Biological Forum – An International Journal **13(2): 201-210(2021)**

ISSN No. (Print): 0975-1130
ISSN No. (Online): 2249-3239

Occurrence and Prevalence of Fusarium Wilt in Major Pigeonpea Growing Areas of North Eastern Karnataka

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(Received 30 March 2021, Accepted 08 June, 2021)
(Published by Research Trend, Website: www.researchtrend.net)

ABSTRACT: The wonder crop pigeonpea is renowned for its multipurpose uses. India alone covers more than 70% area (4.65 M ha) among all pigeonpea growing countries (FAOSTAT, 2015). The crop suffers from numerous pathogens, but fortunately, only a few of them cause huge losses (Kannaiyan *et al*., 1984) (mehtashv). Among the soil borne diseases Fusarium wilt causes considerable yield losses to the pigeonpea in India as well as in major pigeonpea growing areas of Karnataka especiallyNorth Eastern Karnataka. On that note survey was conducted during the three consecutive years 2017, 2018 and 2019 in the major pigeonpea growing districts of Raichur, Kalaburgi, Yadgir and Bidar districts to know the incidence of disease. During the year 2017-18 the highest Fusarium wilt incidence was noticed in Kalaburagi (21.1 %), followed by Raichur (16.67 %) and Yadgir district (7.7%). On contrary, lowest wilt incidence was observed in Bidar district (3.5%). While during 2018-19 the district mean severity among the different districts, ranged between 3 – 13.7% with maximum incidence recorded in Kalaburagi district and minimum in Bidar district. District wise pooled data of the *Fusarium* wilt for three consecutive year's states that the highest incidence of 16.8 % was recorded in Kalaburagi district. Moderate wilt incidence was recorded in Raichur district (10.1 %). Least wilt incidence was observed in Bidar (3.10%) district.

Keywords: Pigeonpea, Fusarium, Survey, Resistant, Susceptible

INTRODUCTION

Among distinct leguminous crops, pigeonpea (*Cajanus cajan* (L.) Millspaugh) also called as pigeonpea, occupies a significant place at global rainfed agriculture (Saxena and Nadarajan *et al*., 2010). The term pigeonpea was coined in Barbados, where its seeds were considered as a very important feed for pigeon. The word Cajanus comes from Malay word 'Katschang' or 'Katjang', which implies pod or bean. It belongs to the Leguminoseae family and may be a short-lived perennial shrub, that's traditionally cultivated as an annual crop in developing countries. it's fast growing, hardy, widely adaptable and drought resistant, often cross pollinated (20-70 %) which is alleged to be awfully old and one in every of the important leguminous crops of tropics and subtropics. it's a diploid legume crop species (2n = 2x = 22), belongs to the tribe Phaseoleae. it's the potential to revive soil fertility by fixing atmospheric nitrogen and has the flexibility to solubilize fixed phosphorus (Ae *et al*., 1990). It is widely used as a pulse, green vegetable, fodder and for a range of other purposes. additionally, it can be cut for forage and improves poor soil through its deep strong rooting systems, leaf drop at maturity and addition of nitrogen by symbiotic activities during crop growth. It has multiple uses such as tender green seeds used as vegetables, stem and roots as fuel wood, besides its main use as dhal. The seed protein content of Pigeonpea (21%) compares well with that of other important grain legumes. Considering importance of pulses in human nutrition, government of India is giving much emphasis on increasing production of pulses in the country by making 2016 as International year of pulses.

The crop suffers from numerous pathogens, these include *viz*., fungi, bacteria, viruses, nematodes and phytoplasmas (Reddy *et al.* 1990; Nene *et al*. 1996). The soil borne diseases of considerable economic importance are Fusarium wilt, Phytophthora blight, dry root rot and Collar rot.

Among the major soil borne diseases, the Fusarium wilt caused by *Fusarium udum* Butler is one of the most important disease capable of causing 30-100% loss in grain yield (Nene *et al.*1980, Upadhyay and Rai, 1982, Kannaiyan and Nene 1981, Reddy *et al.*1990).

The pathogen is primarily a soil inhabitant, and hence controlling the disease is very difficult as no effective chemicals are available at present, even though

application of carbendazim has been successful in controlling the disease, but to a limited extent and also it is not economical. The frequent application of fungicides to the soil has caused environmental hazards causing water and soil pollution in addition to killing the non-target beneficial microorganisms in soil. The disease was first reported from Bihar state in India (Butler 1906).By considering the seriousness and magnitude of the soilborne diseases of pigeonpea and importance of the crop in Northern Karnataka region, there is need to intensify the research on soil borne diseases of pigeonpea with special emphasis on *Fusarium* wilt. Hence the present investigation was undertaken to survey for Fusarium wilt of pigeonpea during three consecutive years 2017, 2018 and 2019.

