Crop specific guidance – Cereals: Wheat, Barley and Oats.

The IPM Tool allows you to prioritise pests that are important on your farm. This helps guide decisions on which IPM measures are appropriate. Implementing IPM can result in 'trade-offs' where methods to control one pest may increase another. Some of these trade-offs are included in the notes below and in the Tool. Prioritising pests will help decide which pests are most important where there are trade-offs. This guidance documents provides advice on IPM measures for cereals insect pests and diseases. For information on IPM interventions for weeds, refer to the separate IPM Weeds guidance document.

Insect Pests

Insect pests in cereals cause damage to the crop either through direct feeding or through the transmission of viruses during feeding. Insect pest control has been highly dependent on using seed treatments and applications of insecticides, but reductions in available chemistry and increasing resistance issues have increased the need to make use of integrated management for control of insect pests.

Few of the non-chemical methods are likely to be 100% effective in arable crops, except for the use of varieties resistant to orange wheat blossom midge (OWBM) or barley yellow dwarf virus (BYDV). However, they do reduce the requirement for chemical control. Combinations of one or more techniques are likely to be most effective. Also, in some instances the presence of some insect damage will not necessarily impact on yield.

Select low risk locations / Avoid following long-term grass leys

Populations of some pests can build up under long-term leys, such as wireworms and leatherjackets. These will potentially feed on any crop following a grass ley. Cereals sown soon after the destruction of a grass leys are susceptible to the direct transfer of frit fly larvae, so a gap of at least six weeks is advised between sward destruction and drilling of the following cereal crop.

Select low risk locations / Soil analysis

It is possible to take soil samples before sowing to estimate pest numbers and assess the risk of economic damage to the crop.

Field History, Rotation & Break crops

Some pests are relatively immobile, and numbers increase only when their host crop is grown too often in the same field. Examples include orange wheat blossom midge (OWBM) and saddle gall midge. Other pests such as wireworms have a long-life cycle so need the host crop to remain for several years. Growing alternative, non-host crops for appropriate periods can avoid this build-up. The length of the break may vary between pests. To limit the potential risk from saddle gall midge, winter-sown oats can be grown as a break crop or trap crop.

In field non-cropped areas / Beetle banks / Diverse crop margins or strips

Beetle banks consist of stands of wildflowers and grasses and are designed to act as reservoirs of beneficial insects such as ground beetles and parasitoids, which help to provide natural biological control of pests including BYDV vectors.

Diverse crop margins and strips act in a similar way to beetle banks to increase natural enemies. However, some of the plant species could benefit pests. Plain grass strips are more likely to predominantly harbour cereal insect pests, whereas more diverse strips should harbour greater biodiversity and greater numbers of beneficials.

Spatial separation

Some pest species are poor fliers so do not travel long distances between host crops in a single season. Wide spatial separation between host crops in successive years can make it difficult for the pest to find them.

Seedbed quality

Poor seedbeds can have two effects on pest damage. Firstly, poor seed/soil contact can cause delays in germination, which can render cereals more susceptible to pests such as slugs. Secondly, rough, cobbly seedbeds allow slugs to access seeds underground. Firm, fine seedbeds avoid both problems and encourage rapid germination and crop establishment, thus decreasing susceptibility to pest attack.

Primary Cultivations / Extra cultivations

The mechanical action of cultivations can reduce soil populations of pests such as slugs, wireworms, and leatherjackets. This can occur in three ways:

- The pests are killed
- Pest are brought to the surface and eaten by birds
- Pests are brought to the surface and become dehydrated.

On the negative side increased cultivations increase carbon footprint and can reduce soil biodiversity.

Primary Cultivations / Minimise trash / Crop residue burial

Undisturbed trash or crop residue can provide shelter and food for pests such as slugs. Allowing cereal volunteers to persist can also create a 'green bridge' which allows aphids to colonise newly established cereal crops and spread BYDV. Conversely, presence of crop residues or trash can reduce pest infestation by providing shelter and refuge for and increased abundance of natural enemies.

Secondary Cultivations / Drilling method

Direct drilling in dry conditions can maintain a consolidated seedbed and limit slug damage. However, in wet conditions it may produce slots that give slugs easy access to seeds. Depth of drilling can also have an impact on slug damage. Ideally cereals should be drilled at about 30–40 mm to minimise damage. Sowing deeper than this will reduce establishment and increase susceptibility to slugs and other pests.

