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Survey and identification of post flowering stalk rot of maize caused by *Fusarium moniliforme*

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Abstract

Maize (*Zea mays* L.) is the third most important cereal next to rice and wheat in the world as well in India, contributing about 20 per cent share of worlds total cereal production. It is known as “Queen of cereal” because of its high production potential and wider adoptability. Maize is affected by several biotic as well as abiotic stresses. Among, fungal diseases play an important role and causes major yield losses. Of late, post flowering stalk rotca used by *Fusarium moniliforme* as becoming major threat to maize cultivation. A Survey was carried out during *kharij*-2015,in order to study the incidence of post flowering stalk rot in major maize growing districts, viz., Chikkaballapura, Mysore, Ramanagar, Hassan, Chikkamagaluru, Davanagere, Shivamogga and Haveri districts. The results revealed that highest disease incidence was observed in Chikkaballapura (20.43%) followed by Hassan (15.45%) and Davanagere (13.04%). No disease was observed in Mysore and Ramanagar districts. The least disease incidence was recorded in Haveri (3.65%) district. The pathogen was isolated from the infected stem showing typical vascular discolouration symptoms by tissue segment method on potato dextrose agar medium (PDA). The pathogen was identified as *Fusarium moniliforme* on the basis of morphological characters.

Keywords: *Fusarium moniliforme*, *Zea mays* L, Queen of cereal

Introduction

Maize is known as “Queen of cereal” because of its high production potential and wider adoptability. In world, maize occupies an area of 163.9 million ha with the production of 832 million tones and productivity of 5080 kg per ha. In India, maize is grown over an area of 8.55 million ha with the production of 21.73 million tones and with a productivity of 2540 kg per ha. In Karnataka, it is cultivated in an area of 13.6 lakh ha with the production of 40.9 lakh tones and productivity of 3018 kg per ha (Anonymous, 2014) [2]. Post flowering stalk rot (PFSR) poses a serious threat to the productivity of maize crop. PFSR is a complex which occurs at post-flowering stage of the crop during both *Kharij* and spring season. In India, eight fungi and three bacteria are reported to cause stalk rots (Raju and Lal, 1976) [7]. PFSR complex is caused by *Fusarium moniliforme*, *Macrophomina phaseolina* and *Cephalosporium maydis*, out of which *F. moniliforme* Sheld is of economic importance (Khehra *et al.*, 1982) [4]. The stalk rot symptoms are observed during post flowering and pre-harvest stage (Lal and Singh, 1984) [5]. The rotting extends from infected roots to the stalk and causes premature drying, stalk breakage and ear dropping, thus significantly reducing maize yield (Sharma *et al.*, 1993) [9]. Field observations revealed the difference in virulence with in *Fusarium moniliforme* populations from different conventional maize growing areas indicating the emergence of new pathotypes. Hence, a survey was carried out in maize growing districts of Southern Karnataka to determine the extent of disease severity and to trace the favourable conditions for disease occurrence.

Material and Methods

Roving survey was conducted during 2014 in the month of September and October in major maize growing areas of Chikkaballapura, Mysore, Haveri, Shivamogga, Davanagere and Chickmagaluru districts to assess the disease incidence by selecting three to four taluks in each district. At each location, the disease incidence was recorded by counting the number of wilted plants in a square meter area at all the four corners as well as centre of the field. Infected stalks collected were air dried under shade and kept for further studies. Fungal isolation was made from lower internodes of the infected stalks using Potato Dextrose Agar (PDA) medium and incubated at 25 ±2°C in a BOD incubator for 5-7 days. Recovered fungal *spp.* were identified by morphological characteristics. The pathogenicity of the isolated *Fusarium spp.* was proved by sick soil method in pot house conditions.

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Results and Discussion

An intensive roving survey was conducted during January to February, 2016 to know the incidence of post flowering stalk rot of maize in eight districts viz., Chikkaballapura, Mysore, Ramanagar, Hassan, Davangere, Chikkamagaluru, Haveri and Shimoga results are presented in Table 1. In Chikkaballapura district, Hirebidanur village recorded maximum disease incidence (24.88%). Least incidence was recorded in Kacharakannahalli (13.33%) with average disease incidence of (20.43%) in same district followed by Hassan (15.45%) and Davanagere (13.04%). There was no disease incidence recorded in Mysore and Ramanagar districts followed by Haveri (3.65%). (Table.1 & Figure.1). In the present study it was found that the maximum disease incidence was noticed in Chikkaballapura district because of favourable conditions prevailing during flowering compared to other districts. Similar observations were made by Harleen and Mohan (2012) [3] they observed that the disease incidence was comparatively high during spring season in Punjab. Isolations from diseased stalks revealed the presence of *Fusarium moniliforme* identified on the basis of morphological characteristics. The colonies of pathogen were

circular, brilliant white, and compact with smooth margin. Macroconidia were slender sickle shaped, pediculate and scattered. Mostly they were septate and measured 3-3.5 μm . Mycelium is white in colour. (Plate.1) These results are in agreement with the findings of Sharma *et al.* (2014) [8] who reported *F. moniliforme* producing white mycelium with 3-4 celled sickle shaped pedicellate macroconidia.

