

SHORT NOTE

SEASONAL ACTIVITY OF THE POMEGRANATE SHOT HOLE BORER, *Xyleborus perforans* (Wollaston) (Coleoptera : Scolytidae)

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The Pomegranate (*Punica granatum* L.) was recorded as a new host of shot hole borer, *Xyleborus perforans* (Wollaston) in Maharashtra (Mote, 1991). Its biology and life cycle have been described by Dantharayan (1973) on tea. Adult female makes deep galleries inside the stem, which hinders the translocation of nutrients and water. The damage caused by shot hole borers were of secondary importance like die back, according to Beeson (1930). Since, last decade, the pest is severe on pomegranate damaging main trunk and branches (Mote and Tambe 1991) in Maharashtra and Andhra Pradesh. Of late, in Karnataka (Krishna Naik and Nandihalli, 1996) it is appearing in serious proportions. No information on its seasonal incidence on pomegranate is available. Hence, investigation on seasonal activity of *X. perforans* were carried out.

Seasonal activity of pomegranate shot-hole borer, *X. perforans* was studied in 3 farmers field (one from Bijapur district and two from Bagalkot district) on variety Ganesh of 4 to 5 years. Observations were recorded at an interval of 30 days (Fixed plot survey) on the total number of plants in an orchard and plants showing drying symptoms due to shot-hole borer. Numbers of

total, active and dead shot-holes on 16 cm² of stem were recorded at the base of the plant by taking vertical and horizontal sections. Appropriate statistical methods were used for analysis (Standard Deviation and correlation).

The plants with drying symptoms were further categorised into:

- a. Plants drying due to shot hole borer without vascular tissues discolouration.
- b. Plants drying due to shot hole borer with vascular tissues discolouration.
- c. Plants drying with vascular tissues discolourations and without shot-hole borer.

Meteorological data were collected from the Regional Research Station, Bijapur and Agricultural Research Station, Bagalkot for correlation studies. In order to establish, the probable cause for plant withering, five pomegranate plants with and without shot holes were taken for observations. Further, the presence of pathogen (*Verticillium sp.*) in the infested plant samples were ascertained from Plant Pathology Department, Agricultural College, Dharwad and Agharkar Research Institute, Maharashtra Association for the Cultivation of Sciences, Pune.

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Borer activity at 0.30 cm height from ground level

The number of active, dead total shot holes varied from 1.00 ± 0.65 to 6.27 ± 0.70 , 0.24 ± 0.42 to 3.14 ± 1.45 and 2.20 ± 0.86 to 7.26 ± 0.96 , respectively in all the three locations. Higher numbers of active shot holes (2.93 ± 1.57 to 6.27 ± 0.70) were recorded from September to December in all locations, which indicated higher borer activity. Lower numbers of active shot holes (1.00 ± 10.37 to 2.26 ± 1.03) were recorded from February to May in all the locations. Maximum numbers of active shot holes were more during summer months at all the locations.

Borer activity at 31-60 cm height from ground level

Number of active, dead and total shot holes varied from 0.07 ± 0.25 to 3.26 ± 1.57 , 0.04 ± 0.10 to 1.87 ± 0.50 and 0.56 ± 0.81 to 4.26 ± 0.88 , respectively. Higher numbers of active shot holes (1.98 ± 1.02 to 3.53 ± 1.12) were recorded from September to December in all the locations. Lower numbers of active shot holes (0.07 ± 0.25 to 2.30 ± 0.88) were recorded from May to July. Maximum numbers of active shot holes were recorded during the month of December. The numbers of dead shot holes more during summer months.

Borer activity at 61 - 90 cm height from ground level

Number of active, dead and total shot holes varied from 0.02 ± 0.04 to 1.46 ± 0.83 , 0.06 ± 0.23 to 1.46 ± 0.83 and 0.20 ± 0.55 to 1.96 ± 0.53 , respectively. Higher numbers of active shot holes (0.52 ± 0.50 to 1.46 ± 0.83) were recorded from September to December in all the locations. Lower numbers of active shot holes (0.02 ± 0.04 to 0.53 ± 0.51) were recorded from May to July. Maximum numbers of active shot holes were recorded during the month of December in all the

locations. The numbers of dead shot holes were more during summer months.

