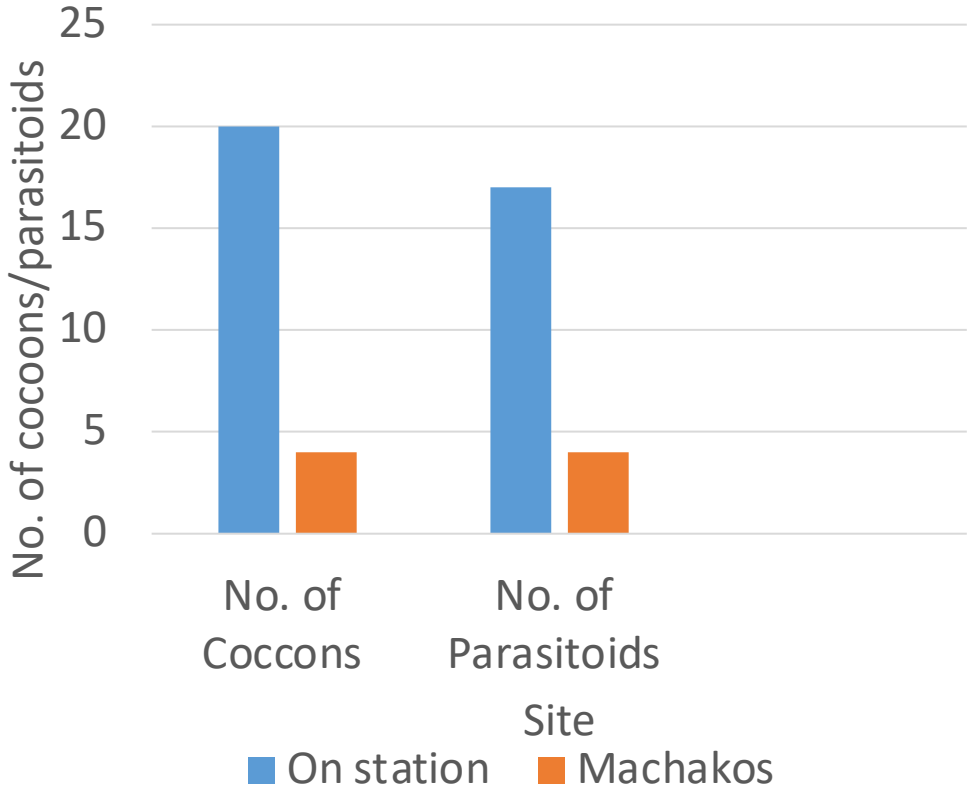
Assessment of infestations and damage of fall armyworms in the study sites

Site	Latitude	Longitude	Percentage infestations (%)	Leaf Damage Rating (score 0-9)
Machakos	1.0127	37.8331	63.43	6.22
	-1.0133	37.8335	59.90	3.6
	-1.0227	37.5007	48.89	7.12
	-1.0491	37.4794	40.23	4.89
On station (NSRC-KALRO)	-1.0025	37.0475N	72	6.67

Results cont'

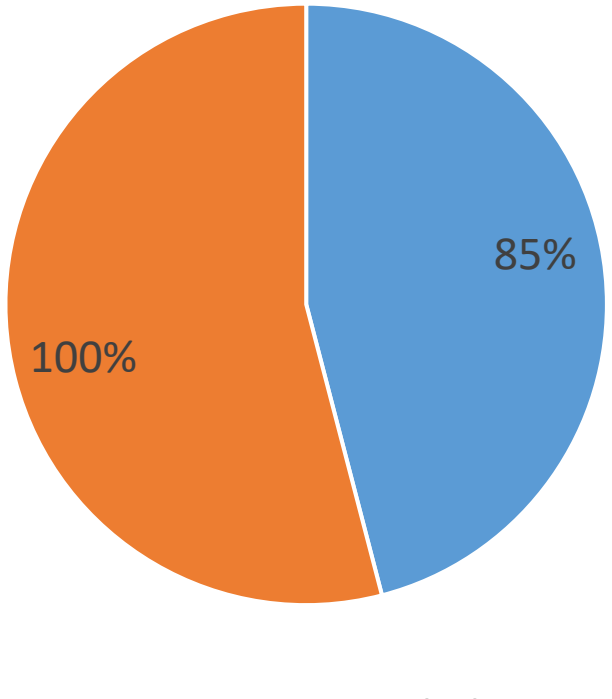
Occurrence of natural enemies of fall armyworm

- 9 parasitoids (8 larval and 1 pupal parasitoids)
- 3 entomopathogens species
- Larval parasitoids recovered from instar 2 and 3 stages of FAW
- Identified natural enemies; *Coccygidium luteum* (Brullé)(Hymenoptera: Braconidae), *Charops ater* Szépligeti (Hymenoptera: Ichneumonidae)
- Other natural enemies are under identification.

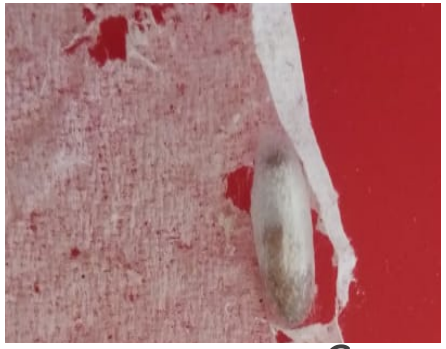


Analysis of number of cocoons formed, and emerged parasitoids

Results cont'



Charops ater
Cocoon (left) and adult (right)



Coccygidium luteum
Cocoon (left) and adult (right)

Results cont'

Larval parasitoids (under identification)






Pupal parasitoid (under identification)

Results cont’

Entomopathogen species 1 (under identification)

Entomopathogen species 2 (under identification)

Entomopathogen species 3 (under identification)

Conclusion

- The presence of parasitoids and entomopathogens strongly suggests that FAW can be ecologically contained below economic threshold levels by deployment of classical biocontrol (parasitoid based) system coupled with on-farm application of entomopathogens in an integrated pest management approach.

Recommendations

- Mass production and use of Larval parasitoids in the management of FAW
- Efficacy trials with entomopathogens against_FAW different instars
- Integration of larval, and pupal parasitoids and entomopathogens in development of IPM plan of the pest

Acknowledgements

Theme: *"Enhancing Phytosanitary Systems for Healthy Plants, Safe & Sustainable Trade"*

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