

Identification of potential Biological Control agents and their implementation Strategy for the management of insect pest of Major crops



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Pakistan is an agricultural country and it is very important to produce good quality oil and fodder. *Brassica* and some other important crops are attacked by a number of pests including lepidopterists, sawflies, beetles and aphids. Cabbage aphid (*Brevicoryne brassicae*), turnip aphid (*Lipaphis erysimi*) and green peach aphid (*Myzus persicae*), diamondback moth (*Plutella xylostella*) and Cabbage butterfly (*Pieris Brassicae*) are most destructive pests. Aphids are the main insect pests in India and northern European agriculture, and are also important pests in horticulture both in field and greenhouse production,

causing damage to crops either directly by feeding or by transmitting plant viral diseases. Three species of aphids, i.e., cabbage aphid (Fig. 1E, F), turnip aphid (Fig. 1C, D), and green peach aphid (Fig. 1G, H) are more abundant and widely distributed. Aphid infested plants show slow growth, which results in seed yield loss of 9-77% causing an 11% reduction in seed oil content. A 75 to 80% yield loss because of infestations of *B. brassicae* and *Lipaphis erysimi* Kalténbach on oilseed brassicas was recorded in Pakistan. Moreover, *L. erysimi* is a harmful insect on *Brassica* oil seeds, especially on *B. juncea* in India and in other tropical regions of the world, causing up to 83% yield loss. More than thirty-four insecticides belonging to various groups are being applied to control lepidopteran pests, including *Spodoptera spp.*, in Pakistan. This indiscriminate use and ill practice of pesticide application without pest scouting are the main causes of the development of resistance in insects of this region.

There are more than 400 species of aphid parasitoids known worldwide. *Diaeretiella rapae* (M'Intosh) belonging to order Hymenoptera and family Braconidae has been reported to play a role in preventing outbreaks of aphids in cruciferous crops. In this context, we have developed a well-equipped laboratory and insect rearing chambers for potential parasitoids identification and mass rearing to control important insect pests of various crops (Activity of our running international Project). We have identified and reared an effective aphid parasitoid, *Diaeretiella rapae* and parasitoid of cabbage butterfly *Cotesia*

glumerata and Parasitoids of lepidopterous insect pest's (Fig.2) in our laboratory for the control of aphid's species successfully. We have also identified some of transmitted NPV viruses, venom proteins/peptides on molecular level from these parasitoids for the synthesis of recombinant proteins that could be used as bio-pesticides in future. By using bio-control agents, we can reduce pesticide dependence, save foreign exchange, save environment and health of human beings.

More than thirtyfour insecticides belonging to various groups are being applied to control lepidopteran pests, including *Spodoptera* spp., either singly or in mixtures in Pakistan. In Pakistan, as a consequence of frequent use of pesticides, the aphids have developed broad-spectrum resistance to insecticides and there are also complaints of chemical control failure against aphid such *B. Brassicae*. Usually 6-10 insecticidal treatments are done on cotton, and two to four sprays on other crops such as cauliflower, cabbage and okra. This indiscriminate use and ill practice of pesticide application without pest scouting are the main causes of the development of resistance in insects of this region.

Furthermore, the expansion of the grown area of *B. napus* has provided good preconditions for population growth of crucifer-specialist pests. Pest management on *B. napus* needs urgently to be improved for economic and environmental reasons. Throughout Europe, it still relies heavily on synthetic pesticides, most often applied routinely and prophylactically, without regard to pest incidence. This has led to their over-use, reducing the economic competitiveness of the crop and threatening biological diversity. The need to reduce dependence on chemical inputs for pest management is encouraging investigation into alternative options for developing more ecologically-sustainable and economically-viable integrated crop management.

There are more than 400 species of aphids parasitoids known worldwide. They belong to order hymenoptera which has three sub families (Braconidae, Aphelinidae and Encyrtidae) and subfamilies Aphidiinae, Braconidae belong to order Diptera. All these parasitoids are solitary endoparasitoid in their mode of action. They oviposit in the host egg larval or pupal stage and after completing their life cycle adult parasitoids remain in the host puparium until death. Mostly aphid parasitoids and their hosts have been introduced from Northern Hemisphere. *Diaeretiella rapae* (M'Intosh) belonging to order Hymenoptera and family Braconidae has been reported to play a role in preventing outbreaks of aphids in cruciferous crops. *D. rapae* is important aphid endoparasitoid on a number of host plants. Its host list comprises more than 60 aphid species, but only five or six host species are generally attacked. In this context, we have developed a well-equipped laboratory and insect rearing chambers for potential parasitoids identification and mass rearing to control important insect pests of various crops. We have identified and reared an effective aphid parasitoid *Diaeretiella rapae* and parasitoid of cabbage butterfly *Cotesia glumerata* in our laboratory and are using to control different aphids species successfully. By using biocontrol agents, we can reduce pesticide dependence, save foreign exchange, save environment and health of human beings.

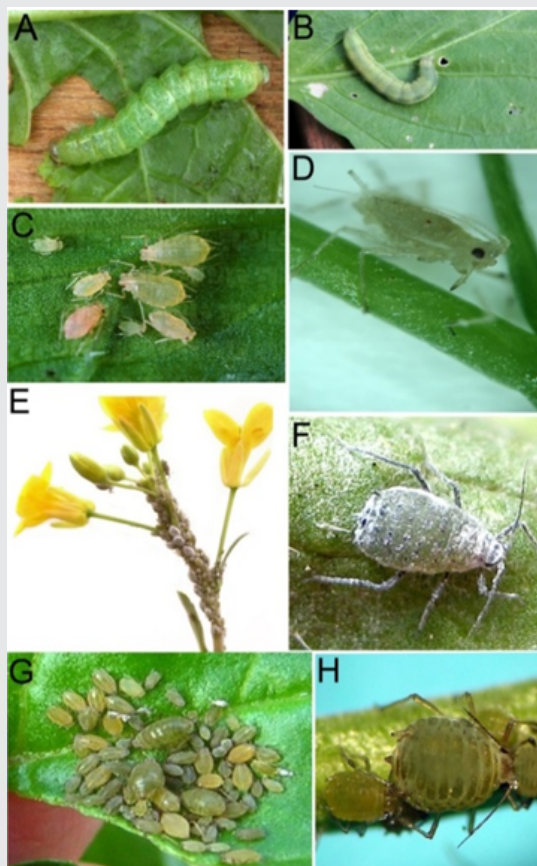




Fig. 1. Major insect pests of oilseed and other crops

Fig.2. Laboratory reared parasitoids of major insect pests of different crops.