The shot hole borer was more active at the ground level as could be seen by maximum shy holes at 0-30 cm height (6.27 ± 0.70) as compared to 31-60 cm (3.26 ± 1.57) or 61 - 90 cm (1.46 ± 0.83) height. Wilting of pomegranate plants both with shot holes and without discolouration of vascular tissue or with discolouration of vascular tissue and without shot holes was not recorded throughout the period.

Similar results were reported by Chandra (1981) who reported year round activity of the beetle with higher activity from October to December. Tambe and Mote (1997) reported increased activity of *X. fornicatus* during post monsoon period. Muraleedharan (1986) and Muraleedharan and Radhakrishna (1989) also observed a similar trend on tea.

Cumulative plant mortality

Mortality percentage of 27.8, 33.5 and 41.8% respectively in two years period due to this shot hole borer damage was observed at three locations.

Correlation between pest activity and weather parameters at Tikota (Bijapur district) indicated that per cent wilt, total and active shot holes were negative correlated with both the maximum and minimum temperature. There was positive correlation between dead shot holes and temperature at 0 - 30 cm (0.557) and 61 - 90 cm (0.567), but it was negative at 31 - 60 cm (-0.134), and was non significant. However, correlation between maximum temperature with total (-0.688) and active shot holes (-0.700) at 0 - 30 cm height from the ground was significant. Correlation between relative humidity and rainfall with per cent wilt and other parameters, at all plant heights were positive but not significant at Tikota. Almost a similar trend was observed between weather parameters (maximum and minimum

Table 1 - Seasonal incidence of pomegranate shot hole borer, *X. perforans* at Bijapur on variety Ganesh (Tikota)

