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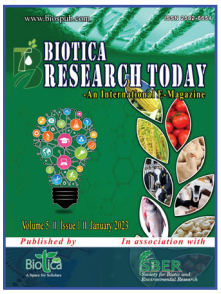

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Integrated Management of Soil Dwelling Pests of Wheat Crop

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Abstract

Wheat (*Triticum aestivum* L.) is the second most important staple food crop and India is the second-largest wheat producer and consumer in all over the world, which provides nutrition to millions of populations. Agriculture sector contributes 18.8% to GDP and plays an important role in the Indian economy. In 2021-22, 106.84 million tonnes of wheat has been produced. Wheat production has been reduced in 2021-22 compare to previous year 2020-21, due to the biotic and abiotic factors. Wheat crop is affected by several pest such as Aphid, Termites, Wheat weevil, White grubs, Grasshopper, Gujhia weevil, Hessian fly, Flea beetles, Armyworm, pink stem borer and rodents are the major pests of wheat in India. the stored grain pests are also causing significant losses in wheat. In this literature two soil dwelling pest of wheat such as termites and white grubs has been described along with their effective management approaches.

Introduction

Wheat (*Triticum aestivum* L.) is one of the second most important staple food and cereal crop in all over the world as well as in India providing nutrition to millions of populations. Agriculture sector contributes 18.8% to GDP and plays an important role in the economy. India is the second-largest wheat producer in the world. The scientific technologies and wheat varieties have enhanced wheat production which has raised crop yield and productivity. According to the Ministry of Agriculture and Farmers Welfare the production of wheat is estimated to come down to 106.84 million tonnes in 2021-22 from 109.59 million tonnes in 2020-21. Reduced wheat production is due to a variety of biotic and abiotic factors (Hussain *et al.*, 2022). The biotic stresses have great impact on wheat plant growth and can reduce wheat production and productivity. Biotic factors *i.e.*, pests have decreased the crop yield with negative impacts on the economy of a country. Wheat is prone to a variety of insect pests that attack at various stages of the crop, causing destruction, and eventually reduce productivity and nutritional quality of wheat grain. Making appropriate management decisions require careful assessment of the effects of various pests on wheat crop quality and quality. Wheat crop is affected by Aphid, Termites, Wheat weevil, Cereal leaf beetle, White grubs, Grasshopper, Gujhia weevil, Hessian fly, Flea beetles, Armyworm, Wheat stem sawfly, *Helicoverpa armigera*, pink stem borer and rodents are now considered as the major pests of wheat in India (Farook *et al.*, 2019). Besides this stored grain pests like Khapra beetle, Lesser grain borer, Rice weevil *etc.* also causes significant losses in wheat. In addition to being a significant source of protein, vitamins, and carbohydrates, wheat is also a key staple food

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for a healthy diet in India. In the North Indian area, wheat is mostly consumed in the form of flat breads called Roti, Chapati and Parathas. Punjab, Uttar Pradesh and Madhya Pradesh are the three states which produce the most wheat.

1. Termites

Termites are serious pests of agricultural crops, about 16 species of termite have been found to damage wheat crop in India, out of 16 species two species *viz*., *Odontotermes obesus* and *Microtermes obesi* were major species which caused significant economic yield losses ranging from 43 to 80% at seed sowing to dough stage of wheat crop. Termite feed on cellulose and damage agricultural crops and wooding plants. They use to live in underground parts in soil and cause death of bunds and roots of plants especially in wheat and sugarcane. They are categorized into macrotermes and microtermes, the wheat damage at growing stage and refer as most destructive termite species in India. Termites are highly polyphagous pest and are found to damage many agricultural crops like wheat, maize, sugarcane, groundnuts, soybean, potato, mint *etc*. Termite attack is more prevalent in areas these are treated with farmyard manure which has not yet fully decomposed before applying. Termites were once thought to be a severe pest of rain fed wheat, but they are now found in irrigated wheat as well.

