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RESEARCH NOTE

Survey for assessment of severity of bacterial pustule of soybean caused by *Xanthomonas axonopodis* pv. *glycines* (Nakano) dye in northern Karnataka

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The rowing survey was undertaken to know the severity of bacterial pustule in major soybean growing areas of Karnataka *viz.*, Belagavi, Dharwad, Haveri and Bagalkot districts during *kharif* 2014. The severity of bacterial pustule varied from 10.15 PDI to 16.94 PDI. Maximum mean severity of bacterial pustule was observed in Belagavi district (15.34 PDI) followed by Dharwad (14.40 PDI) and Bagalkot (11.79 PDI) district. The minimum severity was recorded in Haveri (11.12 PDI) district. In general the highest PDI (16.94 PDI) was noticed at Yabaratti village followed by Bellambi (16.87 PDI) of Belagavi district and the least PDI of bacterial pustule was observed in Devagiri village (2.31-10.15 PDI) of Haveri district. The study identified Yebaratti and Bellambi of Belagavi district as hotspots for bacterial pustule of soybean with infection of index of 16.94 and 19.87 respectively. Though, at present the overall severity was low in all the areas surveyed, the results indicated the increase in appearance of the disease in recent years necessitated to develop suitable management options in the events of disease outbreak and also to control the movement of disease to low disease risk areas.

Key words: Bacterial pustule, Belagavi, Haveri

Soybean [*Glycine max* (L.)] Merill is a protein rich oilseed crop. At present in India, it occupies an area of 10.02 million ha with a production of 11.64 million tonnes and productivity of 1062 kg per ha (Anon., 2015). The major states which cultivate soybean are Madhya Pradesh, Bihar, Gujarat, Himachal Pradesh, Maharashtra, Karnataka, Rajasthan and Uttar Pradesh. Soybean crop can be attacked by more than 100 pathogens. In India, annual yield losses due to various diseases were estimated to an extent of 12 per cent of total production. Over hundred pathogens were known to affect soybean, of which 66 fungi, six bacteria and eight viruses had been reported to be associated with soybean seeds (Hartman *et al.,* 2011). The major economically important diseases are rust, wilts, leaf spots, rots, powdery mildew, bacterial and viral diseases. Among these bacterial pustules caused by *Xanthomonas axonopodis* pv. *glycines* (Nakano) Dye. has become an important disease which is hindering soybean cultivation in recent years in central zone, northern zone and southern zone. Due to climate change and gradual shift in the date of sowing, because of delayed onset of monsoon, the disease is appearing regularly in this area for the last few years. The disease was prevalent in the areas that experience warm weather conditions causing yield reduction upto 40 per cent and also infected other legumes like *Dolichos lablab* (Aritua *et al.,* 2015). Looking into the magnitude of the disease, the task was undertaken to identify the areas with more disease severity, stage of infection and also disease free areas in northern Karnataka.

An intensive rowing survey was conducted during August-October (*kharif* 2014) to know the extent of bacterial pustule intensity on soybean. The survey was taken up in farmer's field of Dharwad, Belgaum, Bagalkot and Haveri districts. In Dharwad; Dharwad , Hubli, Kundagol, Navalgund and Kalghatgi talukas were covered, whereas in Belgaum, Bhailhongal Athani, Chikkodi, Hukkeri and Saundatti talukas were surveyed, in Haveri; Haveri and Byadagi where as in Bagalkot district Hunagund was selected for survey. A total of 122 fields belongs to 27 villages were covered during the survey. Disease incidence on randomly selected 10 plants in each field was recorded by following 0-9 scoring based on per cent leaf area infected (0-No infection,1-1-5%,3-6-12%,5-13-52%,7-26-50% and 9-51-100%) developed by Mayee and Datar (1986). Per cent disease index (PDI) was calculated by using the below mentioned formula given by Wheeler (1969).

$$PDI = \frac{\text{Sum of all the disease ratings}}{\text{Total number of leaves examined}} \times \frac{100}{\text{Max. Disease grade}}$$

Roving survey was conducted during *kharif* 2015 in major soybean growing areas of northern Karnataka to assess the distribution and incidence of bacterial pustule of soybean. The results on survey for recording severity of the disease are presented in table 1.Among the various places surveyed, the maximum severity (16.94 PDI) was recorded in Yabaratti village of Belagavi district followed by Bellambi (16.87 PDI) and Ckikkodi (16.86 PDI). However, the minimum severity was recorded in Devagiri (10.15 PDI) of Haveri district. In taluka wise analysis, Chikkodi taluk recorded maximum disease severity (16.90 PDI) followed by Hukkeri (15.02 PDI) and Belagavi (15.00 PDI). However, mean minimum severity (11.12 PDI) was recorded in Haveri taluk. In district analysis, Belagavi district recorded maximum disease severity of 15.34 PDI followed by Dharwad (14.40 PDI) and Bagalkot (11.79 PDI) districts. However, mean minimum severity was recorded in Haveri (11.12 PDI) district. In the stage wise infection analysis, the severity of bacterial pustule was maximum at pod development stage in Yebaratti (16.94) village of Belagavi district followed by Bellambi (16.87 PDI) and Chikkodi (16.86 PDI). However, the minimum disease severity was recorded in Devagiri village (10.15 PDI) of Haveri district at pod development stage. Suryadi *et al*. (2012) reported that bacterial pustule (BP) caused by *Xanthomonas axonopodis* pv. *glycines* has become a major concern during dry and wet season and increasingly threatened soybean production, losses resulting from the bacterial pustule. Sharma *et al.*(2014) reported that the bacterial pustule of soybean has

