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Survey for Pomegranate Wilt Complex Caused by *Ceratocystis fimbriata* and *Meloigogyne incognita* in Northern Karanataka

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Maximum percentdisease incidence (45.16%) was noticed in Besigeger village of Bellary district. In Koppal districts, maximum per cent disease incidence was recorded in Jerkundi (43.58%) followed by Koppal (41.07%). While lowest disease incidence was observed in Kalakbandi (21.87%). In Bagalkot district, maximum per cent disease incidence was recorded in Hebbal (31.41%) followed by Mahalingpur (22.42%). In Gadag district, maximum per cent disease incidence was recorded in Chumnal (36.42%). While lowest disease incidence was observed in Unchgere (25.70%). In Bijapur district, maximum disease incidence was observed in Babaleshwara (31.14%).Similarly, maximum disease incidence was observed in Appledinni (22.30%) followed by Tuntapur (18.75%) in Raichur district. Among different districts the Bellary district recorded maximum disease incidence (32.46%) followed by Koppal district (32.13%). While lowest incidence was observed in Raichur district (16.70%). Further Shot hole borer (*Xyleborus fernicatus*) association was noticed in the entire district, but it was absent in Raichure district. Higher wilt disease incidence was noticed in more than above 4-5 years orchards and while it was less in belove 3 years orchards. Shot hole bore association was noticed in more than 4-5 years. It was evident from the survey that among the commonly growing pomegranate cultivars, *viz.,*Bhagwa, Kesar, Ganesh, Arkta and Sindhur; the cultivar Bhagwa was found to be highly susceptible to *C. fimbriata* and shot hole borer.

Key words: survey, wilt, incidence, *Ceratocystis fimbriata*.

Pomegranate (*Punica granatum* L.) is an ancient fruit, belonging to the smallest botanical family punicaceae and pomegranate is a native of Iran. It is commercially an important fruit crop of both tropical and subtropical regions. In India, it is regarded as a "vital cash crop", grown in an area of 1, 16,000 ha with a production of 89,000 MT with an average productivity of 7.3 MT (Anon., 2012). Karnataka state has the distribution of cultivating pomegranate under tropical condition in an area of 12,042 ha with a production of 1, 29, 547 tonnes (Anon., 2012). Where this crop has spread across different districts *viz*., Bijapur, Bellary, Bagalkot, Koppal, Chitradurga, Belgaum, Davangere, Tumkur, Bangalore and Gulbarga. Pomegranate suffers from ten economically important diseases, among them bacterial blight or spot, fruit rot, anthracnose and wilt complex are severe and cause significant losses in recent years. Wilt caused by *Ceratocystisfimbriata* is the most severe disease in Karnataka which causes yellowing, drooping and death of pomegranate plant leading to loss to the farmers. There is no more information available on susceptible and resistant cultivars, mode of

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spread of disease, association with insect, soil type. Hence the survey work is conducted in northern Karanataka.

MATERIAL AND METHODS

To assess the extent of wilt complex disease severity, intensive roving survey was conducted during *kharif* 2009 in important pomegranate growing district of northern Karnataka. In each district important pomegranate growing talukas were selected, in each village fields are randomly selected on both sides of road. Samples of soil and roots were collected from sufficiently wet fields from the rhizoshere of pomegranate crop to the root depth.

$$\text{Per cent Disease Incidence} = \frac{\text{No. of individual plants infected}}{\text{Total no. of plants observed}} \times 100$$

Each soil samples was filled in polythene bag and tied with a rubber band and labelled immediately. Information pertaining to the locality, crop history, etc. was also labelled along with the samples. Samples of soil and roots were analysed on the day of collection or after keeping for a few days under refrigerated conditions. The nematode population from soil was estimated.

Galled root system was scored by using a disease rating (0 to 5 scale) given by Taylor and Sesser (1978). The disease severity (root-knot disease) was calculated for the village by using following formula

$$\text{Disease severity} = \frac{\text{Number of infected root samples from village}}{\text{Total number of root samples collected from a village}} \times 100$$

Collection of diseased samples

The roots and soil samples of pomegranate plants severely infected by *C. fimbriata* and *M. incognita* were collected. The pathogen *C. fimbriata* was isolated by standard hyphal tip isolation procedures and then nucleus culture was maintained on potato dextrose agar slants and kept in a refrigerator at 5^0C, for further use in all the laboratory and field studies.

