



ISSN Print: 2394-7500
ISSN Online: 2394-5869
Impact Factor: 5.2
IJAR 2017; 3(8): 848-851
www.allresearchjournal.com
Received: 13-06-2017
Accepted: 17-07-2017

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Investigations on survey, surveillance and cultural characteristics of pod blight of soybean

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Abstract

A survey was undertaken in nine tahsils (Gangakhed, Jintur, Manwat, Palam, Parbhani, Pathri, Purna, Sailu and Sonpeth) of Parbhani district during June to August in Kharif, 2016. In all, 42 soybean fields were surveyed (roving survey) for recording the pod blight intensity and per cent pod infection of soybean pod blight disease. The higher pod blight intensity and per cent pod infection was noticed on the soybean field of Gangakhed tahsil, followed by Manwat, Palam, Parbhani, Pathri, Jintur, Sailu, Purna and Sonpeth. The variety JS-335 showed the maximum pod blight intensity and per cent pod infection in all surveyed tahsils. The average pod blight intensity and per cent pod infection of pod blight disease was (30.68%, 33.88%) in Parbhani District, respectively. The highest pod blight intensity and per cent pod infection (37.22%, 42.42%) respectively, was noticed in Gangakhed tahsil, followed by Manwat (37.10%, 41.28%), Palam (30.49%, 36.92%), Parbhani (31.20%, 33.64%), Pathri (29.88%, 32.75%), Jintur (29.50%, 31.88%), Sailu (28.82%, 31.18%), Purna (28.17%, 28.52%) and Sonpeth (23.75%, 26.40%) respectively. The lowest pod blight intensity and per cent pod infection (23.75%, 26.40%) was noticed in Sonpeth tahsil. The pathogen was isolated and purified. Its pathogenicity was proven in pot culture. The fungal (*Colletotrichum truncatum* is fungi) pathogen was identified as *Colletotrichum truncatum*.

Keywords: survey, pod blight, soybean, *Colletotrichum truncatum*

Introduction

Soybean belongs to the family Leguminosae and sub-family Papilionoidae. The crop is widely grown in the world and is a primary source of vegetable oil and protein. It contains 44.65% protein, 8.77% fats, 27.12% nitrogen, 5.89% ash, 5.96% fibre. In India, the area, production and productivity of soybean during Kharif 2016 is 112.17 lakh ha., 114.90 lakh metric tonnes and 1047 kg/ha, respectively (SOPA, 2016) ^[1, 2]. Maharashtra, the area, production and productivity of soybean during Kharif 2016 were 35.80 lakh hectare, 39.45 lakh Ton and 1102 kg/ha, respectively (SOPA, 2016) ^[1, 2]. Foliar symptoms include necrosis of leaf veins, leaf rolling, petiole canker and premature defoliation. However, pod blight phase is most damaging (Vyas *et al.*, 1997) ^[2]. Reddish brown spots appear on the pods and later turn black. Fruiting bodies (Acervulli) on infected pods resemble small pin cushions surrounded by minute blackish brown setae and infected pods finally get dried out prematurely with shriveled and moldy seeds. Soybean crop is known to be affected by more than 100 plant pathogens. Among them, 35 plant pathogens are of economic importance. Pod blight caused by *C. truncatum* has been reported to the major disease in the production of soybean. It causes yield losses ranging from 16-100% under extreme condition (Sinclair 1992; Anonymous, 1999) ^[1, 3, 4].

Materials and Methods

Disease survey

A roving survey was conducted in soybean growing areas during Kharif 2016 in following tahsils of Parbhani district *viz.*, Gangakheda, Jintur, Manwat, Palam, Parbhani, Pathri, Purna, Sailu, Sonpeth to assess anthracnose intensity (PDI) and pod infection.

Observations on anthracnose intensity were recorded on ten randomly selected soybean plants per field surveyed, applying standard 0-9 grade disease rating scale (Mayee and Datar, 1986) ^[5] as detailed below.