Sowing Date / Delayed sowing

Delayed sowing can reduce the susceptibility of crops to BYDV as the crop may emerge after the aphid migration is complete. However, delaying sowing could also mean the crop is not sown at all due to wet weather. Also, late sown crops may be less robust and generally less tolerant of pests over winter. Late sown crops will be susceptible to wheat bulb fly due to low tiller numbers at the time of egg hatch. Late-sown spring crops are most at risk from gout fly, and in areas where damage is prevalent sowing spring cereals as early as possible and before mid-April is advised.

Sowing Date / Early sowing

Early sowing or planting can result in rapid plant establishment, which in turn can increase the tolerance of the crop to some types of pest damage. For example, the early sowing of winter wheat can increase the tolerance of the crop wheat bulb fly as it is well tillered by the time the pest hatches in the new year. In contrast, early sowing of winter cereals can also increase the risk of BYDV as the crop will be exposed to aphid migration for a longer period than one that is late sown. Early sowing of spring oats is advised to ensure the crop has reached the resistant GS13 by mid-May when egg-laying by frit fly generally begins.

Increased seed rate to suit sowing date

Increasing seed rates can compensate for the loss of plants to pests such as slugs, wheat bulb fly, frit fly or leatherjackets.

Varietal choice

Varieties are now available that are resistant to orange wheat blossom midge (OWBM) or barley yellow dwarf virus (BYDV).

Rolling soil post-planting

Rolling soil post-planting can improve the seedbed quality, resulting in more rapid germination of crops and reducing access of soil-borne pests, such as slugs, to seeds. Rolling may also kill some pests or reduce their mobility.

Decision Support Tools (including thresholds)

IPM decisions should be made based on the results of monitoring and forecasting combined with threshold information where available. Treatment thresholds are the population level or density that must be reached before it becomes economically beneficial. Thresholds enable growers to make decisions based on the level at which pests will impact economic crop yield. They are essential in guiding pest control decisions and preventing the unnecessary use of pesticides.

Links are provided to appropriate decision support tools in the IPM Tool.

Planning pest management strategy

Planning the optimum non-chemical strategy for managing each pest can help to avoid 'fire engine' use of pesticides. Previous records of pest damage are very useful to help predict the likely timing of pest attack. Records should also be kept of the success of non-chemical pest control strategies.

Decision Support / Monitoring techniques

Pest monitoring is an essential component of integrated pest management. This can involve visual inspection of the crop or some sort of trapping system (e.g. water traps, sticky traps, or pheromone traps). Pest numbers are related to thresholds and decisions on the need for treatment. Pheromone traps are available for OWBM and saddle gall midge.

Monitoring and forecasting of pest populations can ensure timely control interventions. Monitoring of pests can be divided into three main principles: observation, weather, and correct identification.

Observation includes regular crop walking, noting populations of insects, weeds, or disease severity, recording crop damage and numbers of beneficial species seen. Using traps can help monitor insect populations.

Weather is one of the main influences for pest development. Monitoring recent and forecasted weather can help predict the impact that pests may have on the crops and prepare for timely control measures.

Correct *identification* of pests can help prevent early outbreaks and is important for deciding on effective control measures. The use of pest ID information (see links in the tool) traps, local warnings, and professional advice from qualified agronomists can all help.

Diseases

Diseases impact on cereals yield mainly through reducing green leaf area during grain filling. For winter wheat control of disease on the upper three leaves is critical. For winter barley tiller survival and maintaining green leaf area for spikelet production is important. For oats yield is dependent on building an efficient leaf canopy and then keeping this photosynthetically active for as long as possible through to harvest.

Field History, Rotation & Break crops

Previous cropping has little or no effect on the likelihood of foliar disease such as rusts, Septoria, Rhynchosporium and net blotch. Eyespot is trash borne from previous cereal crops. Second cereals are at higher risk and a two year break from cereals is needed to prevent eyespot fully. Take all is usually most severe in second, third or fourth successive cereal crops and relies mainly on rotational strategies for control. Mosaic viruses, such as Barley yellow mosaic virus (BaYMV), Barley mild mosaic virus (BaMMV), and Oat mosaic virus (OMV) can persist in the soil for more than 25 years and are unlikely to benefit from break crops, although resistant varieties are available for barley.

