

RESEARCH ARTICLE

Survey and surveillance of soybean stem fly, *Melenogromyza sojae* (Zehntner) in Northern Karnataka

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ABSTRACT

A roving survey was undertaken in four districts of major soybean growing areas of northern Karnataka viz., Dharwad, Belgaum, Bagalkot and Bidar during *Kharif* 2006 and 2007. The average higher per cent stem fly incidence of 63.48 and 61.80 was recorded in Belgaum and Bidar districts, respectively. The lower stem fly incidence (12.67%) was recorded in Dharwad district and moderate incidence (22.91%) was noticed in Bagalkot district. The average higher per cent stem tunnelling of 29.83 and 28.69 was recorded in Belgaum and Bidar district, respectively. The moderate (10.57%) stem tunnelling was in Bagalkot district, while it was lower (8.17%) stem tunnelling in Dharwad district.

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INTRODUCTION

Soybean [*Glycine max* (L.) Merrill] is a fascinating crop with innumerable possibilities of not only improving agriculture but also supporting industries. Soybean is a major source of edible oil (20%) and high quality protein (40%). It is a rich source of amino acids, vitamins and minerals (Alexander, 1974). In Karnataka, soybean is becoming popular as an oilseed crop.

The increase in area was from 0.16 lakh ha during 1991-92 to 2.31 lakh ha with the production of 2.36 lakh tonnes and productivity of 1025 kg per ha during 2009 (Anonymous, 2009). In Karnataka, soybean is intensively cultivated in Belgaum, Bidar, Dharwad, Bagalkot and Haveri districts (Anonymous, 2004). The stem fly, (*Melenogromyza sojae* Zehntner) is considered as one of the major pests attacking the crop throughout the year causing cent per cent infestation at different growth stages (Singh and Singh, 1990). Further, it has also been reported more than 90 per cent of plants infested during *Kharif* season (Gain and Kundu, 1988). Therefore, the present investigation was carried out to survey and for surveillance of stem fly in major growing areas of Northern Karnataka.

MATERIALS AND METHODS

A roving survey was undertaken to know the status of stem fly in soybean growing areas of Northern Karnataka viz, Bidar, Bagalkot, Belgaum and Dharwad districts. Survey was undertaken during flowering and harvesting stage of soybean crop. Three talukas from each district were selected (Table A) and each in taluka five fields/villages were surveyed. In each field, ten spots were surveyed during *Kharif* 2006 and 2007.

Observations were made for stem fly incidence on ten randomly selected plants at each spot and five plants were dissected to observe the stem tunneling during flowering and harvesting. The extent of tunneling was converted to percentage by the following formula (Talekar, 1990).

$$\% \text{ Stem fly infestation} = \frac{\text{No of infested plants}}{\text{Total number of plants}} \times 100$$

$$\% \text{ Stem tunneling} = \frac{\text{Main stem length}}{\text{Affected stem length}} \times 100$$

Sr. No.	Districts	Taluks	Villages
1.	Dharwad	Dharwad	Amminbhavi, Marewad, Narendra, Yadavada and Mangalagatti
		Hubli	Tirumalakoppa, Palikoppa, Agadi Mavinkoppa and Bommasandra
		Kalaghatagi	B-Gudihal, Yammetti, Dummawad Jammihal and Gambayapur
2.	Belgaum	Bailhongal	Bailhongal, Anigol, Belwadi, Hosur and Devalapur
		Chikkodi	Kanagala, Nippani, Bhoj, Nej and Examba
		Hukkeri	Hebbal, Kochari, Gotur, Sankeswar and Nerli
3.	Bagalkot	Bilagi	Yadahalli, Galagali, Amalzeri, Budihal and Kundargi
		Mudhol	Marali, Nagaral, Shirol, Mughalkhed and Siddapur
		Jamakhandi	Sirguppi, Madarkhandi, Hebbal, Jaknur and Goni
4.	Bidar	Bidar	Janawada, Markhal, Basantapur, Mannalli and Andoorwadi
		Bhalki	Ahmadabad Wadi, Nittur, Halikhed, Sindhbandagi and Halabarga
		Humnabad	Nimbur, Changalera, Hudagi, Mannaekkelli and Meenakera

RESULTS AND DISCUSSION

The roving survey was carried out in soybean growing areas *viz.*, Dharwad, Bidar, Belgaum and Bagalkot districts of Northern Karnataka during *Kharif* 2006 and 2007, to assess the stem fly incidence and stem tunnelling during flowering and harvesting stages of the cropping period (Table 1).