Nature of Damage

Termites damage extremely at the seed sowing and at the maturity stage. They feed on seed and decrease the germination percentage. Termites feed as semi-circular manner on the margin of the leaves in the standing crop, causes yellowing and drying of outer leaves first followed by the inner leaves and feeding on tissues of plants cellulose. The severely damaged plants dry up completely and are easily pulled out. Patchy appearances are formed due to the death of seedlings and uneven plant spacing. In case roots are partially damaged, the plants show yellowing.

Identification of Termite

Eggs are dull coloured, kidney shaped and hatches in 30-90 days. Nymphs moult 8-9 times and are full grown in 6-12 months and emerges as adult (Figure 2). Adult are creamy or dull whitish coloured small insects looking like as ants with dark coloured head. These are three type's worker, soldier and reproductive adult. Reproductive adult is winged and disalate (Figure 1).

Integrated Pest Management

Cultural Method:

• Destroy or burn crop residues.

• Deep summer ploughing of field to destroy termites' mounds and tunnels and expose them to sunlight and predators.

• Flood irrigation manages termite attack due to excess moisture.

• Application of fully decomposed farm yard.

Chemical Method:

• Seed treatment with Fipronil 5FS @ 6 g kg^{-1} of seed.

• Deep seed in imidacloprid 70WS 0.1% or chlorpyriphos 20EC 0.04% for 5 min.

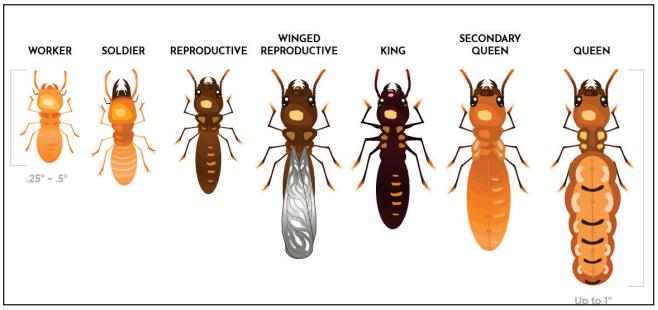

Figure 1: Identification of various castes of termite

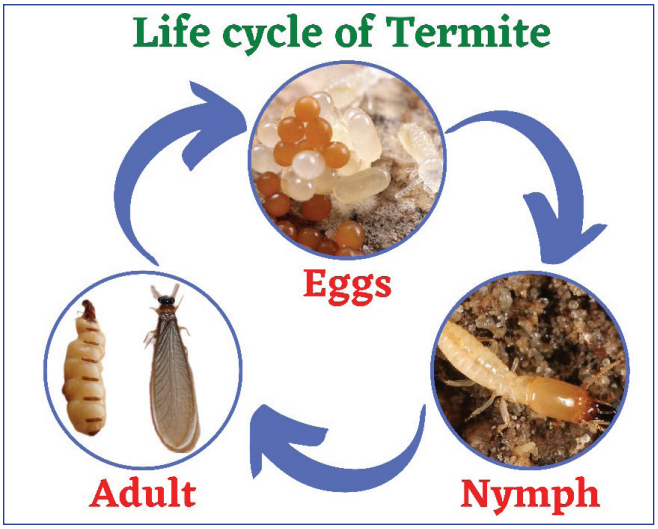

Figure 2: Life cycle of termite

2. White Grub

The adults of root grubs or white grubs (*Holotrichia* spp.) are generally known as Chafer beetle or June beetle all over the world. White grubs are among the most destructive and troublesome of soil insects. This is a polyphagous pest attacking almost all the *Kharif* crops and *Rabi* crops like peas and wheat. The loose soils with moderate to low rainfall provide favourable conditions for the survival and multiplication of these insects and they have become destructive particularly in parts of Rajasthan, Gujarat, Maharashtra, Karnataka and Bihar. The losses inflicted to the various crops by this pest range between 40 and 80% in endemic pockets.

