

Red Spider Mite, *Tetranychus Urticae* Koch (Arachnida: Acari-Tetranychidae): A Threatening Pest to Potato (*Solanum Tuberosum* L.) Production in Eastern Ethiopia

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Abstract

Following the outbreak of a spider mite infestation on the main season of 2014 on potato at Haramaya district, field surveys were undertaken in August 2014 and 2015. The field surveys covered the districts Fedis, Grawa, Haramaya, Jarso, Kersa, Kombolcha and Meta of eastern Ethiopia. The 2014 result revealed that the pest was confined only in Haramaya district. A similar survey conducted in August 2015 revealed the geographic expansion of the pest to other areas of eastern Ethiopia, viz., Dire Dawa Administration, Kersa, Kombolcha and Fedis districts. The spider mite, which is commonly known as red spider mite, was identified as *Tetranychus urticae* Koch (Acari: Tetranychidae). This is the first record of the pest infesting potato (*Solanum tuberosum* L.) in Ethiopia. In addition to potato, the pest infested tomato, cucumber and other *Solanaceous* weeds growing within and around potato fields. It was observed that the pest causes quantitative crop damage by sucking the plant fluids. The pest develops very rapidly on potato plants causing quick leaf-fall and death of the infested plants. Farmers were unable to manage the pest with the conventional agricultural pesticides available on the local markets. This preliminary field survey warrants that the red spider mite would be a threat to potato production in Ethiopia unless apt research efforts are made and management strategies are developed to fight against this devastating pest.

Keywords: Eastern Ethiopia, infestation, potato, red spider mite, *Tetranychus urticae*

Introduction

Potato (*Solanum tuberosum* L.) is an important crop in Ethiopia. The area under potato production in the country was about 66,745 hectares with an average national yield of 11.7 tons per hectare (CSA 2014). The eastern highlands of Ethiopia, mainly Fedis, Grawa, Haramaya, Jarso, Kersa, Kombolcha, Kurfa Chelle

and Meta are the major potato producing districts (Bezabih & Hadera 2007). The area under potato production in East Hararghe Zone was 2,207.12 hectares with an average yield of 19.3 tons per hectare (CSA 2014).

However, the production of the crop is constrained by several biotic and abiotic factors. Among the abiotic factors are

unfavorable climatic conditions and soil physico-chemical properties; and biotic factors limiting the crop productivity are low yielding potato cultivars, insect pests, and plant diseases. The major insect pests of potato include cutworms (*Agrotis* and *Exigua* spp.), red ants (*Dorylus* sp.), potato epilachna (*Epilachna hirta*), metallic leaf beetle (*Lagria vilosa*), potato aphid (*Macrosiphum euphorbiae*), green peach aphid (*Myzus persicae*) and the potato tuber moth (*Phthorimaea operculella*) (Bayeh & Tadesse 1992; Ferdu *et al.* 2009). Among these insect pests, the potato tuber moth gained more attention than all the other potato insect pests (Ferdu *et al.* 2009).

In August 2014, however, farmers from *Finkile*, *Tinike* and *Tuji-Gebissa* areas of Haramaya district, eastern Ethiopia, reported heavy infestation of their potato crop by unidentified pest. Also, the pest heavily infested larger areas of potato fields in the district. Following this incident, agricultural entomologists and plant pathologists from Haramaya University visited the infested potato farms and performed diagnosis of the pest and its pest status or situation under field and laboratory conditions. Damaged leaves were visually examined and the pest was identified as red spider mite [*Tetranychus urticae* Koch (Acari: Tetranychidae)]. It is also known as two-spotted spider mite (TSSM).

The TSSM is a ubiquitous species, present worldwide on a wide variety of plants (Helle & Sabelis 1985). This pest has more than 1200 species of host plants of which more than 150 are economically important (Zhang 2003). TSSM prefers feeding on the underneath of the leaves (Reddall *et al.* 2004). Spider mites use stylets to pierce plant cells and digest the

cellular contents (Riley 1989). The chloroplast within the cells is removed and continued feeding causes a stippled-bleached effect and later, the leaves turn yellow, grey or bronze (Riley 1989). Large population of the spider mite can destroy whole plants, resulting in complete yield loss (Stavrinides & Hadjistylli 2009).

The researchers felt that the pest might be infesting other potato-producing districts in eastern Ethiopia and considered that such information might help to alert farmers about potato production and the economic consequences that may accrue from the infestation if timely measures are not taken. Taking the economic importance of the pest into consideration, an exhaustive field survey was carried out with the specific objective to determine the occurrence, geographical distribution and host plant ranges of the pest in the major potato growing districts of eastern Ethiopia.

