

Original Research Article

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Survey for the Incidence of *Fusarium* Wilt and Root Knot Nematode Complex of Tomato in North Eastern Karnataka, India

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ABSTRACT

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Tomato (*Solanum lycopersicum* Mill.) is the most popular vegetable world-wide. It is used as a fresh vegetable and also can be processed and canned in the form of paste, juice, sauce, powder or as a whole. The ripe fruits are good source of vitamin A, B and C which add a wide range of colour and flavour to the food. Recently, it started gaining more medicinal value because of the antioxidant property of ascorbic acid and lycopene content. The tomato is known to be affected by different diseases caused by fungi, bacteria, viruses and nematodes. Among different diseases affecting tomato, root-knot and wilt complex caused by *Meloidogyne incognita* and *Fusarium oxysporum* f. sp. *lycopersici* was observed in severe form. A survey was conducted in four districts of North Eastern Karnataka. The survey results revealed that disease incidence was noticed throughout the North Eastern Karnataka viz., Raichur, Yadagir, Kalaburgi and Koppal districts wherever tomato was grown. In tomato, wilt was noticed in all locations surveyed with a range of 8.33 to 38.66 per cent. Maximum wilt incidence was observed in Kalaburgi district (26.21%) and least incidence was in Raichur district (21.25%).

Introduction

Tomato (*Solanum lycopersicum* Mill.) belonging to the nightshade family i.e., solanaceae, is one of the most important popular vegetable in the world. It is a native of Peru in South America and the word tomato comes from the Aztec word Tomatl. This crop spread to North America, primarily by

migrating birds and then the crop spread to different countries. Spanish priests introduced the tomato crop to Europe around 1550. In Europe it was known as *Pomaamoris*-Amorous apple or love apple. It was also known as *Pomaperuviana*, apple of Peru. It was Robert Gibbon Johanson, an ordinary farmer in the U.S.A who first ate tomato on a hot day of August, 1820 to demonstrate its

edibility. From then onwards, the tomato spread throughout the world.

Global tomato production is currently around 170.75 million tons and China is the leading country both in area (1 million ha) and production (52.72 million tons). India ranks second with production of 21.24 million tons followed by USA, Turkey and Egypt. In India top five tomato producing states are Madhya Pradesh, Karnataka, Andhra Pradesh, Telangana and Gujarat. Karnataka has an area of 63.73 thousand ha and annual production of about 2138.13 thousand tons with an average productivity of 33.55 tons/ha (Anon., 2017).

Among the fungal diseases, *Fusarium* wilt is the most important disease and is a limiting factor in tomato production (Sokhi *et al.*, 1991). *Fusarium oxysporum* f. sp. *lycopersici* is a soil borne pathogen that is highly specific to tomato and is worldwide in distribution (Walker, 1969).

Among the nematode diseases in tomato, root knot nematode (*Meloidogyne* species), sting nematode (*Belonolaimus longicaudatus*), stubby-root nematode (*Paratrichodorus* and *Trichodorus* spp.) and lesion nematode (*Pratylenchus* sp.) are important. Of these, root knot nematode (*M. incognita*) is the most dominant species accounting for 64 per cent of total population which is widely prevalent inflicting serious loss to tomato fruit yield (Sasser, 1980).

Materials and Methods

A random survey was conducted in major tomato growing areas of North Eastern Karnataka *viz.*, Raichur, Yadagir, Kalaburgi and Koppal districts during *kharif* 2017. Samples of soil and roots were collected from sufficiently wet fields from the rhizospheres of tomato. In the similar manner, totally 10 spots were selected randomly for taking infected

soil and plant samples representing the whole field. Later from this, a composite sample of 200 g of soil and 5 g of root were formed. Randomly 100 plants were selected in different locations in a field and number of plants wilted was counted and the mean wilt incidence was expressed in percentage. Completely wilted plants were also collected. The per cent disease incidence was calculated by using the formula.

$$\text{Disease incidence (\%)} = \frac{\text{Number of plants wilted}}{\text{Total number of plants observed}} \times 100$$

Wilted/nematode affected tomato plants were collected from the field, placed in polythene bag, tied with a rubber band and labeled immediately. Information pertaining to the locality, crop history, *etc.* was also obtained along with the samples. Collected samples of soil and roots were analyzed on the same day or after keeping for a few days under refrigerated conditions. The soil was mixed thoroughly and 200 cc of soil was processed following Cobb's sieving and decanting method (Cobb, 1918) followed by modified Baermann's funnel method (Schindler, 1961).

Results and Discussion

A survey was conducted in four districts of North Eastern Karnataka. The survey results revealed that disease incidence was noticed throughout the North Eastern Karnataka *viz.*, Raichur, Yadagir, Kalaburgi and Koppal districts wherever tomato was grown. During the survey, soil samples were collected.