Nature of Damage

They live in soil and infested to plants at all stages of growth. They mainly feed on roots of the plants and reduce the water absorption capacity of plants. The

infested plant becomes yellow and occurs wilting of leaves. In severs condition entire plant becomes dry.

Identification of Pest

A female fecundity an average of 27 eggs in the loose or sandy soil, which are pear like and enclosed in earthen cells. Grubs are Fleshy 'C' shaped (Scarabaeiform), whitish yellow in colour found close to the base of the clump. This stage is extremely severing for all crops. Pupae are brown coloured, and occur deeper in the soil in earthen chambers and it is a resting stage of white grub. Adult beetles are a rusty-red colour just after emerging from the pupal stage, but turn nearly black (Figure 3).

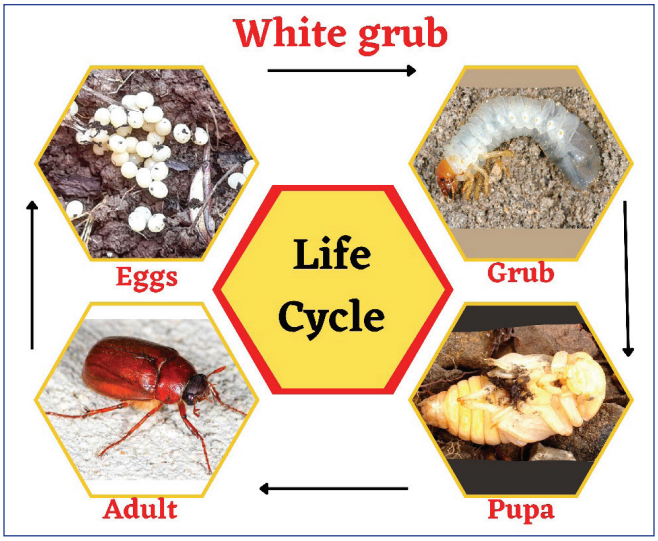

Figure 3: Life cycle of white grub

Integrated Pest Management

Physical Method:

• Collect and destroy the adult beetles from harbouring in nearby neem, Ailanthus, and Acacia trees immediately after the summer showers using powerful petromax (paraffin lamp) lights as a mass campaign in areas near to forest and hilly regions.

• Install light trap @ 1 trap ha^{-1} between 7 pm to 10 pm after the receipt of first monsoon rain to attract and destroy the adult stage of the pest.

Biological Method:

• Apply *Beauveria brongniortii* @ 2.5 kg ha^{-1} (1×10^9 colony forming unit, cfu g^{-1}) entomopathogenic fungal formulation along with FYM at the time of planting in endemic regions.

• Soil application of aqua formulation of entomopathogenic nematode (EPN), *Steinernema carpocapsae* @ 1.5 billion infective juveniles ha^{-1} is found effective for the management of grubs.

Cultural Method:

• Practice deep summer ploughing immediately after crop harvesting to expose the pupae to sunlight and natural enemies.

• Provide adequate irrigation to crop. Stagnating water for 24 hours in the field then the grub will come out from the soil.

• Use well decomposed organic manures.

• Practice crop rotation with sorghum and bajra.

• Trim off trees (neem twigs with leaves, Ailanthus) and shrubs in and around fields and after that collect and destroy the adult beetle.

Chemical Method:

• Mixing of Chlorpyriphos granules @ 25 kg ha^{-1} in soil before sowing.

• Seed treatment with Imidacloprid 8SL @ 2 ml kg^{-1} of seed.

• Spray Chlorpyriphos 20EC @ 2-2.5 ml $litre^{-1}$ of water on the nearby trees like Neem, Acacia, Subabul *etc*. which helps to kill the adult beetles harbouring on them.

Conclusion

Wheat is the second most important cereal crop of India and provides nutrition to millions of populations worldwide. India is the second-largest wheat producer and consumer in the world. Due to the biotic and abiotic factors wheat production has been decreasing continuously. Two soil dwelling destructive pests of wheat crop such as termites and white grubs has been described along with their effective management approaches.

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