

Resistance to Pesticides

Rupert Knowles

Farmer Choices

If a farmer has a pest problem and has been advised to apply pesticides, he has many factors to think about.

List 10 factors that affect the farmer's choice of pesticide

Work in pairs, preferably one person from an FSC with one farmer.

Factors affecting Farmer's Choice of Pesticide 1

1. Approval for the intended use - crop and pest
2. Efficacy (does it kill the pest?)
3. Safety to beneficials
4. Safety to operator bearing in mind the equipment to be used
5. Safety to consumer, public – within harvest interval

Factors affecting Farmer's Choice of Pesticide 2

6. Safety to environment – especially bees and aquatic environment
7. Avoiding resistance
8. Availability
9. Ease of use
10. Price

Pesticide Resistance

- We have a limited number of pesticides to choose from
- Other factors also affect our choice
- Therefore we must avoid build-up of resistance and
- Ensure all pesticides remain effective

How do Pesticides kill Pests?

Fungicides

- Protectant
- Eradicant
- Systemic – 3 types
 - Translaminar – goes through the leaf
 - Goes up in the sap, but not down
 - Truly systemic – goes both ways
- Attack one part of life cycle
- Attack one part of metabolism

How do Pesticides kill Pests?

Insecticides 1

- Contact poison
- Stomach poison
 - Eats leaf e.g. caterpillar
 - Sucks sap e.g. aphid
- Respiration poison

How do Pesticides kill Pests?

Insecticides 2

- Attacks nervous system
- Attacks digestion
- Bacteria – develops and eats inside of pest
- Insect Growth Regulator – stops molting
- Multi site
- Single site

How do pests become resistant?

- Changes to the pest chemistry that the pesticide attacks – ‘target site resistance’
- Resistance will apply to other chemicals that attack the same target site
- Enhanced metabolism inside the pest
- Reduced penetration into the pest
- Changes in pest behaviour

Factors that Contribute to Resistance?

- Using pesticides unnecessarily
- Always using the same pesticide
- Using pesticides from same group
- Eliminating natural enemies
- Using low or high rates
- Enhanced degradation – soil pests

How to Avoid Resistance

- Have a strategy to avoid resistance
 - Consult label
 - Consult internet sites of international anti-resistance groups
 - Include non-chemical pest control (IPM)
 - Keep records and watch for resistance
- Alternate pesticides from different groups
- Mix pesticides from different groups

How are Chemicals grouped?

- Chemistry
- Mode of Action
- Pest resistant mechanism

Some common Insecticide Groups

- Organophosphates
 - Act on nervous system
 - Dimethoate, Chlorpyrifos, Azinthalos-methyl, DDVP, Malathion, Parathion, Phorate
- Pyrethroids
 - Act on nervous system
 - Cypermethrin, Bifenthrin, Lambda-cyhalothrin, Fenvalerate, Bioallethrin, Cyfluthrin, Deltamethrin
- Neonicotinoids
 - Act on nervous system
 - Acetamiprid, Clothianidin, Dinotefuran, Imidacloprid, Nitenpyram, Thiacloprid, Thiamethoxam

Some common Fungicide Groups 1

- DMI fungicides
 - Triazoles: myclobutanil, penconazole, flusilazole, triadimefon
 - Imidazoles: imazalil, prochloraz, triflumizole
- Morpholines
 - Dodemorph, fenpropimorph, tridemorph
- Phenyl Amides
 - Benalaxyl, furalaxyl, metalaxyl,
 - metalaxyl-M (=mefenoxam)

Some common Fungicide Groups 2

- MBC fungicides
 - Benzimidazoles: benomyl, carbendazim, thiabendazole
 - Thiophanate-methyl
- Qo1-fungicides (strobilurins)
 - Azoxystrobin, kresoxim-methyl, famoxadone
- Dicarboximides
 - Iprodione, procymidone, vinclozolin

Pesticides unlikely to cause resistance

- Benzoylureas
 - Inhibit chitin
 - Diflubenzuron, Flufenoxuron, Teflubenzuron
- Fungicides with multi-site contact activity
 - Copper, Sulphur, Thiram, Mancozeb, Captan, Chlorothalonil

FSC Agro-Dealers

- Study the internet websites of the international anti-resistance action groups
 - FRAC
 - IRAC
- Stock and sell fungicides and insecticides from different pesticide groups
- Make sure the new pesticide law does not limit choice and cause resistance.