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POPULATION DYNAMICS OF RICE BLACK BEETLE *HETERONYCHUS LIODERES* REDTENBACHER UNDER MID HILL CONDITIONS OF HIMACHAL PRADESH

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ABSTRACT

Population dynamics of rice black beetle *Heteronychus lioderes* Redtenbacher was studied deploying light trap, pit method and assessment of tiller infestation. The pest was observed to be active from 29th to 42nd standard week (SW) with peak being in 35th SW as shown with light trap catches. The incidence started from 29th SW and reached a peak during 31st SW (3.8 adults in five pits and 48.4% tiller infestation). The weather factors when correlated with incidence revealed significant positive correlation with rainfall, minimum and maximum temperature, whereas it was non-significant positive one with relative humidity.

Key words: *Heteronychus lioderes*, rice, incidence, tiller infestation, light trap catches, seasonal incidence, population dynamics, weather factors, correlation coefficients

Rice is grown in 43.70 million ha with production of 168.50 mt in India, and in Himachal Pradesh it is grown during kharif season except in the Kinnaur, Lahaul and Spiti districts with a productivity of 19.14 q/ ha (Anonymous, 2017). Scarabaeid beetles (Coleoptera: Scarabaeidae) are polyphagous agricultural pests, of which the white grubs or root grubs are cause serious damage by feeding on roots. Both grub and adults inflict heavy damage on various fruit/ forest trees, their nurseries, vegetables, lawns and field crops (Chandel and Kashyap, 1997). They are distributed from high altitude of Himalaya to low altitude of coastal Kerala, from arid and semi-arid tracts to high rainfall, humid regions of north east hill region and west coastal peninsula (Yadav and Vijayvergia, 2000). Amongst these the rice black beetle *Heteronychus lioderes* Redtenbacher, a shiny black which burrows the soil to feed on rice plants, cutting tillers. It had been reported as a serious pest of rice from Shimla and Mandi districts (Sharma and Bhalla, 1964). In the nurseries and in the upland system of rice cultivation, in severe form in the Kangra district (Bhalla and Pawar, 1977). Very few researchers have studied this beetle in detail, and in view of this and considering its importance as pest, the present study explores its population dynamics.

MATERIALS AND METHODS

The present study was conducted at the Rice and Wheat Research Centre of CSK HPKV Malan (Kangra) (32°07.180 N, 76°25.065 E, 961 masl) during kharif season, 2018. The area falls in the mid hill subhumid zone of Himachal Pradesh and is characterized by humid temperate climate and acidic soils, with annual rainfall of about 2500 mm. Kasturi Basmati was sown over an area of 500 m². Recommended package of practices were followed. Observations on population dynamics were also made at nearby farmer's field (Tikkri), where this pest has been reported to occur very frequently for the last couple of years. The observations made at weekly intervals with pit method and tiller infestation, while light trap catches were recorded at the latter location. The crop was surveyed regularly starting from nursery stage up to harvest. Light trap (125W mercury bulb) was installed from early vegetative stage till the maturation, and operated from 7.30 pm to 5. 30 am daily. The trapped adults were counted and mean number of adults/ week was worked out. In the pit method, adults were counted from five pits (30 cm^3 each) and their weekly mean was computed. Tiller infestation % was calculated by counting number of infested tillers on 10 random hills/ plot. The effect of weather factors like maximum and minimum temperature (ºC), morning and evening relative humidity (%) and rainfall (mm) was analysed with correlation coefficients using MS Excel. Meteorological data was obtained from the meteorological observatory of Rice and Wheat Research Centre, Malan.

RESULTS AND DISCUSSION

Data depicted in Fig. 1 reveal that adults of *H. lioderes* are active from 29th to 42 standard week (SW) with peak being during 1st week of August (31st SW).

