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Seasonal incidence of leafhopper, *Amrasca biguttula biguttula* (ishida) on sunflower

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Abstract
The incidence of the leafhoppers on sunflower sown during the last week of August 2013 was 6.66 leaf hopper per leaf and peak incidence was noticed during second week of November (23.16 leafhoppers/ plant). Whereas moderate incidence was noticed up to first week of January (12.66 leafhoppers/ plant). No incidence was noticed from fourth week of April to third week of May 2013 and this may be due to higher temperature. Later leafhopper activity was again increased and reached 6.73 leafhoppers per plant during August 2013. There was significant negative relationship with weather parameters like maximum temperature (4 = -0.74) and minimum temperature (r = -0.793), while significant positive relationship with morning relative humidity (4 = +0.684); afternoon relative humidity (4 = +0.69) and also total rainfall (r = +0.108) which was found non-significant.

Keywords: Sunflower**,** leafhopper, seasonal incidence, correlation

Introduction
Sucking pests of sunflower include jassids, thrips and whitefly. Among these sucking insect pests jassids (leafhoppers) *Amrasca biguttula biguttula* (Ishida) appears in serious form. This is found pests of economic importance in Karnataka. The nymphs of these suck the sap from the tender leaves and as a result the leaves curl and develop yellowish colour. The incidence would start from the seedling stage and prevail through the entire plant life. So an experiment was conducted to know the seasonal incidence of leafhopper, *A. biguttula biguttula* on sunflower.

Material and Methods
To know the seasonal incidence of leafhopper, a field study was made at Regional Agricultural Research Station (RARS), Raichur, Karnataka. A hybrid sunflower KBSH-1 was sown in 100 m^2 area at two months interval for one year starting from August 2002 to August 2003. Crop was raised in three replications with recommended spacing, fertilizer and irrigation.
Observation on population of leafhopper were recorded at weekly interval on top two, middle two and bottom two leaves throughout the year. Observation on weather parameters were also recorded and the population of leafhopper was correlated with weather parameters.

Results and Discussion
Season incidence of leafhoppers
The activity of the leafhoppers on sunflower sown during August 2002 in RARS, Raichur started (Table 1) in the last week of August with 6.66 leafhopper per leaf and peak incidence was noticed during second week of November (23.16 leafhoppers/ plant). Whereas, moderate incidence was noticed up to first week of January (12.66 leafhoppers/ plant). No incidence was noticed from fourth week of April to third week of May 2003 and this may be due to higher temperature. Later leafhopper activity was again increased and reached 6.73 leafhoppers per plant during August 2003. The present findings are in close association with the results of earlier workers [1], in which peak incidence during middle of November to end of December in Raichur region of Karnataka. The peak incidence of leafhopper during second week of November may be due to favorable temperature (32.7 ^oC) this may be compared with the results earlier workers [2, 3] who reported 30.1 ^oC was found to be most favorable to attain the pest its peak.

Table 1: Activity of leafhoppers and weather parameters during *kharif* 2002-03

Sl. No.	Months	Std. Week	Leaf-hoppers/6 leaves/plant	Temperature (ºC)		Relative Humidity (%)		Rainfall (mm)
				Max.	Min.	RH-I	RH-II	
1.	August	35	6.66	34.8	24.0	73	61	3.1
2.	September	36	7.01	34.3	22.6	79	62	28.2
3.		37	7.66	34.6	28.4	73	59	0.0
4.		38	8.80	33.6	22.4	82	65	81.0
5.		39	9.26	35.2	23.6	76	56	0.0
6.	October	40	11.12	36.8	23.7	67	48	0.0
7.		41	13.73	33.1	23.3	86	73	28.8
8.		42	15.20	32.9	22.6	91	71	151.6
9.		43	16.63	32.1	20.4	86	65	0.0
10.		44	18.70	30.9	19.5	81	63	9.0
11.	November	45	20.12	31.7	19.3	86	63	0.0
12.		46	23.16	32.7	18.4	85	58	0.0
13.		47	22.58	31.3	15.7	84	59	0.0
14.		48	20.63	33.2	15.0	78	53	0.0
15.	December	49	19.80	31.6	16.9	82	59	0.0
16.		50	16.66	31.2	15.0	82	59	0.0
17.		51	16.01	32.3	14.3	60	53	0.0
18.		52	14.36	31.9	17.3	79	56	0.0
19.	January	1	12.66	31.3	18.0	75	34	0.0
20.		2	9.76	30.7	19.0	71	33	0.0
21.		3	8.16	30.1	16.1	75	28	0.0
22.		4	6.70	34.5	18.6	62	22	0.0
23.		5	6.43	34.2	19.6	64	30	0.0
24.	February	6	4.81	33.9	19.3	73	34	2.4
25.		7	4.10	36.1	21.5	71	30	0.0
26.		8	3.80	35.7	21.7	63	28	0.0
27.		9	3.61	37.4	22.7	57	22	0.0

