PRE MONSOON RAINFALL CAUSES EARLY ECLOSION OF WHITE GRUB

K.B. Sangve
Department of Zoology, Brijlal Biyani Science College, Amravati (Maharashtra State) 444602 India
kiran.sangve@gmail.com

Abstract
White grub is a polyphagous and nefarious pest of specific significance as it adversely affects the economic status of the farmers. It has threatened the entire Kharif production in the country and especially in the arid and semi-arid regions. Scientist studied both the biology of the pest species and the various effective control measures to check white grubs as well as their adults. Scientific findings have revealed that for effective control of this pest, control measures are more effective on beetles than the grubs which have a peculiar behavior and are difficult to control. Soil application of pesticides in heavy doses has been found to be expensive and also poses residue problem in the soil as well as in the plants. However, the pest can be managed effectively through an integrated approach and the details concerning the nature and extent of damage, behavior of different species and the effective control measures are described in this monograph. The objective of this research paper is to percolate the information on this pest including its management. It is expected that this observations will prove to be of benefit to both the research scientists and agriculture adviser.
Keywords: Pre monsoon, white grub eclosion, kharif crop damage

Introduction:

True white grubs are the larvae of 'May- June beetles' or 'Chafer beetles' or 'Leaf Chafer' found in the genus Phyllophaga, of which there are over 100 different species. They belong to the order Coleoptera and family Scarabaeidae.

White grub is a polyphagous and nefarious pest of specific significance as it adversely affects the economic status of the farmers. It has threatened the entire Kharif production in the country and especially in the arid and semi-arid regions. White grubs are the larvae of Scarab beetles. There are more than 20 species of these beetles whose grubs might be found damaging plants. White grubs feed on the roots of sugarcane, groundnut, maize, pearl millet, cowpea, sorghum, pigeon pea, cluster beans, rajmash, soybeans, and to a lesser degree, other cultivated crops. They also infest various pasture grasses, lawns, and nursery plantings. The adults, which are strongly attracted to fragrant flowers and ripe fruits, feed on the foliage of forest, shade and fruit trees. Adults also feed on the leaves of trees such as neem, acacia, oak, bhimal, toon, khirak and *Rhododendron* (Mishra 2001).

Among the 1500 species of white grubs documented in India, 40 species are considered to be the pests causing significant damage to both field and horticultural crops across the country (Madhusudhan et al., 2021).

The duration of grub is about 6 months and the adult occupies 2-4 months with 5-15 days of aerial life. The yield loss caused by the white grub ranges from 12 to 100% (Pokhrel 2004, Rai et al., 2013). Damage seen more severe when pre monsoon shower occurs which triggers the emergence of white grub. The damage is more accelerated when there was delay of 10-20 days in rain after pre monsoon shower. The most damage observed in the month of June, July and August, while the lowest damage was seen during winter.(Visalakshi et al., 2023).

White grubs are sensitive to differences in soil moisture and texture. Since these factors are not uniform throughout any given field, a white grub infestation, likewise, is not uniform. Therefore, within the same field, some areas may be completely destroyed while others are undamaged.

Habit and Habitat:

Adults of white grub species become active with the arrival of the monsoon or heavy pre-monsoon showers; if the monsoon is late, the beetle's emergence is similarly delayed. Soil moisture can influence the depth of burrowing of adult. The soil type had a significant effect on burrowing depth, with deeper burrows associated with higher level of soil moisture, although there was a trend for burrow depth to be greater with the red soil than black soil. The white grub beetles are occur or found on a foliage of the host trees like Azadirachta indica, neem, Acacia Arabica, babhul, Acacia catechu, khair, Zizyphus, ber, drumstick etc. at the time of dusk. They come out from soil for feeding or mating purpose during the time of dusk. After

feeding or mating, they go down again into the soil up to next evening. Both stages of white grubs are harmful; however, beetles are defoliating pests and damage the leaves of host trees whereas, the larvae feed on the roots of plant. The larvae feed the roots by making circular hole into them and affected the plants produce to death of heart. Damage symptoms on soyabean, poor crop stands, tiled/ curved/ lodged plants, uneven growth; damaged plats are easily pulled from the soil.

