



## INTEGRATED COMMUNITY APPROACH FOR SUCCESSFUL MANAGEMENT OF WHITE GRUBS IN GROUNDNUT: SUCCESS STORY

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### ABSTRACT

“C-shaped” white grubs or root grubs are commonly occurring, soil-inhabiting polyphagous insects and they cause economic losses in several crops. The species of white grub those are endemic to Saurashtra region of Gujarat are, *Apogonia rauca*, *Schizonycha ruficollis* and *Adoretus* sp. Since 2010, sporadic outbreaks of white grubs noted in Saurashtra and in severe form in the year 2016. Up to 90% of surveyed groundnut fields in Saurashtra were infested with white grub, complete crop failures were also observed at some endemic locations. Community-level integrated pest management (IPM) approaches were formulated by ICAR-Directorate of Groundnut Research, Junagadh to tackle the white grub menace during 2017 and 2018. Sensitization of farmers in the white grub-prone villages i.e., Samadhiyala and Mithapur of Mendarada (Taluka), Junagadh (District) was initiated before and during the monsoon season. Information on white grub life cycle, weak links in the life cycle, damage symptoms, management strategies and need for community approach were repeatedly emphasized through pamphlets, posters, field visits, interactive meetings, kisan-mela/ goshti and demonstration of white grub management practices. These interventions resulted in successful implementation of community-level IPM approaches for white grub management during 2017 and 2018. Since 2018, farmers witnessed reduction in per cent groundnut damage caused by white grubs post interventions made by ICAR-DGR and thus saved an estimated monetary loss of around Rs. 10,000-15,000 rupees per ha.

**Key words:** Groundnut, white grub, Gujarat, IPM, community approach, economic loss, life cycle, damage, strategies, interventions,

Gujarat is one of the major groundnut producing states of India followed by Andhra Pradesh, Karnataka, Tamil Nadu, Maharashtra and Rajasthan. In India groundnut is mainly grown during Kharif or monsoon season (Anon., 2015). Apart from abiotic stress like, moisture stress and salinity, groundnut yield is mainly affected by insect pests and diseases. More than 100 insect-pests have been reported infesting groundnut (Amin, 1988; Nandagopal, 1992). White grubs are one of the major pests of groundnut during *monsoon*. The known species of white grubs infesting crops belong to Melolonthinae, Rutelinae and Dynastinae sub-families of Scarabaeidae in Coleopteran insect order (Nataraja et al., 2015). These are generally known as May/June beetles or cockchafer as the adult beetle emerge during the months of May or June and they feed on leaves of plants such as neem, acacia, arjuna, jujube, ber, fig, mango, drumstick, tamarind, etc. (Nandagopal, 2004). The larvae of these beetles are called white grubs or root grubs and they feed on underground roots and stems of living plants. More than 2000 species of white grubs were known to occur in Indian subcontinent, of

which more than 40 species cause serious injury to an extensive variety of crop plants (Veeresh et al., 1991). White grubs are serious pests of various cereal crops such as maize, wheat, barley, sorghum and pearl millet; oilseed crops like groundnut, sesame, sunflower and soybean; vegetable crops like eggplant, cucurbit and okra; plantation crops like coconut and areca nut; and commercial crops like sugarcane. The genus *Holotrichia* includes the major species of white grubs inflicting serious damage to Kharif groundnut. *H. consanguinea* is pre-dominant in Rajasthan, Gujarat, Haryana, Punjab, Bihar and Uttar Pradesh whereas, *H. serrata* is most destructive in states like, Karnataka, Andhra Pradesh, Tamil Nadu and Maharashtra and later it has spread to western and peninsular India (Nandagopal, 2004). Due to climate changes in weather and cropping patterns, and/or changes in the faunal composition, several new species of white grubs are becoming important and inflicting economic damage to groundnut crop.

Saurashtra of Gujarat is known as ‘groundnut bowl of India’; apart from groundnut, crops like, pigeon pea,

castor, and cotton dominate the area in Kharif season. Blessed with medium to black soils and sufficient precipitation (653 mm per annum), Saurashtra is the traditional groundnut belt. Groundnut from Saurashtra used for oil extraction, confectionery making and export while haulms were utilized as livestock feed. Groundnut crop plays significant role in the nutritional and economic security of the rural population. White grubs pose great threat groundnut as well as other Kharif crops in the region.

