



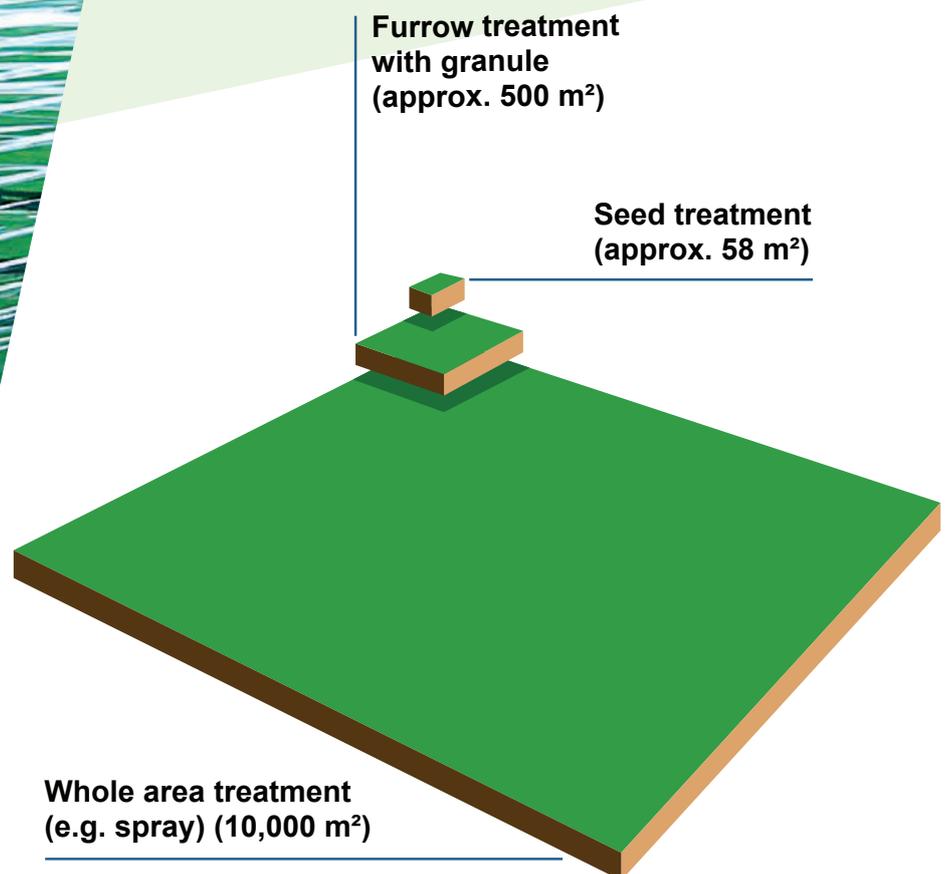
Excellent establishment and crop performance with minimal impact

How to use seed treatments
safely and effectively



The ideal approach for early crop protection

Seed treatments are highly sophisticated and designed with a simple aim – strong crop establishment and healthy growth with minimal environmental impact.



Seed treatments are the most environmentally desirable method of crop protection. They contain low quantities of active substances, very precisely applied and highly targeted in use. The equivalent amount of seed treatment used over a 10,000 m² (hectare) field is just 58 m², without the risk of over spraying.

Advantages of seed treatments

Seed treatments differ from sprays in two key respects. First, because the treatment targets each seed **individually** for maximum effectiveness, there is only limited effect on the soil around the seed or the environment above ground. Compared to sprays, seed treatments are applied to less than 0.6% of the field area - see opposite.

Second, the treatments are applied at low doses in an enclosed environment by professional seed treatment companies away from the field environment.

This highly-targeted application of low doses of seed treatments are an environmentally friendly method of treatment.

However, seed treatments are crop protection products and need to be handled as such and used carefully and safely to avoid risks to the user, environment and wildlife.

On farm, the main risks come from:

- Accidental seed spills
- Seed not covered by soil during drilling that could be eaten by birds or mammals
- Dust abraded from seed

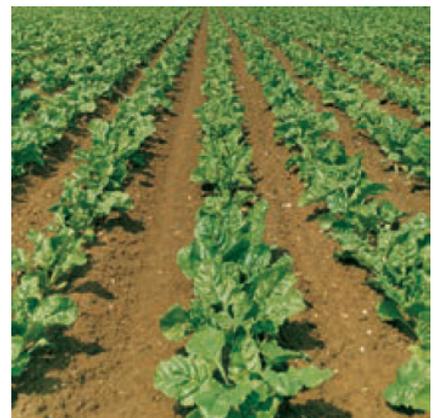
About this guide

As a world leader in seed treatment products and application technology, Bayer has produced this short guide to help you understand both the rewards and potential risks of using seed treatments, as well as the farm practices that produce the best results with the least effect on the surroundings.