MATERIALS AND METHODS

A roving survey was conducted in major Pigeonpea growing areas North Eastern Karnataka *viz.*, Raichur, Kalaburgi, Bidar and Yadgir districts for Fusarium wilt & other soil borne diseases of during 2017-18, 2018-19 and 2019-20. Survey was conducted at flowering to pod filling stage of the crop. In each taluk, five villages were selected and in each village observations were drawn for the incidence of Fusarium wilt (Fig. 1).

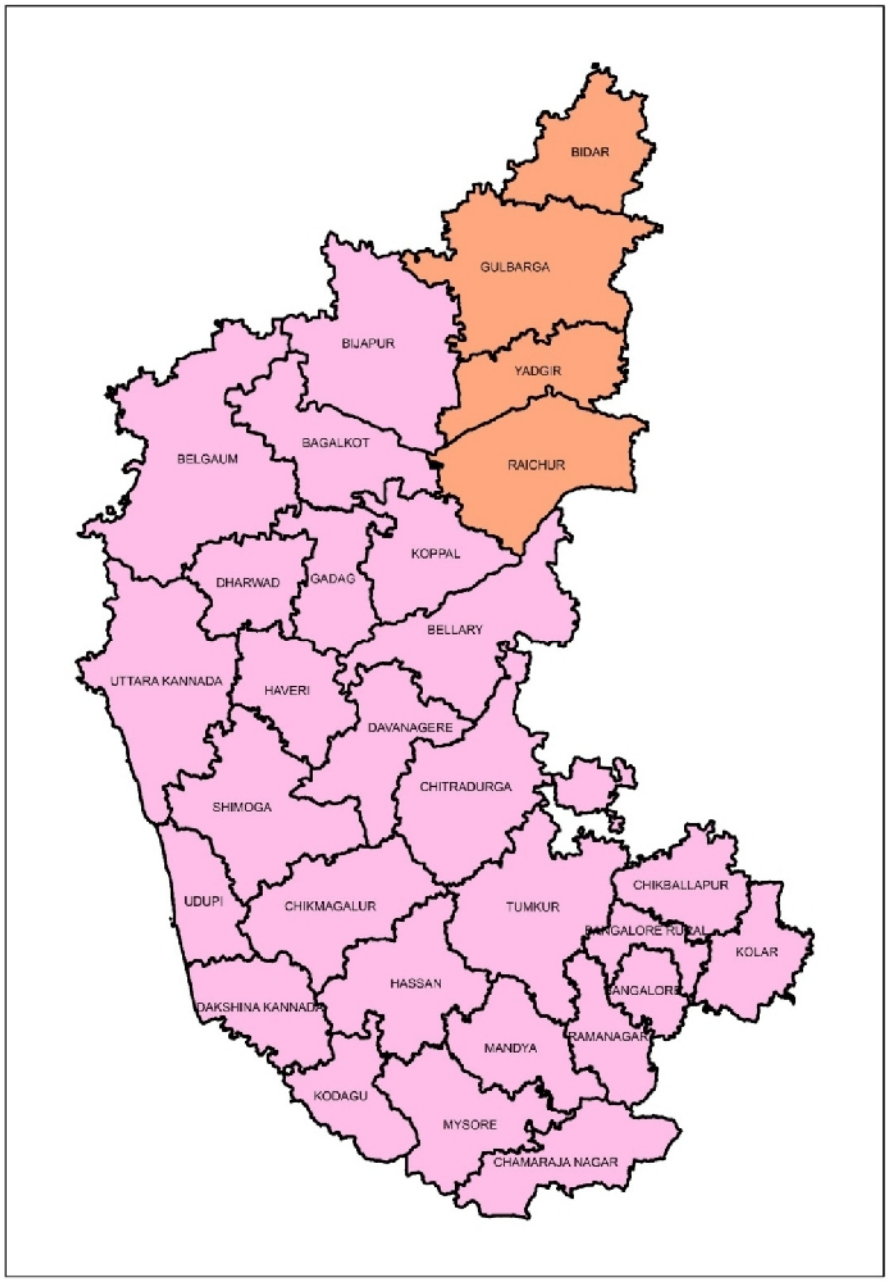

Fig. 1. Survey for the incidence of *Fusarium* wilt of pigeonpea.

The following formula was used to calculate the disease incidence

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

Disease rating scale for Fusarium wilt of pigeonpea as reported by Pande *et al*. (2012) is furnished below.

Disease incidence (%)	Disease reaction
0 – 10	Resistant
10.1 – 20.0	Moderately resistant
20.1 – 40.0	Moderately susceptible
40.1 – 100	Susceptible

A. Collection and isolation of diseased specimen

The field survey was carried out during September-October, for three consecutive years. Wilt affected plant samples were collected from different farmer's fields. After collection, plant samples were brought to the laboratory and washed thoroughly under running tap water. The basal stalk portion and roots of wilted plants were separated, & dried under shade for 3-4 days and preserved for further use.

