



Potential of Entomopathogens in Managing Potato Whitegrubs in Himachal Pradesh

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Abstract: *Brahmina coriacea* (Hope) is the most widespread and destructive species of whitegrubs having potential to inflict 40 to 50 per cent yield losses to potato in Himachal Pradesh. The entomopathogens constitute a potential group of biocontrol agents against whitegrubs, therefore *Beauveria bassiana* Vuill., *Metarhizium anisopliae* (Metchnikoff), *Heterorhabditis indica* Poinar and *Bacillus cereus* Frankland & Frankland were evaluated in potato at Kheradhar. *H. indica* @ 10 kg ha⁻¹ was highly effective with tuber damage ranging from 12.5 to 12.7 per cent in treated plots. Mixed application of *H. indica* + *B. bassiana* or *M. anisopliae* showed additive or synergistic effect. There was 11.4 to 12.2 per cent tuber damage in *H. indica* + *B. bassiana* or *M. anisopliae* treatments. Maximum reduction in tuber damage was observed in *H. indica* + *B. bassiana*, followed by *H. indica* + *M. anisopliae* treatment. There was 48.75 to 55.38 per cent reduction in tuber damage when *Galleria mellonella* cadavers infected with *H. indica* were applied in soil. Direct application of *G. mellonella* cadavers infected with *H. indica* showed higher efficacy which may be attributed to greater activity of infective juveniles in soil.

Keywords: Whitegrubs, *Brahmina coriacea*, *Beauveria bassiana*, *Heterorhabditis indica*, *Metarhizium anisopliae*

The problem of whitegrubs is quite serious in hilly states where potatoes are grown during summer season as rain-fed crop under long day conditions (Chandel et al 2015). In most parts of the north western Himalaya, potato cultivation is done on sloppy lands with light and loose textured soil and high rainfall. The potato fields are normally situated in the vicinity of fruit orchards in Himachal Pradesh and other hilly parts of India. These conditions are conducive for the development and multiplication of whitegrubs. In India, 24 species of whitegrubs damage potato, and *B. coriacea* is most widespread and destructive species in Himachal Pradesh (Pathania and Chandel 2017). The life cycle of *B. coriacea* is annual with three larval stages (Chandel et al 2003), and damage is caused by second and third instar grubs. The economic importance of chafers is primarily due to the feeding activity of third instar grubs. There exists a highly positive correlation between the population of the third instar grubs and tuber damage (Anonymous 2004). Chandel et al (2008) reported that with unit increase in population of third instar grubs of *B. coriacea*, the tuber damage increases by 12.17 per cent. It is very difficult to control whitegrubs by applying conventional insecticides owing to their poor efficacy, high cost and associated environmental pollution. Biological control is an important component of IPM which implies the utilization of ecologically safe and effective methods for the management of whitegrubs. Different entomopathogens such as *Metarhizium anisopliae*, *Beauveria bassiana* and *Heterorhabditis indica* are of

paramount importance in managing whitegrubs, as they sustain themselves in soil, after proper establishment and are commercially labeled for whitegrubs in India. In the present investigation, the field efficacy of entomopathogenic fungi, bacteria and nematodes for the control of *B. coriacea* grubs in potato was studied.

MATERIAL AND METHODS

Field evaluation of talc based formulations of different entomopathogens against whitegrubs in potato: *M. anisopliae*, *B. bassiana* and *Bacillus cereus* formulated as dusts and *H. indica* as semi solid formulation were evaluated against grubs of *B. coriacea* in potato. The experiment was conducted in summer planted potatoes grown in whitegrub endemic area at PDS Kheradhar on variety Kufri Jyoti. All recommended package of practices were adopted except for whitegrub's management. There were seven treatments which were replicated thrice in RBD with plot size of 12 m² (Table 1). The formulations of *M. anisopliae*, *B. bassiana* and *H. indica* were obtained from NBAIR, Bangalore, and the dust formulation of *B. cereus* was supplied from Vivekananda Parvatiya Krishi Anusandhan Sansthan (VPKAS), Almora. Each formulated product was mixed thoroughly with FYM in plastic trough, and added into the furrows near the base of plants. After addition of FYM+ biopesticide mixture, it was gently mixed in the soil using hand hoe. All the treatments were applied at the time of earthing up in first week of July.

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