

RESEARCH NOTE

Survey for assessment of severity of root rot complex and stem fly of soybean in northern Karnataka

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An intensive rowing survey was conducted during August- October (*kharif* 2015-16) to know the extent of root rot intensity on soybean. The survey was taken up in farmer's field of Dharwad, Belgaum, Bagalkot and Haveri districts. The results revealed that, the per cent disease incidence in all the surveyed areas with a ranged from 2.17 to 36.54 per cent. Among the villages surveyed the mean maximum disease incidence (36.54%) was recorded from Ugarbudruk of Belagavi district and the mean least incidence (2.17%) was recorded from Vaderhatti village of Belagavi district. The per cent stem fly infestation in all the surveyed areas ranged from 12.40 to 33.74 per cent. Among the villages surveyed, the mean maximum stem fly infestation (33.74%) was recorded from MARS Dharwad and the mean least infestation of stem fly (12.40%) was recorded from Lokur village of Dharwad district. From the survey it was clear that Belagaum and Dharwad districts are the hotspots for root rot complex of soybean. The mean maximum severity of the disease was recorded at vegetative to pod filling stage, mainly in rainfed condition.

Keywords: Root rot, Stemfly, Survey

Soybean [*Glycine max* (L.) Merrill] 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 the soil borne diseases of soybean, root rot complex caused by *Sclerotium rolfsii*, *Rhizoctonia bataticola* and *Fusarium* sp. is gaining more importance. This disease is distributed throughout the world and is prevalent in areas that experience warm climate and causes significant yield losses in monoculture or short rotation of soybean. Among them *Rhizoctonia bataticola* was predominantly associated in all the areas surveyed and the degree of pathogenic variability of these pathogens varied

from one region to the other. There was also increased severity of stemfly at all the stages of crop growth resulting in plants more vulnerable for secondary infection of these pathogens. 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* 2015-16) to know the extent of root rot intensity on soybean. The survey was taken up in farmer's field of Dharwad, Belgaum, Bagalkot and Haveri districts. In Dharwad; Dharwad, Hubli and Kalghatgi talukas were covered, whereas in Belgaum, Bhailhongal, Athani, Chikkodi, Raibag and Gokak talukas were surveyed, in Haveri; Haveri and Hirekerur were selected for survey. A total of more than 100 fields belonging to 20 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).

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

$$\text{Per cent stem tunneling} = \frac{\text{Number of plants tunneled}}{\text{Total number of plant observed}} \times 100$$

$$\text{Per cent stem girdling} = \frac{\text{Number of plants girdled}}{\text{Total number of plants observed}} \times 100$$

The results revealed that, the per cent disease incidence in all the surveyed areas with a ranged from 2.17 to 36.54 per cent. Among the villages surveyed the mean maximum disease incidence (36.54%) was recorded from Ugarbudruk of Belagavi district and the mean least incidence (2.17%) was recorded from Vaderhatti village of Belagavi district. Among the taluks, the maximum disease incidence (19.22%) was noticed in Athani taluk of Belagavi district and least incidence (3.36%) was recorded in Gokak taluk of Belagavi district. Among the districts surveyed, the mean maximum incidence (11.04%) was noticed in Belagavi district followed by Dharwad district (5.53%) and the mean least incidence (4.66%) was noticed in Haveri district (Table 1).

The per cent stem fly infestation in all the surveyed areas ranged from 12.40 to 33.74 per cent. Among the villages surveyed, the mean maximum stem fly infestation (33.74%) was recorded from MARS Dharwad and the mean least infestation of stem fly (12.40%) was recorded from Lokur village of Dharwad district. Among the taluks surveyed, the maximum stem fly

Table 1a. Survey for root rot complex incidence of soybean in northern Karnataka during *kharij* 2015

