

Studies on Adult Emergence Pattern of Wireworm (*Agriotes* species) in Northern Karnataka

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ABSTRACT: Wireworm, *Agriotes* species (Coleoptera: Elateridae) is one of the important insect pests infesting sugarcane and others crops in Karnataka. Grubs (wireworm) feeds on germinating seeds and young seedlings by feeding the roots and tunneling through lower stem parts of the crops. Hence, plants might suffer reduced water, nutrient supply resulting in delayed plant development or cause mortality of the plant. Both qualitative and quantitative parameters of the infested crop get affected resulting in lower yields, which in form influence the marketability of the produce. The information with regard adult emergence pattern of wireworm (*Agriotes* species) is lacking. In light of the above, the present investigation was undertaken. The adult emergence pattern was carried out for two successive years (2019 and 2020) in endemic areas of northern Karnataka viz., Dharwad, Belagavi and Bagalkot districts. For this study, sugarcane fields were selected in farmer field and wherever possible 125 watt fluorescent bulbs were installed and monitoring was carried out. The data of two years revealed that the adult emergence period was noticed between 9th MSW (Metrological standard week) to 28th MSW. Emergence restricted to 18.00 to 22.00 h in a day and within this period, peak emergence of adult beetles was noticed from 1900 to 2000 h.

Keywords: *Agriotes* species, adult emergence, wireworm, Metrological Standard Week (MSW)

INTRODUCTION

Wireworm, are the grub of click beetles (Coleoptera: Elateridae), are significant economic soil-dwelling pests in temperate and subtropical areas of the world (Traugott *et al.* 2015). Wireworms overwinter mainly in the soil as partially grown larvae and as adult beetles. The adults deposit their eggs in the soil during the summer. First-instar larvae emerge in July and begin feeding on underground parts of plants for two to three years before reaching maturity (Cockerham and Deen 1936; Seal *et al.*, 1992). Mature larvae pupate in the soil during late summer and the new adult beetles remain in the soil until the next summer. There is only one generation in every three to four years. However, considerable overlapping of generations occurs, thus adults and larvae of various sizes and ages are noticed throughout the year. Wireworms are generalists and feed on a wide variety of field crops and vegetable crops *e.g.*, sugarcane, maize, groundnut, wheat, sorghum, potato, onion, ginger, chilli, sugar beet, carrot and soft roots (Keiser *et al.*, 2012). The main damage occurs by feeding on germinating seeds and roots of

young seedlings and tunneling through lower stem parts (Ritter and Richter, 2013). Hence, plants suffer reduced water, nutrient supply resulting in delayed plant development or cause death. Root crops obtain a reduced quality and quantity of marketable yield. Wireworms have become increasingly serious pest in Karnataka during the last few years. Their infestation has been reported throughout Karnataka and the magnitude of the problem has been widespread over the past years.

MATERIAL AND METHODS

Monitoring of adult beetles was carried out for two successive years (2019 and 2020) in endemic areas of northern Karnataka viz., Dharwad, Belagavi and Bagalkot districts from 5th Meteorological Standard Week (MSW) (February) to 32nd MSW (August). For this study, sugarcane fields were selected in farmer field and wherever possible 125 watt fluorescent bulbs were installed and monitoring was carried out every day from 18.00 to 22.00 h in the location. Adults of different species were collected and brought to the laboratory and preserved in 70 per cent ethyl alcohol.

Collection was made every day, later so collected adults were counted and averaged out for respective MSW in all the study location.

RESULT

Dharwad. The emergence of wireworm adults in the irrigated ecosystem, during 2019, adult emergence of *Agriotes* species commenced from 11th MSW (March) with weekly mean catches of 0.71, which gradual increased from 15th MSW (April) and reached peak during 24th MSW (June) with adult catches of 5.00 and gradual decline was noticed from 26th MSW (July) onwards. Whereas, during 2020, adult emergence of *Agriotes* species starts from 11th MSW (March) with 0.43 catches and the peak was noticed from 21st MSW (June) with 5.43 catches. Decline was noticed from 24th MSW (June) onwards. Pooled data of study revealed that, adult emergence of *Agriotes* species noticed from 11th MSW (March) with 0.57 mean adults per trap and gradual increased from 13th MSW (April) and the peak was noticed from 23rd MSW (June) (4.57) while gradual decline was noticed from 26th (July) onwards.

