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Research Paper

Incidence of Tomato leaf miner (*Tuta Absoluta Meryick*) damage on Tomato fields in Pankshin and Kanke Local Government Areas of Plateau State

Ndor D. C

Department of Agricultural Technology, Plateau State College of Agriculture, P.M.B. 001, Garkawa

Email: dombinndor@gmail.com

Abstract

Pest invasion has been a descriptive phenomenon in nature, the consequence being ecological and economical negative effect in natural ecosystem of the area. In agriculture, introduced insect pest has a devastating effect on food production. Such a phenomenon occurred in villages of Pankshin and Kanke Local Government Area of Plateau State a key tomato production area, when boring/mining lepidophera lavae were found on aerial parts of tomato (solanum lycopersicum) plants in 2016 cropping season. A survey was carried out to determine the level of infestation of Tuta absoluta in farmers fields following a wide cry of devastation in the villages. The survey conducted using Completely Randomized Design (CRD) and data collected was transformed using square root transformation ($\sqrt{x+0.5}$). mean plant damage by pest in all tomato farms were scored to be between 8.63 and 9.47% in villages of Pankshin and about 8% in villages of Kanke. Good agricultural cultural practices such as crop rotation with non solanaceous crops, destruction of infested plants and post harvest plant debris etc and application of neem oil would help to control this pest.

Key Words: Tomato Leaf Miner, Incidence, Tomato, Survey, Damage

Introduction

Tomatoes (*Lycopersicum esculentum mill*) are among the most widely cultivated vegetable in Africa. They are grown for home consumption in the backyards of almost every homestead across Sub-Saharan Africa (SSA). They are an important source of vitamins and a cash crop for both small holders and medium scale commercial farmers.

Tomato yields in small holding cropping systems in the region are usually far below the potential of the crop. Averages yields as low as 7t/ha have been reported from Tanzania and those as high as 100t/ha have been recorded from commercial farms in Zimbabwe (Verala *et al*, 2003). There are several reasons for the low yields, among which are low quality seeds, non-availability of inputs, sub-optimum crop husbandry and a large number of pests and diseases. The major pests of tomatoe were identified as arthropod pests (red spider mites and russet mites) insects (fruit works, white flies, leaf miners and thrips) and diseases (early and late blights, bacterial wilt, *fusarium* wilt, bacterial canker and nematodes).

Despite a fruit, the tomato is generally categorized as a vegetable. Tomatoes are the major dietary source of antioxiding lycopene which has been linked to many health benefits including reduced risk of heart disease health benefits including reduced risk of heart disease and cancer. They are also good source of vitamin C, Potassium folate and vitamin K (FAO, 2012)

Tomatoes have a long standing history in human nutrition. Tomatoes compared to other fruits have the highest protein calorie ratio and it is the highest produce of vitamin per day. They contain vitamins and minerals as well as an assortment of phytochemical such as carotoids and natural phenols.

Water content of tomatoes is about 95%. The other 5% consist mainly carbohydrates and fibre (FAO, 2012)

The tomato leaf miner being its primary host is considered the most important tomato pests (Santos *et al*, 2011). Tuta absoluta become serious pests to tomato cultivation in Egypt since 2009 (Salama *et al*, 2015). This pest originated from south America and recently considered to be a serious threat to tomato production in the Mediterranean region. It's now widespread in Asia, Africa, Europe and Central America. The infestation of this pest has also been reported on potato (Caffariri *et al* 1999) and common beans. Both yield and fruit quality can

be significantly reduced by the direct feeding of T. absoluta and secondary pathogens that may enter through the wounds made by the insect (Santos *et al*, 2011) severely attacked tomato fruits lose their commercial value and 50-100% losses have been reported on tomato mainly under low rainfall (OEPP/EPPO, 2005).

The manace of *Tuta absoluta* had not been noticed in Nigeria before now. However in 2016 cropping season there was a wide reports of devastation of this pest all over the country and this study areas of plateau State in particular. Farmers in Pankshin and Kanke Local Government Areas earn their livelihood from rain fed tomato usually between may and July when fresh tomatoes are scares and costly. In the year 2016 there was an outbreak of *Tuta absoluta* in the country, a pest which was not known to the farmer causing damages of 50-100%.