Table 1: Contd….

Sl. No.	Months	Std. Week	Leaf-hoppers/6 leaves/plant	Tempera-ture (^{O} C)		Relative Humidity (%)		Rain-fall (mm)
				Max.	Min.	RH-I	RH-II	
28.	March	10	2.80	37.5	22.1	45	24	0.0
29.		11	2.20	36.7	22.7	70	31	0.0
30.		12	2.01	37.7	23.8	58	25	0.0
31.		13	1.73	39.6	24.9	45	17	0.0
32.	April	14	1.33	40.0	24.0	50	19	0.0
33.		15	0.86	39.5	25.0	54	24	0.0
34.		16	0.30	41.5	27.1	56	22	0.0
35.		17	0.00	41.5	25.9	53	23	0.0
36.		18	0.00	41.3	26.6	50	26	0.0
37.	May	19	0.00	41.7	27.0	49	25	0.0
38.		20	0.00	42.8	26.7	56	25	0.0
39.		21	0.00	42.9	27.6	50	23	0.0
40.		22	0.63	42.8	27.8	51	22	0.0
41.	June	23	1.13	40.9	26.8	61	26	0.0
42.		24	2.46	38.0	25.5	68	37	2.1
43.		25	2.56	37.4	24.7	81	51	41.6
44.		26	3.46	36.1	23.6	80	47	17.3
45.	July	27	3.63	33.8	23.6	83	46	15.0
46.		28	4.76	34.1	22.8	85	55	14.4
47.		29	4.80	36.9	24.2	73	49	4.4
48.		30	4.96	33.1	23.6	84	55	1.6
49.		31	5.20	34.4	22.9	79	55	10.8
50.	August	32	5.61	31.7	23.0	82	60	30.2
51.		33	5.89	34.8	23.5	75	42	4.4
52.		34	6.73	30.5	22.2	87	65	73.2

Table 2: Correlation coefficients and regression equation between various weather parameters and leafhopper population on sunflower during 2002-2003

Sl. No.	Weather parameters	r	Regression equation	R^2
1.	Maximum temperature (^OC)	- 0.7542**	Y = 56.07199 - 1.368506 X	0.568865
2.	Minimum temperature (^OC)	-0.7926**	Y = 40.96151 - 1.509705 X	0.628371
3.	Morning relative humidity (%)	+ 0.684**	Y = 17.44424 + 0.35178 X	0.468262
4.	Afternoon relative humidity (%)	+ 0.6900*	Y = 4.255834 + 0.273648 X	0.476142
5.	Rainfall (mm)	+ 0.1085	Y = 7.243675 + 0.027802 X	0.011773

** Significant at both 5% and 1% N = 52

Correlation and regression analysis between leafhopper population and abiotic factors

Studies were made to know the influence of weather parameters on the activity of leafhoppers on sunflower. It was noticed that there was significant negative relationship with weather parameters like maximum temperature (4 = -0.74) and minimum temperature (r = -0.793), while significant positive relationship with morning relative humidity (4 = +0.684); afternoon relative humidity (4 = +0.69) and also total rainfall (r = +0.108) which was non-significant. The leafhoppers had negative relationship with maximum and minimum temperature on sunflower in Raichur, Karnataka [4, 5]. In conclusion, the activity of leafhoppers maximum during November to December months, so its better to recommend the suitable management practices in cultivation of sunflower during that period.

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