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Pest Survey, Surveillance, Forecasting, Sampling Methods and their Uses in Agriculture

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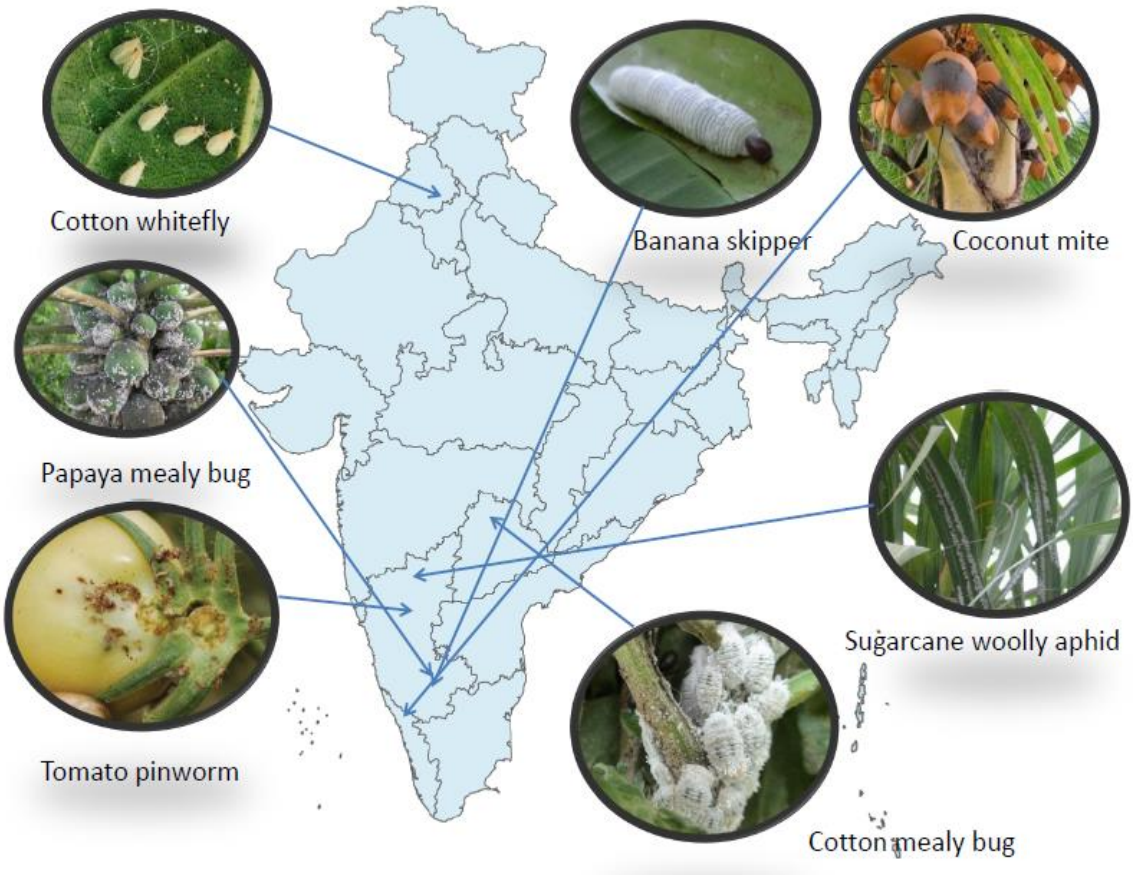
SUMMARY

Pest monitoring through field surveys and surveillance helps in forecasting the population buildup of pest. It reduces the load of pesticides application and forms the basis of Integrated Pest Management. Common sampling techniques for quantifying pest populations and damage caused by them are reviewed emphasizing the need for quick and simple sampling methods. Various direct and indirect sampling methods for establishing pest populations are discussed and methods have been discussed to use indirect sampling method under IPM programme. The use of pheromone lures and traps forms one of the important ingredients of integrated pest management, which calls for integration of all available methods in a cost effective and environmental friendly manner offering consistent efficacy.

INTRODUCTION

Monitoring for pests is a fundamental first step in creating a proper integrated pest management (IPM) programme. Pests are monitored through a variety of monitoring tools such as pheromone traps, light traps, coloured sticky traps, pitfall traps and suction traps. Specific surveys involve field work—going out and looking for the pests. This chapter covers the steps on how to decide where to look, how many places to look in and what sort of data to collect. The chapter goes on to provide information on how to collect and preserve specimens, followed by discussion of other important considerations to make the most of your survey, including guidance on what to do with the data collected. Before you can go into the field and begin looking for pests, there are many planning decisions to be made. A survey plan needs to be robust, and the results should represent the actual pest status. The plan needs to be feasible both physically and financially. There are no hard and fast rules about the correct number of samples, or one correct way of designing a survey. Because of this, it is important that the reasons for the design steps chosen are transparent.