Date of observation	No. of plants in garden	Per cent plant showing drying symptoms with				Average number of shot holes per 4x4 cm area on stem from ground level							
		SH without discoloration	SH with discoloration	Discolouration without SH	0-30 cm			31-60 cm			61-90 cm		
					Active	Dead	Total	Active	Dead	Total	Active	Dead	Total
31-5-1998	600	0	1.13	0	2.50±0.73	0.88±0.52	3.38±0.24	1.53±0.83	0.73±0.45	2.26±0.79	0.80±0.41	0.46±0.51	1.26±0.45
30-6-1998	592	0	0.67	0	2.66±1.11	0.81±0.77	3.47±0.99	1.20±0.56	0.73±0.59	1.93±0.59	0.93±0.25	0.20±0.41	1.13±0.91
31-7-1998	588	0	0.51	0	3.20±1.65	2.22±0.75	5.20±1.56	2.26±0.70	0.94±0.26	3.20±0.86	0.97±0.30	0.36±0.47	1.33±0.80
31-8-1998	585	0	1.70	0	3.93±1.79	1.87±1.24	5.80±2.00	2.73±1.48	1.00±0.37	3.73±1.48	1.06±0.25	0.54±0.50	1.60±0.50
30-9-1998	575	0	2.60	0	4.00±0.75	1.40±0.98	5.40±1.54	2.80±0.94	0.86±0.35	3.66±0.81	1.13±0.51	0.33±0.48	1.46±0.91
31-10-1998	560	0	2.14	0	4.86±2.74	1.94±0.71	6.80±1.47	3.06±1.22	1.00±0.55	4.06±0.79	1.46±0.83	0.50±0.50	1.96±0.53
30-11-1998	548	0	1.82	0	4.93±2.08	0.67±0.48	5.60±1.80	3.20±1.78	0.53±0.51	3.73±1.54	1.33±0.89	0.13±0.35	1.46±0.74
31-12-1998	538	0	0.37	0	4.93±2.28	0.73±0.45	5.66±2.31	3.26±1.57	0.55±0.53	3.81±1.09	1.40±0.82	0.13±0.25	1.53±0.63
31-1-1999	536	0	0.74	0	4.20±2.04	0.53±0.51	4.73±2.25	1.93±1.22	0.73±0.45	2.66±1.04	1.00±0.37	0.20±0.41	1.20±1.01
28-2-1999	532	0	0.93	0	3.66±1.29	0.74±0.46	4.40±1.45	1.60±0.73	1.00±0.37	2.60±0.98	0.98±0.37	0.19±0.40	1.17±1.05
31-3-1999	527	0	0.37	0	1.93±0.70	1.53±0.83	3.46±1.06	1.13±0.91	0.73±0.45	1.86±1.12	0.40±0.50	0.46±0.51	0.86±0.74
30-4-1999	525	0	0.38	0	1.73±0.88	1.40±0.73	3.13±1.06	0.93±0.25	0.60±0.50	1.53±0.51	0.46±0.51	0.27±0.45	0.73±0.45
31-5-1999	523	0	0.76	0	1.60±0.91	0.80±0.41	2.40±1.12	0.83±0.63	0.53±0.63	1.36±0.71	0.40±0.50	0.26±0.45	0.66±0.48
30-6-1999	519	0	1.15	0	1.66±0.89	1.00±0.75	2.66±0.97	0.73±0.45	0.67±0.49	1.40±0.73	0.40±0.50	0.26±0.45	0.66±0.48
31-7-1999	513	0	0.97	0	1.00±0.65	1.20±0.94	2.20±0.86	0.83±0.63	0.37±0.48	1.20±0.77	0.33±0.48	0.20±0.41	0.53±0.51
31-8-1999	508	0	1.16	0	2.66±1.75	1.00±0.75	3.66±1.54	0.98±0.07	0.75±0.43	1.73±0.98	0.53±0.51	0.27±0.45	0.80±0.41
30-9-1999	502	0	2.39	0	2.93±1.57	0.93±0.25	3.86±1.24	1.00±0.37	0.86±0.35	1.86±0.83	0.60±0.50	0.36±0.47	0.86±0.51
31-10-1999	490	0	2.65	0	4.13±1.64	0.93±0.88	5.06±1.79	1.93±1.16	1.13±0.63	3.06±0.88	0.86±0.35	0.34±0.48	1.20±0.56
30-11-1999	477	0	2.93	0	4.20±1.42	1.20±0.41	5.40±1.05	1.98±1.02	1.02±0.07	3.00±1.06	0.93±0.25	0.20±0.41	1.13±0.74
31-12-1999	463	0	2.59	0	5.93±1.38	0.20±0.41	6.13±1.40	2.13±0.91	1.73±0.96	3.86±0.74	1.06±0.45	0.27±0.45	1.33±0.61
31-1-2000	451	0	1.77	0	3.96±2.26	0.96±0.28	4.93±2.28	2.00±0.75	0.73±0.45	2.73±0.79	0.86±0.35	0.20±0.48	1.06±0.26
29-2-2000	453	0	1.35	0	3.20±1.65	0.86±0.40	4.06±1.09	1.89±0.80	0.44±0.50	2.33±0.72	0.87±0.35	0.19±0.45	1.06±0.88
31-3-2000	437	0	0.91	0	1.57±0.82	1.33±0.81	2.80±0.94	1.26±0.70	0.27±0.45	1.53±0.83	0.73±0.79	0.20±0.41	0.93±0.79
30-4-2000	433	0	0.69	0	1.40±0.82	1.13±0.63	2.53±1.12	1.13±0.48	0.33±0.48	1.46±0.99	0.46±0.51	0.27±0.45	0.73±0.45

Note : SH - Shot holes
 SHB - Shot hole borer
 * Standard Deviation given along with the mean values (±)

Table 2 - Seasonal incidence of pomegranate shot hole borer, *X. perforans* at Baalkot on variety Ganesh (Kaladagi)