Since 2010, sporadic outbreaks of white grubs noted in Saurashtra and in severe form in the year 2015-16. Nataraja and Jasrotia (2014) reported white grub incidence causing 20-80% damage to groundnut in Porbandar, Ranavav, Jetpur, Kutiyana, Maliya, Keshod, Visavadar, Mendarada and Dhari of Saurashtra region. In the National Farmers' Fair-cum-Exhibition on Groundnut organized by ICAR-Directorate of Groundnut Research, Junagadh on September 30 to October 1, 2016 farmers and extension personnel highlighted that about 19,000 ha groundnut area in Saurashtra was affected by white grub (Anon., 2016). Comprehensive strategy for the management of white grubs was felt required. In this regard, purposive surveys were carried out to identify areas of white grub infestation, to assess infestation levels and to document white grub species. In addition, community based and integrated approaches for management of white grubs in Saurashtra region of Gujarat were evaluated at farmers' fields having the history of white grub infestation.

#### MATERIALS AND METHODS

After the receipt of the first monsoon showers, a collection of adult beetles was made using light traps during the night time (1900 to 2200 hr) for 7-successive days. Adults were also handpicked from nearby host trees and those fallen to the ground. Similarly, white grubs collected during the crop season were reared in the laboratory to obtain adult beetles. Adults collected from each geographic location were mounted, preserved and labeled. Morphological identification of white grubs was done at Pusa Insect Collection, ICAR-Indian Agricultural Research Institute, New Delhi.

Purposive surveys were conducted in the Saurashtra region of Gujarat to ascertain the extent of damage to groundnut caused by white grubs. Survey was conducted in districts like Junagadh (Chokli, Mendarda, Bilkha, Keshod, Maliya (Hatina), Visavadar, Vanthali, Manavadar villages), Rajkot (Jetpur, Upleta, Dhoraji, Gondal, Kotda Sangani, Jasdan villages), Amreli (Dhari, Padadhari, Dhrol, Amreli, Bagasara villages), Gir

Somnath (Gir, Somnath, Veraval villages), Porbandar (Porbandar, Ranavav, Kutiyana villages), Jamnagar (Jamjodhapur, Bhanvad villages), Bhavnagar (Mahuva, Talaja villages) of Saurashtra region where incidence of white grubs were reported.

To order demonstrate and access the impact of community IPM approach 17 farmers' fields in Samadhiyala and Mithapur villages of Mendarada (Taluka), Junagadh (District) under Mera Gao Mera Gaurav (MGMG) program of ICAR-DGR, Junagadh were selected. They had history of white grub infestation in groundnut. Prior to interventions of ICAR-DGR, farmers at which had Samadhiyala and Mithapur were not aware of weak links in the lifecycle of pest, their emergence pattern, availability of pheromones, and importance of community-level approaches for effective management.

#### RESULTS AND DISCUSSION

White grub adults collected from purposive survey were identified as *Phyllognathus dionysius*, *Apogonia rauca*, *Holotrichia consanguinea*, *Adoretus bicolor*, *Adoretus* sp., *Anomala bengalensis*, and *A. varicolor*. Kapadia et al. (2006) reported several of these species from the south Gujarat region. *Phyllognathus dionysius* was the predominant species during the period 2015-19. Similar observations were also made from Rajasthan by Kumar et al. (2017). At the beginning of the monsoon, several awareness campaigns through distribution of pamphlets and posters; and several field days, interactive meetings, kisan mela/ goshti were organized by ICAR-DGR. With these efforts, farmers started understanding the importance and need for community-level IPM approaches. ICAR-DGR made its interventions in 2017 and 2018 (Table 1). Damage to groundnut was lowest (20%) in Bhavnagar and Gir Somnath districts highest in Junagadh and Amreli (50% each) followed by Rajkot (40%) whereas Porbandar and Jamnagar recorded 30 % damage. Groundnut fields in Visavadar, Junagadh district were severely affected with 100% damage during 2015-16. Prior to interventions, damage caused by white grub was cent % in Samadhiyala and Mithapur. In 2017, due to interventions made, damage to groundnut by white grub declined slightly but ranged from 35 to 85% (Table 2). In the subsequent year i.e., 2018 damage to groundnut by white grubs was further reduced (3 to 40%). In couple of farmers' fields, intervention made from beginning of the monsoon till the crop establishment could reduce damage up to 96%. Awareness about white grubs in groundnut was done by distributing pamphlets and posters in the village. Regular visits to fields, interactive meetings,

