Society of Overseas Nepalese Entomologists (SONE)

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Recent Havoc on Tomato Crop by Invasive Leaf Miners in Nepal and No Management Options Available to Small Scale Growers

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Tomato in Nepalese Statistics

Tomato (*Lycopersicon esculentum* Miller) is ranked third most important vegetable in Nepal after cauliflower and cabbage in terms of area and production. It grows very well in Terai, and lower basin and middle parts of the hilly/mountainous regions of Nepal. According to Nepalese agriculture statistic, about 20-30 thousand hectares are planted every year to tomato and; it yields 2-3 million metric tons of tomato a year. Nearly 40 % of total tomato production is used for home consumption and 60 % for sale. It is estimated that about 3,000 farmers are commercially involved in tomato cultivation in Nepal.

Tomato is an integral part of Nepalese food cuisines since it reaches to every Nepalese household kitchen regardless of economic status and ethnicity. In Nepal, it is used for multiple purposes including fresh, salad, chutney, cooked vegetable and processed. Because of rich in nutrient and vitamins, tomato is known as poor man's apple in Nepal.

Invasion Story of Tomato Leaf Miners to Nepal

A serious tomato insect pest commonly known as leaf miner or South American tomato moth, *Tuta absoluta* (Lepidoptera: Gelechiidae) worldwide, recently debut in Nepal. This insect species prefers tomato as a major host plant though it has broader host feeding ranges on solanaceous crops (e.g., potato, egg plants), wild plants and weeds. *Tuta absoluta* is a highly troublesome insect pest to tomato plants and fruit.

In a global scale, this pest was first time reported in 1960s in South America followed by 2006-2010 in European and Mediterranean regions, and 2014-2016 from South East Asia. Tomato leaf miner was first time detected in 2016 in Kathmandu and its vicinity (Dhading, Kavre, Bhaktapur and Lalitpur), and these locations maybe considered for the entry point of this pest in Nepal. Although it remains unclear about route of invasion, this pest is most likely invaded to Nepal from India as it was reported there in 2014; and Kathmandu imports tomato from India to fulfill the market demand.

Within a short span of time (2016-2019), tomato leaf miner has invaded other commercial tomato production areas of Nepal including Terai (Dang and Banke districts) and hilly (Kaski, Shyanja, Chitwan, Palpa, Arghakhanchi, Salyan and Pyuthan districts) regions of Nepal which are major tomato growing districts in Nepal. According to International Development Enterprise organization, the pest invasion areas estimated 25-30 % tomato yield loss. There is a great threat of spread of this pest to other parts of the country especially the Terai and other mid-hill regions where tomato is a major vegetable and source of income to farmers. The pest will have a great impact on small and commercial farmers as tomato is major vegetable in terms of production, consumption and market value in Nepal.

Life Cycle of Tomato Leaf Miners

The nocturnal moth has life-cycle comprising: egg, larva, pupa and adult. The insect has a high reproductive potential. The females lay about 250

eggs during their lifetime on aerial parts of host plants. After hatching, the young larvae penetrate leaves, aerial fruits and stems on which they feed and develop. The larvae has four instars and the larvae do not enter diapause if food is available. Pupation may take place in the soil, on the leaf surface or within mines, depending on environmental conditions. When the miner does not pupate in the soil, a cocoon is usually built. The overall life cycle of the insect is completed in 29–38 days and the insect may go 10–12 generations per year on favorable environmental conditions. The pest can overwinter in all stages or as eggs, larvae, pupae and adults.

Damage and Symptoms of Tomato Leaf Miners

Adult female deposits cylindrical, creamy white to yellow eggs on the underside of host plant leaves. After 4-5 days, the eggs hatch to give rise a creamy dark headed larvae which penetrate into tomato leaves, fruits, or stems on which they feed and develop. The feeding creates conspicuous mines and galleries on leaves. Most often the tunnels bored inside the fruit will lead fruit rot by secondary pathogens. Galleries in stems alter the general development of the plants. On leaves, the larvae feed only on mesophyll tissues and give rise to irregular mines and necrotic regions. The pest prefers apical buds, flowers or new fruits and therefore, found easily in those parts in the infested fields. Black frass is also distinctly visible on aerial parts

Pest Control Options to Nepalese Tomato Growers

Populations of leaf miner has developed resistance to many of the insecticides such as abamectin, cartap and permethrin and other novel pesticides including Spinosad. Synthetic sex pheromone lures are only the current available option to monitor and mass trap the pest populations in Nepal. The combined use of pheromone products with yellow delta trap in water are found effective in reducing the pest populations. Cultural practices such as rotation with non-solanaceous crops, ploughing, adequate fertilization, irrigation, destruction of infested plants and plant debris are suggested to the farmers as strategies of integrated pest management.

Summary

- The tomato leaf miner is global threat on tomato production and a recently invaded tomato growing regions of Nepal.
- This pest first reported in Nepal in 2016 after its entry to Bangladesh and India.
- Sex pheromone lure baited traps are on use to monitor and control the pest population.
- The pest is resistant to almost all groups of insecticides including Spinosad.
- Biological control and integrated methods are underway on research.
- Only the options for now are local and trans-border quarantine to reduce the spread and damage of the pest.

Author Biography

The author is an agriculture entomologist affiliated with Agriculture and Forestry University, Rampur Chitwan Nepal, and currently pursuing PhD degree at the New England University, Australia.

SONE Latest News

- Congratulation **Dr. Sulochana Paudyal** for successfully completing PhD degree from Oklahoma State University. We wish you best of luck.
- SONE successfully organized the Zoom Webinar on "**Tips to Improve Resume and Job Application Skills**". Special appreciation to Drs. Bal Krishna Gautam and Sandipa Ghimire Gautam for sharing their experiences.

Editorial Team