EXECUTIVE SUMMARY

1. India uses nearly 83,000-85,000 tons of chemical pesticides annually to control pests and vectors affecting agricultural production and human health. The use of pesticides is particularly high in the case of cotton and paddy, which account for about 45% and 25% respectively of the total pesticides used in agriculture. Fruits and vegetables consume around 8% and cereals, pulses, oilseeds, millets use around 6-7% of the total pesticides in agriculture.

Although India's consumption of pesticides per hectare is lower than the consumption in developed countries, (Compared to 3 kg. per hectare in Europe and U.S.A. and 12 kg. per hectare in Japan, average pesticide consumption in India is only 300 grams per hectare), the level of pesticide residues is high in India. The problem of pesticide residues is particularly serious in the case of cereals, pulses, fruits, vegetables, milk and milk products.

Another consequence of large scale and increased usage of pesticides is the development of resistance in target species. For example, Diamond Black moth (Plutella Xylostella), a serious pest of crucifers and now a serious problem on mustard in N. India, has developed resistance to HCH, endrin, parathion, fenitrothion, malathion, quinalophos, cypermethrin, fenvalerate and deltamethrin. Several reports also indicate that Spodoptera litura (Tobacco caterpillar), Jassid (Empoasca kerri), Aphid (Lipaphis erysimi) and Helicoverpa armigera have also developed resistance to various chemical pesticides.

2. Environmental considerations and the problem of pesticide resistance suggest that there is urgent need to adopt environmentally safe pest control strategies. The use of biopesticides is a vital element of this strategy. It is particularly relevant for the integrated pest management (IPM) programmes initiated by the government. In addition to being environment friendly, the use of biopesticides is also found to be cost effective.

3. The major advantages of the use of biopesticides include the following :

(i) Reduction of pesticide load on the environment by up to around 50-70%.
(ii) Conservation of natural enemies, such as predators, parasites, thereby maintaining ecological balance between pest and natural enemies.
(iii) Reduction in the pest resurgence and pesticide resistance.
(iv) Reduction in the cost of pesticide input to the farmer.
(v) Reduction of pesticide residues in crops and vegetables.

4. The important biocontrol agents include predators (such as Chrysopids), parasites (such as trichogramma), bacteria (such as bacillus thuringiensis (B.t), fungi (such as

trichoderma), baculoviruses (such as NPV and GV) and botanical products (such as neem).

5. In spite of obvious advantages associated with their application, the use of biopesticides is limited. A number of factors such as the unavailability of biopesticides of high and uniform quality and the greater marketing strength of the chemical pesticide producers has restricted the use of these agents to a considerable extent.

6. A large number of research centres, universities and government agencies are engaged in the development of biopesticide production and application technologies. Technology to produce parasites, predators, baculoviruses, B.t and neem has already been developed. However, there are important technological gaps between India and developed countries in the field of biopesticides. These relate to the development of improved strains, large scale production techniques and improved application methods.

Recommendations

7. Crops, pests and areas where biopesticides are likely to play a major role in the short and medium term should be identified and promotional efforts may be concentrated on these. Some of the crops which require immediate attention are cotton, rice, vegetables, sugarcane, oilseeds and pulses.

8. Greater importance to the use of biopesticides in the IPM programme may be given. However, where necessary, the use of chemicals with biopesticides can also be considered.

9. Duplication of research efforts by various universities and research centres should be avoided. Joint research to solve various aspects of the problems should be encouraged.

10. Research aimed at increasing the target range, speed of action, greater tolerance to environmental conditions and better formulations could be supported. Very little research in the field of genetics which can lead to the development of more effective strains is being undertaken. Efforts in this field need to be expanded.

11. Commercialization of existing technologies, using modern production methods and equipment, may be supported. The biopesticide research centres do not have sufficient expertise in manufacturing technologies. Collaborations with industry and engineering consultants to develop large scale, efficient technologies should be supported.

12. The quality specifications of various biopesticides may be standardized and monitored by the government agencies. At present the quality is not monitored by the government, resulting in the frequent marketing of poor quality products.