CULTURAL PRACTICES FOR PREVENTION AND MANAGEMENT; HOST PLANT RESISTANCE; BIOLOGICAL AND CHEMICAL

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CULTURAL PRACTICES

Cultural controls aim to keep plant healthy

To maintain a healthy crop:

- Develop healthy soil
- Choose the right variety/cultivar
- Mow high weeds
- Irrigate regularly and effectively
- Set realistic goals

Outline

- Cultural practices
  - (various)
- Host plant Resistance
- Biological
- Chemical control

TYPES OF CULTURAL

- Preventive
- Suppress

Disease free seeds

Use disease /weed free seed to establish crop

CULTURAL PRACTICES FOR MANAGEMENT

- Resistant cultivars
- Disease free seeds (certified)
- Crop rotation
- Intercropping
- Barrier cropping
- Mulching
- Hand weeding
- Sanitation
- Provision of nutrient and water
- Use of plant extracts
- Prevent spread or entry

Crop rotation

- The act of replacing growing crops in succession with unrelated or non-susceptible hosts, or with green manure crops or leaving the land fallow (in this case non cereal crops)
  - It breaks the pest cycle
    - e.g bacteria wilt (brocolii) , RKNs in lettuce (tomato or beans), MLND (leguminous crops during the closed season)
  - Recycles nutrients
  - Enhances soil quality by improving soil structure, balancing the accumulation and decomposition of organic matter and prevents soil erosion

Example of Combining several CPs to manage disease

Head smut

To control RKNS:
Use trap crops
Biocontrol or soil ammendment
Use resistant cultivars
Ensure adequate nutrition

Use resistant varieties
Use certified seeds
Rotate with non-cereals
Plough deep

Using cover crops

- To suppress weeds
- Attract natural enemies
- Increases nutrients
- Increases microbial activity
- Improve water penetration

Use of a trap crop to attract insects that can then be killed away from the target crop

USE OF RESISTANT CULTIVARS

To avoid severity of pest abundance

- The resistance may be inherent through genes (resistance genes) OR
- may be acquired by giving adequate nutrition, and adequate watering or spraying with salysilic acid



Resistance may be inherent or acquired

CULTIVATION

- Different ways of tilling the land help to manage the pests

e.g Deep ploughing

- will bury any plant debris that may be infested
- Will bring pupae to the top where they dry off and die or be buried deep and the adults are not able to emerge
- Will also bury weed seeds deep reducing early competition with target crops

E.g Conservation tillage will favour the increase of all insects that pupate on ground (thrips, leaf miner, fruit fly) for lack of disturbance of the soil

IRRIGATION METHODS

Influence the pest occurrence and abundance

- Overhead : washes away insects such as aphids, whiteflies and thrips and will prevent the egg laying activities of Potato tuber moth BUT
- Amount applied is important to allow leaves to dry because wetness does encourage fungal disease development if the area remains humid for long where moderate to warm temperatures will encourage spore germination
- Amount of water applied may also favour rots like bacterial soft rot and downy mildew
- Dry conditions and dust support abundance of mites

SANITATION

- Involves the removal of old plant debris/residue and weeds/alternate hosts from the field
  - Eliminates inoculum and areas for pest survival
  - The actions will keep away mites, aphids, thrips, scales, stem borer, fungal, bacterial and viral diseases (MCMV, *Ralstonia, Fusarium wilt*)
- Also involves cleaning farm equipment
  - to prevent spread of pest problems like, RKNs, bacterial wilt and post harvest pests which may infest grains left in the machines (planters, combine harvesters, mixing drums)

Other practices include

- Intercropping, Soil solarization, biofumigation, Mowing, mulching, flood irrigation all will reduce weed development and disease innoculum

- The cultural practices have to be used in combination to control foliar diseases,soil borne diseases and weeds

Intercropping:

A Cultural practice that reduce pests

A field of maize and dry beans intercropping system

Photo credit: Howard F. Schwartz, CSU

Interferes with the searching ability of insect pests and where resistant varieties have been used Nematodes are controled but may favour fungus development such as white mould

Pigeon pea intercropped with mung bean

Pigeon pea intercropped with groundnuts

BIOLOGICAL CONTROL

Three forms

- Classical introducing natural enemies identified from the place where pest originated. It is assumed that the Natural enemies will establish and control the pest

- Augmentation : rear in insectary and release to increase the effect of what is existing in the field

- Inundative: identifying the NE s within the field and making conditions favorable for them to exert the effect on pests e.g border crops that will serve as refugia, cover crops whose flowers will provide food and refuge for the naural enemies





Northfield, Eigenbrode, Snyder 2012 (Ecology)

Plant type and the Insect Community

Geocoris pallens

Nabis alternatus

Hippodamia convergens

Coccinella septempuncata

Aphidius ervi

Acyrthosiphon pisum

Pisum sativum

Northfield, Eigenbrode, Snyder 2012 (Ecology)

CHEMICAL CONTROL

- Use of natural or synthetic substances that cause the death /repulsion or attraction of pests and to be effective consider :
- Mode of action: the way it kills
  - Is it a repellant, disrupter, poison, eradicator, systemic
- Persistence: length of time it is active or it takes to break down after application
  - Non persistent: short period of activity within which it acts on the pests
  - Persistent: Takes long to break hence remains active for a linger period to act on the pests

CHEMICAL CONTROL

- Non target effects: the effect it has on other insects (natural enemies), non insects in the environment such as man, wild life, fish. There are risks for:
  - Killing beneficial insects
  - Creating new pests after killing the enemies
- Resistance development: resistance lessens th effectiveness of a pesticide for reducing target populations. The pesticide only
  - kills susceptible pests,
  - Survivors pass the traits to the offsprings
  - Resistance develops over generations

CHEMICAL CONTROL

Resistance is brought about by

- The use of one pesticide molecule repeatedly
- The use of a pesticide over large areas landing in areas that may not have a population that requires management as opposed to hot spots
- The use of highly residual pesticides that allow for many insects getting into contact with exposed plant to be exposed to the pesticide

How to reduce the potential of resistance development

- Rotate pesticides, target applications, use persistent chemicals wisely

In case of herbicides it is important to consider :

- Foliar vs soil application

MLND MANAGEMENT

- Plant in an area where maize was not grown previously or has not just been harvested
- Use disease free seeds
- Control vectors for MCMV from 2 wks after germination (use pesticide with residual effect)
- Deep ploughing
- Rogueing
- Practice closed season
- Plant in appropriate agro ecological zone/environment

THANK YOU

SEMIs UoN

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