Sl. No.	District	Taluk	Location	Variety	Soil type	Stage of crop	Cropping situation	Incidence of root rot complex			Per cent incidence/infestation		
								R.	S.	F.	Root complex	Stem tunneling due to stemfly	Stem girdling due to girdle beetle
01.	Dharwad	Dharwad	Narendra	DSb 21	Black	Vegetative	Rainfed	+	+	-	3.47	23.21	2.82
			Murakatti	JS 93-05	Black	Pod filling	Rainfed	+	-	+	8.34	26.87	5.22
			MARS	JS 335	Black	Pod filling	Irrigated	+	-	+	4.89	33.74	3.32
			Dharwad										
			Navalur	JS 335	Black	Flowering	Rainfed	+	+	-	5.46	14.87	3.65
			Kavalgeri	JS 93-05	Black	Pod filling	Rainfed	+	+	+	12.56	19.26	10.28
			Lokur	JS 335	Black	Pod filling	Rainfed	+	+	-	4.24	12.40	1.10
			Garag	JS 335	Black	Flowering	Rainfed	+	-	-	3.17	13.24	2.65
			Mean								6.01	20.51	4.34
			Kalatagi	Devikoppa	Black	Pod filling	Rainfed	+	-	+	3.17	14.57	3.82
			Dumnavad	JS 335	Black	Vegetative	Rainfed	+	-	+	4.84	23.27	4.65
			Mean								4.05	18.92	4.23
			+	Associated	-	Not associated		S. - Sclerotium rolfsii,			F- Fusarium sp.		
			Hubballi	Bammagatti	Black	Pod filling	Rainfed	-	-	+	3.29	22.29	3.32
			Gabbur	JS 335	Black	Vegetative	Rainfed	-	+	+	5.80	33.73	3.34
			Rayapur	JS 335	Black	Pod filling	Irrigated	+	+	+	10.56	15.94	5.11
			Mean								6.55	23.98	3.92
			Haveri	JS 93-05	Black	Pod filling	Rainfed	+	+	+	7.80	16.70	4.48
			Motebennur	JS 335	Black	Flowering	Rainfed	-	-	+	3.90	13.45	2.32
			Devagiri	JS 335	Black	Pod filling	Rainfed	+	+	-	4.60	15.48	1.18
			Mean								5.43	15.21	2.66
			Hirekerur	Rattihalli	Black	Flowering	Rainfed	+	-	-	2.97	14.88	3.13
			Koda	JS 335	Black	Pod filling	Rainfed	+	+	+	4.84	23.17	3.60
			Mean								3.90	19.02	3.36
			+	Associated	-	Not associated		S. - Sclerotium rolfsii, F-Fusarium sp.					
			Belagavi	Athani	Maheshwadagi	Pod filling	Rainfed	+	+	-	5.64	24.58	5.42
			Ugarkhurd	JS 335	Black	Flowering	Irrigated	+	+	+	15.48	32.67	10.34
			Ugarbudruk	JS 335	Black	Pod filling	Irrigated	+	+	+	36.54	28.34	15.45
			Mean								19.22	28.53	10.40
			Bailhongal	Budarakatti	Black	Vegetative	Rainfed	+	+	+	22.60	26.70	4.48
			Ankalagi	JS 93-05	Black	Pod filling	Rainfed	+	+	+	12.67	33.45	2.32
			Mean								17.63	30.07	3.4
			Raibag	Satti	Black	Flowering	Rainfed	+	+	-	4.45	24.87	3.84
			Kudachi	JS 335	Black	Pod filling	Irrigated	+	-	+	3.46	22.27	1.15
			Mean								3.95	23.57	2.49
			Gokak	Musguppi	Black	Pod filling	Rainfed	+	-	+	4.56	24.86	3.45
			Vaderhatti	JS 335	Black	Flowering	Rainfed	-	+	-	2.17	22.34	1.56
			Mean								3.36	23.60	2.50
			+	Associated	-	Not associated							

Table 2. Incidence of root rot complex in northern Karnataka during *kharif* 2015