The bulk of tomato production in Nigeria comes from Jos Plateau which covers the study areas. This study was aimed at investigating incidence of infestation by the moth and damage caused in tomato fields in Pankshin and Kanke Local Government Areas of Plateau State.

Tuta absoluta the tomato leaf miner is a devastating pest of tomato. It originated from South America and recently considered to be a serious threat to tomato production in the Mediterranean region and now wide spread in Asia, Africa, Europe and Central America. *Tuta absoluta* is a very challenging pest to control. Effectiveness of chemical control is limited due to insect nature of damage as well as its rapid capability of development of insecticide resistant strains (EPPO, 2005).

Biology of *Tuta absoluta*

Tuta absoluta has a high rate of reproduction. It has a cycle consisting of four different phases (complete metamorphosis) egg, caterpillar (Larva), Pupa, chrysalis and adult. There are about 10-12 generations per year. The total life cycle is completed within 30-35 days. The female adult lays about 40-260 eggs usually under the leaf of the shoot of young tender tomato plant. The egg takes up to six days to hatch depending on the temperature of the surrounding. Adults are hocturnal and hide between leaves during day time. Adults are 5-7mm long and with a wing span of 10-12mm. Eggs are small cylindering, creamy white to yellow 0.35mm long. The larva is cream in colour with characteristic dark head. The caterpillar destroys the tissue EPPO, 2005). *Tuta absoluta* can over winter as eggs, pupa or adults depending on environmental conditions. The larvae does not enter diapauses when food is available. The most important identifying character is the filiform (head like structure) antenna and black shots present in anterror wing.

Geographical Distribution

Tuta absoluta originated from South America. It is a serious pest in South America since the 80's and distributed in Argentina, Bolivia, chile, Colombia, Ecuador Paraguay, peru, uraguay and Venezuela (EPPO 2005).

Since the first detection in Spain in 2006 this pest is spreading rapidly across Southern Europe and North Africa to engulf the whole of Mediterranean countries. Until today the presence of *Tuta absoluta* has been reported in Italy, France, Malta, United Kingdom, Greece, Switzer Land, Portugal, Morrocco, Algeria, Tunisia, Libya, Ghana and Albania during last decade.

Nature of Damage

The larval period is most damaging period which is completed within 12-15 days. The caterpillars destroy the tissue of the plant or mine the leaves producing large galleries and borrow into the fruit, causing a substantial loss of tomato production. The larva geed on mesophyll tissues and make irregular mines on leaf surfaces. Damage can reach up to 100%.

Effects of *Tuta absoluta* results in the presence of irregular and discoloured pattern on the leaves

- The leaflets dry out.
- The mines in the leaves form whitish irregular spots covered with droppings.
- Larva nutritional activities on the stems and flower disrupt the development of organs and cause the flower and fruit to fall.
- General rotting and loss of fruits. This pest damage occurs throughout the growing cycle of tomatoes. The larvae are very unlikely to enter diapauses as long as food source is available. Tomato plants can be attacked from seedlings to mature plants. Infestations are food from epical birds, leaves, stems, flower, and fruits on which the blackface is visible (EPP, 2005).

Monitoring Methods for *Tuta absoluta*

Monitoring methods are observations, which are used to monitor the population of the pest to determine the right time for treatment and release of biological control agents. It involves the visual inspection of packing materials, seedlings and sampling in the field, the use of pheromone types and light types. Visual inspection of packaging material: the presence of the *Tuta absoluta* in packaging material can be suspected with the presence of chrysalis (Pupa) once suspected it is recommended to destroy or disinfect the material.

Visual inspection of seedling and sampling on the field: This involves regular checking of the tomato plant (host Plant). Especially underneath the leaves to look for signs of adult. Also random sampling can be done on the field to detect the presence of eggs mines and caterpillars.