The survey results indicated that the severity / hot spots of the stem fly was recorded in Belgaum and Bidar districts to the tune of 63.48 per cent and 61.80 per cent during harvesting stage, respectively. Whereas the lower stem fly incidence 12.67 per cent was recorded in Dharwad district and moderate stem fly incidence (22.91%) in Bagalkot district. The per cent stem tunnelling was higher (29.83%) and (28.69%) was recorded in Belgaum and Bidar districts, respectively. The lower stem tunnelling of 8.17 per cent was noticed in Dharwad district while it was moderate (10.57%) in Bagalkot district. District wise detailed results are presented in the following paragraphs.

The results obtained from Dharwad district indicated that the stem fly incidence was observed in all the talukas of the district. The mean of two years recorded stem fly incidence was 12.22 and 12.67 per cent during the flowering and harvesting stages, respectively. The mean stem tunnelling of 7.38 and 8.17 per cent was recorded during the flowering and harvesting stages respectively. Among the talukas the highest per cent stem fly incidence of 12.65 and 12.99 was recorded in Dharwad taluka and the lowest of 11.52 and 12.01 per cent stem fly incidence was recorded in Hubli taluka during flowering and harvesting stage, respectively. The average stem tunnelling of 8.39 per cent was recorded in Dharwad taluka and the least was (8.05%) in Hubli taluka during harvesting stage.

The roving survey results of Bidar district revealed that the average stem fly incidence of 59.81 and 61.80 per cent was recorded with stem tunnelling of 28.43 and 28.69 per cent at

flowering and harvesting stages, respectively. Among the talukas comparatively, higher incidence of stem fly and stem tunnelling was recorded in Bhalki followed by Humanabad and was lower in Bidar taluka.

At Belgaum district the survey pooled results over the years revealed that the average stem tunnelling per cent of 29.61 and 29.83 was recorded where in stem fly incidence was 58.63 and 63.48 per cent during flowering and harvesting stages, respectively. The highest stem tunnelling was 31.99 and 30.73 and stem fly infestation was 61.16 and 64.82 per cent recorded during flowering and harvesting stages of the cropping period. Among the talukas the higher stem tunnelling of 31.99 and 30.73 per cent and 61.16 and 64.82 per cent incidence was recorded due to stem fly in Hukkeri taluka and lower of stem fly incidence and stem tunnelling was observed in Chikkodi taluka.

The mean of two years data of Bagalkot district revealed that the stem fly incidence of 21.45 and 22.91 per cent was recorded with stem tunnelling of 9.99 and 10.57 per cent at flowering and harvesting stages, respectively. Among the taluka the lower per cent of stem tunnelling of 9.32 and 9.75 and 20.98 and 21.74 per cent incidence was recorded due to stem fly in Jamakhandi taluka and higher stem fly incidence of 22.70 and 24.19 per cent and stem tunnelling of 10.78 and 11.87 per cent was recorded in Mudhol taluka during flowering and harvesting stages, respectively (Table 1).

