INFLUENCE OF WEATHER FACTORS ON THE INCIDENCE OF SISSOO DEFOLIATOR, *PLECOPTERA REFLEXA* GUENEE ON *DALBERGIA SISSOO* SEEDLINGS

VINOD KUMAR GARG, N. KULKARNI* AND P.B. MESHRAM**

J.N. Krishi Vishwa Vidyalaya,
Regional Agricultural Research Station,
Khandwa (Madhya Pradesh).

Introduction

Dalbergia sissoo Roxb. ('Sissoo') belonging to the family Leguminosae is grown throughout the sub-Himalayan tract from the Indus to Assam and in the Himalayan valleys, particularly in Gangetic plain of India and it also found in patches of Central India. *D. sissoo* furnishes one of the most important timbers of India. The hardwood is brown with darker streaks, very hard, strong and durable (Troup, 1986). It is planted extensively on the roadsides as shade trees as well as a component of Agro-Forestry Module. Farmers take to plantation of *D. sissoo* on farm easily. *D. sissoo* fixes nitrogen in the soil from environment by nitrification process and increases the level of nitrogen in the soil. Shade of tree does not adversely affect the yield and yield attributing characters of the crop plants. One of the major constraints in the successful production of *D. sissoo* seedlings in forest nurseries is damage by different insect pests. Among them is the Sissoo defoliator *Plecoptera reflexa* Guenee (Lepidoptera : Noctuidae), a very serious and frequent pest.

Locality specific information on pest incidence and correlation with the meteorological parameters may help us in the monitoring these pests in a particular locality. There is no such study reported earlier in forest nurseries of Chhindwara Forest Divisions hence the present study was undertaken.

Material and Methods

Studies were conducted in six nurseries namely Karaboh, Chourai and Saliwada (East Forest Division), Khirsadoh (West Forest Division), Amla (South Forest Division) and Lavaghoghari (Forest Development Corporation Ltd., Chhindwara Project Division) at Chhindwara Forest Circle to find out the influence of weather elements on the incidence of *P. reflexa* during 1999-2001.

Weekly observations on total number of healthy and damaged seedlings were recorded from each sample. Based on these observations per cent incidence of the insect pest was calculated. Population of the insect pest was also counted while assessing the incidence. Data from

* Tropical Forest Research Institute, Jabalpur (M.P.).
** Centre for Forestry Research and Human Resource Development, Chhindwara (M.P.).

different samples was pooled and mean value calculated.

The nursery stock available in these nurseries was weekly surveyed for infestation by insect pest for the period under observations. For surveys, method suggested by Bakshi (1977) was followed. For each available plant species three samples consisting of quadrates of 0.5 m^2 x 0.5 m^2 were taken randomly.

The data on incidence and population of insect pest recorded during periodical surveys in six representative nurseries in Chhindwara Foret Divisions was pooled so as to calculate the mean percentage incidence of *P. reflexa* in the area under study, throughout the season. This mean was further compared with the weekly weather parameters (based on standard meteorological weeks) like maximum, minimum temperature (in °C), relative humidity (in %), rainfall (in mm) and total number of rainy days.

Results and Discussion

During both the years, the activity of *P. reflexa* initiated from third week of June and remained active up to last week of October (Table 1). In the year 1999-2000 the peak incidence and population of *P. reflexa* were recorded at 33rd standard meteorological week (SMW) i.e. 27.78 per cent and 17.18 larvae. The data presented in Table 1 indicated that the maximum temperature and relative humidity from 22nd to 24th SMW ranged respectively from 34.42°C to 37.14°C and 59.28 per cent to 65.14 per cent. The infestation of incidence and population of *P. reflexa*, started from 25th SMW. The mean weekly maximum temperature and relative humidity from 25th SMW to 33rd SMW ranged respectively, from 25.00°C to 30.85°C, 70.42 per cent to 89.85 per cent. The incidence of infestation and population gained to its maximum during 33rd SMW. From 34th SMW to 43rd SMW maximum temperature and relative humidity ranged, respectively, 25.00°C to 28.57°C, 70.00 per cent to 91.00 per cent. From 44th SMW onwards no incidence and population was observed, temperature and relative humidity also decreased. The correlation coefficient of incidence and population of *P. reflexa* vs. maximum temperature of the corresponding period showed significant negative correlation (-0.5944 and –0.6113). The correlation of incidence and population of *P. reflexa* vs. relative humidity of the corresponding period proved significantly positive 0.5631 and 0.5027 (Table 2).

In the year 2000-01, the activity of the pest started from 25th SMW and remained active up to 43rd (Table 1). The incidence and population reached to its peak in the SMW 33rd with 32.85 per cent and 26.21 larval population in 2000-01. The maximum temperature and relative humidity from 22nd to 24th SMW ranged, respectively from 31.30°C to 35.00°C and 53.10 per cent to 70.80 per cent. The infestation of incidence and population of *P. reflexa* started from 25th till 43rd SMW. The mean weekly maximum temperatures and relative humidity from 25th SMW to 33rd SMW ranged, respectively, from 24.60°C to 31.10°C, 72.80 per cent to 85.10 per cent. The incidence of infestation and population gained to its maximum during 33rd SMW. From 34th SMW to 43rd SMW maximum temperature and relative humidity ranged respectively, 23.40°C to 31.60°C, 65.60 per cent to 82.70 per cent. From 44th SMW onwards temperature and relative humidity showed decreasing trend.

