Journal of Pharmacognosy and Phytochemistry
Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
www.phytojournal.com
JPP 2020; 9(5): 2798-2801
Received: 11-07-2020
Accepted: 24-08-2020

Sandeep Kumar
S. V.P. University of Agriculture and Technology, Meerut, Uttar Pradesh, India

Vishvendra
S. V.P. University of Agriculture and Technology, Meerut, Uttar Pradesh, India

CS Prasad
S. V.P. University of Agriculture and Technology, Meerut, Uttar Pradesh, India

Corresponding Author:
Sandeep Kumar
S. V.P. University of Agriculture and Technology, Meerut, Uttar Pradesh, India

Biology and isolation of bio-agents from sugarcane white grub in western plain zone of Uttar Pradesh, India

Sandeep Kumar, Vishvendra and CS Prasad

Abstract
An experiment conducted at biocontrol laboratory of Sardar Vallabbhai Patel University of Agriculture and Technology, Meerut, Uttar Pradesh. To study the out of 35 grubs sampled of sugarcane white grub were examined, the entomopathogenic nematodes *Heterorhabditis* species were recovered from grub of two samples and *Heterorhabditis* spp. was identified in this region. The white grub species *Holotrichia nagpurensis* was dominant on sugarcane crop. The total life cycle of *Holotrichia nagpurensis* was completed in about 254.5 days during 2011-12 and 2012-13.

Keywords: Isolation, biology, white grub beetles and sugarcane crop

Introduction
Sugarcane, *Saccharum officinarum* L., is an important cash crop for a large population of the world. It belongs to the genus *Saccharum* and family Poaceae. It is grown world wide under extremely divergent agro-climatic conditions. It is a tropical plant that can be grown most successfully in those regions, where the climate is more or less tropical but it can also be grown in sub-tropics, as in North India. An average mean temperature of 26 ^{0}C to 32 ^{0}C is the best suited for the growth of sugarcane. The India ranks wassecond in sugarcane production in the world, followed by Brazil. The one dozen insect pest are recognized at various stage of sugarcane crop growth. In western UP, root borer, top borer,inter-node borer, Gurdaspur borer, pyrilla, mealy bug, termite and white grub are abundant but white grub is emerging as serious problem in some localities. According to an estimate, sugarcane production declines by 20.0 and 19 percent insect pests and disease respectively.
The biology of *Holotrichia consanguinea, H. serrata* and *H. insularis* the predominant species attacking sugarcane. The mating lasts for 4 to 7 minutes in *H. consangunia*, 15 minutes in *H irtsiiluris* and 5 to I5 minutes in *H. serrate.* Pre-oviposition period varies with the species and it is 2-8 days in *H consanguinea*, 4 to *6* days in *H insularis* and 5 to 15 days in *H serrata.* The females of *H. consanguinea* lay eggs for 5 to 7 days, and 28 days to 7 months alter *H serrata* Post oviposition period was reported to be 2 to 7 days in *H. consanguinea*. The eggs of *H. consanguinea* were laid in moist sandy or loose soils at 5 to 15 cm depth singly or in batches but *H serrata* lay eggs In earthen cells at a depth of 8 to 16 cm Single female of *H. consanguinea* lays 8 to 25 eggs and 30 eggs in case of *H. insularis.* The freshly laid oval creamy white eggs of *H. consanguinea* measure 2.8 to 3.4 mm in length and 1.5 to 2.0 mm in breadth. The eggs of *H serrata* are mm long and 1.7 mm broad and 3.5 mm long and 1.5 mm wide in *H. insularis.* The eggs before hatching become enlarged and spherical and colour changes to dirty white.
The incubation period in *H insularis* is 8 to 12 days and 7 to 13 days in *H serrata.* There were three larval instars in root grubs. The first instar larvae were generally creamy white and consume small rootlets rather slowly. The head capsule of newly emerged grub was wider than the thorax and abdomen, but as grubs grow the thorax and abdomen become wider than head capsule The second instar was active, but almost of the damage was done by third instar The larval period is completed in 6 to 11 weeks in *H. consunguniea* and 5 to 8 months in *H. serrata*. In case of *H. insularis* the first instar lasts for 8 to15 days, the second instar for 21 to 28 days and the third instar period has not been mentioned [1]