The Pathogen was isolated by adopting a standard tissue isolation method. Pigeonpea plants showing typical vascular wilt symptoms collected from different locations were used for isolation. Wilt infected stem and roots were split open longitudinally with the help of sterile scalpel. The plant parts showing brown discoloration of vascular tissues were cut into small bits, surface sterilized by dipping in 1% sodium hypochlorite for one minute, then rinsed with 3 changes of sterile distilled water, blot dried and then transferred aseptically on to Petriplates containing sterilized PDA medium at equidistance @ 5 bits/petriplate. The inoculated Petriplates were incubated at 25 + 2^{o}C in an incubator.

The surface sterilized seeds of highly susceptible pigeonpea genotypes ICP 2376 were grown in pots filled with sterilized sand in a greenhouse maintained at 25 ± 2ºC. These plastic pots were filled to 2/3 of its volume with sterilized sand. Before sowing, seeds are surface sterilized using two per cent sodium hypochlorite for two minutes, rinsed in sterile water in order to wash off sodium hypochlorite, sow 25 to 30 seeds in each plastic bags and allow to grow for eight days.

RESULTS AND DISCUSSION

A. Symptoms of Fusarium wilt observed in the field

The typical wilt symptoms was observed when the plants were of 4-6 weeks old. During the flowering and maturity stage highest mortality of mature plants was seen. The infected plant depicted the withering and drying of green plant parts exactly as if they were suffering from drought. In the beginning it starts with yellowing of leaves and later dark purple band occur on the stem (Plate 1). Drying starts from the collar region and extends upward to the branches and it gradually results in drying of leaves, stem, and branches and finally lead to death of the plant. Partial wilting is also common in the field due to lateral root infection. Tap root infection results in complete wilting of the plants. Stem discoloration can be observed in streaks or patches, which are clearly visible when the bark is peeled off.

Plate 1. Symptoms of *Fusarium* wilt on pigeonpea [**A.** Healthy plant; **B.** Purple banding on the stem; **C.** Partially wilted plant; **D.** Completely wilted plant; **E.** lateral root infection; **F.** Vascular discoloration of vascular bundle].

B. Isolation and pathogenicity

The Pathogen was isolated by adopting a standard tissue isolation method. Pigeonpea plants showing typical vascular wilt symptoms collected from different locations were used for isolation. Wilt infected stem and roots were split open longitudinally with the help of sterile scalpel. The plant parts showing brown discoloration of vascular tissues were cut into small bits, surface sterilized by dipping in 1% sodium hypochlorite for one minute, then rinsed with 3 changes of sterile distilled water, blot dried and then transferred aseptically on to petriplates containing sterilized PDA medium at equidistance @ 5 bits/petriplate. The inoculated Petriplates were incubated at 25 + 2^{o}C in an incubator.

The culture on agar medium showed deep purple pigmentation. Aerialmycelium was almost absent with the profuse development of pinnate sporodochia. Microconidia was observed with its size varying from one celled, hyaline, ovoid/fusoid or curved. Macroconidia was hyaline, typically thin walled with 1-4 septations, falcate with a distinct foot cell and an apical cell of decreasing diameter towards the tip, which varied with curved or hooked. Chlamydospores were formed in which was globose, intercalary and terminal production. Various shape, size and growth pattern was observed among the isolates. Based on the cultural and morphology characters of the mycelium and chlamydospore, the fungus was identified as *F. udum*.

C. Occurrence and distribution of Fusarium wilt

The pigeonpea crop is grown as solo crop in some areas especially in major pigeonpea growing areas of Karnataka *viz*., Kalaburgi, Raichur, Yadgir and Bidar. A survey was conducted during September –October 2017, 2018 and 2019 to know the status of Fusarium wilt incidence under field condition (Plate 2).