Belagavi. During 2019, adult emergence of *Agriotes* species commenced from 9th MSW (March) with weekly mean catches of 1.14 but maximum beetles

(6.29) were caught upto 21st MSW (June) which gradually declined from 25th MSW (July) onwards. Similarly the emergence of *Agriotes* species during 2020, commenced from 9th MSW (March) with 1.29 catches, but maximum beetles (4.86) were caught during 22nd MSW (June). Pooled data analysis indicated that, the adults emergence of *Agriotes* species commenced from 9th MSW (March) with weekly mean catches of 1.21 but maximum adults (5.50) were caught during 22nd MSW (June) and started to show decline in population thereafter.

Bagalkot. During 2019, adult emergence of *Agriotes* species commenced from 9th MSW (March) (0.71) and reached peak during 21th MSW (June) with 4.57 catches, while gradual decline was noticed from 25th MSW (July) onwards. However during 2020, adult emergence of *Agriotes* species started from 11th MSW (March) with 1.00 mean adults per trap and reached peak during 21st MSW (June) (4.57) while gradual decline was noticed thereafter. Pooled data analysis indicated that, adult emergence of *Agriotes* species started from 9th MSW (March) (0.36) and reached peak was noticed from 21st MSW (June) (4.57) while gradual decline was noticed thereafter.

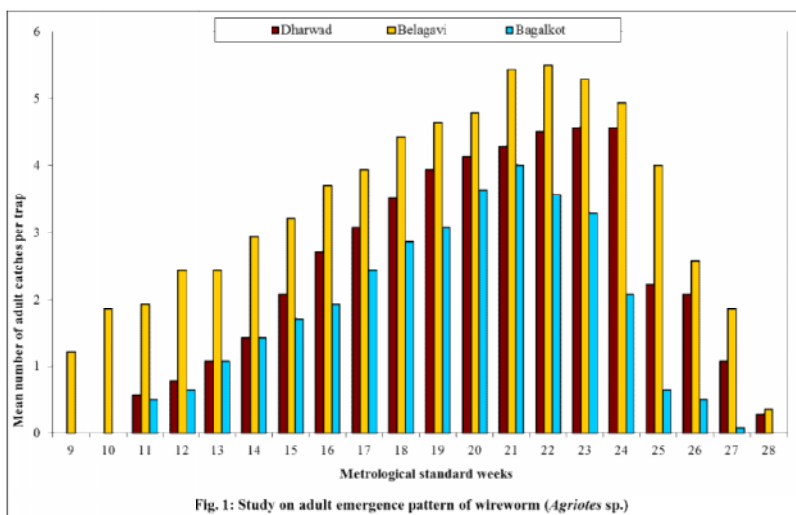


Fig. 1: Study on adult emergence pattern of wireworm (*Agriotes* sp.)

DISCUSSION

In the present investigation conducted during 2019 and 2020, the results on adult emergence of *Agriotes* species differed from location to location *i.e.*, first noticed from 9th MSW (March) in Dharwad to 11th MSW (March) in Bagalkot and the peak was noticed from month June while gradual decline was noticed from 26th MSW (July) onwards. Adult emergence of *Agriotes* species is usually observed after receipt of first summer shower during the month of March (Fig. 1).

