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Wilt: An important fungal disease of cotton under South Gujarat region of India

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Abstract
Cotton (*Gossypium* spp.) is one of the most important fiber crops playing a key role in economic globe. In this experiment, different districts of South Gujarat were closely examined for wilt disease in different cultivars / Bt cotton hybrids during the crop season to know the current scenario of wilt disease. The symptoms of *Fusarium oxysporum* f. sp. *vasinfectum* is both seed borne and soil borne and colonizes the roots and vascular system of susceptible cotton cultivars, causing root and vascular discoloration, wilting and sometimes death of the plant. As the wilt disease is becoming an important and destructive disease in the cotton growing areas. So, a field survey was conducted to collect the information on the severity of wilt of cotton in selected districts of South Gujarat region, *viz*. Surat, Bharuch and Narmada, respectively. The maximum incidence of wilt disease was found in Bharuch district ranged from 8.00 to 21.00 with the maximum per cent incidence 21.00 per cent was observed in Ranipura village of Amod Taluka of South Gujarat and rest were intermittent.

Keywords: Cotton, intensity, *Fusarium oxysporum*, village, district, susceptible

Introduction
Cotton (*Gossypium* spp.) is one of the most important fiber crops playing a key role in economic and social scenario of the globe. The wilt disease is responsible for serious losses to the cotton crop. It is oldest among the commercial crops of the world providing fiber for clothing of the mankind. It is also known as "THE WHITE GOLD" or "THE KING OF FIBERS". Cotton is one of the most ancient and important commercial crops next only to food grains and is the principal raw material for a flourishing textile industry. It provides employment and sustenance to a population of nearly 42 Million people, who are involved directly or indirectly in cotton production, processing, textiles and related activities (Manickam, 2013) [7]. Cotton is an important fiber yielding crop of global importance, which is grown in tropical and subtropical regions of more than 80 countries of the world. The major cotton producing countries are USA, China, India, Pakistan, Uzbekistan, Egypt, Argentina, Australia, Greece, Brazil and Turkey. In total global cotton production 70% cotton production comes from the four countries, which includes China (27%), India (22%), USA (13%) and Pakistan (8%). Cotton is grown worldwide for its natural fiber and oil. Cotton seed contain 30 per cent starch, 25 per cent oil and 16.20 per cent protein. It is also being used in the manufacture of medicinal supplies, tarpaulin, cordage and belting. The cotton hulls serve as roughage for livestock and the fuzz (short seed hair) is used in the manufacture of papers, plastics, carpets, rayon, explosives and cotton wool (Prasad, 2015) [8].
For many developing and underdeveloped countries cotton export is the main source of foreign exchange earnings. The cotton crop is affected by plenteous pests, diseases and weeds etc causing solemn economic losses in a crop. In the post Bt cotton era (2002 onwards) sucking pests like Aphids, Jassids, Thrips, Whitefly, Mealybugs, Myrid bugs and Mites continue to ravage the cotton crop and pose a serious threat to sustain and enhance cotton productivity (Tanweer, 2013) [9]. The wilt disease is responsible for serious losses to the crop in the central and western India on a large scale and on almost all the cultivated varieties of both *G. arboreum* and *G. herbaceum*, the two indigenous species, especially in black cotton soils of Maharashtra, Madhya Pradesh, Karnataka and Gujarat. At present the most of cultivated cultivars are susceptible to wilt disease (*Fusarium oxysporum* f. sp. *vasinfectum*) and caused 54-60% yield loss (Anonymus, 2003) [1, 3].

because of reduced stand, stunted growth, small bolls and poor lint quality. The symptoms of *Fusarium oxysporum* f. sp. *vasinfectum* is both seed borne and soil borne and colonizes the roots and vascular system of susceptible cotton cultivars, causing root and vascular discoloration, wilting and sometimes death of the plant (Chen *et al*., 1985 [2]; Hillocks, 1992 [5]; Davis *et al*., 1996) [3]. Looking to the frequent occurrence in one or other region and inflicting serious damage under South Gujarat region. Hence, the present investigation was undertaken to clarify deeply and thoroughly the wilt disease in these districts.

Material and Methods

The random rowing survey for cotton wilt disease was carried out in cotton growing areas of Surat, Bharuch and Narmada district of Gujarat, during 2017-2018, in August to December. For this purpose, three talukas in each district was taken and in each taluka one village was taken for the wilt disease assessment.