Hyphal tip isolation

This method was followed for maintaining of pure culture. Hyphal tip isolation was done on water plates**.** Dilute spore suspension of the pathogen was prepared in sterilized distilled water containing eight to ten spores per ml from 15 days old culture. One ml of such suspension was spread uniformly on two per cent solidified water agar plates and observed for spores under the microscope. Single spore was marked with a marker on backside of the Petri plate and it was allowed to germinate. Such plates were periodically observed for spore germination under microscope. The hyphae growing from each cell of the single spore was traced and marked with marker. The tip of the hyphae was cut carefully and transferred to PDA plates and incubated at 25±2^{0}C for 15 days. Later, mycelial bits of the fungus were transferred in the centre of Petriplates containing PDA and incubated at 25±2^{0}C for 15 days.

RESULTS

Maximum percent (Table-1) disease incidence (45.16%) was noticed in Besigeger village of Bellary district. In Koppal districts, maximum per cent disease incidence was recorded in Jerkundi (43.58%) followed by Koppal (41.07%). While lowest disease incidence was observed in Kalakbandi (21.87%). In Bagalkot district, maximum per cent disease incidence was recorded in Hebbal (31.41%) followed by Mahalingpur (22.42%). In Gadag district, maximum per cent disease incidence was recorded in Chumnal (36.42%). While lowest disease incidence was observed in Unchgere (25.70%). In Bijapur district, maximum disease incidence was observed in Babaleshwara (31.14%).Similarly, maximum disease incidence was observed in Appledinni (22.30%) followed by Tuntapur (18.75%) in Raichur district. Among different districts the Bellarydistrict recorded maximum disease incidence (32.46%) followed by Koppal district (32.13%). While lowest incidence was observed in Raichur district (16.70%). Further Shot hole borer (*Xyleborus fernicatus*) association was noticed in the entire district, but it was absent in Raichure district. Higher wilt disease incidence was noticed in more than above 4-5 years orchards and while it was less in belove 3 years orchards. Shot hole bore association was noticed in more than 4-5 years. It was evident from the survey that among the commonly growing pomegranate cultivars, *viz.,*Bhagwa, Kesar, Ganesh, Arkta and Sindhur; the cultivar Bhagwa was found to be highly susceptible to *C. fimbriata* and shot hole borer (Plate 1).

Table 1. Survey and surveillance for wilt complex of pomegranate in northern Karnataka

S. No.	District	Taluk	Village	Variety	Age (Years)	Percent disease incidence	No. pants partial wilted	No. planst s complete wilted	Total No. of plants observed	Shot hole borer association	Month
1.	Bijapur	Bijapur	Babaleswar	Ganesh	10	31.14	27	11	122	Present	July
				Arkta	5	19.46	16	6	113	Present	July
				Kesar	5	26.01	23	9	123	Present	July
			Mean (%)			25.53					
2.	Bagalkot	Mudhol	Hebbal	Ganesh	8	31.41	36	13	156	Present	June
				Arkta	5	27.48	28	8	131	Present	June
				Kesar	3	17.39	13	3	92	Present	June
				Sindur	5	16.12	16	9	155	Present	June
				Sindur	4	17.83	22	11	185	Present	June
				Sindur	4	22.22	17	13	135	Present	June
				Sindur	3	16.36	12	6	110	Present	June
			Malingpur	Arkta	7	21.39	32	14	215	Present	June
				Sindur	5	22.42	26	11	165	Present	June
			Mean (%)			21.40					
3.	Koppal	Yalburga	Jerkundi	Kesar	12	43.58	46	22	156	Present	July
			Kalakbandi	Kesar	4	21.87	28	14	192	Present	July
			Jumargudi	Kesar	8	24.87	28	13	165	Present	July
		Ggada	Vajrabandi	Kesar	5	28.37	26	16	148	Present	July
		Koppal	koppal	Kesar	5	41.07	33	13	112	Present	July
			Basavanagudi	Kesar	7	33.06	29	12	124	Present	July
4.	Gadag	Rona	Unchgere	Arkta	9	25.70	31	13	171	Present	July
		Kustagi	Chumnal	Arkta	10	36.42	41	14	151	Present	July
			Mean (%)			31.06					
5.	Raichur	Raichur	Tuntapur	Arkta	2	18.75	13	5	96	Absent	August
			Appledinni	Kesar	2.5	16.36	14	4	110	Absent	August
				Kesar	1	10.68	11	3	131	Absent	August
				Arkta	3	15.44	19	9	136	Absent	August
				Arkta	3	22.30	23	8	139	Absent	August
			Mean (%)			16.70					
6.	Bellary	H.B.halli	Beisigegere	Bhagwa	8	33.33	17	5	250	Present	January
				Bhagwa	7	25.00	12	4	96	Present	January
				Bhagwa	6	26.36	13	3	156	Present	January
				Ganesh	7	45.16	22	5	131	Present	January
			Mean (%)			32.46					