The pathogenicity of the isolated *Fusarium sp.* was proved by sick soil method. The pathogen has produced symptoms of yellowing of leaves, drooping of leaves and development of dark streaks on rind and basal portion and blackening of vascular bundles and formation of cavity in basal internode in maize. The pathogen was reisolated from the infected stem and it was found to be the same as the original culture (Plate 2) thereby Koch's postulates is proved. These results are in agreement with Sharma *et al.* (2014) [8] who carried out work on pathogenicity of *F. moniliforme* isolates on eight sugarcane pathological differentials viz. Co1148, Co7717, Co997, SES594, Khakai, CoC671, CoJ64 and CoS8436. Similarly *Fusarium* pathogen was observed during the studies conducted by previous workers (Patil, 2002; Ali and Sonar, 1984) [6, 1].

Table 1: Prevalence of post flowering stalk rot of maize in different districts of Southern Karnataka during spring season 2016

Sl.No.	District	Taluk /Location	Disease incidence (%)	Mean disease incidence (%)
1	Chikkaballapura	Gouribidanur	20.00	20.43
		Hosure	19.23	
		Kacharakannahalli	13.33	
		Tondebhavvi	18.23	
		Basaapura	24.67	
		Hirebidanur	24.88	
		Hegganahalli	22.66	
2	Mysore	Hunsoor	0.00	0.00
		Periyapatna	0.00	
		Kirnalli	0.00	
		Kopppalu	0.00	
3	Ramanagar	Chennapatna	0.00	
4	Hassan	Yadiyuru	13.33	15.45
		Chennarayapatna	17.66	
5	Chikkamagaluru	Kadur	4.66	3.99
		Tarikere	3.33	
6	Davanagere	Kallalli	12.75	13.04
		Bidarahalli	13.33	
7	Shimoga	Shikaaripura	14.28	12.23
		Soraba	12.75	
		Saagara	9.66	
8	Haveri	Hirekerur	4.00	3.65

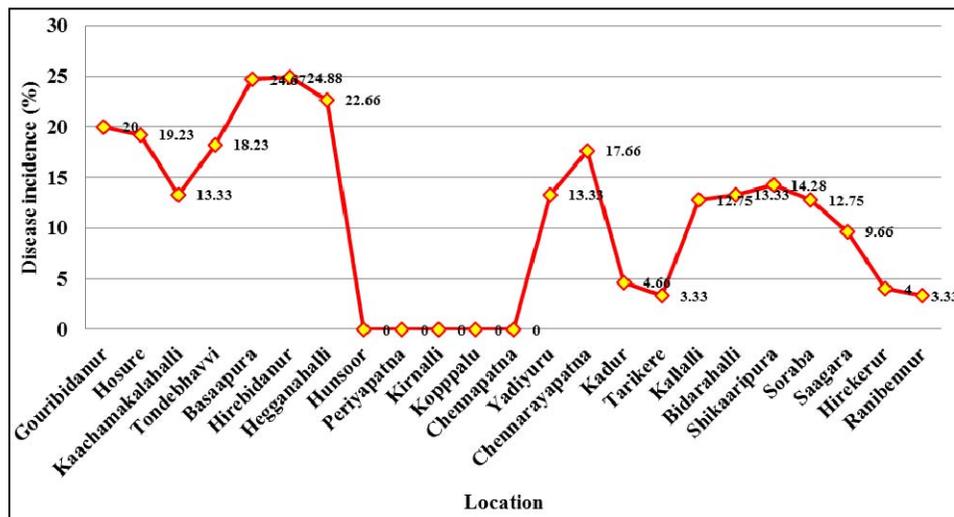


Fig 1: Prevalence of post flowering stalk rot of maize in different districts of Southern Karnataka during spring season 2016



Plate 1: Pure culture *Fusarium moniliforme*



Plate 2: Pathogenicity test

acremonium and *Fusarium moniliforme* with stalk rot of maize. Indian Phytopath. 1976; 3:227-231.

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