Table 1. Survey on the disease intensity of bacterial pustule of soybean caused by *Xanthomonas axonopodis* pv. glycines in major affected areas of Karnataka during *kharif* 2014

District		Village	Variety	Cropping system	No. of fields	Mean PDI of villages	Mean PDI of talukas	Mean PDI of districts
Belagavi	Chikkodi	Yebaratti	JS335,DSb21	Rainfed	3	16.07	16.47	15.17
		Chikkodi	JS 335	Rainfed	4	16.88		
		Hukkeri	Badakundri	JS 335	Rainfed	3	14.62	15.02
		Sankeshwar	JS335,DSb21	Rainfed	2	14.35		
		Hukkeri	JS335,DSb21	Rainfed	2	14.71		
		Yamakanamaradi	JS 335	Rainfed	5	14.55		
		Bellambi	JS 335	Rainfed	3	16.87		
	Bailhongal	Belavadi	JS335,DSb21	Rainfed	4	13.25	14.47	
		Badal anakalagi	JS 335	Rainfed	3	14.49		
		Budarakatti	JS 335	Rainfed	2	15.67		
		Belagavi	Kakati	JS 335	Rainfed	4	16.22	14.75
		Sutagatti	JS 335 JS 335	Rainfed	3	14.51		
		Kadolli	JS 335	Rainfed	2	15.35		
		Vantamuri	JS 335	Rainfed	3	14.22		
		Honaga	JS 335	Rainfed	2	14.73		
Dharwad	Dharwad	Kanavihonnapur	JS 335	Rainfed	2	14.66	14.67	14.47
		Mugali	JS335,DSb21	Rainfed	3	14.56		
		Narendra	JS335,DSb21	Rainfed	2	14.67		
		Navalur	JS 335	Rainfed	2	15.41		
		Yettinagudda	JS 335	Rainfed	1	14.50		
		Hosatti	JS 335	Rainfed	1	14.65		
		MARS Dharwad	JS 335	Rainfed	2	14.29		
	Hubli	Gabbur	JS335,DSb21	Rainfed	3	12.81	14.56	
		Rayapur	JS 335	Rainfed	3	17.55		
		Sattur	JS 335	Rainfed	2	14.35		
		Unkal	JS 335	Rainfed	2	15.49		
		Bammagatti	JS 335	Rainfed	1	12.61		
	Kalaghatagi	Hitagatigi	JS 335	Rainfed	3	14.91	14.18	
		Devikoppa	JS 335	Rainfed	3	15.73		
		Kalaghatagi	JS 335	Rainfed	2	12.46		
		Dummavad	JS 335	Rainfed	2	13.31		
		Kalaghatagi	JS 335	Rainfed	3	14.51		
Haveri	Ranebennur	Asundi	JS 335	Rainfed	2	10.15	11.00	11.00
		Kakola	JS335,DSb21	Rainfed	2	12.25		
		Itagi	JS335,DSb21	Rainfed	2	10.58		
		Hanagal	JS 335	Rainfed	3	11.50		
		Kalaghatagi	JS 335	Rainfed	3	14.51		
Bagalkot	Hunagund	Aminagada	JS 335	Rainfed	3	10.65	11.48	11.48
		Basavanal	JS335,DSb21	Rainfed	2	12.32		
		Basavanal	JS335,DSb21	Rainfed	1	11.98		
		Kamatagi	JS 335	Rainfed	2	12.22		

been widely distributed in Uttarakhand, M.P., Rajasthan, Karnataka, A.P., Maharashtra, Himachal Pradesh, Jharkhand and NE states causing yield loss of 20 per cent and generally appears 35 days after sowing to throughout the season. At pod maturity stage, the analysis of disease severity revealed that the maximum disease severity of 16.22 PDI was recorded in Kakati village of Belagavi district followed by Devikoppa (15.73 PDI) and Rayapur (16.55 PDI) of Dharwad district. However, the minimum disease severity was recorded in Haveri (10.58 PDI) district (Table 2).The present investigations clearly identified Belagavi district with more severity when compared to Dharwad and Bagalkot districts because the hot humid weather has helped in the development of disease and spread of infection at a faster rate in Belagavi district. The stage of infection revealed maximum disease at pod maturity when compared to leaf infection and grand growth period. The results can be used in developing forecasting system and suitable integrated disease management strategies in future.

Table 2. Soybean bacterial pustule severity as influenced by stage of the crop and locations

		Stage of the crop			
		Pod development		Pod maturity	
Mean PDI		14.36		13.96	
District		Bagalkot	Belagavi	Dharwad	Haveri
Mean PDI		11.79	15.34	14.40	11.12
Range:	Max	12.32	16.94	16.55	12.25
	Min.	10.65	13.25	12.61	10.15

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