Literature supporting the present findings are scanty however, findings pertaining to the other soil dwelling insect pest in other crops are taken into consideration to support the findings. Tippannavar (2013) reported that, adult emergence of white grub (*Holotrichia serrata*)

commenced during the month of May and June, after the onset of pre-monsoon showers under rainfed ecosystem. Similarly, Prathibha *et al.* (2013) observed the emergence of adult white grub (*Leucopholis coneophora*) commenced after the receipt of summer shower during third week of April in 2011, 2012 and 2013 in Kerala with peak emergence during the month of June (>200 mm rainfall). Theurkar *et al.* (2013) have recorded second fortnight of June as the peak period of emergence of both *Holotrichia serrata* and *Holotrichia fissa*. Further, Kalleshwaraswamy *et al.* (2015) also observed the adult emergence of white grub (*Leucopholis lepidophora*) after first summer shower with peak adult emergence from June to November months in Shivamoga (Karnataka). Shrilakshmi (2015)

reported that, adult emergence of white grub (*Holotrichia fissa*) commenced after the receipt of summer showers and continued till last week of July. So these findings clearly indicated that, emergence of the adults depend up on soil moisture, soil temperature and other soil environment conditions. Similar factors might be attributed for the adult emergence of wireworms in the present study.

CONCLUSION

Adult emergence of *Agriotes* species was commenced from 9th Meteorological Standard Week (MSW) (March) and continued up to 16th MSW (May).

Irrespective of locations, peak emergence was noticed between 21st to 24th MSW (June).

FUTURE SCOPE

This study will help to understand the adult emergence pattern of *Agriotes* species to provide information on their management.

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Conflict of Interest. None

Table 1: Study on adult emergence pattern of wireworm (*Agriotes* species) in Dharwad.

Year	Mean number of adults beetle caught weekly per traps																			Total No. of adult catches	
	Metrological standard weeks (MSW)																				
	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27		28
2019	0.00	0.00	0.71	0.86	1.43	1.71	2.14	2.71	3.00	3.43	4.00	4.14	3.14	3.71	4.43	5.00	1.43	2.00	1.00	0.43	45.27
2020	0.00	0.00	0.43	0.71	0.71	1.14	2.00	2.71	3.14	3.57	3.86	4.14	5.43	5.29	4.71	4.14	3.00	2.14	1.14	0.14	48.40
Mean	0.00	0.00	0.57	0.79	1.07	1.43	2.07	2.71	3.07	3.50	3.93	4.14	4.29	4.50	4.57	4.57	2.22	2.07	1.07	0.29	46.84

* No adults was recorded between 1-8 and after 28 MSW

Table 2: Study on adult emergence pattern of wireworm (*Agriotes* species) in Belagavi.

Year	Mean number of adults beetle caught weekly per traps																			Total No. of adult catches	
	Metrological standard weeks (MSW)																				
	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27		28
2019	1.14	1.57	2.14	2.57	2.57	3.00	3.29	3.57	4.00	4.43	5.00	5.57	6.29	6.14	5.71	5.57	5.43	3.71	2.57	0.71	74.98
2020	1.29	2.14	1.71	2.29	2.29	2.86	3.14	3.86	3.86	4.43	4.29	4.00	4.57	4.86	4.86	4.29	2.57	1.43	0.14	0.00	58.88
Mean	1.21	1.86	1.93	2.43	2.43	2.93	3.21	3.71	3.93	4.43	4.64	4.79	5.43	5.50	5.29	4.93	4.00	2.57	1.86	0.36	66.93

* No adults was recorded between 1-8 and after 28 MSW

Table 3: Study on adult emergence pattern of wireworm (*Agriotes* species) in Bagalkot.

Year	Mean number of adults beetle caught weekly per traps																			Total No. of adult catches	
	Metrological standard weeks (MSW)																				
	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27		28
2019	0.71	0.86	1.29	1.29	1.43	1.71	2.00	2.29	3.00	3.00	3.29	4.14	4.57	4.43	4.57	4.00	2.71	1.57	0.71	0.00	47.57
2020	0.00	0.00	1.00	1.29	1.43	2.00	2.29	2.29	2.57	2.86	3.00	3.57	4.57	4.29	4.00	2.14	1.14	0.71	0.14	0.00	39.29
Mean	0.00	0.00	0.50	0.64	1.07	1.43	1.71	1.93	2.43	2.86	3.07	3.64	4.00	3.57	3.29	2.07	0.64	0.50	0.07	0.00	43.43

* No adults was recorded between 1-8 and after 28 MSW

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