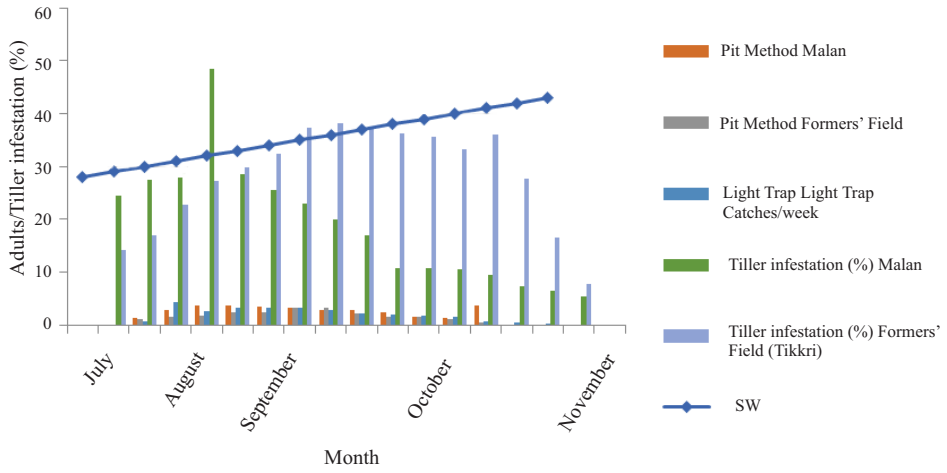

Fig. 1. Population dynamics of *H. liioderes*

Rao (1993) studied the biology of *H. liioderes* in Manipur and reported that adults are attracted to light in large numbers from March to October, thus corroborating present results. Maharajan and Kanal (2016) monitored scarabaeid adults at weekly intervals with 85W light trap during April- July in a field with multiple crops in 2014 and found that beetles were more in May and June than in April and July, and out of all beetles captured, 6% were *H. liioderes*. Rafarasoa et al. (2016) also reported that *Heteronychus* sp. are significant pests of upland rice in the Central Highlands of Madagascar.

In pit method too, adults were noticed in 29th SW, and peak incidence was noted during 1st week of August (31 SW) with 3.8 adults/ 5 pits. Thereafter, the population of pest decreased and the activity ceased during 2nd week of October (41 SW). At farmers' fields (Tikkri), adults were first noticed again in the 29th SW (1.2 adults/ 5 pits) with peak occurrence being during 1st week of September (35th SW- 3.4 adults/ 5 pits), and then declined / ceased during 2nd week of October (41st SW). The data on tiller infestation revealed that the infestation started in 2nd week of July (28th SW- 24.5%) at the RWRC, Malan, increased by the 4th week of July (30th SW- 28%) with peak being at 1st week of August (31st SW- 48.4%), and then declined till harvest. While at farmers' fields (Tikkri), tiller infestation was observed in 2nd week of July i.e. 28th SW (14.2%), with peak being during the 1st week of September i.e. 36th SW (38.3%). Similar results were obtained Garg and Shah (1983) in Uttarakhand, who reported severe outbreaks of white grubs including *H. liioderes* over large areas, being maximum during last week of August and first week of September. Shah (1986) also reported *H. loideres* infested low-lying irrigated as well as unirrigated rice fields in western Himalayas.

The correlation coefficients weather factors clearly indicated that minimum (r=0.61) and maximum temperature (r=0.27) and rainfall (r=0.50) showed significant positive correlation with light trap catches. However, relative humidity showed non-significant positive correlation (r=0.50-morning; r=0.22-evening). Observations with pit method also followed a similar trend. Data on the tiller infestation showed positive significant correlation with minimum temperature (r=0.45) and rainfall (r=0.62) while a non-significant positive correlation was observed with maximum temperature (r=0.38) and relative humidity (r=0.50-morning; r=0.34-evening). Dashad et al. (2008) studied the emergence pattern of white grub beetles in relation with weather factors using light trap and reported that it was positively correlated with the temperature (r=0.82), relative humidity (r=0.77) and rainfall (r=0.69). Higher temperature as well as heavy rain were observed to be detrimental for adult flights (Yubak Dhoj, 2006). The present study revealed that the activity of beetles was more during July-August, and these observations disagree with those of Pandey et al. (1993) in Lumle that peak emergence of this pest is in April-May. King et al. (1981) studied the population dynamics of another black beetle, *H. arator* in *Paspalum dilatatum* pasture and reported that mortality could be modelled as a simple function of seasonal temperature.

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