Use of pheromones: these are chemicals secreted by an animal, especially an insect that affects the development of behaviour of members of the same species. They can be natural or synthetic. The synthetic pheromone can be used to attract adults into the traps.

Control Of *Tuta absoluta*

Tuta absoluta can be controlled using the following

Observation of the Plant on the Field or Nursery:

This involves the regular checking of plants on the field especially underneath leaves and fruits to check for eggs, mines, larvae or droppings. The infected leaves, stems are removed and burnt immediately or buried 50cm dip in the ground. In the nursery it is recommended to disinfect the ground. Also pheromone traps can be installed to reduce the population present.

Use of Plant Protection Products:

This involves the use of insecticides. Insecticide application should be done taking into account the counting of the pheromone traps. If thirty *Tuta absoluta* are caught in the trap in a week, the insecticide should be applied every ten days on the field. If no traps are used, the insecticides should be applied when one plant in five has a living larva. The choice of insecticide varies according to country's regulation. Some fairly effective insecticide applied by the sahel pesticide committee (June 2012 Version) includes: Abametion Indozacarb, and spinozad others includes: chlorfenapyr, limidachorid, emanmectim, benzoate and bacillus thumigiesis. It is worth noting that their effectiveness in sub-sahara requires checking.

Materials and Methods

Sampling:

The survey was conducted in a completely randomized designed (CRD) where eight farms constituted treatments and three villages the replicates. It was carried out in June 2016 cropping season. In each farm of the selected farms eight ridges were considered and ten plants were examined per ridge for data collection.

The number of plants infested was recorded on a specially designed form for data collection. Identification of moth and damage: To identify the moth and damage cused, a pictorial presentation containing the leaf miner on tomato showing eggs, larvae and also other pests was used (Verala *et al*, 2003). Infested parts of the plants were recorded through visual inspection. The insect was easily noticed because it prefers apical buds, flower, or new fruits on which also the blackfrass is deposited. This was carried in all he randomly selected forms in the two local government areas.

Statistical Analysis

Data collected was transformed using square root transformation ($\sqrt{x+0.5}$) according to Barletts Homogeneity Variance Test (Santos *et al*. 2011) transformed data was then subjected to analysis of variance (Anova) mean separation and difference were considered significant at $P<0.05$ level using SPSS software.

Results and Discussion

Results

In the survey, it was observed that the mean plant damage inflicted by the pest in all tomato fields was scored to be between 8.63 and 9.47% in villages of Pankshin and about 8% in villages of Kanke (Table 1 & 2).

Table 1: Percentage infestation of tomato leaf miner in Pankshin

Village	Percentage
Tazuk	9.49^{a}
Wolme	8.79^{ab}
Wokkos	8.63^{b}
SEM	**0.17***

Values followed by different letters mean that the differences were significant at P= 0.05

Table 2: Percentage infestation of tomato leafminer in Kanke

Village	Percentage
Wiye	7.98^{a}
Langshi	7.91^{a}
Shiko	7.91^{a}
SEM	**0.19^{NS}**

In table 1 infestation was significantly higher in Tazuk compared to those of Wolme and Wokkos which were statistically the same.

Infestations at Kanke were not significantly different amongst the villages (Table 2).

Table 3: Percentage damage to plant parts by tomato leaf miners in Pankshin

Village	Leaves (%)	Fruits (%)
Tazuk	5.55[b]	5.60[a]
Wolme	7.10[a]	4.55[a]
Wokkos	5.23[b]	4.78[a]
SEM	0.18*	0.23

Value followed by same letters are not significant at P=0.05

Table 3 indicated that the attack on leaves was significantly higher (P<0.05) in Wolme compared to Tazuk and Wokkos Infestation on fruits was not significantly different in all village at 5% level of significance. Infestations on leaves were generally higher than on fruits.