Materials and Methods
Statistical analysis
The data were subjected to the analysis of variance using simple randomized block design (RBD) programme

Isolation of natural enemies of white grubs

A. Isolation of Microbial pathogens

- Composite soil sample were collected from top 10 cm layer.
- The soil samples were sun dried to avoid infestations by entomopathogenic nematodes and further re-moisturised.
- Then streptomycin sulphate was mixed in the soil sample to prevent the infestation of if any entomopathogenic bacteria present.
- The above soil samples were placed in different 500 gm plastic container and then 2nd instar white grub were released into each container in bottom. The containers were covered tightly with lids containing small holes to facilitate gaseous exchange and were kept at room temperature.
- Grubs mortality was checked daily up to one week to find out if any dead grub.

B. Isolation of EPN from white grubs by baiting method.

Baiting methodology

- Composite soil samples from different districts were collected from top 10 cm layer.
- Collected soil sample were placed in 500gm plastic container and 2nd were released into each container. The containers were covered tightly with lids containing small holes to facilitate gaseous exchange and were kept at room temperature.
- Grubs mortality was checked daily up to one week. If found any dead grub, it was taken out and rinsed thrice with sterile distilled water (SDW) and placed on white trap to collect the emerging infective juveniles (IJs) which will be rinsed in SDW and stored in tissue culture flasks.

Re-inoculation of extracted nematodes were done by using Koch's postulates technique to confirm the pathogenic status of EPN.

Isolated EPN from the infected grub of white grub were sent to Deptt. of Nematology (Dr. Sudarshan Ganguly) IARI New Delhi for identification. The morphological characters of identified EPN were made.

Biology of the White grubs

The mated pairs of beetles were collected from the host trees at early morning. Five pairs were taken for studies and released in plastic buckets which were filled with half of sterilized F.Y.M. and half sand at the bottom. Small twigs of neem were provided as food, and fresh twigs were replaced and the soil was examined for eggs every day. The eggs collected were kept in petri plates filled with a mixture of 1:1 FYM and fine sand kept them moist by filter papers. After the eggs hatched the grubs transfer into the petriplates (9 cm diameter) with a mixture of 1:1 FYM and fine sand. Care was taken to see that the soil mixture in the petri plates was kept moist. The grubs were then transferred to glass jar filled with moist FYM and fine sand in ratio of 1:1. Sorghum seeds were sown in these glass jars and half decay potato to provide root material for the grubs to feed on. Sorghum seeds were sown every 3 to 5 days to ensure uninterrupted supply of root material to the voracious final instar grubs. The final instar grubs were left in the glass jar for pupation. Care was taken to see that the jars were kept moist. As soon as the pupa turned to adult it was transferred into the oviposition cages to observe the emergence. The eggs, grubs and pupal period were recorded.

Results and Discussion

The entomopathogenic nematodes (EPN) was natural occurrence in western plain zone of Uttar Pradesh. Out of 35 grubs samples examined, entomopathogenic 2 (5.71) nematodes were recovered from grub samples. These finding are in accordance with the results of workers [2, 3].