The guide is divided into five main sections; the last three are particularly important to help growers and drill operators in the field:

- Agronomic benefits of seed treatments
- Seed-and soil-borne diseases
- Preparing to drill
- Sowing the crop
- Clearing up afterwards

Many of the points are second nature to professional drill operators, but everyone needs to be fully aware of all aspects of treated seed stewardship: it's the final attention to detail that can make the difference.



Agronomic benefits

Seed treatment is by far the best means to protect cereal and other crops including sugar beet from seed- and soil-borne pests and diseases and pest-borne virus infections. However, it offers a range of further important benefits.

Seed-borne diseases

The right broad-spectrum seed treatment can effectively eliminate cereal seed-borne and seedling diseases such as loose smut, covered smut, leaf stripe and bunt. None of these diseases can be treated using foliar sprays, and there is no commonly-available genetic resistance in today's wheat and barley varieties, so seed treatment is the only option.

Greater efficiency

Seed treatments are compatible with Integrated Pest Management (IPM) approaches. They also reduce the need to treat crops after emergence.

They are more environmentally friendly than spray treatments which also need careful timing. Moreover, a single seed treatment may well do the job of multiple sprays. Since seeds can be precisely and professionally treated before reaching the farmer, seed treatment is as convenient and reassuring as a genetic trait.

Improved workload and inputs

Seed treatments can ease farm workload and aid crop management with fewer inputs.

In addition, seed treatments reduce diesel consumption, energy use and manpower post-emergence by saving passes of the tractor in the crop.



Ergot in wheat



Loose smut in barley



Treated wheat seed

Resistance and environment

Many farmers in the UK use treated seed to reduce the risk of varietal or chemical resistance. They also see seed treatment as effective in environmental stewardship since significantly lower quantities of an active substance are needed for disease or pest control, with a smaller and highly-targeted part of the field being treated.

Further benefits

Seed treatment is an easier way than other alternatives to reduce take-all disease in cereals and reduce viability of ergot or *Sclerotinia sclerotia* in seed lots. These aren't always specifically targeted by seed treatments or genetic traits, but are major benefits.

For more information on Bayer products, visit cropscience.bayer.co.uk



Seed treatments save on diesel



Seed- and Soil-borne diseases

In the modern age of highly effective single purpose dressings (SPDs) such as Redigo Pro (prothioconazole and tebuconazole), and Raxil Star (prothioconazole, tebuconazole and fluopyram), it can be easy to forget some of the seed- and soil-borne diseases that used to devastate crops.

Extreme weather conditions and the sowing of undressed seed have seen a resurgence in some of these diseases, making vigilantly checking and protecting crops all the more important.

The next few pages will help you identify your bunt from your ergot.

Barley and wheat SPD seed treatment comparisons

				
	Wheat, oats, durum wheat, rye and triticale	Barley	Winter barley only	
Bunt (seed-borne)	★★★	N/A	N/A	
Bunt (soil-borne)	★★★	N/A	N/A	
Leaf stripe	N/A	★★ ¹	★★★	
Ergot (reduced germination)	★★★	★★★	★★★~	
Microdochium-nivale	★★★	★★★	★★(★)	
Loose smut	★★★	★★★	★★★	
Seed-borne net blotch	★★★	★★★~	★★★	
Covered smut	N/A	★★★	★★★	
Blue mould	★★★ ²	★★★	N/A	

¹ Partial control in winter barley and spring barley. ² Reduces the effects caused by blue mould on the germinating cereal seeds. ~ Not a label claim, ratings based on trials data and field experience. Note: 3 stars refers to full control and 1 star refers to partial control.

If you'd like to find out more about identifying these diseases in your crop you can find information on the Bayer website:

crops.bayer.co.uk/forgotten-diseases

Bunt/stinking smut

(Tilletia tritici)

A disease specific to wheat, bunt is well-known for smelling of rotting fish. The disease replaces the grain in infected ears with balls of spores. When these balls are ruptured by the combine, the spores are released as a sooty cloud, contaminating not just the seed in the combine but also the soil, nearby crops and the grain store.

