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Pests, Causes for Outbreak and Categories - I

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SUMMARY

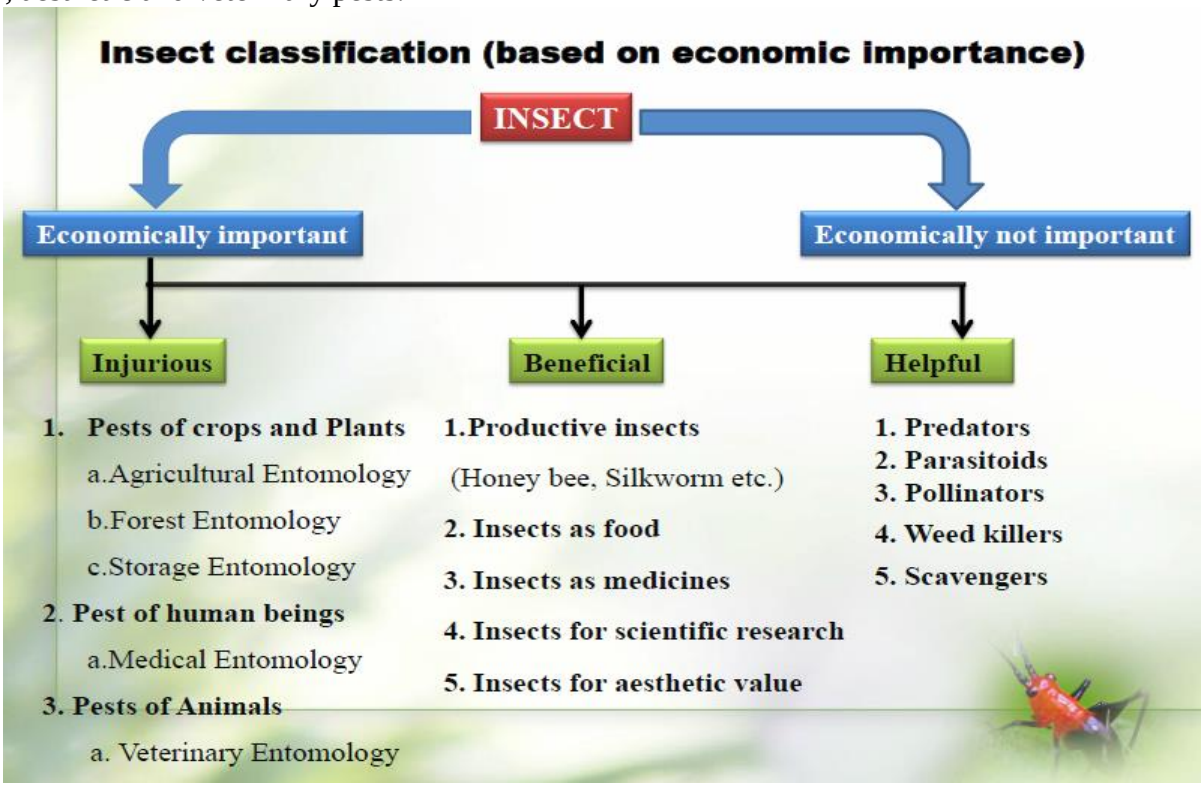
Outbreaks of insect pests have plagued the planet from time immemorial. Naturally, it is important to understand the causes of pest outbreaks, for then it may be possible to control or prevent them from happening by manipulating the causal factors. The general theory of population dynamics recognizes two major kinds of insect outbreaks: "gradient" and "eruptive".

INTRODUCTION

PEST - Derived from French word 'Peste' and Latin term 'Pestis' meaning plague or contagious disease - Pest is any animal which is noxious, destructive or troublesome to man or his interests - A pest is any organism which occurs in large numbers and conflict with man's welfare, convenience and profit. "Pest is an any organism whose population increases to such an extent as to cause economic loss to crops or a nuisance and health hazards to man and his live stock".The word pest is derived from French '*Peste*' and latin terms '*pestis*' means plague or contagious disease.