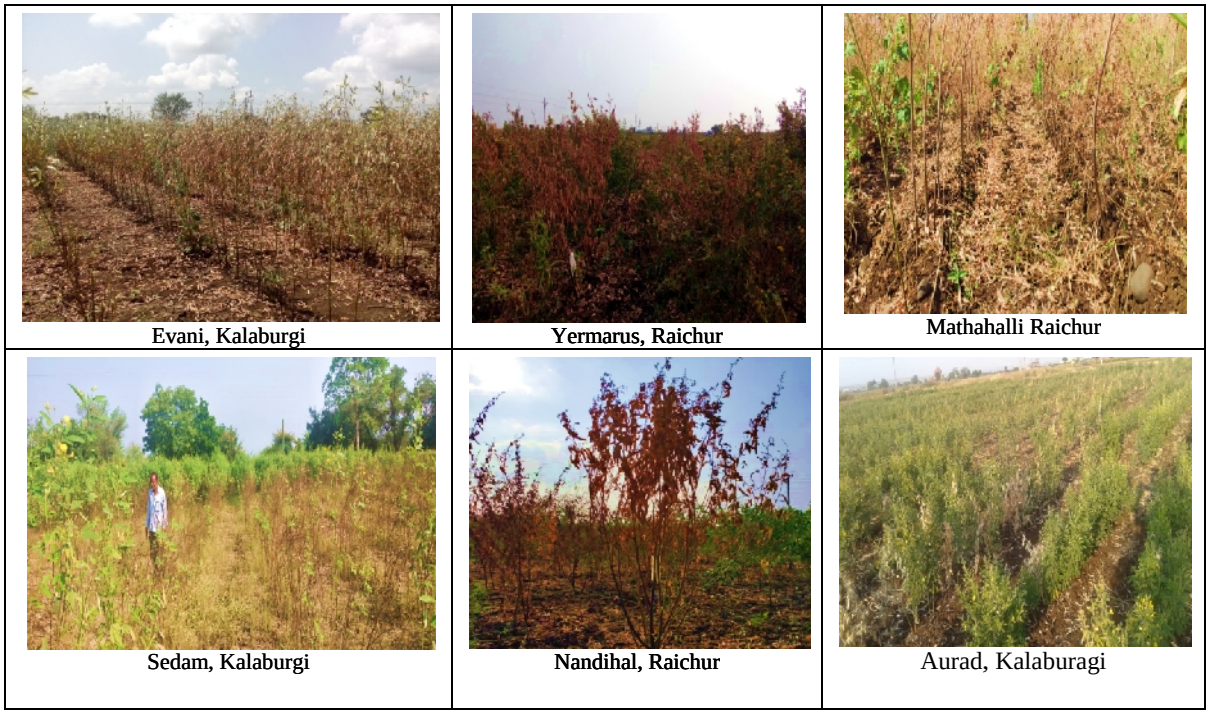

Plate 2. Severity of wilt observed in pigeonpea during survey in Raichur and Kalaburagi districts.

During the *Kharif* 2017-18 highest incidence of *Fusarium* wilt was observed in Evani (49.2%) and Sannur (30.0%) villages of Kalaburagi district followed by Mathahalli (31.3%) village of Raichur district and Birnoor (26.5%) village of Yadgir district. On contrary, the least wilt incidence of 0.3% was reported in Tadola village of Bidar district (Table 1, Fig. 2). Studies were conducted by Maurya *et al*. (2020) survey was conducted to know the incidence of Fusarium wilt and the cyst nematode of pigeonpea of Prayagraj district, the results reveals that maximum wilt incidence was recorded in Dari village (57.6 %) whereas, the lowest incidence of 12.8% was recorded in Chaka village.

Taluk wise mean incidence during 2017-18 revealed that (Table 2, Fig. 3) maximum wilt incidence of 25.7 % was recorded in Chittapur followed by Jewargi (23.9%) taluk of Kalaburagi district and Lingasugur (21.5%) taluk of Raichur district. Lowest wilt incidence of 2.91 % was observed in Humnabad taluk.

Table 1: Survey for the incidence of Fusarium wilt during *Kharif* 2017, 2018 & 2019.

Sr. No.	District	Taluk	Village	No. of fields	Latitude	Longitude	Soil type	Percent wilt incidence		
								2017-18	2018-19	2019-20
1	Raichur	Raichur	Yermarus	5	16.2633	77.3568	Black soil	11.9	9.90	7.00
			Yergera	4	16.0675	77.414	Black soil	9.30	8.30	11.5
			Sultanpura	3	16.2653	77.177	Black soil	14.7	4.30	9.00
			Timmapur	4	15.8256	76.877	Black soil	9.40	1.00	2.00
			UAS campus	5	16.205	77.328	Black soil	14.0	2.90	5.00
			Hunsalahada	5	16.212	77.34	Black soil	16.3	7.50	3.50
			Muranapura	3	16.5	77.1548	Black soil	2.70	0.00	1.50
			Kalmal	3	16.197	77.206	Black soil	11.3	5.50	7.30
			Mean					**11.2**	**4.93**	**5.79**
		Lingasugur	Nandihal	5	16.081	75.4	Black soil	11.3	15.2	8.20
			Hirelekkihal	3	16.155	76.51	Black soil	20.0	2.00	7.00
			Chikkalakkihal	5	16.1552	76.51	Black soil	25.0	2.50	5.50
			Sajjalaguda	4	16.156	76.52	Black soil	23.9	13.9	7.30
			Amadihal	5	16.01	76.36	Black soil	27.5	14.0	5.00
			Mean					**21.5**	**9.52**	**6.6**
		Deodurga	Deodurga	5	16.423	76.93	Black soil	4.40	0.00	1.50
			Mathahalli	3	16.32	76.83	Black soil	31.3	0.00	2.00
			Chikkabidu	5	16.148	76.52	Black soil	8.60	18.6	10.0
			Anjigur	5	16.43	76.82	Black soil	15.9	5.95	7.00
			Mean					**15.0**	**6.14**	**5.1**
		Manvi	Shakapur	5	16.32	77.02	Black soil	20.9	3.20	2.00
			Siravara	5	16.18	77.02	Black soil	18.7	7.80	12.0
			Jakkaladinni	5	16.21	77.063	Black soil	17.1	13.1	11.0
			Mean					**18.9**	**8.0**	**8.3**
	Mean							**16.6**	**7.15**	**6.46**
2	Kalaburgi	Chittapur	Revur	5	17.1	76.996	Black soil	16.8	17.2	11.0
			Margolla	5	16.98	76.771	Black soil	14.9	15.0	12.0
			Evani	3	17.118	77.08	Red soil	**49.2**	20.5	12.5
			Madbol	5	17.141	77.13	Black soil	17.9	15.0	21.0
			Sannur	3	17.123	77.13	Black soil	30.0	35.7	25.0
			Mean					**25.7**	**20.6**	**16.3**
		Kalaburagi	Shahbad	5	17.14	76.94	Black soil	28.8	20.0	18.0
			Nandur	5	17.26	76.87	Black soil	3.60	4.50	5.00
			ARS, Kalaburgi	3	17.33	76.83	Black soil	11.0	7.00	10.0
			Hirapur	5	17.35	76.91	Red soil	23.0	13.2	17.5
			Shirasigi	4	17.31	76.776	Black soil	18.0	17.8	12.0
			Mean					**16.8**	**12.5**	**12.5**
		Jewargi	Jewargi	5	17.018	76.765	Black soil	22.5	18.8	35.0
			Aurad	5	17.45	76.89	Black	16.3	23.2	20.5