Pest survey:

An official procedure conducted over a defined period of time to determine the characteristics of a pest population or to determine which pest species occur in an area.

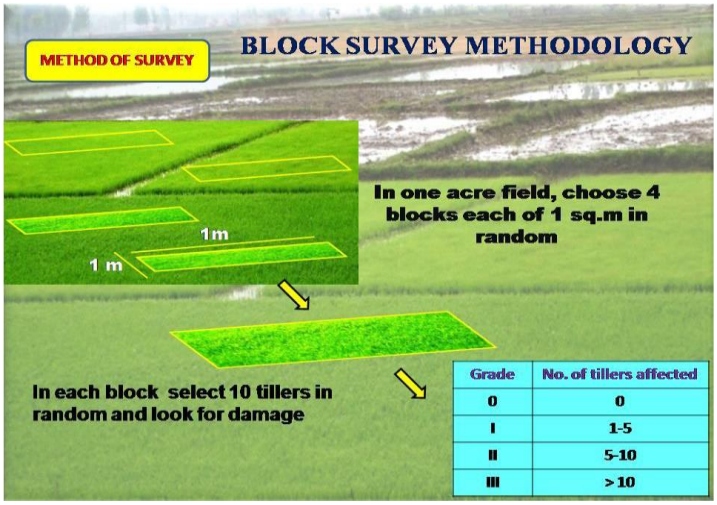
Two types of survey - Roving survey and fixed plot survey

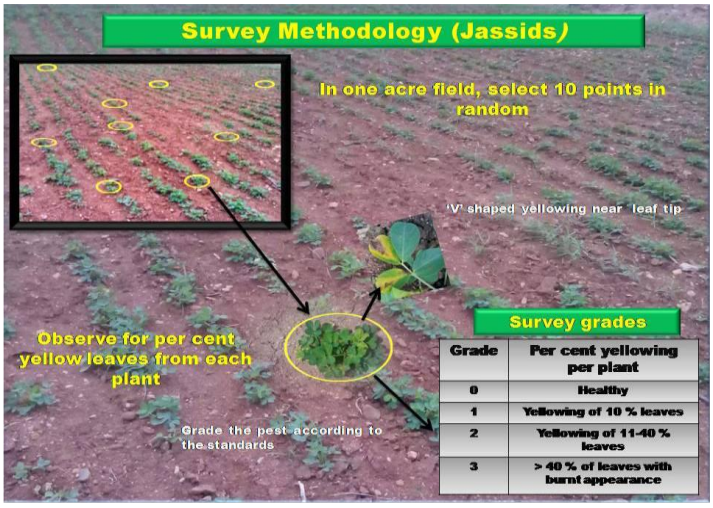
A. Roving survey

- Assessment of pest population/damage from randomly selected spots representing larger area
- Large area surveyed in short period

B. Fixed plot survey

- Assessment of pest population/damage from a fixed plots of a region.
- The data on pest population/damage recorded periodic from sowing till harvest.





Pest Surveillance

Refers to an official process which collects and records data on pest occurrence or absence by survey, monitoring or other procedures.

Objectives of Pest Surveillance

- To know existing and new pest species.
- To assess pest population and damage at different growth stage of crop.
- To study the influence of weather parameters on pest.
- To study changing pest status (Minor to major).
- To assess natural enemies and their influence on pests.
- Effect of new cropping pattern and varieties on pest.

There are two major types of surveillance systems

General surveillance:

Process whereby information on particular pest which is of concern for an area is gathered from many sources, wherever it is available and provided for use by NPPOs (National Plant Protection Organizations).

Specific survey:

Procedures by which NPPOs obtain information on pest of concern on specific sites in an area over a defined period of time.

