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# SURVEY OF WILT DISEASE (*FUSARIUM OXYSPORUM* F. SP. *LYCOPERSICI*) OF TOMATO AT SELECTED DISTRICTS OF UTTAR PRADESH, INDIA

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**ABSTRACT**

A survey was carried out for assessing fusarium wilt disease incidence of tomato in selected districts of Uttar Pradesh. From each selected district, three blocks were selected and in each block, three tomato grown villages were selected for the survey. Two to five tomato fields were surveyed in every village and number of wilted plants were observed in selected area ($3m^{-2}$). The highest incidence 80.34 % was recorded in Masauli block of Barabanki district followed by 74.5 % in Arniya block of Bulandshahr district. The lowest disease incidence was reported 10.67 % from Bamaur Block of Jhansi districts. The disease incidence ranged from 10.67- 80.34 % among all blocks of selected districts. During survey it was noticed that wilt disease of tomato causes significant loss to tomato crop and leading to low tomato production and productivity in Uttar Pradesh, India.

## INTRODUCTION

India is the second largest producer of tomato after china in the world, but productivity of tomato in India is still very low comparatively. Wilt disease of tomato caused by *Fusarium oxysporum* f. sp. *lycopersici* (Sacc.) Snyder and Hansen, is the worst disease of tomato and one of the main reason for its low productivity. This disease was first reported by G.E. Massee in 1895 from England. Since, then it is reported from different countries and recognized as one of the most devastating disease in major tomato growing regions worldwide (Walker, 1971; Beckman, 1987; Abdel- Monaim, 2012). The first symptoms of the disease are clearing of the veinlets and chlorosis of the leaves. . At later stage, browning of vascular system occurs, plants become stunted and die. In India Fusarium wilt incidence of tomato has been recorded from 25-55% from various states (Kapoor, 1988; Kirankumar *et al*., 2008). The crop loss due to disease may go upto 80% under favorable condition (Asha *et al*., 2011; Pandey and Gupta, 2013). In Uttar Pradesh it is reported that wilt disease causes more than 25.14 - 47.94 % crop loss (Enespa and Dwivedi, 2014). The disease has been observed in severe form in tomato growing states, *viz*., Haryana, Punjab, Uttar Pradesh, Uttaranchal, Rajasthan, West Bengal, Chhattisgarh, Tamil Nadu, Karnataka, Andhra Pradesh, Bihar, Jharkhand, Gujarat, Maharashtra, Assam, Sikkim and Tripura (Pandey and Gupta, 2013).

Perusal of the literature revealed that productivity of tomato is decreasing every year in Uttar Pradesh . In this study we are trying to know the status of wilt disease incidence and variation among them in different regions of the state. In the view of above, the objective of present study is the survey of wilt disease of tomato (*Fusarium oxysporum* f. sp. *lycopersici*) from selected tomato growing districts of Uttar Pradesh, India.

## MATERIALS AND METHODS

A survey was conducted at selected districts; *viz*. Allahabad, Mirzapur, Varanasi, Azamgarh, Lucknow, Barabanki, Kanpur, Jhansi, Khiri, Aligarh, Bulandshahr, Hapur, Meerut, and G. B. Nagar of Uttar Pradesh, India, during January to March 2014 and 2015. In each district, three blocks were selected and in each block, three villages were surveyed. In every village, two to five tomato field were surveyed and number of wilted plant observed in selected area ($3m^{-2}$). The diseased plants were uprooted collected in a clean polythene bag along with rhizospheric soil of wilted plant from the farmer's field. The plant and soil samples were brought to laboratory for isolation and identification of the pathogen.

The disease severity was recorded by 0-4 scale as described by Weitang *et al*. (2004) where zero representing no infection and four denoting plants completely infected. The 0-4 scale of the disease severity was classified as follows:

0 - No infection.