The present investigations are in agreement with several workers *viz.*, Patil (2002), Anonymous (2004) and Savajji (2006). who reported the stem fly incidence from Jamakhandi (14.80%) and Mudhol (14.45%) of Bagalkot district, Gokak (16.20%), Raibag (16.30%) and Athani talukas (14.45%) of Belgaum districts. Survey conducted during 2003-04 revealed the infestation of stem fly was up to 20 per cent at Dharwad and 65 per cent at Athani and Chikkodi talukas at Belgaum district

Table 1: Survey and surveillance of stem fly, <i>Melanogromyza sojae</i> in Northern Karnataka												
Locations	Stem fly incidence (%) at						Stem tunnelling (%) at					
	Flowering stage			Harvesting stage			Flowering stage			Harvesting stage		
(A) Dharwad district	2006	2007	Mean	2006	2007	Mean	2006	2007	Mean	2006	2007	Mean
Dharwad taluka												
Amminbhavi	14.30	12.64	13.47	14.80	12.51	13.65	7.41	7.25	7.33	7.80	8.19	7.99
Marewad	15.25	11.55	13.40	15.16	11.75	13.45	7.79	7.50	7.64	8.00	8.26	8.13
Narendra	13.41	10.90	12.15	14.89	11.09	12.99	9.09	6.55	7.82	9.74	6.97	8.35
Yadawad	13.05	11.09	12.07	13.96	11.14	12.55	8.10	7.40	7.75	9.85	8.31	9.08
Mangalagatti	11.54	12.80	12.17	13.41	11.29	12.35	7.38	7.85	7.61	8.59	8.27	8.43
Mean	13.51	11.79	12.65	14.44	11.55	12.99	7.95	7.31	7.63	8.79	8.00	8.39
Hubli taluka												
Tirumalkoppa	11.70	11.21	11.45	12.87	11.85	12.36	8.84	7.34	8.09	8.35	7.61	7.98
Palikoppa	11.40	11.66	11.53	13.34	11.38	12.36	7.90	7.15	7.52	8.62	7.64	8.13
Agadi	10.58	11.70	11.14	12.18	11.00	11.59	6.41	7.24	6.82	7.35	7.45	7.40
Mavinkoppa	11.16	12.32	11.74	11.98	11.37	11.67	7.45	6.88	7.16	10.23	8.06	9.14
Bommasandra	12.49	11.18	11.83	15.58	11.57	13.57	7.44	6.86	7.15	7.56	7.73	7.64
Mean	11.44	11.61	11.52	12.59	11.43	12.01	7.60	7.09	7.34	8.42	7.69	8.05
Kalaghatagi taluka												
B gudihal	13.19	12.08	12.63	13.87	11.60	12.73	6.60	6.80	6.70	7.90	7.31	7.60
Yammetti	13.63	11.57	12.60	12.53	11.64	12.08	7.40	7.50	7.45	8.68	7.57	8.12
Dummad	14.41	11.88	13.14	12.85	10.96	11.90	7.10	7.52	7.31	8.90	7.82	8.36
Jammihal	11.81	11.68	11.74	12.47	11.71	12.07	7.65	7.60	7.10	8.65	7.94	8.29
Gambyapur	13.20	11.33	12.26	12.78	11.46	12.12	7.07	6.55	6.81	7.91	8.09	8.00
Mean	13.25	11.70	12.47	12.90	11.47	12.18	7.16	7.19	7.17	8.41	7.74	8.07
District mean	12.74	11.70	12.22	13.87	11.48	12.67	7.57	7.19	7.38	8.54	7.81	8.17
Bidar district												
Bidar taluka												
Janawad	57.52	54.62	56.07	63.35	59.52	61.43	30.40	26.50	28.45	29.74	24.84	27.29
Markhal	60.45	54.81	57.63	61.85	58.05	59.95	30.40	24.80	27.60	30.60	23.50	27.05
Basantpur	62.45	58.10	60.27	65.21	58.18	61.69	30.60	25.46	28.03	29.00	23.70	26.35
Mannalli	62.16	55.90	59.03	64.05	58.30	61.17	29.50	26.94	28.22	28.90	25.40	27.15
Andoorwadi	64.00	56.47	60.23	65.27	52.57	58.72	30.80	23.45	27.12	35.20	25.05	30.12
Mean	61.31	55.98	58.64	63.94	57.32	60.63	30.28	25.43	27.85	30.68	24.49	27.58
Bhalki taluka												
Ahmadabadwadi	66.00	60.08	63.04	67.02	59.56	63.29	34.00	27.95	30.97	30.40	26.80	26.80
Nittur	61.05	57.75	59.40	67.50	60.54	64.02	32.25	26.24	29.24	32.70	26.47	29.58
Hallikhed	68.45	58.88	63.66	66.00	59.85	62.92	31.90	27.85	29.87	34.00	25.60	29.80
Halbarga	65.45	56.65	61.05	66.30	59.35	62.82	33.80	24.70	29.25	34.00	27.56	29.68
Sindhbandagi	65.20	57.21	61.20	63.35	57.38	60.36	29.50	25.60	27.55	31.80	28.30	30.05
Mean	65.23	58.11	61.27	66.03	59.33	62.68	32.29	26.46	29.33	32.71	26.94	29.52
Humnabad taluka												
Nimbur	61.66	56.07	58.86	64.43	57.33	60.88	30.50	26.35	28.42	26.40	25.70	26.05
Hudgi	59.19	59.40	59.29	66.50	58.58	62.54	29.10	24.80	26.95	29.40	25.21	27.30
Meenkera	63.65	54.25	58.95	65.88	59.82	62.85	29.70	25.80	27.75	34.55	27.45	31.00
Changlera	61.45	57.41	59.43	65.75	59.06	62.40	31.30	25.50	28.40	33.65	26.66	30.15
Mannaekkelli	62.70	55.50	59.10	64.01	59.68	61.84	32.20	25.98	29.09	29.46	28.35	28.90
Mean	61.73	56.52	59.12	65.31	58.89	62.10	30.56	25.61	28.08	30.69	26.67	28.68
District mean	62.75	56.87	59.81	65.09	58.51	61.80	31.04	25.83	28.43	31.36	26.03	28.69