Date of Observation	No. of plants in garden	Per cent plant showing drying symptoms with				Average number of shot holes per 4 x 4 cm area on stem SHB from ground level											
		SH without Discolouration	SH with discolouration	Discolouration without SH	0-30 cm				31-60 cm				61-90 cm				
					Active	Dead	Total	Active	Dead	Total	Active	Dead	Total				
15-5-1998	1500	0	1.53	0	2.15±0.91	1.23±0.89	3.56±1.24	2.0±0.92	0.80±0.41	2.80±1.62	0.93±0.45	0.35±0.43	1.28±1.18				
15-6-1998	1477	0	1.01	0	2.10±0.38	1.06±0.25	3.16±1.05	1.00±0.37	1.02±0.56	2.20±1.15	0.50±0.50	0.56±0.49	1.06±0.90				
15-7-1998	1462	0	0.88	0	2.40±1.05	1.93±0.25	4.33±1.68	1.50±0.66	0.93±0.25	2.43±0.85	1.00±0.37	0.23±0.41	1.23±0.81				
15-8-1998	1449	0	2.27	0	3.89±0.86	0.80±0.41	4.83±1.72	1.91±0.85	0.92±0.25	2.83±1.28	1.01±0.35	0.32±0.47	1.33±0.88				
15-9-1998	1416	0	2.61	0	4.56±1.42	0.47±0.51	5.03±1.37	2.83±0.79	0.17±0.36	3.00±1.11	1.11±0.29	0.35±0.47	1.46±0.93				
15-10-1998	1379	0	2.32	0	3.73±1.38	0.40±0.50	4.13±1.47	2.86±0.83	0.04±0.10	2.90±1.64	1.12±0.31	0.18±0.37	1.30±1.08				
15-11-1998	1347	0	2.07	0	3.74±1.87	0.06±0.15	3.80±1.12	2.33±1.04	0.13±0.35	2.46±1.30	1.00±0.37	0.06±0.23	1.06±0.94				
15-12-1998	1319	0	0.83	0	2.93±1.79	1.10±0.28	4.03±1.47	2.49±1.14	0.07±0.25	2.56±1.16	1.00±0.37	0.10±0.28	1.10±0.92				
15-1-1999	1308	0	1.14	0	1.26±0.59	1.26±0.59	4.26±1.38	2.33±1.23	0.33±0.48	2.66±1.06	0.93±0.25	0.23±0.41	1.16±0.87				
15-2-1999	1293	0	1.16	0	2.13±1.12	1.70±1.19	3.83±1.01	1.63±0.85	0.60±0.50	2.23±1.10	0.39±0.49	0.34±0.50	0.93±0.86				
15-3-1999	1278	0	0.86	0	1.60±0.82	1.70±1.30	3.30±0.91	1.03±0.11	0.83±0.36	1.86±1.22	0.36±0.47	0.50±0.50	0.86±0.89				
15-4-1999	1267	0	0.87	0	1.14±0.36	1.86±1.24	3.00±0.87	0.70±0.45	0.76±0.32	1.46±1.07	0.36±0.47	0.47±0.51	0.83±0.91				
15-5-1999	1256	0	1.19	0	1.01±0.03	1.79±1.14	2.80±0.92	0.23±0.41	0.83±0.52	1.06±0.94	0.20±0.41	0.43±0.49	0.63±0.61				
15-6-1999	1241	0	1.62	0	1.13±0.35	1.80±1.14	2.93±0.69	0.30±0.45	0.50±0.50	0.80±0.84	0.02±0.04	0.18±0.37	0.40±0.62				
15-7-1999	1221	0	1.59	0	1.46±0.63	1.20±0.56	2.66±1.56	0.07±0.25	0.49±0.50	0.56±0.81	0.03±0.11	0.17±0.36	0.20±0.55				
15-8-1999	1204	0	1.66	0	2.00±1.06	1.20±0.56	3.20±1.27	0.20±0.41	0.60±0.50	0.80±0.76	0.30±0.45	0.06±0.23	0.36±0.61				
15-9-1999	1184	0	2.62	0	3.00±1.13	0.33±0.48	3.33±1.24	0.82±0.57	0.34±0.48	1.16±0.64	0.52±0.50	0.34±0.48	0.86±0.73				
15-10-1999	1153	0	2.94	0	3.56±1.23	0.24±0.42	3.80±1.03	1.10±0.28	0.16±0.35	1.26±0.58	0.60±0.50	0.23±0.41	0.83±0.83				
15-11-1999	1119	0	3.12	0	3.93±1.22	0.57±0.49	4.50±0.90	1.22±0.63	0.18±0.37	1.40±0.77	0.66±0.48	0.30±0.45	0.96±0.80				
15-12-1999	1084	0	2.85	0	4.00±1.25	0.56±0.49	4.56±1.07	1.38±0.69	0.28±0.45	1.66±1.15	0.56±0.49	0.37±0.48	0.93±0.86				
15-1-2000	1053	0	2.18	0	3.91±1.37	0.42±0.49	4.33±0.99	1.30±0.64	0.16±0.35	1.46±1.22	0.52±0.50	0.38±0.48	0.90±0.88				
15-2-2000	1030	0	2.03	0	3.26±1.62	0.64±0.48	3.90±0.75	1.30±1.04	0.24±0.49	1.54±1.50	0.56±0.55	0.40±0.50	0.96±0.85				
15-3-2000	1009	0	1.48	0	1.93±1.27	1.00±0.65	2.93±1.57	1.20±0.67	0.33±0.48	1.53±0.83	0.40±0.50	0.46±0.51	0.86±0.35				
15-4-2000	996	0	1.30	0	1.86±1.45	1.07±0.70	2.93±1.27	1.00±0.84	0.40±0.50	1.40±1.05	0.26±0.45	0.54±0.51	0.80±0.56				