Select low risk locations

The selection of lower risk locations can be an effective part of an IPM disease control strategy and is best considered as part of an overall approach against cereal pathogens, as it may affect the degree that other strategies, for example varietal choice and sowing date, are used to control disease.

Epidemics of yellow rust tend to be more severe in coastal regions, particularly in the east, due to the favourable conditions of cooler summers and frequent sea mists. Eyespot favours heavy soils that retain water, however these sites may also have high yield potential. Therefore such locations could still be used with the eyespot risk reduced by later sowing, use of a resistant variety or ensuring the crop was proceeded by a break crop.

Control volunteers & weeds

Cereal volunteers carry a range of diseases and are most significant as a 'green bridge' for powdery mildew, yellow rust, brown rust, and crown rust. Ideally volunteers should be destroyed prior to the emergence of new crops.

Seed testing

The use of certified seed is important for most crops to ensure that heavily infected seed stocks are not used and can be an effective approach to reducing some diseases. Seed testing of home saved seed should be used to identify common seed-borne diseases such as Fusarium spp., bunt and loose smut and contaminants such as ergot. The use of farm-saved seed with high infection levels can cause inoculum to build up and spread within and across fields, and where disease levels exceed set standards or thresholds, apply an appropriate seed treatment or do not use the seed. If seeds are determined to be free of seed borne diseases, particularly bunt and smut, then seed treatment may not be required.

Seedbed quality / Drilling method

Direct and non-inversion drilling increases the risk of disease transfer from previous crop residues and volunteers to the newly growing crop. The main risk is from volunteers, which should be effectively controlled.

Sowing Date / Early sowing

Late sown cereals crops tend to suffer more damage from powdery mildew than earlier sown crops although incidence of the disease may be more common on earlier sown crops but it will have less impact. However, powdery mildew is less damaging to yield than rusts or Septoria.

Sowing Date / Delayed sowing

Delaying sowing can reduce the severity of some diseases. For example, in localities which are prone to BYDV, late drilled (mid-Oct) winter wheat and other cereal crops are less affected by (BYDV) than early sown crops. Late drilling substantially reduces Septoria Tritici Blotch, and will reduce sharp eyespot and take-all in second or third wheats and cereals.

Hygiene

This is the first defence against the introduction of soil-borne diseases into clean land. Machinery used in infested fields should be power-washed before use in uninfected fields, and soil should at least be knocked off from boots and tools. Clean fields should be visited first in the sequence of crops so that cleaning down equipment can be done at the end of the day.

Primary Cultivations / Crop residue burial

Burial of crop debris by ploughing can reduce inoculum for some pathogens which produce inoculum on plant debris such as Septoria, Rhynchosporium and net blotch. This is most important for pathogens, such as eyespot, which disperse spores mainly over short distances. However, if the preceding crop is a non-host, inversion tillage may increase eyespot by bringing older infected residue back to the surface. Also on the negative side the use of ploughing can reduce soil biodiversity.

Varietal choice / Resistant varieties

Resistant varieties are a key part of non-chemical disease control. There are good sources of information on disease resistance to many of the major pathogens in the Recommended List of cereals varieties published by AHDB. This information is updated annually to account for new pathogen strains which can infect previously resistant varieties.

Nutrient management / Avoid excessive N application

Crops which are nutrient deficient can be predisposed to disease infection. Ensure appropriate soil nutrient supply by regular soil sampling and testing and use of appropriate fertilisers. Excessive nitrogen will exacerbate powdery mildew and rusts. Where excess nitrogen is used, crops are more likely to lodge and this favours these pathogens and other that develop under very humid conditions ie. septoria tritici blotch and fusurium ear blight.

Decision Support Tools (including thresholds)

IPM decisions should be made based on the results of monitoring and forecasting combined with threshold information where available. Treatment thresholds are the population level or density that must be reached before it becomes economically beneficial. Thresholds enable growers to make decisions based on the level at which diseases will impact economic crop yield. They are essential in guiding disease control decisions and preventing the unnecessary use of pesticides.

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