Standard disease rating (0-9 grade) scale**Table 1:** Standard disease rating (0-9 grade) scale

Rating scale	Description
0	No symptoms on the leaf.
1	Small, irregular brown spots covering 1 per cent or less of the leaf area.
3	Small, irregular, brown spots with concentric rings covering 1-10 per cent of the leaf area.
5	Lesions enlarging, irregular, brown with concentric rings covering 11-25 per cent of the leaf area.
7	Lesions coalescing to form irregular brown patches with concentric rings. Covering 26-50 per cent of the leaf area. Lesions also on stem and petioles.
9	Lesions coalescing to form irregular, dark brown patches with concentric rings covering 51 per cent or more of the leaf area. Lesions on stem and petioles.

Based on numerical ratings or scale observed per cent disease intensity was worked out applying the formula given by Mc Kinney (1923).

$$\text{Per cent disease Intensity (PDI)} = \frac{\text{Summation of numerical ratings}}{\text{Number of leaves/plants Observed} \times \text{maximum rating}} \times 100$$

Per cent disease incidence of pod blight was calculated by using formula.

$$\text{Per cent disease Incidence} = \frac{\text{Number of plants infected}}{\text{Total number of plants examined}} \times 100$$

Isolation of pathogen

Soybean plants (JS-335) naturally infected with typical pod blight symptoms were collected from farmers' field and brought to the laboratory. All samples collected from different locations were subjected to isolation of pod blight pathogen on potato dextrose agar medium (PDA) in the laboratory.

Pathogenicity test of pod blight pathogen

Five seeds of the susceptible variety JS-335 were sown in each pot filled with soil and FYM in 2:1 proportion and immediately watered with sterilized distilled water. After germination, only four seedlings were maintained in each pot. When the plants were 4 weeks old, the conidial suspension ($3-5 \times 10^6$ conidia/ml) of the test pathogen was prepared as the inoculum for pathogenicity test. The underside of the leaf was sprayed with water and dusted with carborendum powder. Further, these leaves were smeared with conidial suspension by means of sterile cotton swab. These pots were placed in a glasshouse, where high humidity and optimum temperature (24 ± 2 °C) were maintained for further development of pod blight disease symptom. After eight to ten days incubation period, typical symptoms on foliage of artificially diseased (pod blight) soybean plants were observed. The microbe was re-isolated on potato dextrose agar medium.

Results**Survey of pod blight disease intensity of soybean in different tahsils of Parbhani district**

The results revealed that the severity of disease was maximum in Gangakhed tahsil, followed by Manwat, Palam, Parbhani, Pathri, Jintur, Sailu, Purna and Sonpeth. The minimum disease severity was observed in Sonpeth tahsil (Table 2 and Figure 1). The result also showed that the variety JS-335 was highly susceptible to disease in all tahsils, followed by MAUS-158 and MAUS-71 (Table 3 and Fig 2).

Survey of per cent pod infection of pod blight of soybean in different tahsils of Parbhani district

The results (Table 2 and Figure 1) revealed that the maximum percent pod infection (42.42%) was observed in Gangakhed tahsil, followed by Manwat, (41.28%), Palam (36.92%), Parbhani (33.64%), Pathri (32.75%), Jintur (31.88%), Sailu (31.18%), Purna (28.52%) and Sonpeth (26.40%). The minimum percent pod infection (26.40%) of pod blight of soybean was found in Sonpeth tahsil. The soybean yield was reduced substantially due to this disease. The average percent disease incidence in Parbhani district was about 30.68%. In all, forty two fields were surveyed and average disease incidence to the tune of 30.68% has been observed.

Pathogenicity

Foliar symptoms include necrosis of leaf veins, leaf rolling, petiole canker and premature defoliation. However, pod blight phase is most damaging (Vyas *et al.*, 1997) [2].

Identification of fungal pathogen

The pathogen isolated from the diseased plants was identified on the basis of the morphological characters as *C. truncatum*. Jagtap *et al.* (2009) [7] stated that conidial shape is more useful than size in isolate determination of pathogen. Average conidial length was (18.18-26.46 micro meter), whereas width was (3.56-4.63 micro meter). Average setal length was (44.36-166.65 micron) whereas width was (4.92-5.50 micro meter).

