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Population Dynamics of Grape Stem Borer *Celosterna scabrator* Fabr. (Cerambycidae : Coleoptera)

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Abstract

Studies were conducted during 2015-16 and 2016-17 on the population dynamics of grape stem borer *Celosterna scabrator* Fabr. (Cerambycidae : Coleoptera) at three locations of Vijayapura district. Studies revealed variations in time of first occurrence, duration of occurrence and appearance of peaks in trap catches of beetles. First trap catches appeared between 26th and 28th standard weeks and recorded up to second standard week. Live tunnels appeared between 26th to 28th standard weeks and observed till 4th standard week. Neglected gardens without any prophylactic measures to trap adults on emergence presented maximum incidence of the pest to the tune of 90.00 per cent in terms of live tunnels.

Keywords : Diagonsis, necrosis, incidence, dynamics

Karnataka is the second largest grape growing state in India after Maharashtra with an area of 20.46 thousand ha with a production of 302.39 thousand MT and productivity of 14.78 tones / ha (www.nhb.gov.in/Horticulture%20Crops/Grape/Grape1.htm). Grape growing regions are located in the following two agro-climatic regions in the state *viz*., North Interior Karnataka and South Interior Karnataka. North Interior Karnataka comprises Vijayapura, Bagalkot, Belgaum, Koppal, Bidar and Gulbarga. In 2014-15, Vijayapura district contributed an area of 8906 ha, production of 1, 06,536 tons, with average productivity 20 t / ha. Large acreages of grape cultivation are quite evident in Basavana Bagewadi, Vijayapura, Indi, Muddebihal and Sindgi talukas of Vijayapura.

Soil and water salinity, acute water shortage, saturation in domestic raisin market and insect pests and diseases are the problems of viticulture in north interior Karnataka.

Grape being a perennial crop ravaged by number of insect pests. Total of 132 insects are known to attack grape vine in the world and as many as 100 insect mites have been reported to damage various parts of grape vine from different grape growing states of India. Of these only 15-20 species considered to cause losses in various regions and stem borer is one among them (Mani *et al.,* 2014). Stem borer, *Celosterna scabrator* F., (Coleoptera:Cerambycidae) is a pest of national significance and insect is a borer, the grub of which bores in to stem and branches and causes drying and withering of affected branches. The adult beetles start emerging from the vines during July to September by making a round hole on the vine. Female beetles make conspicuous slits on the bark of the trunk and arms of the vine (http://farmer.gov.in/imagedefault/ipm/IPM%20package%20for%20Grapes.pdf)

Stem borer *C. scabrator* makes holes on the main stem and arms. Leaves on affected parts turn yellow and mottled and ultimately dry and drop down. It is the pest found in major grape growing in India. It is an endemic pest and can cause up to 25 per cent loss. Its occurrence is maximum during the months of November-April. (http://nrcgrapes.nic.in/zipfiles/grape%20profile%20-%20nrc%20grapes.pdf). Adult beetles cause damage by scraping the young shoots and also by making slits on outer bark for egg laying. Larva makes damage by feeding inside the trunk and branches and by tunneling upward and downward. Stem borer affected plants show typical yellowing of leaves, followed by shedding of leaves, drying and dieback of branches. As a result affected vines get weakened; growth of vine is reduced leading to decrease in the yield. Maturity of the berries is also delayed ultimately influencing the quality of grapes. (Mani *et al.,* 2008). Systematic work on the population dynamics of *C. scabrator* is not done in northern Karnataka, which is much needed for the effective management of pest and also for developing forecasting modules. With this background, the

present study was conducted on population dynamics of *C. scabrator*

Material and Methods

The studies were conducted during 2015-16 and 2016-17 at three locations of Vijayapura district (16° 50' 0" N, 75° 42' 0" E). *viz.,* Vijayapura (Location 1), Aliabad. (Location 2) and Tikota (Location 3). Vine orchards of same age (Six years) and same variety (Thompson seedless) were selected to study the population dynamics. Population dynamics of adults and grubs were studied in different vine orchards. Care was taken to maintain the isolation distance from other alternate hosts of the pest.

Population dynamics of adults

Solar light traps were installed @ one trap / acre to trap the adults and to assess their population and seasonality. Traps were installed at the centre of the vine orchard. Observations were recorded at weekly interval on the number of beetles trapped from first week of June 2015 to last week of January 2016 and first week of June 2016 to last week of January 2017. Orchards with no prophylactic measures for the management of adults during the study period were selected for the experiment. Observations were recorded thereafter under unprotected conditions.