Note : SH - Shot holes

SHB - Shot hole borer

* Standard Deviation given along with the mean values (±)

Table 3 - Seasonal incidence of pomegranate shot hole borer, X. perforans at Baalkot on variety Ganesh (Sharadal)

Date of Observation (in garden)	No. of plants	Per cent plant showing symptoms with				Average number of shot holes per 4x4 cm area on stem due to SHHB from ground level											
		SH without discoloration		SH with discoloration		0-30 cm				31-60 cm				61-90 cm			
		Discolouration	Discolouration	Discolouration	Discolouration	Active	Dead	Total	Active	Dead	Total	Active	Dead	Total	Active	Dead	Total
15-5-1998	1100	0	1.90	0	0	2.00±1.06	2.53±2.09	4.53±0.74	1.13±0.51	1.87±0.50	3.00±1.06	0.57±0.49	0.89±0.81	1.46±0.74			
15-6-1998	1079	0	1.12	0	0	2.13±0.51	2.20±0.56	4.33±0.61	1.87±0.50	0.75±0.45	2.60±1.35	0.93±0.25	0.40±0.80	1.33±0.97			
15-7-1998	1067	0	0.93	0	0	2.98±1.63	3.08±1.50	6.06±0.70	2.30±0.88	0.96±0.15	3.26±0.59	1.03±0.11	0.50±0.50	1.53±0.74			
15-8-1998	1057	0	2.93	0	0	5.93±1.75	2.33±0.61	6.26±0.70	2.93±1.16	0.73±0.45	3.66±0.81	1.23±0.66	0.50±0.50	1.73±0.79			
15-9-1998	1026	0	3.41	0	0	4.93±1.79	2.30±0.64	7.26±0.96	3.40±1.29	0.86±0.74	4.26±0.88	1.50±0.86	0.36±0.47	1.86±0.74			
15-10-1998	991	0	3.02	0	0	5.13±1.35	1.33±0.89	6.46±0.83	3.46±1.12	0.54±0.50	4.00±0.84	1.50±0.86	0.10±0.28	1.60±0.82			
15-11-1998	961	0	2.70	0	0	5.20±1.32	1.06±0.25	6.26±0.96	3.53±1.18	0.27±0.45	3.80±1.26	1.30±0.92	0.23±0.41	1.53±0.99			
15-12-1998	935	0	1.06	0	0	5.26±1.27	1.07±0.27	6.33±0.97	3.20±1.26	0.20±0.41	3.40±1.40	1.00±0.37	0.33±0.48	1.35±1.04			
15-1-1999	925	0	1.41	0	0	3.20±1.42	2.60±1.35	5.80±0.86	1.66±1.17	1.40±1.05	3.06±1.66	0.36±0.47	0.50±0.50	0.86±0.35			
15-2-1999	912	0	1.31	0	0	2.54±1.28	2.52±1.20	5.06±0.70	1.18±0.49	1.42±0.62	2.60±1.63	0.25±0.43	0.48±0.50	0.73±0.45			
15-3-1999	900	0	1.11	0	0	2.26±1.03	2.14±0.91	4.40±0.82	1.09±0.20	1.17±0.46	2.26±1.27	0.20±0.41	0.40±0.50	0.60±0.50			
15-4-1999	890	0	1.01	0	0	1.06±0.25	3.14±1.45	4.20±1.20	0.40±0.50	1.66±0.72	2.06±1.09	0.12±0.31	0.41±0.50	0.53±0.50			
15-5-1999	886	0	1.58	0	0	1.00±0.37	2.53±1.50	3.53±1.20	0.38±0.48	1.35±0.95	1.73±1.03	0.08±0.25	0.38±0.48	0.46±0.51			