Table 2: Pod blight intensity and per cent pod infection of soybean in Parbhani Tahsils during kharif, 2016

Tahsils	Villages	Soybean varieties	Pod blight intensity (%)	Pod infection (%)
Gangakhed	Pimpri	JS-335	41.10	46.60
	Pangri	MAUS-158	40.10	45.70
	Harangul	JS-335	42.50	47.20
	Sanglewadi	MAUS-158	22.20	26.50
	Gaundgaon	JS-335	40.20	46.10
	Average		37.22	42.42
Jintur	Bori	MAUS-71	16.20	18.40

	Ashegaon	MAUS-71	16.50	21.50
	Asola	JS-335	39.80	42.20
	Dahegaon	JS-335	39.80	40.72
	Karanji	JS-335	35.20	36.60
Average			29.50	31.88
Manwat	Gogalgaon	JS-335	40.70	45.00
	Tadborgaon	JS-335	41.50	45.50
	Kekarjavla	MAUS-71	43.10	46.20
	Mangrul BK	JS-335	41.40	46.40
	Lohara	MAUS-158	18.80	23.30
Average			37.10	41.28
Palam	Palam	JS-335	41.50	46.50
	Digras	JS-335	39.20	47.30
	Tandulwadi	JS-335	38.00	45.22
	Parwa	MAUS-71	17.66	22.10
	Javla	MAUS-158	16.10	23.50
Average			30.49	36.92
Parbhani	Karegaon	JS-335	37.50	40.20
	Nandgaon	JS-335	35.70	37.00
	Pingli	MAUS-71	14.50	18.70
	Bori	JS-335	34.10	36.20
	Somthana	JS-335	34.20	36.10
Average			31.20	33.64
Pathri	Zari	MAUS-71	17.75	20.00
	Dongargaon	JS-335	41.50	45.85
	Renapur	JS-335	41.80	44.35
	Loni B.K	MAUS-71	18.50	20.80
Average			29.88	32.75
Purna	Sandalpur	JS-335	41.50	42.20
	Tadkalas	MAUS-71	16.50	16.80
	Degaon	JS-335	37.20	37.40
	Alegaon	MAUS-71	17.50	17.70
Average			28.17	28.52
Sailu	Dhanegaon	JS-335	43.50	46.80
	Rajura	JS-335	41.70	43.10
	Narsapur	MAUS-71	18.50	21.10
	Borkini	MAUS-71	19.60	21.90
	Salegaon	MAUS-71	20.80	23.00
Average			28.82	31.18
Sonpeth	Golegaon	JS-335	37.20	35.20
	Dudhgaon	MAUS-71	19.50	23.80
	Wadgaon	MAUS-71	21.10	22.50
	Pohandul	MAUS-158	17.20	24.10
Average			23.75	26.40