Population dynamics of grubs

Grubs immediately after hatching tunnel into the trunk or branches of vines. Vines throwing fresh wood powder, frass and excretory pellets are considered as live tunnels. Observations were made at weekly intervals and vines ejecting fresh wood powder, frass and excretory pellets were recorded from hundred randomly selected vines from an orchard. After each observation vines with live tunnels were tagged for avoiding consideration of same vines during subsequent observations. Finally percent live tunnels were computed every week.

Results and Discussion

Population dynamics of adults

During 2015-16, at location one and two, first trap catches of beetles were noticed during 26th standard week (June last week) whereas in location three, adult catches were noticed from 28th standard week (July second week) onwards. At all the three locations peaks were observed during different standard weeks. At location one, at 31st standard week (last week of July) maximum adults were caught in the trap / week (17.00). At location two maximum catches were recorded during 32nd standard week (August first week) (17.00 / trap / week). At location three, peaks were observed between 40th (Second week of October) and 42nd standard weeks (fourth week of October) (20.00/trap/week) (Fig 1).

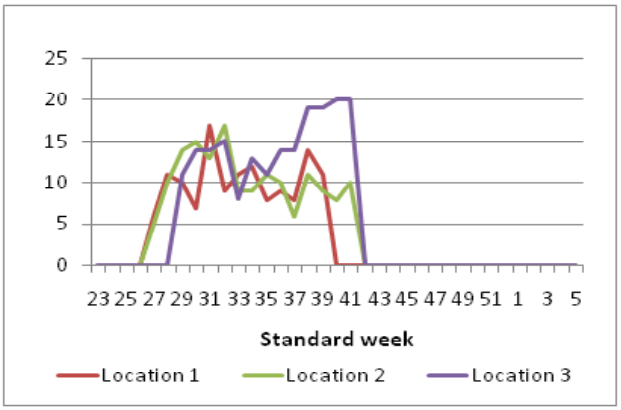

Fig 1: Light trap catches of *C. scabrator* during 2015-16

During 2016-17 first trap catches were observed during 32nd standard week (August second week) at location one and at locations two and three they were recorded during 34th standard week. (August fourth week) Maximum peak at first location was recorded during 40th standard week (October first week) (24.00

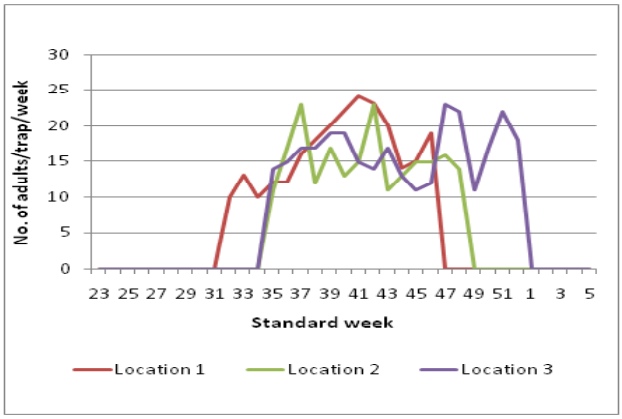

Fig 2: Light trap catches of *C. scabrator* during 2016-17

/ trap / week) whereas at location two peaks were recorded during 36th standard week (September first week) and 42nd standard weeks (October third week) (23.00 / trap / week). At location three peaks were

observed during 47th standard week (November third week) (23.00 / trap / week) and 50th standard week (December second week). (22.00 / trap / week) (Fig 2).

Population Dynamics of grubs

Percent live tunnels (2015-16)

Live tunnels were first observed at location one during 27th standard week (first week of July) during which only 2.00 per cent live tunnels were observed. Incidence continued till 4th standard week (January fourth week).Peak incidence of 19.00 per cent was observed during 42nd standard week (Third week of October) and further no increase in incidence was observed till 4th standard week. (January fourth week) At location two live tunnels were observed from 30th