1 - Slight infection which is about 25% of full scale, one or two leaves became yellow.
2 - Moderate infection, two or three leaves became yellow, 50 % of leaves became wilted.
3 - Extensive infection, the all plant leaves became yellow, 75 % of leaves become wilted, and growth is inhibited.
4 - Complete infection, the whole plant leaves become yellow, 100 % of leaves become wilted, and the plants die.

$$\text{Diseare incidence (\%)} = \left[\frac{\sum \text{Scale} \times \text{number of plants infected}}{\text{Highest scale} \times \text{Total number of plants}}\right] \times 100$$

## RESULTS AND DISCUSSION

Fusarium wilt of tomato often occur on mature plants after flowering and at the beginning of fruit set. In the field conditions symptoms can be seen as yellowing of the foliage and stunting of plants (Fig. 1A). Due to heavy infestation the wilted leaves often dry up (Fig. 1B) and drop prematurely. Eventually the entire plant wilts and dies. Plants infected with Fusarium wilt shows the brown discoloration of the vascular system. When the epidermis and cortical tissue of the main stem, is cut and pealed back, a distinct brown discoloration of the vascular tissue can be seen (Fig. 2A).

In Uttar Pradesh, revealed that the disease incidence varied widely from one place to another place. The heavy incidence of the disease was recorded 80.34 % in Masauli block of Barabanki district followed by 74.5 % in Arniya block of Bulandshahr district (Table 1). The lowest disease incidence 10 % was recorded from Bamaur Block of Jhansi district. The incidence of wilt disease was found to