Table 1

Mean weekly incidence and population of Sissoo defoliator (Plecoptera reflexa) on seedlings in Nurseries during the period of observation and weather parameters

SMW	Mean percentage of Incidence		Population of the larvae (nos.)		Temperature (°C)				Relative Humidity (%)		Rainfall (mm)		Rainy Days (nos.)	
	99-00	00-01	99-00	00-01	99-00		00-01		99-00	00-01	99-00	00-01	99-00	00-01
					Max.	Min.	Max.	Min.						
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
22	-	-	-	-	37.14	26.85	35.00	26.30	59.28	53.10	-	36	-	4
23	-	-	-	-	37.00	26.42	31.30	24.30	65.10	70.80	5	103	1	4
24	-	-	-	-	34.42	24.42	32.40	25.00	65.14	67.6	39	-	3	-
25	2.62	1.68	1.74	0.99	29.71	23.00	28.70	23.10	80.20	77.00	90	49	3	3
26	4.81	4.21	3.26	2.48	30.85	24.28	31.10	24.30	71.14	72.8	-	9	-	1
27	7.00	8.19	4.81	4.37	30.85	24.28	30.30	24.00	75.00	77.10	25	37	2	3
28	9.64	11.71	8.36	7.58	29.28	23.42	27.40	23.10	70.42	83.8	15	143	2	5
29	12.43	15.76	10.36	11.45	27.04	22.57	24.60	21.60	84.57	85.10	78	45	5	3
30	17.30	19.84	12.29	14.41	25.00	21.85	25.10	22.30	89.85	80.80	57	10	7	1
31	20.35	24.8	14.31	17.66	25.85	21.71	27.60	22.60	85.28	75.00	182	23	4	2
32	23.94	27.88	15.38	21.64	25.85	21.85	29.30	23.40	87.57	77.40	67	45	3	2
33	27.78	32.85	17.18	26.21	28.28	22.42	26.60	22.60	80.14	78.60	2	20	1	2
34	25.71	29.11	15.32	23.97	27.40	22.71	28.30	23.40	78.00	82.70	10	14	1	2

Contd...

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
35	23.29	24.02	13.71	20.15	28.57	22.71	27.40	22.70	80.14	81.10	4	9	1	1
36	18.95	20.03	11.60	16.02	26.85	22.28	25.70	22.10	82.28	81.00	10	-	2	-
37	15.29	16.17	9.49	12.62	26.00	21.71	28.40	22.10	87.71	73.70	204	-	7	-
38	11.57	12.78	7.63	9.25	25.00	21.14	31.60	23.80	91.00	68.40	190	-	7	-
39	9.22	9.26	6.36	5.90	26.85	21.71	30.40	21.70	86.57	73.60	48	6	4	1
40	6.57	6.96	4.21	3.40	27.85	21.85	31.60	22.00	86.57	69.60	106	3	4	1
41	4.02	5.38	2.21	2.49	27.57	21.71	31.10	23.10	85.28	67.70	134	-	5	-
42	2.36	2.77	1.24	1.24	26.57	19.42	26.40	22.40	73.57	65.60	-	-	-	-
43	0.30	0.62	0.33	0.30	27.71	18.57	23.40	22.40	70.00	69.30	-	-	-	-
44	-	-	-	-	28.00	18.71	23.40	21.60	70.14	69.80	-	-	-	-

Table 2

Correlation Matrix of incidence/population of P. reflexa Guenee vs. Meteorological data during 1999-2000

	Incidence	Population	Max. Temp.	Min. Temp.	Relative Humidity (%)	Rainfall (mm)	Rainy Days
Incidence	1.0000						
Population	0.9882*	1.0000					
Max.Temp.	- 0.5944*	- 0.6113*	1.0000				
Min. Temp.	- 0.2181	- 0.2135	0.7964*	1.0000			
R.H. (%)	0.5631*	0.5027*	-0.8750*	-0.5586*	1.0000		
Rainfall	0.0954	0.1225	-0.4646*	-0.2881	0.6400*	1.0000	
Rainy days	0.1729	0.2291	-0.5392*	-0.2468	0.7550*	0.8128*	1.0000

* Significant at 5 per cent

Table 3

Correlation Matrix of incidence/population of P. reflexa Guenee vs Meteorological data during 2000-2001

	Incidence	Population	Max. Temp.	Min. Temp.	Relative Humidity (%)	Rainfall (mm)	Rainy Days
Incidence	1.0000						
Population	0.9944*	1.0000					
Max.Temp	-0.4097	-0.4074	1.0000				
Min. Temp	-0.3321	-0.2998	0.7084*	1.0000			
R.H. (%)	0.4698*	0.4632*	-0.1226	-0.0994	1.0000		
Rain fall	-0.0830	-0.0925	0.0317	0.2255	0.2503	1.0000	
Rainy days	-0.0745	0.0598	0.1557	0.3814	0.2418	0.8143*	1.0000

* Significant at 5 per cent

The correlation coefficient of incidence and population of *P. reflexa* vs. maximum temperature of the corresponding period showed significant negative correlation (-0.5944 and –0.6113).