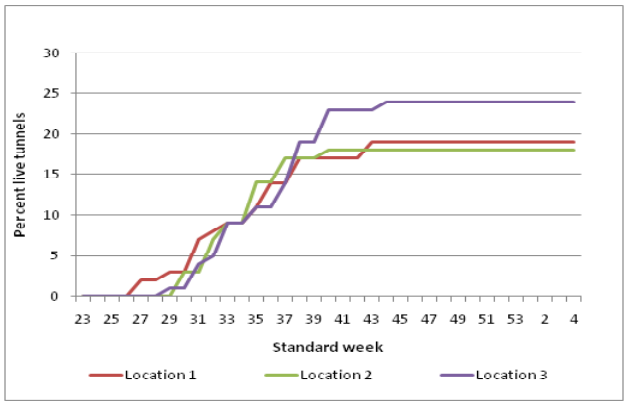

Fig 3: Percent live tunnels made by *C. scabrator* grubs at three locations during 2015-16

standard week (Third week of July) and maximum incidence of 17.00 per cent was recorded during 40th standard week (First week of October). There after no further increase in live tunnels was observed. At location three first incidences was observed during 28th standard week (July third week) and continued till 4th standard week (January fourth week) with maximum incidence of 23.00 per cent during 42nd standard week (Third week of October) (Fig 3).

Percent live tunnels (2016-17)

During 2016-17 live tunnels started appearing during 34th standard week (August fourth week) at all the three locations. Peak incidence at location one was recorded between 50th standard week (Second week of December) and 4th standard week (January fourth week). Incidence level was to the tune of 90.00 per cent. At location two, peak incidence was observed

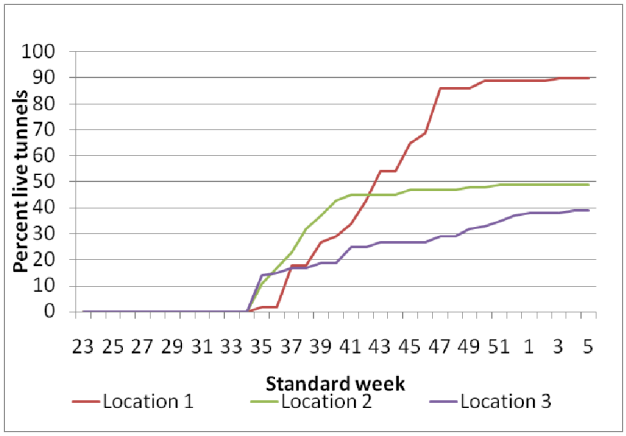

Fig 4: Percent live tunnels made by *C. scabrator* grubs at three locations during 2016-17

between 52nd standard week (December fourth week) to 4th standard week (January fourth week) with incidence level of 50.00 per cent. Location three recorded maximum incidence of approximately 40.00 per cent between 52nd standard week (December last week) and 4th standard week (January fourth week) (Fig 4).

Present studies indicated the variations in the time of emergence of adults with peaks occurring at different standard weeks between different locations. During 2015-16 first trap catches were observed during 26th standard week (June) to 28th standard week (July) (Fig. 1) where as during 2016-17 first trap catches

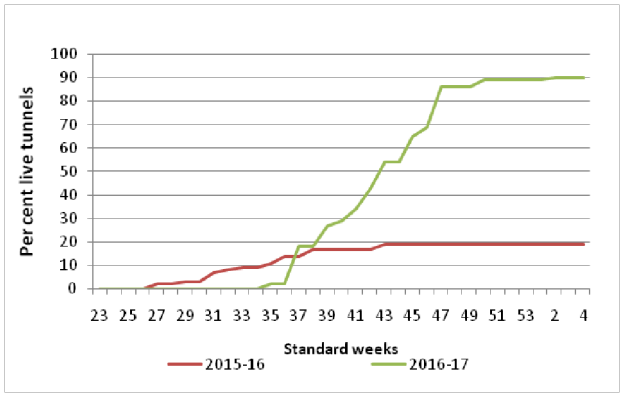

Fig 5: Percent live tunnels made by *C. scabrator* during 2015-16 and 2016-17 at Vijayapura

were found between the standard weeks 32 and 34 (August) (Fig 2). Similarly in the studies on occurrence of live tunnels at three locations revealed variations in the time of occurrence of first live tunnels and also magnitude of occurrence.