							soil			
			Hargadda	3	17.35	76.915	Black soil	37.3	15.0	17.0
			Chigarahalli	5	17.41	76.89	Black soil	24.5	17.8	20.5
			Ijeri	5	16.922	76.69	Black soil	18.9	13.0	12.0
		Mean						**23.9**	**17.56**	**21.0**
		Aland	Padavasahalli	5	17.57	76.56	Red soil	12.3	7.20	17.5
			Honnahalli	5	17.58	76.49	Red soil	29.4	4.80	0.00
			Telkarni	5	17.53	76.19	Black soil	27.0	13.7	22.0
			Kadagandhi	4	17.46	76.138	Black soil	18.0	8.20	19.5
		Mean						**21.7**	**8.50**	**14.8**
		Sedam	Kodla	5	17.11	77.37	Black soil	20.6	9.60	13.5
			Adaki	4	17.12	77.382	Black soil	10.5	7.50	11.0
			Neelhalli	5	17.082	77.3	Black soil	20.4	10.2	15.7
		Mean						**17.1**	**9.10**	**13.4**
	Mean							**21.1**	**13.7**	**15.6**
3	Yadgir	Yadgir	Shettihalli	3	16.83	77.155	Black soil	8.60	5.60	0.00
			Nalvari	5	16.955	76.994	Black soil	2.90	13.9	4.70
			Pursapur	4	16.7868	77.101	Black soil	3.50	1.50	13.0
			Birnoor	4	16.8144	77.055	Black soil	26.5	17.5	0.00
			Ayyala	3	16.8136	77.0217	Black soil	9.40	3.50	1.50
			Yaragol	5	16.9035	77.06623	Black soil	14.6	7.60	2.00
			Alipur	4	16.84005	77.11425	Black soil	1.30	0.30	11.0
		Mean						**9.54**	**7.10**	**4.60**
		Shahapur	Aralahalli	3	16.7051	76.839	Black soil	2.00	10.0	5.00
			Hothpet	5	16.735	76.745	Black soil	10.3	7.20	6.50
			Vibuthihalli	4	16.635	76.853	Black soil	7.30	5.30	8.00
			Beemarayanagudi	5	16.732	76.7985	Black soil	15.9	10.0	11.0
			Madrike	4	16.604	76.873	Black soil	3.20	3.20	7.00
		Mean						**7.74**	**7.14**	**7.50**
		Surpur	Krishnapur	5	16.521	76.761	Red soil	3.60	7.00	5.00
			Titga	3	16.664	76.502	Black soil	4.40	0.00	6.50
			Satyapet	4	16.636	76.788	Black soil	1.40	0.00	1.00
			Hasanapuracamp	5	16.532	76.769	Black soil	8.70	8.75	2.50
			Lakshmipur	4	16.5562	76.758	Red soil	10.4	13.2	11.0
		Mean						**5.70**	**5.79**	**5.20**
	Mean							**7.70**	**6.70**	**5.80**
4	Bidar	Bidar	Honnadi	5	17.914	77.504	Red soil	5.20	1.00	1.30
			Mirjapur	4	17.802	76.903	Red soil	1.50	0.00	4.00
			Janawada	3	18.001	77.336	Black soil	5.00	0.20	7.10
			Bynaha	3	17.911	77.415	Black soil	2.00	3.20	0.00
			Kapalapur	3	17.982	77.564	Black soil	3.10	0.50	1.80
		Mean						**3.40**	**1.00**	**2.90**
		Basavakalyan	Manavalli	5	17.948	76.957	Red soil	11.8	11.0	0.50

