INSECTICIDE RESISTANCE MANAGEMENT STRATEGIES

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In intensive agriculture, insecticides have been looked upon omnipotent weapons for modern pest management. Excessive and indiscriminate use of insecticides in crops has led to problem of insecticide resistance, pest resurgence, accumulation of harmful residues and toxicity to non target organisms. This has prompted the necessity for the development of non insecticidal alternatives that could be feasible and effective for insect pest management, while also being compatible with the environment. Resistance to insecticides reduces the effective window for insecticide to achieve economic control of insect pests, hence, the choice of effective insecticide is important if pest control has to be efficient. Primarily, the insecticide resistance management (IRM) strategies aim to at least slow down the resistance treadmill, thereby extending the usefulness of available chemicals. Successful IPM is not just a clever re-organization of chemical countermeasures in to mixture and/ or rotation schemes. IPM strategies must complement good Integrated Pest Management (IPM) practice and only when IRM is properly incorporated into acceptable IPM programme will there be any hope of successful resistance management. Integrated Pest Management approaches incorporate all approaches to ensure favourable biological, ecological and sociological consequences.

What is resistance?:

Resistance to insecticides may be defined as 'a heritable change in the sensitivity of a pest population that is reflected in the repeated failure of a product to achieve the expected level of control when used according to the recommendation for that pest species'.

Resistance arises through the over use or misuse of an insecticide or acaricide against a pest species and results in the selection of resistant forms of the pest and the consequent evolution of populations that are resistant to that insecticide or acaricide.

Principles of resistance management :

Insecticide or acaricide resistance management strategies seek to minimise the selection for resistance to any one type of insecticide or acaricide. This requires an understanding of insecticides as they are grouped according to similarity of Mode of Action (MoA) in controlling insects and mites. In practice, sequences or rotations of compounds from different MoA groups provide an effective approach to resistance management.

Effective resistance management strategies use alternations or sequences of different modes of section:

The objective of Insecticide Resistance Management is to prevent or delay resistance developing to insecticides, or to help regain susceptibility in insect pest populations in which resistance has already arisen. IRM is important in maintaining the efficacy of valuable insecticides. It is usually easier to prevent resistance occurring than it is to reactively regain susceptibility.

Insecticide applications are often arranged into MoA spray windows or blocks that are defined by the stage of crop development and the biology of the pest(s) of concern. Expert advice should always be followed with regard to spray and its timings. Several sprays of a compound may be possible within each spray window but it is generally essential to ensure that successive generations of the pest are not treated with compounds from the same MoA group.

Mode of action, target-site resistance and cross-resistance:

In the majority of cases, not only does resistance render the selecting insecticide ineffective but it often confers cross-resistance to other chemically related compounds. Compounds within a specific chemical group usually share a common target site within the pest, and thus share a common Mode of Action. It is common for resistance to develop that is based on a genetic modification of this target site. When this happens the compound loses its pesticidal efficacy. Because all compounds within the chemical sub-group share a common MoA, there is a high risk that the resistance will automatically confer cross-resistance to all the compounds in the same sub-group. It is this concept of cross-resistance within chemically related insecticides that is the basis of the Mode of Action classification.

Alternation of chemistry:

Constant use of insecticides from one chemical grouping will increase the risk of rapid build up of resistance to that chemical group. Alternate use of chemical groups with different MoAs will slow down the process of selection for resistance.

Use of cultural practices:

Incorporation of cultural techniques for controlling an

insect pest will reduce selection pressure from the insecticides. Any resistance management strategies should incorporate all available methods of control for the insect pest concerned.

Understanding of the insect life cycle:

A good understanding of the life cycle of the pest is essential so that control methods can be effectively targeted. An insecticide should always be targeted at the pest growth stage that is most susceptible for that insecticide or acaride.

Application:

Use recommended dose: Recommended dose of insecticide have been carefully used to ensure the most effective control of the pest.

Rate of application: Full recommended dose of insecticides should always be used to ensure the most effective control of the pest.

Coverage: The majority of insecticides require good coverage of the target area to ensure the best possible chance of contact and subsequent control of the pest.