In tomato, wilt was noticed in all locations surveyed with a range of 8.33 to 38.66 per cent. Maximum wilt incidence was observed in Kalaburgi district (26.21%) and least incidence was in Raichur district (21.25%). The data of per cent wilt incidence has been presented in Table 1.

Table.1 Incidence of *Fusarium* wilt, root knot nematode and their wilt complex in major tomato growing areas of North Eastern Karnataka during *kharif* 2017

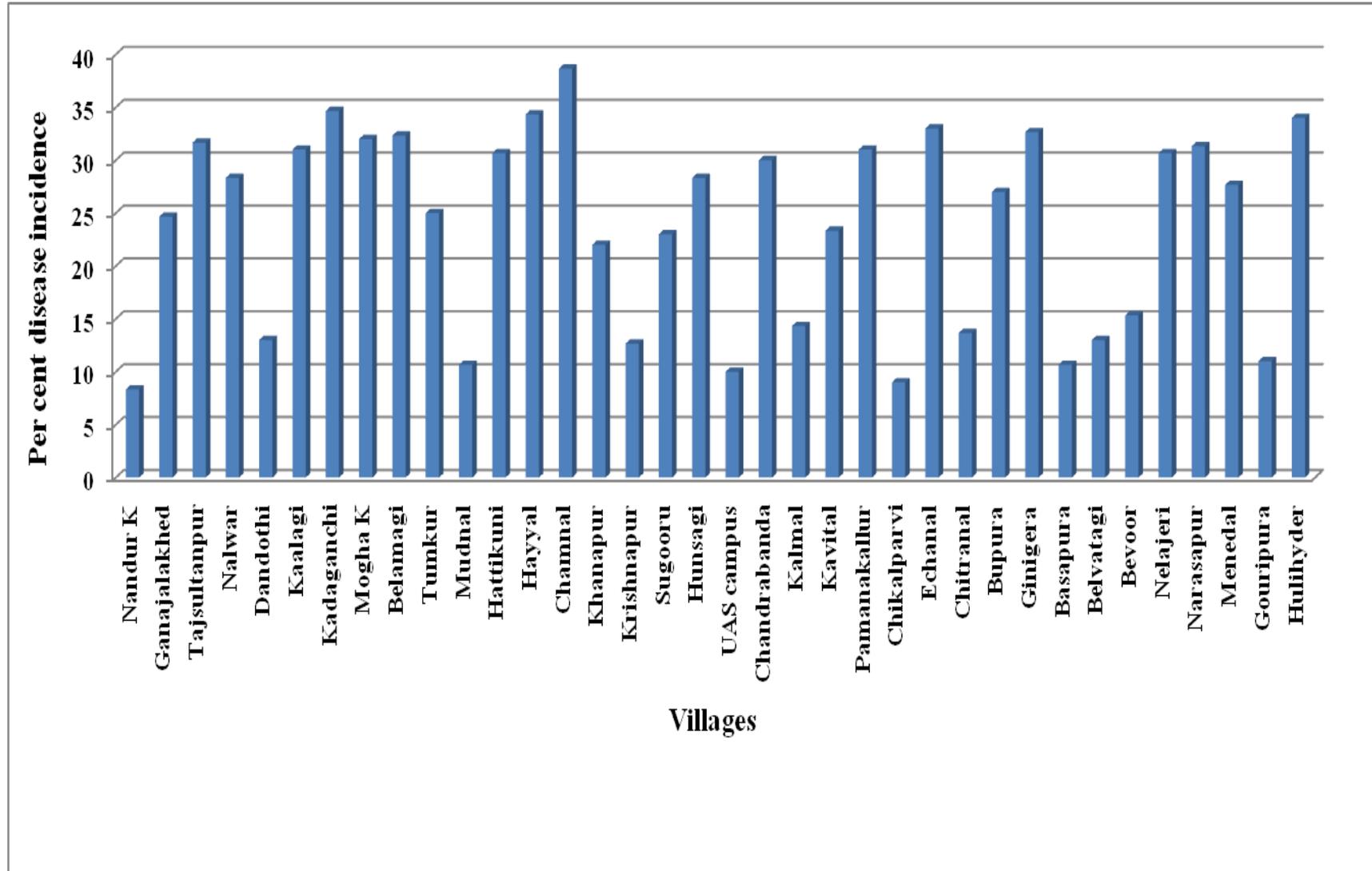
SI. No	District	Taluk	Villages	Number of samples	<i>Meloidogyne incognita</i> (M)	<i>Fusarium</i> (F)	M+F	Disease incidence (%) (F, M or F+M)		
1	Kalaburgi	Kalaburgi	Nandur K	3	-	+	-	8.33		
			Ganajalakhed	3	+	+	+	24.66		
			Tajsultanpur	3	+	+	+	31.66		
				Mean						21.55
		Chittapur	Nalwar	3	+	+	+	28.33		
			Dandothi	3	-	+	-	13.00		
			Kaalagi	3	+	+	+	31.00		
				Mean						24.11
		Aland	Kadaganchi	3	+	+	+	34.66		
			Mogha K	3	+	+	+	32.00		
			Belamagi	3	+	+	+	32.33		
				Mean						32.99
				Grand mean						26.21
2	Yadagir	Yadagir	Tumkur	3	+	+	+	25.00		
			Mudnal	3	+	-	-	10.66		
			Hattikuni	3	+	+	+	30.66		
				Mean						22.10
		Shahapur	Hayyal	3	+	+	+	34.33		
			Chamnal	3	+	+	+	38.66		
			Khanapur	3	-	+	-	22.00		
				Mean						31.66
		Krishnapur	3	-	+	-	12.66			