Pests are organisms which impose burdens on human population by causing-

- Injury to crop plants, forests and ornamentals.
- Annoyance, injury and death to humans and domesticated animals.
- Destruction or value depreciation of stored products. - Pests include insects, nematodes, mites, snails, slugs, etc. and vertebrates like rats, birds, etc. Depending upon the importance, pests may be agricultural forest, household, medical, aesthetic and veterinary pests.



The pest status of an insect spices may be determined by numbers of ways such as

- Increase in the number of insects,
- Change is the type of damage inflicted on the crop,
- Change in method of cultivation or harvesting,
- Fluctuation in the market value of the crop etc.

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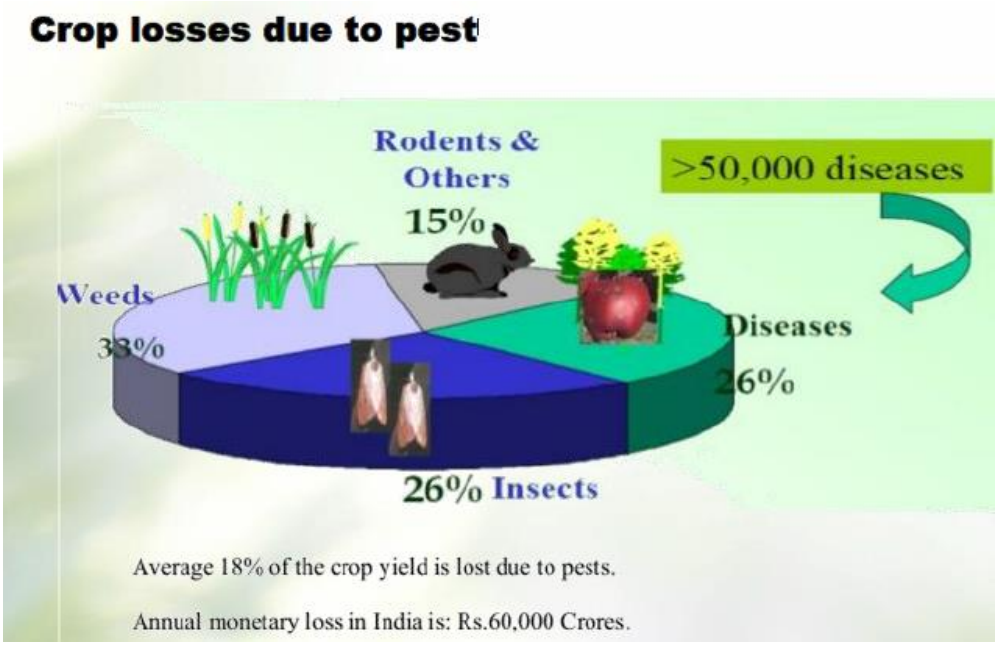


Reasons for outbreak of Pests

- Destruction of forest or bringing forest area under cultivation.
- Destruction of natural enemies.
- Intensive and extensive cultivation of crops: Eg. Stem borers in rice and sugarcane.
- Introduction of new crops and improved variations Introduction of new crop may some as new host for the pest.

Estimation of losses caused by insect pests to major agricultural crops in India

Crop	Approx. estimated loss in yield		Hypothetical production (MT)	Value of loss in million Rs
	%	Total (MT)		
Cotton	30	18.9	62.9	339660
Rice	25	32.2	128.9	240138
Maize	20	4.8	23.8	29450
Sugarcane	20	87.1	435.3	70667
Rapeseed-mustard	20	1.5	7.3	26100
Groundnut	15	1.6	10.8	25165
Other oilseeds	15	2.6	17.3	35851
Pulses	15	2.6	17.4	43551
Course cereals	10	2.0	19.9	11933
wheat	5	4.1	82.7	41368
Total/average	17.5			863884