Pest Forecasting:

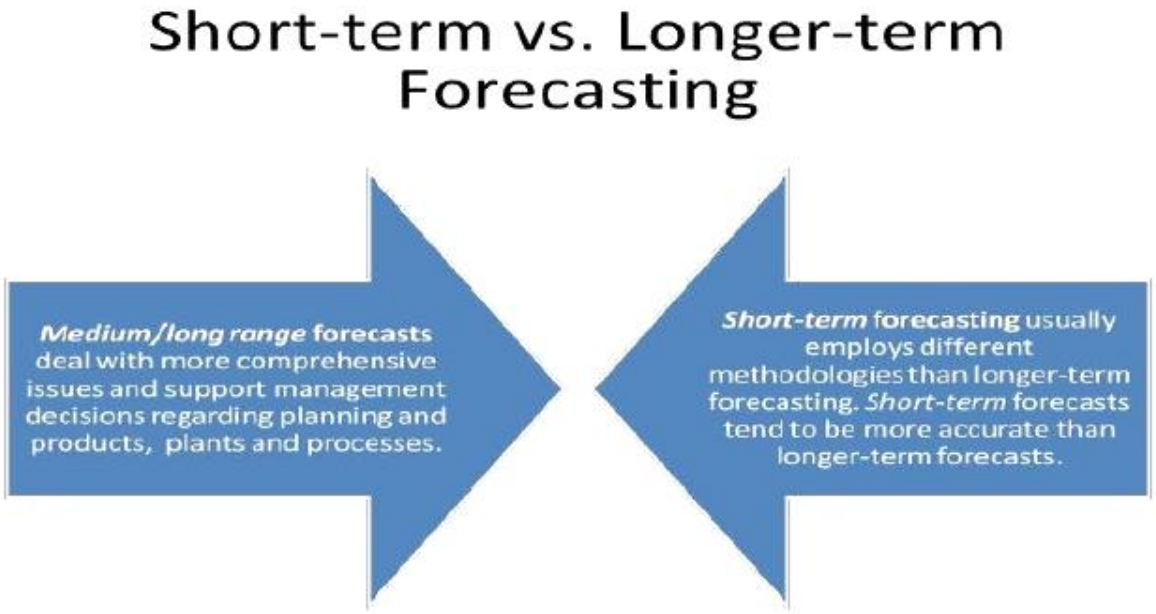
Forecasting of pest incidence or outbreak based on information obtained from, pest surveillance.

Uses

- Predicting pest outbreak which needs control measure.
- Suitable stage at which control measure gives maximum protection.

Two Types of Pest Forecasting

a. Short Term Forecasting - Based on 1 or 2 seasons.
b. Long Term Forecasting - Based on effect of weather parameters on pest.



Sampling Techniques

1. Absolute sampling - To count all the pests occurring in a plot
2. Relative sampling - To measure pest in terms of some values which can be compared over time and space e.g. Light trap catch, Pheromone trap.

Light trap

Yellow sticky trap

Pheromone trap

Methods of sampling

a. **In situ counts** - Visual observation on number of insects on plant canopy (either entire plot or randomly selected plot)
b. **Knock down** - Collecting insects from an area by removing from crop and (Sudden trap) counting (Jarring)
c. **Netting** - Use of sweep net for hoppers, grasshopper etc.
d. **Norcotised collection** - Quick moving insects anaesthetized and counted
e. **Trapping –**

- Light trap - Phototropic insects.
- Pheromone trap - Species specific.

- Sticky trap - Sucking insects.
- Bait trap - Sorghum shoot fly - Fishmeal trap. Emergence trap - For soil insects.

Pheromone trap

Light trap

f. **Crop samples** Affected plant parts are counted *e.g. Bollworms.*

Stage of Sampling

- Usually most injurious stage counted.
- Sometimes egg masses counted.
- Practical considerations.
- Hoppers - Nymphs and adult counted.

Sample Size

- Differs with nature of pest and crop.
- Proper sample size gives accurate results.

Decision Making

- Population or damage assessed from the crop.
- Compared with ETL and EIL.
- When pest level crosses ETL, control measure has to be taken to prevent pest from reaching EIL.

CONCLUSION

Models are potential tools for synthesizing the available information and knowledge on population dynamics of pests in agro ecosystems and natural habitats. The development of long-term monitoring spatial data on crop–pest– weather relationships will narrow the gaps in knowledge required for reliable forecasts. Computer-based systems have increased the speed and accuracy of forecasting, and decreasing its costs. Pest monitoring is the foundation for the issue of early warnings, development and validation of pest forecast models and decision support systems, which are crucial for the design and implementation of successful IPM programmes. Recent developments in information and communication technology offer great scope for wide dissemination and use of pest forecasts. In the tropics, agro ecosystems are characterized by greater crop diversity in small parcels of land with dynamically changing weather. Available generic simulation models need to be validated with location-specific c inputs for greater accuracy. In developing countries, there is a strong need to establish agro-meteorological networks for specific c crop sectors with the major objective of pest forecasting through models and decision support systems.

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