



# Recent advances in biological control methods of cabbage pest

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## Abstract:

Growing the spatial structure of field crops can help regulate biological pest management and parasite populations in agricultural systems. Change and resource limitations, the occurrence of biological control was not assessed at every cabbage plot, but rather by using data on biocontrol designs available and observations on parasitoid movements. Research of how damages control measures affect cabbage production reveals that the outcomes depend on the preferred method. Their early entrance or releasing of the parasitoids following the pest's colonisation of the field determines the effectiveness of biological control approaches that rely on parasitoids, whether used as a releases or a conservative strategy. Whenever insects become intimately linked to weeds biological control products, traditional biological treatment of both insects and weeds may result in potential interactions. The use of live organisms and their compounds as a substitute to chemical insecticides or as a part of an integrated pest management programme is commonly known as biological control.

**Keywords** – Biological control, Insect pests, Vegetable crops, Cabbage, Pest regulation, Natural enemies, Predators, Parasitoids, Crop protection, Integrated pest management (IPM).

## Introduction:

In a diet consisting of maize, cabbage is a crucial vitamin and mineral supplement. It also provides small scale farmers with a revenue stream. Among the most frequently encountered crops, cabbage has been grown over a sizable area all year long. Its production and use are hampered by greater rates of insect infestation because it is typically farmed on big scales. Synthetic insecticides are essential for protecting vegetable crops from a variety of insect pests. Because of resource limitations, the prevalence of biological control was not assessed at every cabbage plot, but rather by using data on potential biocontrol designs available and observations on parasitoid movements. "Classical biological control is a tried-and-true, economical method for dealing with a variety of pests in vegetable crops". Although different strategies are successful at various times, locations, and with the impact of environmental variables, biological control is being merged with other preventive actions.

The most efficient and environmentally friendly method of managing pests in vegetable crops is typically regarded as biocontrol agents (Kamal et al., 2015; Lacey et al., 2015). As both a substitute for chemical pesticides, the preservation of natural enemies, predator, parasitic organisms, and microbiological biological control can be sustained. Conversely, biological control, a non-chemical approach to parasitic management, frequently entails a predatory connection between the pests pathogen and the organism (Barzman et al., 2015; Fahad et al., 2015a). In complex as opposed to simple environments, natural enemy populations are often more diversified and efficient at delivering biocontrol services (Brooker et al., 2015). On the genotypes with the highest pest activity, the activities of the predators were noted. In the experimental area, the number of insects climbed progressively until harvest (TOG BUG, 2015). In order to reduce the use of insecticides and thus environmental destruction, numerous research have focused on the prevalence of predators and parasitoids in vegetable and orchids crops (Roberts et al., 2015; Singh & SK Borthakur, 2015).

“In the greenhouse, biological control agents are crucial components of integrated pest management (IPM)” (Fahad et al., 2015b). The use of biocontrol agents presents a desirable complement or alternative to use of chemical insecticides (Brabbs et al., 2015; Joshi et al., 2015). In order to manage insects on cabbage plants, biological control and natural insecticides can be used, according to the study's findings (Macfadyen et al., 2015). Consequently, the significance of green spaces for plant protection has expanded due to the growing significance of control of insect pests (Olle et al., 2015)



Fig.1. Advantages of Biological control

The formation and preservation of the natural stability are the goals of biocontrol agents, so the initial and most crucial method is to preserve and enhance the effectiveness of natural enemies while also placing an emphasis on offering overwintering sanctuary, alternate solution prey, and presenters for parasitoid and predator organisms. Biocontrol is an excellent option for managing pest insects in vegetable crops since it can lower the cost of security and achieve sustained pest control (Pretty & Z Pervez Bharucha, 2015).



Fig.2. Healthy pupae (H) and infected pupae (I) Cabbage plants are infected by a complicated pest.

#### Literature review:

In order to better understand the value of biological control, a literature review on the many pests of important vegetable crops, including the damage they cause and its prospective treatment using biological control products was conducted.

El-Sayed M. et.al 2015 demonstrated by the effects of weather on population changes associated with the most common cabbage parasites have been discovered to be less pronounced when relative humidity (R.H.) increased and temperature dropped as a result of a colder climate. The most widely cultivated vegetable in the globe and one of the most widely consumed food crops, cabbage thrives in various regions of the nation. The ecosystem is more steady and insect populations oscillations are decreased with lower pesticide doses, while agricultural production are diminished and expenses associated with mitigating insect-related damage remain notoriously high (Embaby & Lotfy, 2015).