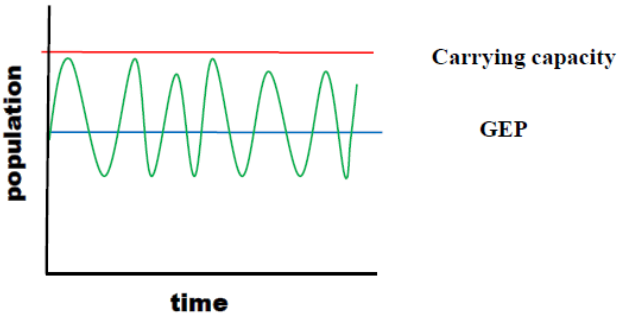
Production and MSP fixed by GOI for 2007-08, are adopted from anonymous (2010)

Sunflower and head borer

- Improved agronomic practices.
- Introduction of new pest in new areas.
- Accidental introduction of foreign pest.

When an insect is called a pest?

General equilibrium positions (GEP): It is the average of a population over a long period of time, around which the insect population tends to oscillate due to biotic and abiotic factors.

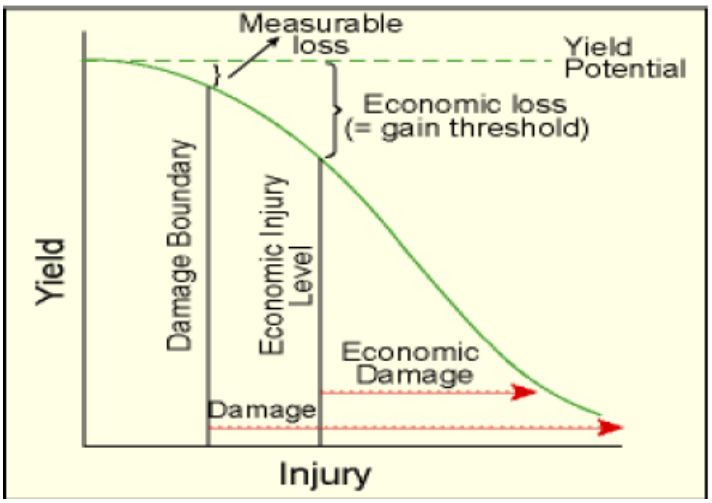


- Biotic factor: fecundity, food availability, natural enemies etc.
- Abiotic factors: Temperature, Rainfall, Humidity, wind etc.

Damage boundary (DB): It is the lowest level of damage which can be measured.

Economic Injury level (EIL): It is defined as the lowest population density of insect that will cause economic damage.

- The critical density of insect population where the loss caused by the pest equals the cost of control measures.



How to Calculate Economic Injury Level?

EIL can be calculated by using the following formula-

$$EIL = P' = \frac{C}{V \times I \times D \times K}$$

P’ = Economic Injury level in insects / Production or insects / ha
C= cost of management activity per unit production (Rs/ha)
V= Market value per unit yield (Rs/tonne)
I = Crop injury per insect (percent defoliation or percent fruit damage)
D= Damage or yield less per unit injury(Tonne less or % defoliation)
K= proportional reduction in injury from pesticide use.

Worked Example:

Problem: Calculate EIL in terms of pest population/ha with the following figures.

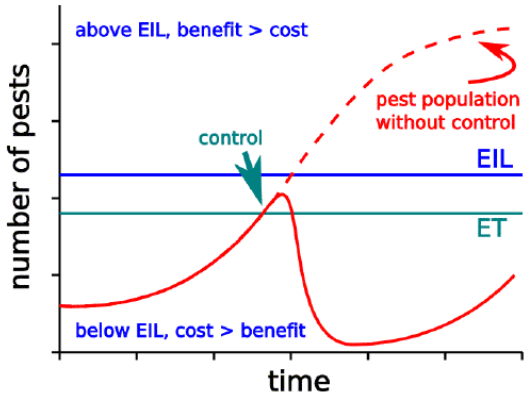
C= management cost per unit area = Rs. 3000/ha
V= market value (in Rs/ unit product) =Rs 1000/tonne
I= crop injury / Pest density = 1% defoliation /100 insect
D= Loss caused by unit injury = 0.05 tonne loss/ 1%defoliation
K = Proportionate reduction in injury by pesticide application = 0.8(80% control)
EIL=C/VIDK
= 3000/1000x0.01x0.05x0.8 =**7500 insects/ ha.**