Life Cycle of White Grub

The life span of different species of white grubs ranges from one to five years. The life history of some of the beetles which take more than three years in temperate region and two years seems to the normal. The adult life span is relatively brief, lasting for only a few weeks. Different species of white grubs have similar patterns of life cycle but may vary according to the climatic factor at the time of emergence, egg lying, active larval period, time of pupation and other stages. The white grubs have completed their life cycle in egg, pupa and adults. The oviposition period oranges from about 50- 100 days; fecundity varies from 0- 140 per female. After mating of beetles, eggs were laid after 12 to 18 days. The female deposit their eggs singly underground near the feeding material of roots, most larvae were present in the upper 30 cm of the soil surface.. After absorption of water, the elongated oval eggs become connected into the spherical in shape. The full grown larva burrows deep in to the soil and stops feeding. It prepared a small earthen cell and pupated within earthen cell. Pupation likewise occurs beneath in soil surface newly formed pupa measured near about 14- 20mm in length and 6 to 8 mm in breadth. The pupal period lasted for different ranged.

Larvae, (harmful stage.)

The ‘C’ shape larval legs are all around growing yet seldom utilized for velocity. Head is huge or slanted earthy colored in shading with dim hint downwardly slanted firmly sclerotized, with amazing uncovered mandibles (Imms,1957). The harm brought about by Scarab hatchlings is assessed to lessen the harvest yields by around 40-80 % and in a later report by around 12-60% (Pokhrel, 2004). The white grub, *Holotrichia species* hatchlings are fed on the tap underlying foundations of the seedlings and the harmed plants wither and pass on. The recently arisen grub of *Holotrichia species* is velvety white in shading. They are three instars of the vermin and body length and body width change with the species. The first and second instar hatchlings period is short in contrast with the third instars hatchlings.

Nature and extent of damage

The rainy season provides favorable conditions for, grub attack. In case of severe infestation the entire plant stand is destroyed and sometimes the field needs re-sowing. White grubs (Melolonthid larvae) feed underground on the roots of host plants, while the adult beetles are observed feeding on the foliage of certain other choice plants in the vicinity during the night. The damage done by grubs to Kharif crops is sometimes more than Imagination, The losses inflicted to the various crops by this pest range between 40 and 80% in endemic pockets when the plant harbored 2-14 grubs results great loss to yield.

Symptoms of Attack

The pest is subterranean; the damage caused by this pest is not commonly noticed. An attacked plant becomes pale, gives wilted appearance and finally dries which can easily be pulled out In heavy infestation, fields show patchy appearance due to withering of plants. The grubs eat away the nodules, fine root lets and girdle the main root of the leguminous crops. Due to this type of damage in soyabean plants which have a tap root system, are highly susceptible to grubs, attack whereas crops like bajra, Pennisetum typhoides; sorghum and maize, Zea-mays having adventious root system can withstand considerable grub population. Young plants on pulling from the soil come out easily with only tap root and devoid of tertiaries and seconderies.

Image No. 1 Normal soybean field

Image No.2 white grub effect on Soybean Crop

Image 3,4 and 5 White grub attack on the roots of soybean plants

Image No.6 Mature larval stage of White grub

Image No.7 infected Soybean plant

Pest Management Strategy and Recommendation

It is rather difficult to eradicate this polyphagous and noxious pest because of its peculiar behavior and nature of damage to the various crops. The pest can be managed effectively only by integration of several methods. The control of adult beetles during June to July along with the control of the white grub larvae in the soil during July-August becomes inevitable in the endemic areas. The effective control measures to combat white grub.