15-6-1999	867	0	2.19	0	0	1.13±0.51	2.73±1.16	3.86±0.99	0.40±0.50	1.40±0.91	1.80±0.94	0.20±0.41	0.40±0.50	0.60±0.50			
15-7-1999	848	0	1.88	0	0	1.20±0.41	1.46±0.51	2.66±1.04	0.46±0.51	1.07±0.25	1.53±0.63	0.20±0.41	0.20±0.41	0.40±0.50			
15-8-1999	832	0	2.16	0	0	2.66±0.89	2.14±0.35	4.80±0.94	1.13±0.35	0.87±0.34	2.00±0.65	0.49±0.50	0.13±0.35	0.53±0.51			
15-9-1999	814	0	3.56	0	0	3.06±1.09	1.47±0.51	4.53±0.91	1.15±0.40	0.51±0.50	1.66±0.72	0.30±0.45	0.10±0.28	0.40±0.50			
15-10-1999	785	0	4.07	0	0	5.93±0.45	0.47±0.51	6.40±1.18	3.34±1.59	0.46±0.51	3.80±1.14	1.20±0.56	0.20±0.41	1.40±0.82			
15-11-1999	753	0	4.24	0	0	6.27±0.70	0.73±0.45	7.00±0.84	3.36±1.60	0.50±0.50	3.86±1.12	1.20±0.56	0.20±0.41	1.46±0.74			
15-12-1999	721	0	4.00	0	0	6.01±0.84	0.85±0.35	6.86±0.74	3.40±1.45	0.56±0.19	3.94±0.96	1.30±0.92	0.23±0.41	1.53±0.63			
15-1-2000	692	0	3.02	0	0	4.21±1.56	2.39±0.96	6.60±0.74	2.30±0.88	1.10±0.28	3.40±1.12	1.20±0.56	0.20±0.41	1.40±0.73			
15-2-2000	671	0	2.81	0	0	2.93±1.48	2.47±1.18	5.40±1.29	1.80±1.08	1.13±0.83	2.93±0.72	0.70±0.45	0.50±0.56	1.20±0.86			
15-3-2000	652	0	1.83	0	0	2.13±1.12	1.76±0.97	3.89±1.74	1.12±1.00	1.09±0.88	2.21±1.20	0.73±0.45	0.33±0.48	1.06±0.70			
15-4-2000	640	0	1.70	0	0	1.93±1.27	0.68±0.47	2.61±1.51	1.00±0.06	1.10±0.80	2.10±1.22	0.60±0.49	0.38±0.58	0.98±0.54			

Note : SH - Shot holes

SHB - Shot hole borer

* Standard Deviation given along with the mean values (±)

temperature and rainfall) and per cent wilt recorded at Sharadal and Kaladagi locations (Bagalkot district), however, the correlation was not significant.

Seasonal activity studies on pomegranate shot hole borer, *X. perforans* indicated that the borer was active throughout the year with higher activity during post monsoon period (from September to December). The wilting of the plants was always associated with presence of shot holes and discoloration of vascular tissue. The borer was more active near the ground level on collar region (0 - 30 cm height) than higher on the trunk (31 - 60 or 61 - 90 cm).

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