Table 4: Percentage damage of plants parts by leaf miner in Kanke

Village	Leaves (%)	Fruits (%)
Wiye	5.62[b]	8.40
Langshi	7.60[b]	8.70
Shiko	7.00[a]	8.74
SEM	0.15*	0.12[NS]

Percentage damage on leaves was significant among villages at Kanke (table 4). Damage at Shiko is significantly higher than at Wiye and Langshi. Damage on fruits in all the villages were same statistically (table 4).

Discussion

Field observation indicated that tomato plants were attacked at any developmental State. Leaves were more attractive than other parts of the plant. As also reported by Salama *at al*. (2015) such attraction was for the purpose of egg hatching and feeding. After hatching young larvae penetrate tomato leaves, stems or fruits on which they feed and develop (OEPP/EPPO, 2005). Infestation is characterized by conspicuous mines and galleries. (Chidege *et al*, 2016) Fruits are attacked as soon as they are formed creating room for pathogens to invade the fruit. This secondary infection is capable of causing fruit rot. Both fruit yield and quality can be significantly reduced by the direct feeding of the pest and secondary pathogens.

Records have shown that neighbouring countries of Ghana, Libya and Algeria have recorded occurrence of this pest from where it has entered into the country (OEPP/EPPO, 2005).

The ability of the moth to fly for a distance of 0.4km over night as recorded by Salama *et al*, (2015) points to the ability of the moth to move from place to place. It has also been observed that the larvae are more attracted to tomato as a preferred host compared to other host such as black light shade, egg plant or potato (Salama *et al*, 2015).

Conclusion and Recommendation

This was the first occurrence of the moth at an economic threshold population which has not yet been established for the pest in Nigeria being a new entrust.

It has a high rate of reproduction and it noctorual in life style, making control a serious challenge. Elsewhere, observations of the pest on the field or in the nursery, use of plant protection products and biological control have been suggested as control methods (Wyckhuys, 2013). Integrated pest management approach is being developed to control *Tuta absoluta*. Other suggested control methods includes cultural practices such as rotation with non solanaceous crop, ploughing, adequate fertilization, irrigation destruction of infested plants and post harvest plant debris, phytosanitory measures such as importing plant materials and fruits of tomato from countries where *Tuta absoluta* occurs should be certified free from the pest (EPPO, 2005). It is therefore, recommended that in Nigeria a close monitor be made on the occurrence of this insect every season. Studies should be conducted on establishing economic threshold populations on tomato in order to recommend appropriate time of action.

Reference

Antonio Cesar Dos Santos, Regiane Christina Oliveira De Freitas Byeno Simone Silva Viera. A Denay De Freitas Bueno (2011). Efficiency of Insecticides on *Tuta absoluta* (Meyrick) and other Pests in Pole Tomato. *Bio Assay*: 6:4

Caffarini Pim, Folcia A. M., Panzandi S. R. and Perez A. (1999). Incidence of Low Levels of Foliar Damage Caused by *Tuta absoluta* (Meyrick) on Tomato *Bulctin de Sanided Vegetal Plagas* 25:75-78.

Chidege Manno, Shakil Alzaidi, Nayem Hassan, Abisgold Julie, Elialilia Kaaya, and Sheila Mrogoro, (2016). First Record of Tomato Leaf Miner *Tuta absoluta* (Meyrick) *Ecologia Balkania* Vol. 7, Issue 2Pp 35-44.

FAO, (2012). Growing Greener Cities in Africa: Five Status Report on Urban and Semi Urban Horticulture in Africa. Rome Food and Agriculture the United Nations

OEPP/EPPO (2005) European Plant Protection Organization Data Sheet on Quarantine Pests *Tuta absoluta* Bulletin OEPP/EPPO – Bulletin 35: 434-435.

Wyckhuys K, Bordat, D, Desneuxm N. and Quintero I.S.F. (2013). New Pest and invasive Diseases: *Tuta absoluta* Meyrick.

Verala A. M.; Seif, A. and Lohr B. (2003) A Guide to IPM in Tomato Production in Eastern and Southern Africa. The International Centre of Insect Physiology and Ecology

(ICIPE) Ed A Ngeny – Mengech ICIPE Science Press Nairobi Kenya.