With respect to the appearance of live tunnels at location 1, incidence begun during 27th standard week (July) during 2015-16. At the same location during 2016-17 first live tunnels appeared during standard week 34 (August). Incidence level was 20.00 per cent during 2015-16. But greatest damage recorded during 2016-17 (90.00 per cent). Similar observations were recorded at location 2 (Fig 6). At location 3 first live

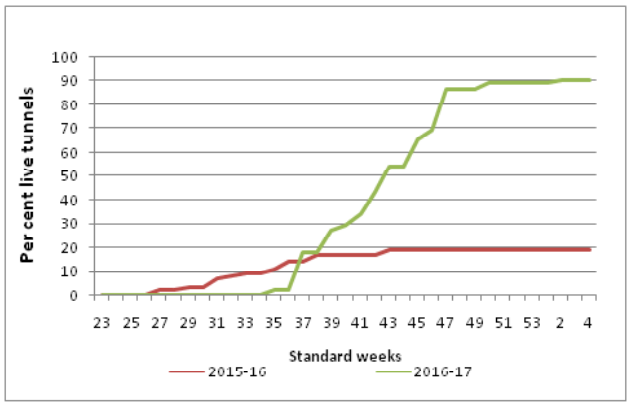

Fig 6: Percent live tunnels made by *C. scabrator* during 2015-16 and 2016-17 at Aliabad

tunnels appeared during 28th standard week (July) during 2015-16 whereas during 2016-17, incidences in the form of live tunnels appeared during 34th standard week (August). Similarly the severity of incidence ranged between 24.00 per cent during 2015-16 to 39.00 per cent during 2016-17 (Fig 7).

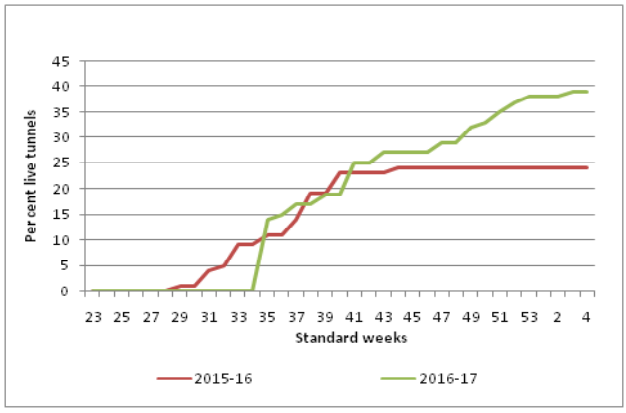

Fig 7: Percent live tunnels made by *C. scabrator* during 2015-16 and 2016-17 at Tikota

Limited literature is available on the population dynamics of cerambycids in general and *C. scabrator* in particular. Mani *et al.* (2008) reported that adult beetles of *C. scabrator* emerge during July-August. Adult beetles start emerging from the vines during July to September by making a round hole on the vine. (http://farmer.gov.in/imagedefault/ipm/IPM%20package%20for%20Grapes.pdf). Bhawane *et al.* (2015) investigated that usually most of the longhorn beetles emerge after first shower of monsoon; the light traps were applied from 6. 00 pm to 10.00 pm.

The results of present investigation on population dynamics are not fully in agreement with the reports of earlier workers. The present study revealed that adults emerge not only between July-September but emergence continues throughout the months of October, November, December and January. Different emergence patterns of adults and appearance of live tunnels in grape ecosystem may be due to the fact that the pest has many alternate hosts like trees belonging to various families *viz.*, Casuarinaceae, Dipterocarpaceae, Leguminacae, Rhamnaceae, Verbenaceae, Myrtaceae, etc. (Choudhuri, 1963) on which the pest may complete its life cycle before attacking the grape vines.

Neglected gardens wherein no management practices were taken during the previous years for the management of pest are more susceptible to the attack of pest. This finding is in agreement with the findings of Mani *et al.* (2008) as the maximum incidence to the tune of 90.00 per cent was recorded at Vijayapura (Location one) which is totally a neglected garden.

First trap catches of beetles appear between 26th (June) and 28th standard weeks (July) and can be seen up to second standard week (January). Live tunnels appear between 27th (July first week) to 34th standard weeks (August fourth week) and are seen till 4th standard week (January fourth week). Emergence pattern of adults affects the formation of live tunnels. Neglected gardens are more susceptible to the attack of pest. Long term studies on the emergence pattern of stem borer adults, condition of vine orchards that influence the incidence of stem borer, life cycle on alternate hosts, climate effect on pest incidence and biology, influence of host plant factors (biophysical and biochemical) on pest will help in developing a forecast module for the pest *C. scabrator*

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