Table 1: Contd.....

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(C) Belgaum district	2006	2007	Mean	2006	2007	Mean	2006	2007	Mean	2006	2007	Mean
Bailhongal taluka												
Bailhongal	61.40	64.95	63.17	57.73	64.95	61.34	28.00	30.50	29.25	26.85	29.45	28.15
Anigol	60.00	57.55	58.77	58.66	68.90	63.78	28.20	30.93	29.56	25.9	32.30	29.10
Belwadi	55.05	60.37	57.71	59.22	66.20	62.71	28.20	32.45	30.32	26.09	30.60	28.34
Hosur	51.11	57.25	54.18	62.47	67.16	64.81	27.76	31.40	29.58	26.00	37.20	31.60
Devalapur	54.72	64.60	59.66	59.31	68.56	63.93	27.90	31.50	29.70	28.40	35.50	32.80
Mean	58.79	60.94	59.86	59.47	67.15	63.31	28.03	31.35	29.69	26.64	33.01	29.82
Chikkodi taluka												
Kanagala	48.25	65.70	56.97	58.60	67.01	62.80	21.60	34.14	27.87	24.65	28.60	26.62
Nippani	57.20	61.66	59.43	59.23	64.03	61.63	23.22	29.20	26.21	24.56	32.60	28.58
Bhoj	52.50	54.60	53.55	52.71	61.25	56.98	22.53	29.40	25.96	24.65	36.36	30.50
Nej	54.13	54.75	54.44	59.48	71.72	65.60	25.80	28.70	27.25	26.75	34.50	30.62
Examba	52.60	57.25	54.92	58.91	65.15	62.03	24.80	32.30	28.55	26.41	30.60	28.50
Mean	52.93	56.45	54.69	58.78	65.83	62.30	23.59	30.74	27.16	25.38	32.53	28.95
Hukkeri taluka												
Hebbal	61.21	64.95	63.07	58.28	68.37	63.47	30.50	37.50	34.00	29.30	35.90	32.60
Kochari	54.15	64.55	59.35	59.11	71.85	65.48	30.73	27.90	29.31	25.70	33.21	29.45
Gatur	57.05	66.94	61.94	60.99	69.00	64.99	29.4	28.40	28.90	27.90	35.02	31.46
Sankeswar	55.83	66.03	60.93	59.60	72.26	65.93	29.46	40.40	34.93	29.25	32.66	30.95
Nerli	55.65	67.30	61.47	61.80	67.06	64.43	28.80	36.90	32.85	27.50	30.94	29.22
Mean	56.37	65.95	61.16	59.95	69.70	64.82	29.77	34.22	31.99	27.93	33.54	30.73
District mean	55.36	61.89	58.57	59.40	67.56	63.48	27.13	32.10	29.61	26.65	33.02	29.83
Bagalkot district												
	2006	2007	Mean	2006	2007	Mean	2006	2007	Mean	2006	2007	Mean
Bilagi taluka												
Yadahalli	20.25	21.12	20.68	18.57	24.15	21.36	8.95	10.20	9.57	10.45	10.46	10.45
Galgali	18.30	22.56	20.43	20.85	24.17	22.51	9.44	9.00	9.22	10.35	09.60	9.97
Amalgeri	20.43	20.71	20.57	22.40	25.85	24.12	10.25	9.65	9.95	10.85	09.85	10.35
Budihal	20.95	20.54	20.74	21.70	25.98	23.84	9.63	11.20	10.41	9.96	11.26	10.61
Kundargi	20.22	21.90	21.06	22.50	22.00	22.25	10.50	9.11	9.80	10.36	9.15	9.75