**Table 1: Disease incidence of Fusarium wilt of tomato in different Blocks of selected districts of Uttar Pradesh.**

| District | Block | Villages | Range | Disease. Inci. % |
|---|---|---|---|---|
| Allahabad | Chaka | Dandi, Purwa Khas, Mahewa Patti | 27 - 40 | 35.34 |
| | Jasra | Gauhania, Ghurpur, Jasra | 36 - 51 | 45.34 |
| | Manda | Chak Deeha, Handiya, Rajapur | 35 - 65 | 52.67 |
| Mirzapur | Lalganj | Lalganj, Devhat, Basahi Kala | 35 - 47 | 39.34 |
| | Haliyapur | Devgat, Lalapur, Kushiyara | 11 - 19 | 15.00 |
| | Narayanpur | Bhalwa, Ibrahimpur, Jamui | 25 - 39 | 33.67 |
| Varanasi | Bara Gaon | Baragaon, Fattepur, Ratanpur | 12 - 28 | 20.16 |
| | Arajiline | Araijiline, Mahmadpur, Sarai Mohan | 10 - 23 | 15.34 |
| Azamgarh | Azmatgarh | Ajagara, Bishnupura, Khand | 14 - 18 | 15.17 |
| | Haraiya | Gangepur, Paharpur, Chand Patti | 10 - 15 | 12.50 |
| | Koilsa | Koilsa, Burhanpur, Domanpur | 15 - 20 | 18.17 |
| Lucknow | Mohnlal Ganja | Jamalpur Daduri, Rambhan Khera, Dayalpur | 49 - 65 | 55.34 |
| | Chin hat | Sarai Shekh, Palhri, Tiwaripur | 35 - 50 | 42.33 |
| | Malihabad | Badaura, Bahelia, Ishapur | 38 - 55 | 45.34 |
| Barabanki | Harak | Daulatpur, Kaisva Salain Chak, Dehva | 49 - 72 | 63.00 |
| | Masauli | Badagaon, Masauli, Madarpur | 79 - 90 | **80.34** |
| | Deva | Gopalpur, Umrai, Shahpur | 46 - 55 | 50.34 |
| Kanpur | Kalyanpur | Singhpur Kachhar, Binour, Kursauli | 23 - 32 | 30.34 |
| | Bidhan | Bidheru, Hajipur, Kathui | 13 - 27 | 20.30 |
| | Kakwan | Kakwan, Uttha, Maidau | 22 - 31 | 25.50 |
| Jhansi | Mauranipur | Churara, Durgapur, Khilara | 30 - 45 | 38.34 |
| | Bada Gaon | Banguwan, Digara, Lidhora | 09 - 15 | 12.00 |
| | Bamaur | Alampur, Bamor, Deori | 09 - 13 | **10.67** |
| Khiri | Bijua | Bijuw, Ambara, Palhanapur | 30 - 47 | 40.50 |
| | Lakhimpur | Lakhimpur (Dehat), Adampur, Motipur | 20 - 29 | 25.50 |
| | Behjam | Achhnia, Behjam, Khajuha | 30 - 35 | 32.34 |
| Aligarh | Khair | Khair, Shivala, Bamani | 40 - 61 | 53.67 |
| | Autroli | Gaokhera, Jamal Garhi, Usmanpur | 12 - 17 | 14.84 |
| | Tappal | Tappal, Lal Garhi, Manpur | 62 - 33 | 62.33 |
| Bulandshahr | Arnia | Lakhawti Mirzapur, Muni, Wazidpur | 65 - 82 | **74.50** |
| | Bulandshahr | Dhakaoli, Hasnpur, Imilia | 24 - 36 | 29.83 |
| | Debai | Debai Khurd, Rajghat, Mohammadabad | 20 - 56 | 35.50 |
| Hapur | Hapur | Chitoli, Hafijpur, Akdauli | 29 - 42 | 33.67 |
| | Garh M. | Garh, Allahbuxpur, Baganpur | 32 - 45 | 38.34 |
| | Simbhawali | Simbhaoli, Himmatpur, Mohammadpur | 20 - 35 | 27.00 |
| Meerut | Daurala | Daurala, Modipuram, Siwaya, | 20 - 28 | 24.84 |
| | Meerut | Hajipur, Jalalpur, Aminagar | 33 - 45 | 40.17 |
| | Kharkhoda | Badholi, Dastoi, Jasora | 12 - 17 | 14.84 |
| G. B. Nagar | Dadri | Bisahda, Pyali Tajpur, Akilpur | 21 - 29 | 24.67 |
| | Jewar | Hasanpur, Nagala Banjaan, Jahangirpur | 18 - 37 | 27.34 |
| | Dankaur | Nawada, Amarpur, Dalelgarh | 23 - 35 | 29.67 |
| S. Ed (±) | | | | 06.16 |
| CD (5%) | | | | 12.24 |

**Figure 1(A) : Fusarium wilt infected field of tomato, (B). Wilted Plant along with healthy plant in field.**

**Figure 2(A) : Wilted plant of tomato shows discoloration of vascular tissues. (B). Wilt pathogen *Fusarium oxysporum* f. sp. *lycopersici* growth on tomato fruits**

range between 10.67 % and 80.34 %, resulting reduction in production of tomato every year.

Importance of wilt disease of tomato has been reported earlier, it may cause crop losses, 10 % to 80 % (Kapoor, 1988) from Delhi, Maharashtra and Tamilnadu. Bharat and Sharma (2013) surveyed and reported highest incidence 27.65 % of the wilt at Kadriyana, Himachal Pradesh. Yield loss due to this disease depends on the environmental conditions; it occurs especially in warmer areas because the pathogen requires a soil temperature around 28ºC for its growth and development (Gupta and Thind, 2012). Perusal of the work done by Pandey and Gupta (2014); Bharat and Thakur (2014) revealed that the wilt disease incidence varied from region to region and within a region, the intensity of the disease varied depending upon the variation of pathogen. Three different host specific races of pathogen (race 1, 2 and 3) have been identified from different countries (Cai *et al*., 2003) but it has been negligible in India partly, it may be one of the reason behind the variation of disease intensity. The diversity in population of *Fusarium oxysporum* f. sp. *lycopersici* needs to vary at pathogenic, morphological and genetic level.

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