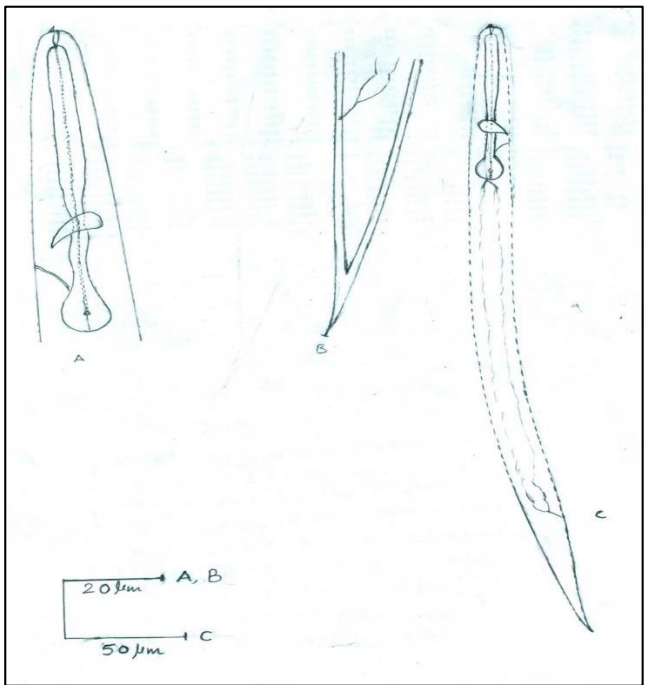
Table 1: Survey and baiting for isolation of EPN from western plain zone of Uttar Pradesh

Location	No. of samples processed (dead grub)	Standing crop	No. Of positive samples (% occurrence)	Nematode identified
Khanodha (Meerut)	13	Sugarcane	2 (15.38)	*Heterorhbditis* sp.
Behada sadhat (Muzaffarnagar)	8	Sugarcane	0 (0)	-
Daha (Bagpat)	9	Sugarcane	0 (0)	-
Jhabiran (Saharnpur)	5	Sugarcane	0 (0)	-
Total	35		2 (5.71)	*Hetrorhbditis* sp.

The measurement and figure of Infective juveniles of your *Heterorhabditis* species. This species was also recorded from north region of Uttar Pradesh [3].

(n = 10)

L = 384.5 ± 25.18 (340-418 µm); W= 20 ± 1.63 (18-20 µm); NR= 73.08 ± 7.08 (60-88 µm); Ep= 88.3 ± 8.99 (70-107 µm); Es= 108.5 ± 8.57 (90-126 µm); Tl= 61.4 ± 4.14 (55- 68 µm); Abw= 12.7 ± 0.94 (12-14 µm); a= 19.96 ± 0.93 (18-21.38); b = 3.5 ± 0.24 (3.17-4); c = 6.28 ± 0.49 (5.23-6.78); c` = 4.8 ± 0.25 (4.42-5.16); D% = 81.29 ± 2.05 (77.78-84.92); E% = 144.36 ± 15.94 (167.16-144.36); F% 32.64 ± 2.66 (27.69-32.64)



Biology of *Holotrichia nagupensis*

The biology of *H. Negupensis* has been studied recently at the S.V.P. U.A. & T Meerut in Uttar Pradesh. Some variation in the duration of various stages of development, the species started to have Ist fortnight of July to second fortnight of September in adult stage in western plain zone of Uttar Pradesh. The total life cycle was completed mean in 254.5 days. These finding are in accordance with the results of workers [4-11].

Adult Stage – The adult beetles catched from light trap and host plant neem. The adult beetles emerged mostly during first fortnight of July to second fortnight of September and it was the dominant species of in this region. The average adult period was about 41.50 days. These finding are having large conformity with the results of workers.

Mating- mating was observed to occur on twigs of neem and beetles were collected in early morning. These finding are large conformity with the results of workers [9].

Eggs- The newly laid egg was white in colour and round in shape. The incubation period of about 9 to 15 days. These finding are in accordance with the results of workers [9].

Grub- on hatching, the young larvae immediately starts to burrow into the soil and began feed on organic matter. It was extremely vulnerable and under laboratory condition. The Ist instar stage taken average period about 28 days. The second instar grubs caused some damage to the root of plants and it was taken about mean 45.5 days. These finding are in accordance with the results of workers [12-15].