Mean	20.03	21.36	20.69	21.20	24.43	22.81	9.75	9.83	9.79	10.39	10.06	10.22
Mudhol taluka												
Malali	21.52	26.15	23.87	19.57	26.62	23.09	11.39	12.43	11.91	11.94	12.15	12.04
Nagaral	20.96	25.85	23.40	20.31	26.95	23.63	10.24	10.25	10.24	9.70	13.95	11.82
Shirol	20.35	24.50	22.42	22.70	27.30	25.00	10.16	10.30	10.23	11.70	15.95	13.82
Mughalkhod	22.27	23.64	22.95	22.00	25.47	23.73	10.09	11.50	10.79	10.29	11.20	10.74
Siddapur	19.93	21.90	21.90	21.60	29.47	25.53	10.65	10.81	10.73	9.80	12.10	10.95
Mean	21.00	24.40	22.70	21.23	27.16	24.19	10.50	11.05	10.78	10.68	13.07	11.87
Jamkhandi taluka												
Sirguppi	19.88	21.10	20.49	20.48	22.24	21.36	9.38	10.18	9.78	9.65	10.17	9.91
Madarkhandi	20.55	22.17	21.36	20.41	21.22	20.81	9.07	7.84	8.75	9.86	11.50	10.68
Hebbal	20.58	20.31	20.44	21.46	21.67	21.56	9.74	8.45	9.09	9.45	9.65	9.55
Jakanur	21.27	21.27	21.27	20.60	24.97	22.78	9.55	8.95	9.33	9.12	7.85	8.48
Goni	21.51	21.21	21.36	21.15	23.26	22.20	10.10	9.80	9.95	10.24	10.09	10.16
Mean	20.75	21.21	20.98	20.82	22.67	21.74	9.56	9.04	9.32	9.66	9.85	9.75
District mean	20.59	22.32	21.45	21.08	24.75	22.91	9.93	10.05	9.99	10.24	10.91	10.57

(Anonymous, 2004).

The variation in pest incidence over the years in the present investigation might be due to variation in rainfall, temperature and relative humidity that have direct influence on the incidence of the stem fly. The effect of climate on pest incidence was reported by Gain and Kundu (1988) who observed that high temperature (39.4–42°C), low relative humidity and low rainfall have adversely affected the stem fly activity while, low temperature (24.5–25°C), high relative humidity and high rainfall favoured the activity of the fly.

During the roving survey, opening of stems showed the feeding tunnels with the presence of larvae or pupae inside. In older plants, two or three separate tunnels were often present. The one in the lower half was older and had developed dark brown colour. The second / third tunnel was observed at top most part of the stem and extended downwards up to the first tunnel. These observations were in conformation with those described by Talekar (1990).

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