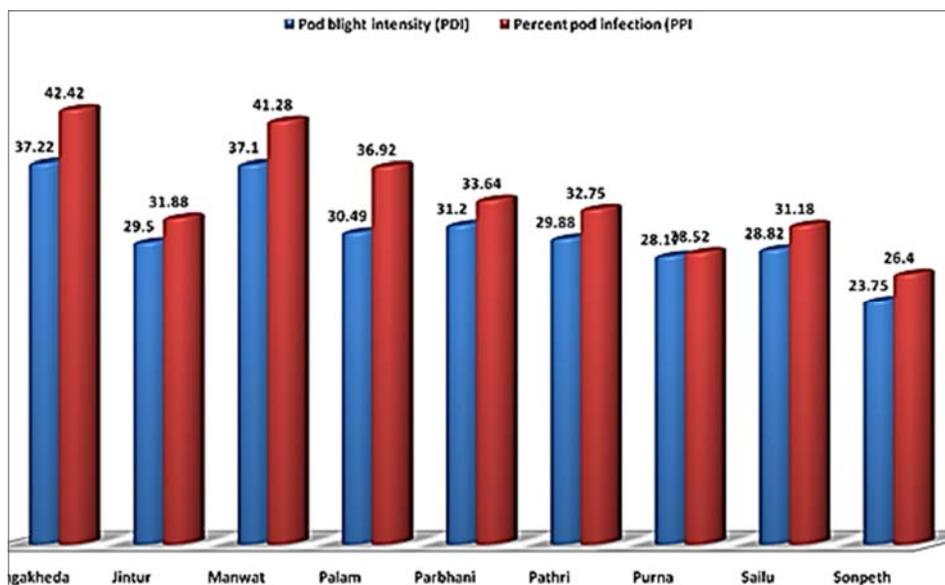
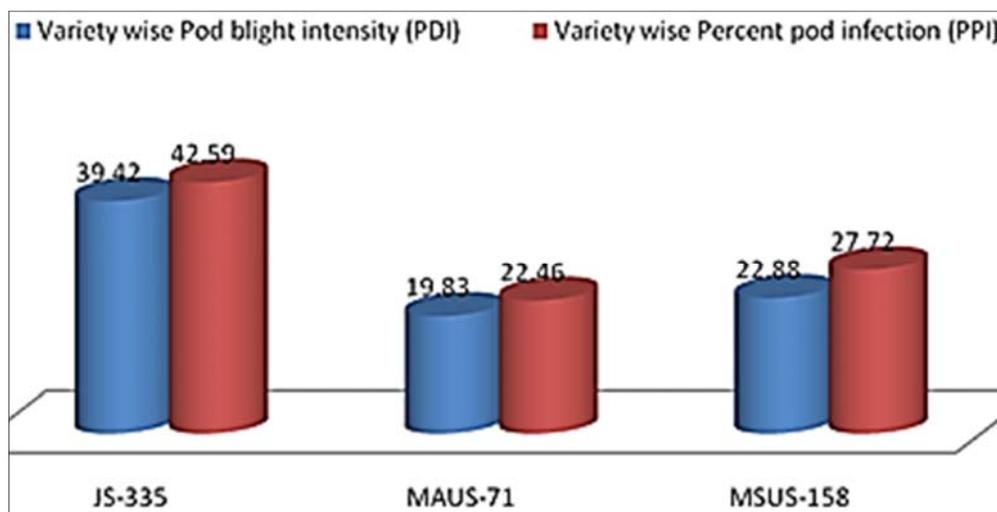


Fig 1: Tahsil wise pod blight intensity (PDI) and per cent pod infection (PPI) in Parbhani district during kharif 2016

Table 3: Variety-wise pod blight intensity (PDI) and per cent pod infection (PPI) in Parbhani District during Kharif, 2016

Varieties	Kharif, 2016		
	No of Locations	Pod blight intensity (PDI)	Percent pod infection (PPI)
JS-335	23	39.42	42.59
MAUS-71	14	19.83	22.46
MSUS-158	5	22.88	27.72
Average	42	27.37	30.92

**Fig 2:** Variety wise pod blight intensity (PDI) and per cent pod infection in Parbhani district during kharif 2016

Discussion

Results (Table.2, Fig.1, Table. 3 Fig. 2) revealed that during Kharif, 2016 average pod blight intensity and per cent pod infection in nine tehsils of Parbhani district surveyed were ranged from 23.75 (Sonpeth) to 37.22 (Gangakhed) per cent and 26.40 (Sonpeth) to 42.42 (Gangakhed) per cent, respectively. However soybean crop grown in tahsils of Gangakhed were found to be affected more severely with maximum average disease intensity (37.22) and per cent pod infection (42.42). This was followed by tehsils viz., Manwat (37.10% and 41.28%), Parbhani (31.20% and 33.64%), Palam (30.49% and 36.92%), Pathri (29.88% and 32.75%), Jintur (29.50% and 31.88%), Sailu (28.82% and 31.18%), Purna (28.17% and 28.52%) and Sonpeth (23.75% and 26.40%).

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