Matthew J.W. Cock et.al 2015 explained by “the use of predators, parasitoids, and pathogens—commonly called to as biocontrol agents (BCAs)—as natural enemies to control pests is based on biological control”. Given these limitations and the possible harm that application of pesticides could do to the human and environmental health, biological treatment is the most suitable form of pest management. In traditional biological management, an exotic natural enemy—likes a predator or parasite—is introduced into a new surroundings in which it did not previously existed. Interests in alternatives pest management methods, such as the utilisation of natural sources microbiological insect diseases, is still stoked by the need to reduce dependence on chemical insecticides. Functional uses of the fungi, such as their culture, composition, interaction with other pest control methods, inclusion in Integrated Pest Management (IPM) methods, ecological issues, and perhaps even possibilities for commerce, have already been discussed previously (Cock et al., 2015)(Ortiz-Urquiza et al., 2015).

Steven E. Naranjo et.al 2015 presented by A crucial element of integrated pest management is biological control but there hasn't been much attention paid to valuing this important ecological service economically. And although BC's real benefit is infrequently measured, it may offer one of the best returns on investments accessible

with IPM. Pesticides are one of the most significant and often utilised IPM strategies, however they can also operate as obstacles to BC. As a result, it is necessary to embrace new alternatives for managing the economically important crops pest insects, such as agricultural techniques, biological control, and botanical management. The goal of biological management is to lower insect population less than its economical level (Naranjo et al., 2015)(Mwanauta et al., 2015).

Biological Control:

Approaches to the Biological Control of Insect Pests:

The use of living organisms to lessen the harm that insect infestations could otherwise do is known as biological control. “The biological control of all pests, including insects, vertebrates, plant diseases, and herbicides, is possible; however, the methods and substances used depend on the type of pest”. The use of chemical agricultural chemicals must be drastically reduced, and appropriate biocontrol methods must be promoted.

Predators, parasitoids, and pathogens are the three types of natural enemies of pest insect species –

**Predators:** Predators of several separate species eat insects. “Most vertebrates, especially birds, amphibians, reptiles, fish, and mammals, depend heavily on insects for food”. These insect larvae vertebrate typically consume a wide variety of species of insects and do not often concentrate on parasites when they are present in large numbers. Since they consume a narrower variety of prey animals and have limited life cycles than other invertebrate predators, insects and other arthropods are more frequently used in biocontrol agents. This is due to their density of population can alter in response to modifications in the concentration of their target.

**Parasitoids:** Insects known as parasitoids have an adolescent form that grows upon or in a particular host species before killing it. The adolescents can be predators because they normally live on their own. Additionally, they might consume pollination, honeydew, or flower nectar as sources of food. The list of options of parasitoids is constrained, and most are highly specialised, as they must adapt to the product lifecycle, biology, and defenses of their hosts. Therefore, it is crucial to correctly identify the hosts and parasitoid organism when utilising parasites for biocontrol agents.

**Pathogens:** Like some other creatures and plants, insects can contract diseases from bacterial, fungus, protozoans, and pathogens. These illnesses may limit or eliminate insect pests' capacity to consume and develop, as well as their ability to reproduce. In particular, certain nematodes populations that inflict sickness or death through their bacteria symbiotic organisms also prey on insects. Infections can organically spread across an insect pest under specific weather conditions, especially when the insect pest has a high density.

Ecological effects on cabbage pests:-

1. Temperatures and humid conditions:

Temperature variations impact how quickly seeds germinate, grow, and die. A mild temperature, an extended time of humidity, and a sizable insect population are all necessary for the fungi to quickly spread. The goal of this study was to recognise all insects of the cabbage crop that are present today and likely to result in problems in the near future. The impact of various environmental processes, such as temperature and humidity, on the incidence of the various insects and their natural predators was also investigated.

## 2. Environmental conditions:

“The Central Laboratory for Agricultural Climate assessed the monthly average of temperature degree and relative humidity R.H. [%] that affect cabbage insects and density of population in the region during the experimental season”.

## 3. Natural enemies:

In the Plant Pathology Department, environmental entities influencing cabbage parasites were gathered and characterized. During in the study season, the population size of cabbage pests was determined by grade. Reduced concentrations of prospective parasites are achieved in large part by natural enemies. It has been repeatedly demonstrated when pesticides have eliminated the natural enemies of potential bugs. When insects are freed from the control of their natural enemies, many frequently turn into pests that were once scarcely noticeable and of little economic importance.

## Conclusion:

Overall, all the data suggest to the beneficial influence of pesticides intake on cabbage sales. As a conclusion, the estimate results indicate the well accepted statement that cabbage growers in regions with biocontrol agents earn much less money. Initially, the degree to which biological control has been established in the field of cabbages, and secondly, the degree to which DBM has developed chemical tolerance. Furthermore, assessment findings of production factors using emerge resulted in the assumption that biological control reduces the revenue from cabbage production as compared to development under biocontrol agents. For the long-term maintenance of this insect, biologically effective measures should be used in conjunction with biological control techniques in Integrated Pest Management systems. One approach to eradicating these parasites that is beneficial to the environment is biological control.

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