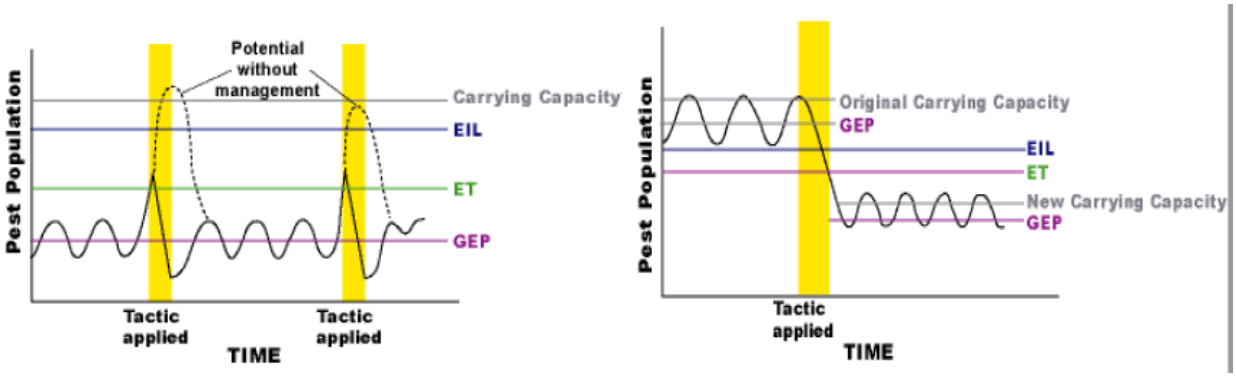
Is EIL of a pest constant at all time?

EIL is influenced by

- **Market value of the crop (Primary factor):** When crop value increases, EIL decreases and vice versa
- **Management of injury by insect (Primary factor):** When management cost increases, EIL also increases.
- **Degree of injury per insect (Secondary factor):** Insect damaging leaves or reproductive parts will have different EILs For instance, defoliators will have higher EIL If insects are found on fruits – EIL low. If insects are vectors of diseases EIL is very low.
- **Crop susceptibility to injury(Secondary factor):** If the crop can tolerate the injury and gives good yield, EIL can be fixed at higher volume. When the crop is older, it can withstand high population- EIL can be high.

Economic Threshold Level (ETL) or Action threshold: It is defined as the pest density at which control measures should be applied to prevent an increasing pest population from reaching EIL.





Resurgence

Tremendous increase in pest population brought about by insecticides despite good initial reduction in pest population at the time of treatment.
Deltamethrin, Quinalphos, Phorate - Resurgence of BPH in rice
Synthetic pyrethroids - Whitefly in cotton
Carbofuran - Leaf folder in rice

Losses caused by pests

Crop loss from all factors - 500 billion US $ annually world wide
Insect pests - 15.6% loss of production
Plant pathogens - 13.3%
Weeds - 13.2%

CONCLUSION

Pesticides resistance and pest outbreak both are harmful to environment and human being as well, there are many times found that pest outbreak in India and other countries that was severe, and did high economic loss to mankind. To control their population many scientist developed new and effective method, and we use chemical method much more, because it is highly efficient method and it gives quick result. But continuous use of pesticides make insects resistant to the chemical thus we go to IRM (integrated resistance management) by which we are trying to break the resistance it is an effective method developed by IRAC (insecticidal resistance action committee) this method is a combine approach of all available method of managing pesticidal resistance, like cultural control, mechanical control, biological control, chemical control etc

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