The correlation of incidence and population of *P. reflexa* vs. relative humidity of the corresponding period proved significantly positive ie. 0.4698 and 0.4632 (Table 3). But variation in the population may be due to the influence of many abiotic factors and biotic factors that might be operating independently. This is

in agreement with earlier reports of Besson (1941) and Mathur (1942), who have opined that the variation in population abundance in influenced by the climatic factors. The present observation conform to Jemla Naik *et al*. (1995), who have indicate that the correlation existed between the population of *P. reflexa* and abiotic factors like temperature, rainfall, relative humidity, wind speed and sunshine hours, but it differs with them as regards the incidence of infestation. They had found six peaks ie., first peak during July (100 per cent), second peak in August (94 per cent), third in April (72 per cent), fourth and fifth were in September and May (68 and 58 per cent) and sixth peak in June (42 per cent). It was not observed only during December to February. In the present observation there was steady increase in the population during the season instead of different activity peaks. Present study showed that the incidence and population was significantly correlated with the maximum temperature of the corresponding period during 1999-2000. Although, it showed similar trends during the next year, but was statistically non-significant. It was positively significant with the relative humidity during both the years. The temperature and relative humidity ranges of 23°C to 32°C and 70 per cent to 90 per cent seems to be favourable for the maximum incidence of this pest in nursery.

SUMMARY

The activity of *P. reflexa* initiated in 25th SMW with 2.62 per cent incidence and 1.74 mean larval population in 1999-2000. It reached to its peak in the SMW 33rd with the incidence and mean larval population being, respectively, 27.78 per cent and 17.18. It remained active till 43rd SMW. During 2000-01, activity of this pest initiated in 25th SMW with 1.68 per cent incidence and 0.99 mean larval population. It reached to its peak in the SMW 33rd with the incidence being 32.85 per cent with 26.21 mean larvae per quadrate. It remained active till 43rd SMW. The correlation coefficient of the incidence and population *vs* maximum temperature of the corresponding period showed significant negative correlation. During both the years mean value of the correlation coefficient of maximum temperature, respectively for incidence and population was calculated to be -0.5944 and -0.6113. The data indicated that the correlation of incidence and population with that of relative humidity was also significantly positive.

शीशम के पौधों पर शीशम निष्पत्रक कीट *प्लेक्टोप्टेरा रिलेक्सा* गुएनी के आपात पर मौसम कारकों का प्रभाव

विनोद कुमार गर्ग, एन० कुलकर्णी व पी०बी० मेश्राम

सारांश

प्ले० रिलेक्सा की क्रियाशीलता 25वें एसएमडब्लू पर 2.62% आपात और 1.74 माध्य जातक संख्या रहने पर 1999–2000 में आरम्भ हुई। इसको शिखर 33वें एसएमडब्लू पर कीट आपात और जातकों की संख्या क्रमशः 27.8% और 17.18% रहने पर मिला। 43वें एसएमडब्लू तक सक्रियता बनी रही। 2000–01 में इस नाशिकीट की सक्रियता 25वें एसएमडब्लू पर 1.68% आपात और माध्य जातक संख्या 0.99 रहने पर आरम्भ हुई। इसको शिखर 33वें एसएमडब्लू पर प्राप्त हुआ जब आपात 32.85% और माध्य जातक संख्या प्रति चतुष्कोण्क 26.21 थी। 43वें एसएमडब्लू तक सक्रियता बनी रही। आपात और जातक संख्या का सहसम्बन्ध गुणक तत्सम्बन्धित अवधि के अधिकतम तापमान सार्थकतः नकारात्मक पाया गया। दोनों वर्षो में अधिकतम तापमान के सहसम्बन्ध गुणक का माध्यमान आपात और जातक संख्या के साथ क्रमशः –0.5944 और –0.6113 पाया गया।

इन आंकड़ो से संकेत मिला कि आपात और जातक संख्या का सहसम्बन्ध आपेक्षिक नमी के साथ भी सार्थकतः घनात्मक है।

References

Bakhsi, B.K. (1977). *Disease Insect Surveys Report* (1975-77). Forest Research Institute, Dehra Dun. 46p

Besson, C.F.C. (1941). *The Ecology and control of the forest insects of India and neighbouring countries,* Manager of Publications, Delhi. pp. 500-501.

Jemla Naik, D., C.T. Ashok Kumar, M.R. Ravi Kumaar and D. Thippesha (1995). Seasonal incidence of Shisham defoliator, *Plecoptera reflexa* (Noctuidae: Lepidoptera). *My Forest,* **31**(4): 49-50.

Mathur, R.N. (1942). On the biology of the Noctuidae (Lepidoptera). *Indian For. Rec.* (N.S.) *Ent*. **17**(3): 74-154.

Troup, R.S. (1986). *The Silviculture of Indian trees* (repr. edn), Clarendon Press, Oxford. **1** : 294.