			Hippagara	3	17.935	76.878	Red soil	1.00	0.00	0.00
			Tadola	3	17.998	76.939	Red soil	0.30	2.20	1.20
			Bagduri	3	17.876	77	Red soil	0.50	0.30	0.00
			Shivapura	4	17.8615	76.97094	Black soil	7.60	3.60	8.00
		Mean						**4.20**	**3.40**	**1.90**
		Humnabad	Hankuni	5	17.796	77.144	Red soil	1.60	10.5	7.00
			Kanakatta	5	17.799	77.033	Red soil	6.50	12.2	1.30
			Hudagi	3	17.71	77.226	Black soil	3.40	0.50	1.20
			Nandagao	3	17.786	77.305	Black soil	2.10	0.00	5.00
			Shanltabad	3	17.683	77.143	Black soil	1.00	0.00	1.30
		Mean						**2.90**	**4.60**	**3.20**
	Mean							**3.50**	**3.00**	**2.70**

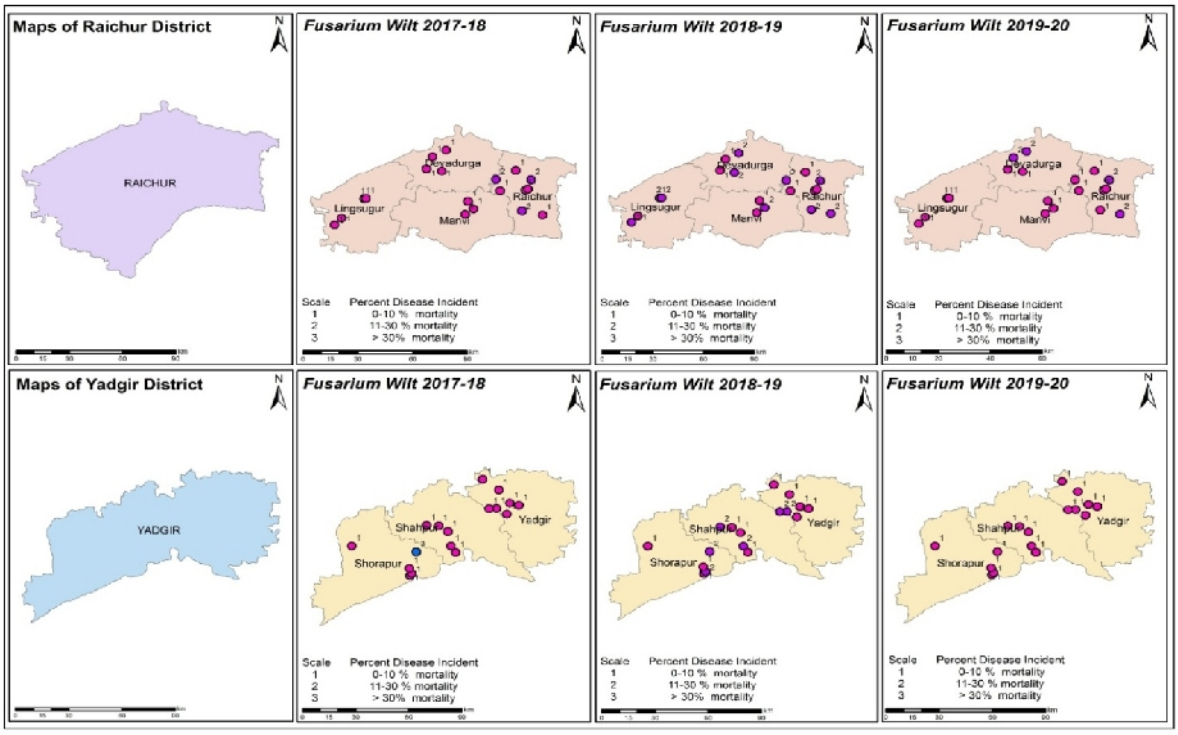

Fig. 2. Cartographical representation of *Fusarium* wilt of pigeonpea in Raichur and Yadgir districts.

Table 2: Taluk wise mean incidence and severity of Fusarium wilt of pigeonpea in major areas of Karnataka over the years.

Sr. No.	District	Taluk	Percent disease incidence			Average
			2017-18	2018-19	2019-20	
1	Raichur	Raichur	11.2	4.93	5.79	**7.30**
		Lingasugur	21.5	9.52	6.60	**12.5**
		Deodurga	15.0	6.14	5.10	**8.70**
		Manvi	18.9	8.00	8.30	**11.7**
2	Kalaburagi	Chittapur	25.7	20.6	16.3	**20.9**
		Kalaburagi	16.8	12.5	12.5	**13.9**
		Jewargi	23.9	17.5	21.0	**20.8**
		Aland	21.7	8.50	14.8	**15.0**
		Sedam	17.1	9.10	13.4	**13.2**
3	Yadgir	Yadgir	9.50	7.10	4.60	**7.10**
		Shahapur	7.70	7.14	7.50	**7.40**
		Surpur	5.70	5.70	5.20	**5.50**
4	Bidar	Bidar	3.40	1.00	2.90	**2.40**
		Basavakalyan	4.20	3.40	1.90	**3.20**
		Humnabad	2.90	4.60	3.20	**3.60**