Randomly select five locations in each field a total 100 plants should be assessed and work out per cent disease incidence (PDI) according to the grade and score given (Table: 1). Disease incidence is calculated by the formula given by Wheeler (1969) [10].

$$PDI = \frac{\text{Total no. of wilted/ diseased plants}}{\text{Total no. of germinated/ assessed plants}} \times 100$$

Table 1: Grading system for wilt disease

Score	Description
0	I= No infection
1	R= Slight yellowing and no defoliation, < 5% wilting
2	MR= Yellowing and browning of leaves, 6-15% plants showing wilting
3	MS= Yellowing, browning and discolouration of leaves, Some leaves fall off. Of late partial wilting may occur, 16-25% plants showing wilting
4	S= In early infection seedlings wilt, mature plant show yellowing, browning and dropping off of the leaves, >25% plants showing wilting

For wilt disease, it is standard methodology of AICRP, Cotton

Results and Discussion

Cotton crop is affected by a large number of diseases. Among them wilt of cotton caused by *Fusarium oxysporum* f. sp. *vasinfectum* (FOV) is observed in moderate form causing considerable damage in these areas in recent times. The symptoms observed in wilt infected cotton plant from seedling to maturity stage. At the seedling stage, drooping of leaves and cortical decay of seedling were observed. In case of young plants, leaves turned yellow followed by wrinkling and drying, loss of turgidity with brownish discoloration of stem near soil base, root becomes soft and browning of vascular bundles was observed.

The vascular discoloration of stem extended throughout the plant and when the roots of such infected plants were split opened and examined the brownish black discoloration of vascular system was appeared (Holmes *et al*., 2009 [6] and Halpern *et al*., 2018) [4].

The classic symptoms of typical Fusarium wilt are: stunting, yellowing, wilting, and withering with darkened vascular system in stems were found similar to those described earlier by various workers. Considering its regular occurrence and economic loss, the disease was selected for present investigation. Different districts of South Gujarat were closely examined for the presence of wilt disease in different cultivars/ Bt hybrids during the cotton crop season to know the current scenario of wilt disease occurrence in three districts of South Gujarat *viz*., Surat, Bharuch and Narmada.

The *Table 2* and *Fig. 1* revealed that during 2017-18 the wilt incidence in Surat district ranged from 3.00 to 13.00%. Maximum incidence of 13.00% was observed in Vakrant Amba village of Umarpada taluka. The average disease incidence of 9.00% was observed in Surat district. In Bharuch district wilt incidence ranged from 8.00 to 21.00 with the maximum per cent incidence 21.00% was observed in Ranipura village of Amod taluka and average district disease incidence was 14.33%, while in Narmada district, the disease incidence ranged between 11.00 and 15.00%, the maximum disease incidence 15.00% was observed in Kamodvav village of Dediyapada taluka with district average 12.66%.

Table 2: Survey for cotton wilt in South Gujarat, during 2017-18.

Score no.	District	Taluka	Villages	Per cent disease incidence
1	Surat	Mangrol	Dansoli	11.00
		Choryasi	MCRS,Surat	3.00
		Umarpada	VakrantAmba	13.00
District Mean				9.00
2	Bharuch	Valia	Moriyana	8.00
		Netrang	Kelvikuva	14.00
		Amod	Ranipura	21.00
District Mean				14.33
3	Narmada	Rajpipla	MotaLimatwada	12.00
		Dediyapada	Kamodvav	15.00
		Sagbara	Simamli	11.00
District Mean				12.66

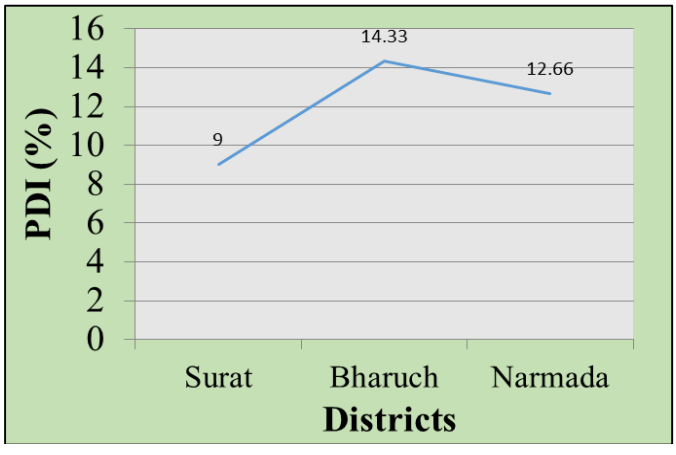

Fig 1: Survey for cotton wilt in South Gujarat, during 2017-2018

Conclusion

Survey carried out during 2017-18 revealed that wilt incidence of cotton was found in all surveyed district of South Gujarat. During 2017-18, the highest (21.00%) wilt incidence was noticed in Ranipura village of Bharuch district, while the lowest (3.00%) in MCRS, Surat.

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