Cont...

		Shorapur	Sugooru	3	+	+	+	23.00
			Hunsagi	3	+	+	+	28.33
			Mean					21.33
			Grand mean					25.03
3	Raichur	Raichur	UAS campus	3	-	+	-	10.00
			Chandrabanda	3	+	+	+	30.00
			Kalmal	3	+	-	-	14.33
			Mean					18.11
		Manvi	Kavital	3	+	+	+	23.33
			Pamanakallur	3	+	+	+	31.00
			Chikalparvi	3	-	+	-	9.00
			Mean					21.11
		Lingasugur	Echanal	3	+	+	+	33.00
			Chitranal	3	-	+	-	13.66
			Bupura	3	+	+	+	27.00
			Mean					24.55
					Grand mean			
4	Koppal	Koppal	Ginigeru	3	+	+	+	32.66
			Basapura	3	+	-	-	10.66
			Belvatagi	3	-	+	-	13.00
			Mean					18.77
		Yelaburga	Bevoor	3	+	-	-	15.33
			Nelajeri	3	+	+	+	30.66
			Narasapur	3	+	+	+	31.33
			Mean					25.77
		Kustagi	Menedal	3	+	+	+	27.66
			Gouripura	3	-	+	-	11.00
			Hulihyder	3	+	+	+	34.00
			Mean					24.22
					Grand mean			

+ = Presence; - = Absence

Fig.1 Incidence of *Fusarium* wilt, root knot nematode and their wilt complex in major tomato growing areas of North Eastern Karnataka



In Kalaburgi district, maximum disease incidence was observed in Kadaganchi village of Aland taluk (34.66%) followed by Belamagivillage (32.33 %) and lowest was in Nandur K village of Kalaburgitaluk (8.33%). In Yadagir district, maximum disease incidence was observed in Chamnal village of Shahapurtaluk (38.66%) followed by Hayyal village (34.33%) and lowest was in Mudnal village of Yadagirtaluk (10.66%). In Raichur district, 33.00 per cent of disease incidence was noticed from Echanal village of Lingasugurtaluk and 9.00 per cent incidence in Chikalparvi village of Manvitaluk. In Koppal district maximum disease incidence was observed in Hulihyder village of Kustagitaluk (34.00%) and lowest incidence was in Gouripura village (11.00%) (Fig. 1).

The findings of the present study revealed that wilt incidence was observed in all the districts surveyed. The incidence varied from village to village and field to field. This may be due to type of soil, variety of tomato grown, previous crop grown, moisture available in the field and management practices followed.

The present survey also indicated that the root knot disease caused by *M. incognita* was found in all the districts surveyed as well as its association with *F. oxysporum* f. sp. *lycopersici* in most of the locations surveyed with a high frequency of both the pathogens (*M. incognita* + *F.oxysporum* f. sp. *lycopersici*) from soil and root samples collected.

During survey, diseased samples were collected from different locations and pathogens were isolated. *Fusarium oxysporum* f. sp. *lycopersici* and *M. incognita* were isolated from all most all the locations collected and thus they proved to be the most predominant pathogens in tomato. Similar observations were also made in survey conducted by Mahesh (2016) in tomato,

Jagadish (2014) in tomato and Mallesh (2008) in coleus and ashwagandha at different parts of Karnataka. Krishna Rao and Krishnappa (1994) on chickpea in Karnataka, Pandey and Singh (1990) from Allahabad on chickpea, Sharma and McDonald (1990) from parts of the world also reported the association of nematode fungi in legumes and cereals, as well.

In general, wilt caused by *F.oxysporum* f. sp. *lycopersici* and *M. incognita* are one of the major constraints in the production of tomato crops. Very less or little information was available on the wilt complex of tomato in the North Eastern Karnataka region. Hence, a survey was undertaken to assess the wilt incidence of tomato in Kalaburgi, Yadagir, Raichur and Koppal districts. The data collected during the roving survey revealed that, maximum wilt incidence was observed in Chamnal (38.66 %) village of Yadagir district and minimum wilt incidence in Nandur K (8.33 %) village of Kalaburgi district.

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