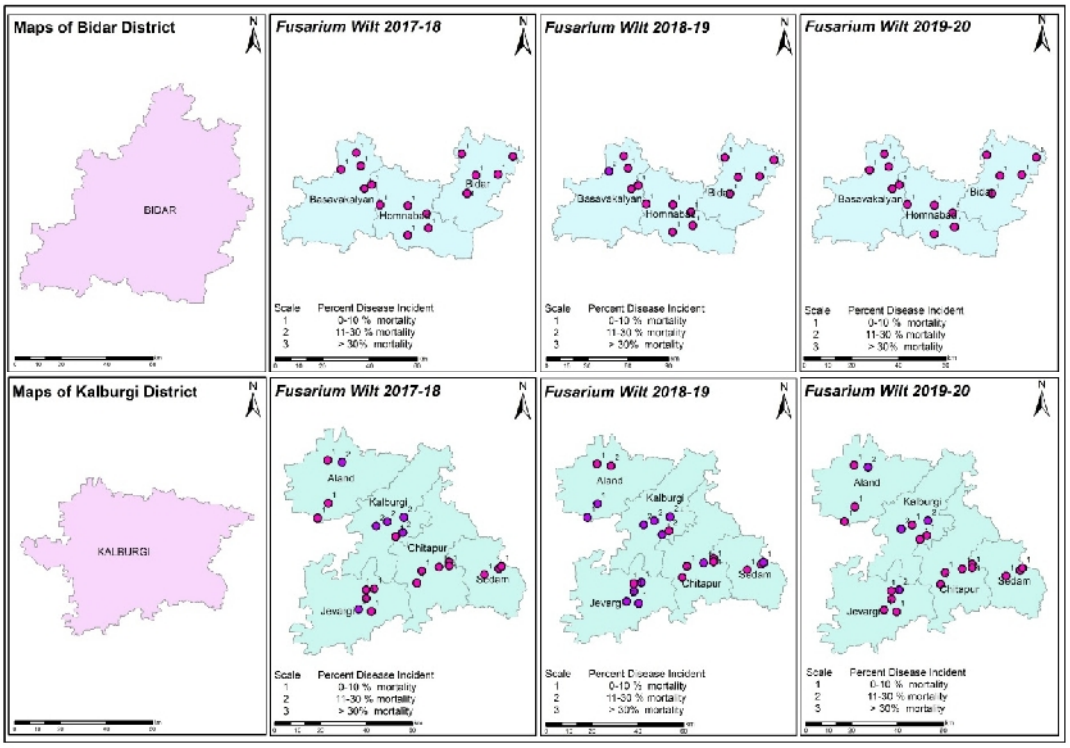

Fig. 3. Cartographical representation of *Fusarium* wilt of pigeonpea in Bidar and Kalaburgi districts.

Looking into the district wise severity of wilt during 2017-18 (Table 3), highest incidence was observed in Kalaburagi district (21.1 %), followed by Raichur (16.67 %) and Yadgir district (7.7%). On contrary, lowest wilt incidence was observed in Bidar district (3.5%). Similar studies were conducted by ravikumar during 2014-15, and conducted survey all over the India. The results obtained from the survey is as follows, among the five states surveyed for pigeonpea wilt incidence in southern and central region of India during *Kharif* 2013- 14 (192 villages) and 2014-15 (205 villages), the mean maximum incidence was recorded more in Karnataka state (9.99%) followed by Maharashtra, Telangana, Madhya Pradesh which recorded 9.66 per cent, 8.05 per cent, 7.81 per cent respectively and the least incidence was 7.36 per cent recorded in Tamil Nadu state during 2013-14.

During the *Kharif* 2018-19, highest incidence of 35.7% was recorded in Sannur and Aurad (23.2%) villages of Kalaburagi district followed by Chikkabidu (18.6%) and Nandihal villages (15.2%) of Raichur district. No wilt incidence was recorded in Mirjapur, Hippagara, Nandagao and Shanltabad villages of Bidar district.

Chittapur taluk of Kalaburagi district was observed with highest incidence of 20.6% then followed by Jewargi (17.5%) and Kalaburagi taluk (12.5%), whereas moderate wilt percentage ranged from 7.1 to 9.52 was noticed in Yadgir, Shahpur taluk of Yadgir district, Aland and Sedam taluk of Kalaburagi district, Manvi and Lingasugur district of Raichur district, Least incidence of 2.1 was recorded in Bidar taluk.

Overall districts mean severity among the different districts, ranged between 3 – 13.7% with maximum incidence recorded in Kalaburagi district and minimum in Bidar district. The results on survey were in confirmation with the studies conducted by Saifulla and Mahesh to identify the hot spots of *Fusarium* wilt of pigeonpea in different districts of Southern Karnataka for three consecutive *Kharif* seasons from 2004-05 to 2006-07. Among the six districts surveyed during *Kharif* 2004-05, the maximum mean wilt incidence of 12.55 per cent was recorded in Kolar district with disease incidence ranged between 0-90 per cent.