Table 2. Occurrence of root – knot disease of pomegranate in different locations

Locations	Per cent root-knot incidence
Bijapur District	
Babaleswar	60.00
Bagalkot District	
Hebbal	71.42
Mahalingpur	-
Koppal District	
Jerkundi	50.00
Kalakabandi	40.00
Jumargudi	33.37
Vajrabandi	60.00
Koppal	25.00
Basavangudi	71.42
Gadag District	
Unchgera	62.50
Chumnal	57.14
Raichur District	
Tuntapur	7.00
Appledinni	28.57
Bellary district	
Besigegere	100.00

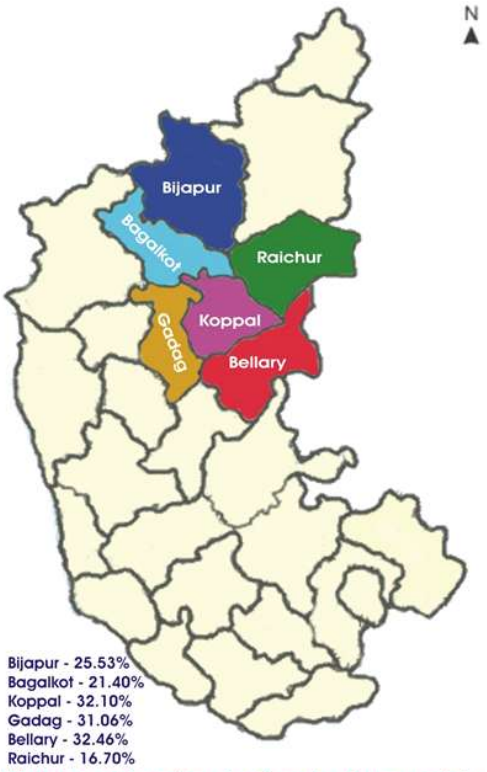

Plate 1. Survey and surveillance for witi complex of pomegranate in northern karnatak

Percentage of *M. incognita* in different location surveyed

Among all the (Table 2) locations surveyed, *M. incognita* was observed more 100 per cent in Besegegere in Bellary district, followed by Basavanagudi and Hebbal (71.42%) were on par with each other. Zero per cent was observed in Mahalingpur of Bagalkot district.

DISCUSSION

Wilt complex caused by fungi *C. fimbriata* and root knot nematode *Meloidogyne incognita*. Very little information is available with regard to the incidence and severity of the disease on pomegranate in northern Karnataka. Hence, a survey was undertaken to assess the wilt incidence on pomegranate crop in Bijapur, Bagalkot, Koppal, Gadag, Raichur and Bellary districts.

The findings of the present study revealed that the wilt complex caused by *C. fimbriata* and *M. incognita* was observed in all the districts surveyed. But overall disease incidence was more in Bellary district (average disease incidence - 32.46%) followed by Koppal district (average disease incidence - 32.13%) and lowest incidence was observed in Raichur district (average disease incidence - 16.70%).

However, earlier surveys in Karnataka revealed the presence of *C. fimbriata* and *M. incognita* with an average disease incidence of 0.1 -33.3 per cent (Benagi *et al*., 2009) Jadhav and Sharma, 2008 (8.69%) and Somasekhara *et al*, 2009 (5.69%).However shot hole borer was present in above five years plants (Balikai *et al.,* 2009), Somasekhara *et al.* (2000).

The present survey conducted revealed that *C. fimbriata*, *M. incognita,* and shot hole borer in most of the locations surveyed, are responsible for wilt complex with a high frequency of earlier two pathogens from soil and root samples. *M. incognita* was highest in Besigegere (25.76) in Bellary district, followed by Koppal (17.30) in Koppal district. While no infestation was found at Mahalingpure. *H. dihystera* was observed highest in Chumnal (24.13) Gadag district, followed by Mahalingpur (21.21) in Bagalkot district. While Kalakbandi recorded no occurance. *Xiphinema* spp was having more absolute density in Basavanagudi (10.16) in Koppal district, followed by Kalakbandi

(8.19) in Koppal district. Dorylamid ppn was observed with more density in Basavangudi (8.47) in Koppal district, followed by Koppal (5.76) in Koppal district. However, no occurrence in Jerkundi, Kalakbandi, Unchgera, Chumnal and Tuntapur. *R. reniformis* was observed more in Babaleswar (10.00) Bijapur district, followed by Kalakabandi (8.19) and no occurance in Mahalingpur, Jumargudi, Vajrabandi, Koppal, Unchgera and Tuntapur (Darekar *et al*., 1990).

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