District	Taluk	Per cent disease incidence
Dharwad	Dharwad	6.01
	Kalghatagi	4.05
	Hubballi	6.55
	Mean	5.53
Haveri	Haveri	5.43
	Hirekerur	3.90
	Mean	4.66
Belagavi	Athani	19.22
	Bailhongal	17.63
	Raibag	3.95
	Gokak	3.36
	Mean	11.04

infestation (30.07%) was noticed in taluk of Bailhongal, Belagavi district and least infestation (15.21%) was recorded in Haveri taluk of Haveri district. Among the districts surveyed, the mean maximum infestation (26.06%) was noticed in Belagavi district and the mean least infestation (17.11%) was noticed in Haveri district (Table 2). Similar observations were made in recording severity of root rot of soybean in different locations (Kavita, 2006 and Sangeetha and Shamarao Jahagirdar, 2013).

The per cent girdle beetle infestation in all the surveyed areas ranged from 1.10 to 15.45 per cent. Among the villages surveyed the mean maximum girdle beetle infestation (15.45%) was recorded from Ugarbudruk of Belagavi district and the mean least infestation of girdle beetle (1.10%) was recorded from Lokur village of Dharwad district. Among the districts surveyed, the mean maximum infestation (4.69%) was noticed in Belagavi district followed by Dharwad district (4.16%) and the mean least infestation (3.01%) was noticed in Haveri district (Table 3). Intensive cultivation of soybean crop year after year, non-adoption of disease management practices, favourable weather condition and also the cultivation of highly susceptible varieties of soybean could be the reason for higher pest infestation in different locations of northern Karnataka (Virakar, 2004; Vinodkumar *et al.*, 2014).

A total of three genotypes JS 335, JS 93-05 and DSb 21 varieties which were most commonly grown in the surveyed areas in major soybean growing tracts were observed for disease and pest incidence. The disease and pest severity varied from genotype to genotype in different geographical regions. The disease and pest incidence were recorded in different cropping situation and cropping system, the higher incidence was

Table 3. Infestation of stemfly and girdle beetle in northern Karnataka during *kharif* 2015

District	Taluk	Per cent infestation	
		Stem tunnelling due to stemfly infestation	Stem girdling due to girdle beetle
Dharwad	Dharwad	20.51	4.34
	Kalghatagi	18.92	4.23
	Hubli	23.98	3.92
	Mean	20.02	4.16
Haveri	Haveri	15.21	2.66
	Hirekerur	19.01	3.36
	Mean	17.11	3.01
Belagavi	Athani	28.53	10.40
	Bailhongal	30.07	3.40
	Raibag	23.57	2.49
	Gokak	23.60	2.50
	Mean	26.06	4.69

recorded in soybean grown as sole crop. Among different cropping situations, the higher disease (14.28%) and pest incidence (6.84%) was noticed in irrigated situation followed by rainfed (6.06 per cent disease incidence (PDI), 11.42 PST, 3.67 PSG). The disease incidence varied from locality to locality, because of cropping pattern, environmental conditions and buildup of inoculum. Such variations in soybean root rot complex incidence and wide spread nature have been reported by early researchers (Sangeetha and Shamarao Jahagirdar, 2013). The study clearly demonstrated the role of stemfly infestation in causing 63.33 per cent with rotting of roots independent of root rot pathogen infection. Though stemfly was considered as seedling borer, the present study also demonstrated its infestation even upto 60 days. In Australia, more than 4000 ha has been affected by stemfly infestation leading death of plants and charcoal rot like symptoms (Bowman, 2013). In conclusion, a random survey conducted in major soybean growing areas of parts of northern Karnataka revealed that among the districts surveyed, the mean maximum incidence of root rot disease (11.04%) was noticed in Belagavi district and the mean least incidence (4.66%) was noticed in Haveri district. The maximum stemfly infestation (30.07%) was noticed in taluk of Bailhongal, Belagavi district and least infestation (15.21%) was recorded in Haveri taluk of Haveri district. From the survey it was clear that Belagaum and Dharwad districts are the hotspots for root rot complex of soybean. The mean maximum severity of the disease was recorded at vegetative to pod filling stage, mainly in rainfed condition.

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