Table 3: District wise mean incidence and severity of Fusarium wilt of pigeonpea in major areas of Karnataka over the years.

Sr. No.	District	Percent disease incidence			Average
		2017-18	2018-19	2019-20	
1	Raichur	16.67	7.15	6.46	**10.1**
2	Kalaburagi	21.1	13.7	15.6	**16.8**
3	Yadgir	7.70	6.70	5.80	**6.70**
4	Bidar	3.50	3.00	2.70	**3.10**

During second year (2005-06), among the five districts surveyed, maximum mean wilt incidence of 13.92 per cent was recorded in Chamarajanagar district and disease incidence ranged between 0-65 per cent. In third year (2006-07), the maximum mean wilt incidence of 8.13 per cent was recorded in Bengaluru district among the seven districts surveyed in southern Karnataka.

Similarly, survey report of 2019-20 revealed that highest incidence of *Fusarium* wilt was recorded in Jewargi (35.00%) village followed by Sannur (25.00%) followed by Telkarni (22.00%), Madbol (21.1%) and Aurad villages of Kalaburagi district. The crop in Bynaha, Hippagara, Bagduri villages of Bidar district was completely free from the disease.

Disease scenario of different taluks during 2019-20 indicated that, highest incidence of 21.0 was observed in Jewargi taluk. Moderate wilt incidence ranged between 12.5 to 16.3 percent was observed from Kalaburagi, Sedam, Aland and Chittapur taluks of Kalaburagi districts. On the contrary negligible incidence of 1.9 per cent was recorded in Basavakalyan taluk of Bidar district.

District wise severity of wilt surveyed during 2019-20 exhibited that, highest and lowest wilt incidence of 15.6 percent and 2.7 percent were observed in Kalaburagi and Bidar district respectively. Followed by Raichur (6.46%) and Yadgir district (5.8%). Lowest wilt incidence was observed in Bidar district (2.7%).These observations are in accordance with the studies of (Bidari, 1995; Butler, 1918 and Gaur and Sharma, 1989), Kannaiyan and Nene, 1981, Pawar *et al.* (2013), Muhammad Saifulla and Mahesh 2005, Ravikumar, 2015.

The taluk wise pooled data of *Fusarium* wilt for three consecutive years depicts that the highest wilt incidence was recorded in Chittapur taluk (20.9 %) followed by Jewargi taluk (20.8 %) of Kalaburagi district. Mild wilt incidence was observed in Lingasugur (12.5 %) and Manvi (11.7 %) of Raichur district. However the least wilt incidence was observed in Bidar taluk (2.40 %) of Bidar district. Sushreeta *et al*.conducted survey in different districts of Uttar Pradesh and recorded the highest wilt incidence of 59.6 per cent in Sultanpur district and in all other districts (Varanasi, Barabanki, Gorakhpur and Mirzapur) wilt incidence was ranged between 10.7per cent - 59.6per cent at different growth stages *viz*., flowering, pre-podding, podding and post-podding stages.

Wilt has been a never ending havoc to the pigeonpea crop for decades. The highest incidence of 16.8 % was recorded in Kalaburgi district for three consecutive years moderate wilt incidence was recorded in Raichur district (10.1 %). Least wilt incidence was observed in Bidar (3.10%) district.

CONCLUSION

The survey conducted across the locations and seasons revealed the maximum Fusarium wilt incidence was recorded in Kalaburagi district followed by Raichur district whereas Bidar district has recorded the minimum wilt incidence.

Monocropping has been practiced in the villages pertaining to Kalaburgi district also Fusarium wilt incidence is generally more in farmer's field with the local cultivars such as, Kari togari, Gulyal local and Kattibheeja as compared to improved cultivars. In addition cultivar Asha is considered to be a very good resistant source against Fusarium wilt across the four surveyed districts. Where as in some villages belonging to Bidar the intercropping of pigeonpea with other crops like sorghum, horsegram, blackgram etc., majority of the pigeonpea crop was grown under vertisoils compared to alfisols. The variations in the diseases incidence in different locations may be because of the impact of the environmental factors or variation in the resistance of the cultivars to the pathogen.

The current study provides the data on the occurrence, prevalence and distribution of Fusarium wilt incidence in major pigeonpea growing areas of Karnataka and to find out the hot spots of *F. udum* in different places of North Eastern Karnataka. The pathogen is gaining more importance especially in the current scenario of climate change. Even though various control measures are taken so far, more focus on the breeding aspects so that the diseases will be prevented naturally with the innate resistance.

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How to cite this article: Bindhu, K.G., Yenjerappa, S.T., Ajithkumar, K., Gururaj Sunkad, Sreenivasa, A.G. and Mahadevaswamy (2021). Occurrence and prevalence of Fusarium wilt in major growing areas of North Eastern Karnataka. *Biological Forum – An International Journal*, *13*(2): 201-210.