Pupa- The average pupal period is about 21 days. It was the inactive stage of the insect. These finding are in accordance with the results of workers.

Table 2: Duration of various development stages of *H. Negupensis*.

Stage	Duration in days		Mean
	Minimum	Maximum	
No. of eggs	232	496	364
Egg (Incubation) Period	9	15	12
Grub Period			
Ist instar	21	35	28
2nd instar	39	52	45.5
3rd instar	129	167	148
Total grub duration	189	254	221.5
Pupa	19	23	21
Total duration of one generation	217	292	254.5
Adult Longevity	37	44	40.50
(days)			
Male			
Female	33	49	41.00

References

1. Brar KS, Sandhu GS. Biology of *Holotrichia consanguinea* Blanchard infesting groundnut in Punjab Indian J. Ent., 1980a; 42(3):426-433.
2. Trevor Jackson. Biological control of grass grab in Canterbury. Proceeding of the New Zealand Grassland Association. 1990; 52:217-220.
3. Pal R, Abid Hussain M, Prasad CS. Natural occurrence of entomopathogenic nematodes in Meerut district, north India. International Journal of Nematology 2008; 18(2):198-202.
4. Kalra AN, Kulshreshtha JP. Studies on biology and control of *Lachnosterna consanguinea* Blanch. a serious pest of sugarcane in Bihar, India. Bull. Ent. Res. 1961; 52:577-587.
5. Srivastava BK, Khan RM. Bionomics and control of *Holotrichia insularis* Br. (Melolonthidea: Coleoptera) Indian J. Ent. 1963; 25(4):347-354.
6. Desan MT, Patel RM. Some observation on the biology and control of white grubs in soil (*Holo!richia* near *consanguinea* Bl.) affecting groundnut and cereals in Gujarat. Indian J Ent., 1965; 27(1):89-94.
7. Patel RM, Patel GG, Vyas HN. Further observations on the biology and control of white grubs (*Holotrichia consanguinea* blanch) in Soil, affecting groundnut in Gujarat. Indian. J. Ent., 1967; 29(2):170-176.
8. Rai BK, Joshi HC, Rathore YK, Dutta SM, Shinde VKR. Studies on bionomics and control of white grub *Holotrichia consanguinea* Blanch. In Lalsot district Jaipur, Rajasthan. Indian J. Ent., 1969; 31(2):132-142.
9. Veeresh GK. Studies on the root grubs in Karnataka, with special reference to bionomics and control *Holotrichia serrata* F. (Coleoptera: Melolonthinae), UASMonograph Series, 1977; 2:87.
10. Srivastava AS, Mathur YK. Recent advances-bionomics and control of white grub. *Bulletin* Department of

Entomology, C.S. Azad University of Agri. & Tech., Kanpur. 1979, 14.
11. Yadava CPS. Integrated control of white grub. Final report of *ICAR* Finance scheme. Department of Entomology, University of Udaipur, Jobner (Rajasthan), 1981.
12. Ritcher OP. Biology of Scarabaeidae. Ann. Revew Ent. 1958; 3:311-334.
13. Yadava CPS, Saxena RC. Bionomics of *Holotrichia consanguinea* Bl. Indian J. Agric. Sci. 1977; 47(1):139-142.
14. Brar KS, Sandhu GS. Note on the chemical control of adults of *Holotrichia consanguinea* Blanchard. Indian. J Ent. 1980b; 42(3):528-530.
15. Vishwa Nath, Srivastava AS. Bionomocs of white grub, *Holotrichia consanguinea* Blanchard. Indian. J. Plant Prot., 1982; 10:83-84.
16. Bindra OS, Singh J. Biological observation on the white grub *Lachnosterna* (*Holotrichia*) *consanguinea* Blanchard (Coleoptera: Scarabaeidae) and the relative efficacy of different insecticides against the adults. Indian. J. Ent. 1971; 35(2):225-227.