S.N.	Event	Duration	Dosage	Result
Chemical control	Pre-sowing treatment	(15th June-15th July)	Soil application of Themate 10% Dust @ 1-3 kg/ha	Average
	Post-sowing treatment	(August-September)		Average
	Spraying or drenching	One week a after sowing	1.Imidacloprid 40% + Fipronil 40% @250 g for each ha 2. Chlorpyriphos 20%@ 4000 ml for each ha.	Most beneficial
Microbial control	Culture	During attack	*Beauveria basssiana* and *Beauveria brongniarti*	Significant 70%
	Culture	When in Rain delay	*Metarhizium anisopliae and B. bassiana @ 5 x 108 conidia ha-1 was found effective*	Most Significant 94%
Mechanical control		by vigorous shaking or twigs of trees and bushes like Ber, Khejri, Neem	from 8.30 P.M. onwards and killing the adult beetle, thus collected by drowning them in soap water	Significant
Organic management			The Datura, *Datura innoxia* and Bitti, *Thevetia peruviana* plant extractives in 5% concentrate in Ethanol	Significant

Result and Discussion:

White grubs are the pests of national Importance and are a serious constraint to almost all the kharif crops grown under rain fed conditions. Both the grubs and adults are polyphagus and univoltine in nature. No single control measure is effective for their management, hence is the only option for their effective management by application of *M. anisopliae* @ 3.3 x 10 13 conidia ha-1 against white grub in Amravati District. They have recorded 50-60 and 70-90 per cent reduction in grub population in kharif soybean crop.

This situation is not observed in every year. However pre monsoon rain and delay in monsoon more the week or two causes eclosion of white grub *Holotrichia serrata.* During drought, damage caused is higher as the grubs kill seedling plants by feeding on the roots. They are subterranean feeders on roots up to the depth of 15 to 25cm. This habit protects the grub from contact chemical pesticide. It is control naturally when rain will be at regular interval. In wet soil grub unable to respire and result in death. Effective biological control is to use *Metarhizium anisopliae* culture in drenching. At the adults stage it is control by light traps. But it is not a universal practice adopted by the farmers. Secondly as it is in the months of May and June the farm have no crops and farmers neglect this situation.

Most of the farmers have a thought that the white grubs attack is due to use of dry cow dung. It's not but it is one of the reasons as the adult female prefers the cow dung for egg laying. To avoid the attack of white grub plough the land after removal of Rabbi Crop generally in the month of March. The summer heat kills the pupal stage of white grub.

Acknowledgement

I express my sincere thanks to all the farmers who share their experience and information with me. I also thankful to the Director, Krushi Vidnyan Kendra Durgapur, Amravati district for constant help.

References:

1. Bhattacharyya B, Gogoi I, Das PPG, and Kalita B. 2023. "Management of agricultural insect pests for sustainable agriculture and environment." In *Sustainable Agriculture and the Environment* (pp. 161-193). Academic Press.
2. Imms, A.D. (1957). A General Textbook of Entomology. Methuen, London. pp. 886.
3. Madhusudhan, KT, JB Gopali, MP Basavarajappa, and VD Gasti. 2021. "Development of IPM modules against root grubs, *Holotrichia serrata* (F.) in onion ecosystem." *Journal of Experimental Zoology India* 24 (1).
4. Mishra, PN. 2001. "Scarab fauna of Himalayan region and their management." *Indian phytophagous scarabs and their management: present status and future strategy. Agrobios, Jodhpur*:74-85. Nepal. pp. 134.
5. Pokhrel, MR. 2004. "Field survey of white grubs and laboratory evaluation of *Metarhizium*

anisopliae (Metsch.) Sorokin for its control with side effects on Bombyx mori L in. M. Sc. Ag." *Agriculture). Institute of Agriculture and Animal Science, Tribhuvan University, Rampur, Chitwan, Nepal*.

6. Rai, Deepak, SN Sushil, J Stanley, JP Gupta, and Veenika Singh. 2013. "Deployment of Noval Technologies for The Management of White Grubs in Lower Hills of NW Himalyan Region."*International Journal of Horticulture* 3.
7. Visalakshi M, Patil J, Suresh M, and Manisha BL. 2023. "Seasonal Incidence and Eco Friendly Management of White Grub in Sugarcane Using Entomopathogenic Nematode and Entomopathogenic Fungus in Andhra Pradesh, India." *International Journal of Environment and Climate Change13*(9): 696-706.
8. Yadava CPS and Sharma GK. 1995. Indian white grubs and their management. All India Coordinated Research Project on White grubs, Technical Bulletin No.2, Indian Council of Agricultural Research