Table 1. Interventions made by ICAR-DGR, Junagadh through community IPM approaches

| S.No. | Particulars of intervention  | Remarks  |
|-------|--|--|
| 1     | Installation of synthetic pheromone, Anisole @ 3 pheromone dispensers/ tree. Installation was done at 15 m radius on trees in and around field for 3 consecutive days after receipt of first monsoon showers | Anisole and pheromone dispensers were provided by ICAR-DGR, Junagadh and farmers were given demonstration of installation                              |
| 2     | Spraying of insecticides (imidacloprid 17.8SL @ 1.5 ml/L or chlorpyrifos 20EC @ 2 ml/ l on host trees in and around fields during late evening hours soon after first monsoon showers for 3-4 days           | Tractor mounted and Tree sprayers. Tree sprayers were made available by ICAR-DGR, Junagadh. Farmers were given demonstration of spraying to tall trees |
| 3     | Installation of locally made light traps @ 1 trap/ ha using incandescent light source. A trough containing water and some kerosene was placed below the light source   | Light traps  |
| 4     | Seed treatment with imidacloprid 17.8SL @ 2 ml/ kg or chlorpyrifos 20EC @ 12 ml/ kg seed   | Farmers given demonstration of seed treatment  |

Table 2. Damage to groundnut by white grub as influenced by interventions

| S. No. | Name of farmer           | Name of the village | Damage to groundnut by white grubs (in %) |                            | % reduction in damage to groundnut caused by white grubs post-interventions |
|--------|--------------------------|---------------------|---|----------------------------|---|
|        |                          |                     | Beginning of interventions (2017)         | After interventions (2018) |   |
| 1      | Asavinbhai R. Suvagiya,  | Samadhiyala         | 35  | 5                          | 86  |
| 2      | Chandubhai K. Suvagiya   |                     | 70  | 3                          | 96  |
| 3      | Pravinbhai B. Trada      |                     | 60  | 7                          | 88  |
| 4      | Vinubhai G Domadiya      |                     | 35  | 6                          | 83  |
| 5      | Arvinbhai P. Suvagiya    |                     | 85  | 10                         | 88  |
| 6      | Balubhai T. Trada        |                     | 45  | 5                          | 89  |
| 7      | Devashibhai R. Kumabahni |                     | 40  | 7                          | 83  |
| 8      | Rameshbahi G. Trada      |                     | 40  | 4                          | 90  |
| 9      | Pravinbhai K. Rajani     | Mithapur            | 50  | 5                          | 90  |
| 10     | Maheshbhai C. Rajani     |                     | 45  | 5                          | 89  |
| 11     | Viththalbhai G. Rajani   |                     | 45  | 5                          | 89  |
| 12     | Mahendrabhai D. Gohel    |                     | 45  | 5                          | 89  |
| 13     | Girishbhai G. Rajani     |                     | 50  | 10                         | 80  |
| 14     | Nandlalbahi A. Kotadiya  |                     | 70  | 30                         | 57  |
| 15     | Rajubhai M. Polara       |                     | 60  | 40                         | 33  |
| 16     | Harshukhbhai L. Vekariya |                     | 50  | 5                          | 90  |
| 17     | Viththalbhai P. Patoliya |                     | 60  | 20                         | 67  |

field days and kisan mela/goshti, and demonstration of integrated white grub management practices along with regular advisories passed on through text and calls helped in success of the community IPM approach. Feedbacks were collected from farmers from villages under MGMG program for assessing the impacts and to further refine the community IPM approach. Farmers have appraised that since 2020, damage to groundnut by white grub was nil or negligible. Community IPM approach has saved an estimated monetary loss of Rs. 10,000 to 15,000/ hectare.

Integrated community approach was very successful for the management of white grubs in selected MGMG village. Early detection through continuous surveillance and monitoring and implementation of timely, community-level IPM approaches can effectively manage white grubs in groundnut and save monetary losses.

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#### AUTHOR CONTRIBUTION STATEMENT

All authors have equally contributed.

#### CONFLICT OF INTEREST

No conflict of interest.

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