Materials and Methods

Field surveys and collection of specimens

Field surveys in major potato-growing districts of eastern Ethiopia were conducted in August 2014 and 2015 (Fig. 1). In each district, five to six potato growing farmers associations with highest potato production statistics and that were proximal to the road were purposely selected for the surveys. Geographical coordinates of the surveyed locations were also recorded using GPS. Coordinates were then mapped using ArcView software to determine the geographical distribution of red spider mites in eastern Ethiopia. During the surveys, potato

plants were examined visually as well as aided with magnifying glasses at different growth stages of the crop.

The incidence of the red spider mite was carefully examined by randomly taking ten plants from each field using a 10X hand lens for the presence or absence of mites. Pictures of spider mite infested potato plants and damaged fields were taken with digital camera. Plants found within and nearby infested potato fields were also inspected for possible infestation by red spider mites. Whenever found infested, names of such plants were recorded. In the areas where red spider mites were observed, informal discussions were held with farmers and development

agents on the probable sources of infestation.

Samples of adult red spider mites were collected and placed in plastic vials half filled with 70% ethyl alcohol. About 50-80 red spider mites were collected in a vial and were sent to the International Center of Insect Physiology and Ecology (ICIPE), in Nairobi, Kenya, for authoritative identification. Geographical coordinates of the surveyed locations were also recorded using GPS. Coordinates were then mapped using ArcView software to determine the geographical distribution of red spider mites in eastern Ethiopia.

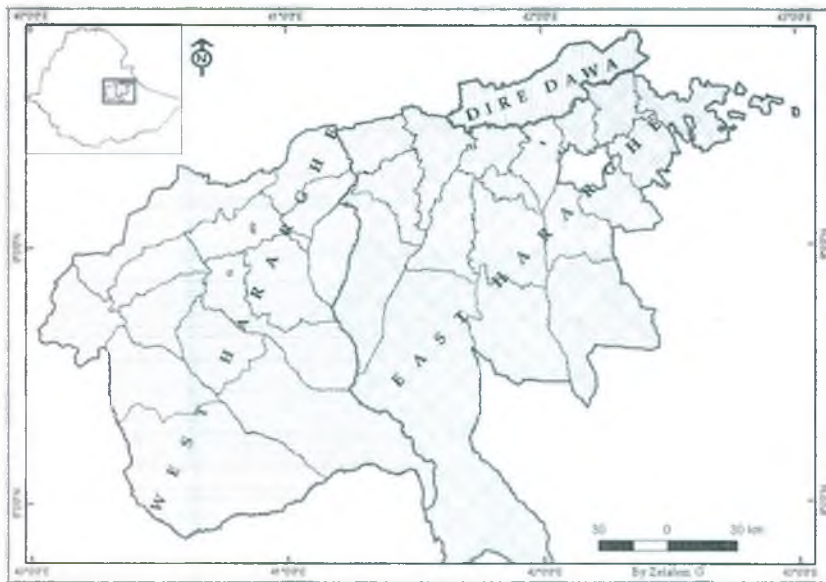


Figure 1. Map of eastern Ethiopia showing districts in field surveys for tracking red spider mite

Alternate host plants of red spider mite

The red spider mite infested field horticultural crops, like tomato and cucumber, beside potato. The pest was also found inhabiting khat (*Chata edulis*) and maize, thereby indicating that it would be a threat to other cultivated crops in the near future. During the survey the pest was also observed while infesting other Solanaceous weeds like *Datura stramonium* and *Solanum elaeagnifolium*. The plant species *Melia azedarach*, known for its insecticidal properties (Carpinella 2002), was also found heavily infested by the red spider mite. *Tetranychus urticae* is a major pest of rose flowers in commercial farms (Belder *et al.* 2009). In fact, *T. urticae* was earlier reported on pigeon pea (Tsedeke 1987) and tomato (Gashawbeza *et al.* 2009) in the country.

Potato is a cash crop for farmers of eastern Ethiopia as there is a potential regional domestic and export market to Djibouti and Somalia (Bezabih & Hadera 2007). The major potato-producing districts in eastern Ethiopia were infested with red spider mite, primarily being reported from Haramaya district. The pest mite is, therefore, a potential serious threat to potato production in this part of the country. Currently, red spider mite is restricted to eastern Hararghe but could expand its geographical range to other parts of Ethiopia if timely measures are not taken to curb the rapid expansion.

Agricultural extension experts, development agents and farmers need to be alerted and trained on the identity and damage symptoms so that they can detect the infestation by the red spider mite pest as early as possible. Novel and integrated

pest management (IPM) compatible acaricides need to be identified or screened for use as integral components of the pest management options. Recommended miticides need to be applied in rotation as part of an IPM scheme to avoid the development of resistance. Moreover, emphasis on the sustainable management of the pest and research attention should be given to the required level through integration of all available options for effective management of the pest population, including use of biocontrol agents and cultural management like crop hygiene.

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