To spot bunt, you need to look for yellow streaks on flag leaves, and stunted plants with dark grey-green ears and slightly open glumes. Cases of bunt are rare, but usually occur when farm saved seed has been repeatedly sown without a single purpose dressing. The disease spreads very quickly as each bunt ball contains millions of spores. As well as contaminating grain, bunt can also contaminate any machinery or equipment it comes into contact with.



Covered smut

(Ustilago hordei)

Covered smut primarily occurs in barley. It is usually only found in crops that are grown repeatedly from home-saved, untreated seed.

There are no identifiable symptoms of covered smut until ear emergence. At this time, ears look normal except the grains appear to be covered by a thin membrane. However upon breaking open the membrane it will be apparent that the grains have been replaced by masses of black spores.

These black spores are either released from the membrane and carried by the wind to neighbouring plants, or remain under the membrane, to contaminate surrounding seeds after harvesting. In either case, the spores are then dormant on the exterior of the seed until germination, when they will infect the developing seedling.



Leaf stripe

(Pyrenophora graminea)

This is one of the most serious seed-borne diseases of barley. Infected seed and poor soil conditions may see the disease kill seedlings as they emerge, but more commonly the disease causes a loss of green leaf area and may even result in there being no harvestable grain at all in infected tillers. It can build up rapidly to cause complete crop loss in repeatedly home-saved seed.

To identify the disease, look for long stripes on leaves that often start out pale green, before becoming yellow and finally turning to brown.



Seed-borne net blotch

(Pyrenophora teres)

Seed-borne net blotch only affects barley. With this barley seed-borne disease, the first leaf becomes infected as it emerges. Spores produced from the first leaf then spread the disease to other leaves and to surrounding plants.

Net blotch is often mistaken for leaf stripe, which looks very similar in infected young seedlings. To tell the difference, later leaves infected with net blotch will have short brown blotches, or 'nets', that have a network of random darker lines on the leaves.



Ergot

(Claviceps purpurea)

Ergot is known well by many growers, likely due to the risk associated with this disease and grain rejections. Ergot replaces the grain in spikelets of wheat, barley, oats, rye or triticale with a hard, dark purple sclerotium. It is the diseased sclerotia themselves that are known as ergots.

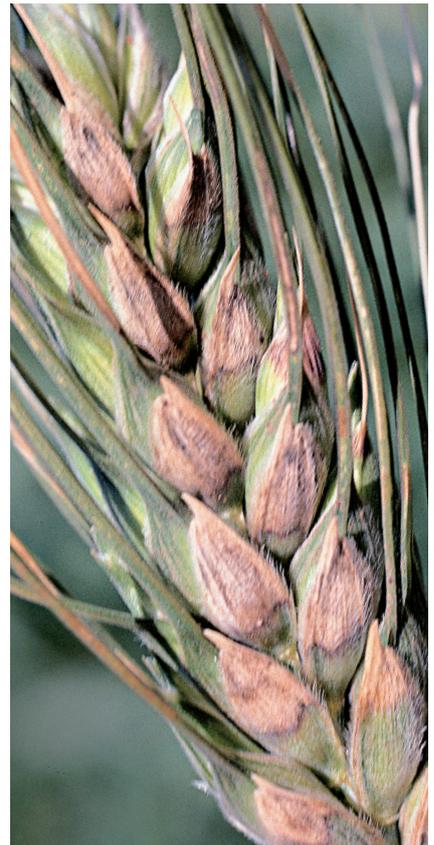
Ergots fall to the ground at harvest time, germinating in the spring to give spore producing structures. The spores they produce are released into the air, getting into the open flowers of nearby cereals.



Microdochium-nivale

As part of the Fusarium group of fungi causing seedling blight, *Microdochium nivale* can cause a significant reduction in crop establishment which can lead to a reduction in yield. The disease is most commonly seen in wheat but can infect other cereals too. Infection may be from the soil, but the disease is also seed-borne.

Losses are most pronounced when untreated seed is sown with high levels of infection into poor seedbeds, and with late sown crops. On surviving infected seedlings, the disease splashes up the plant and can cause infection of the ear. Wet weather at flowering can lead to high levels of infected seed.



Loose smut

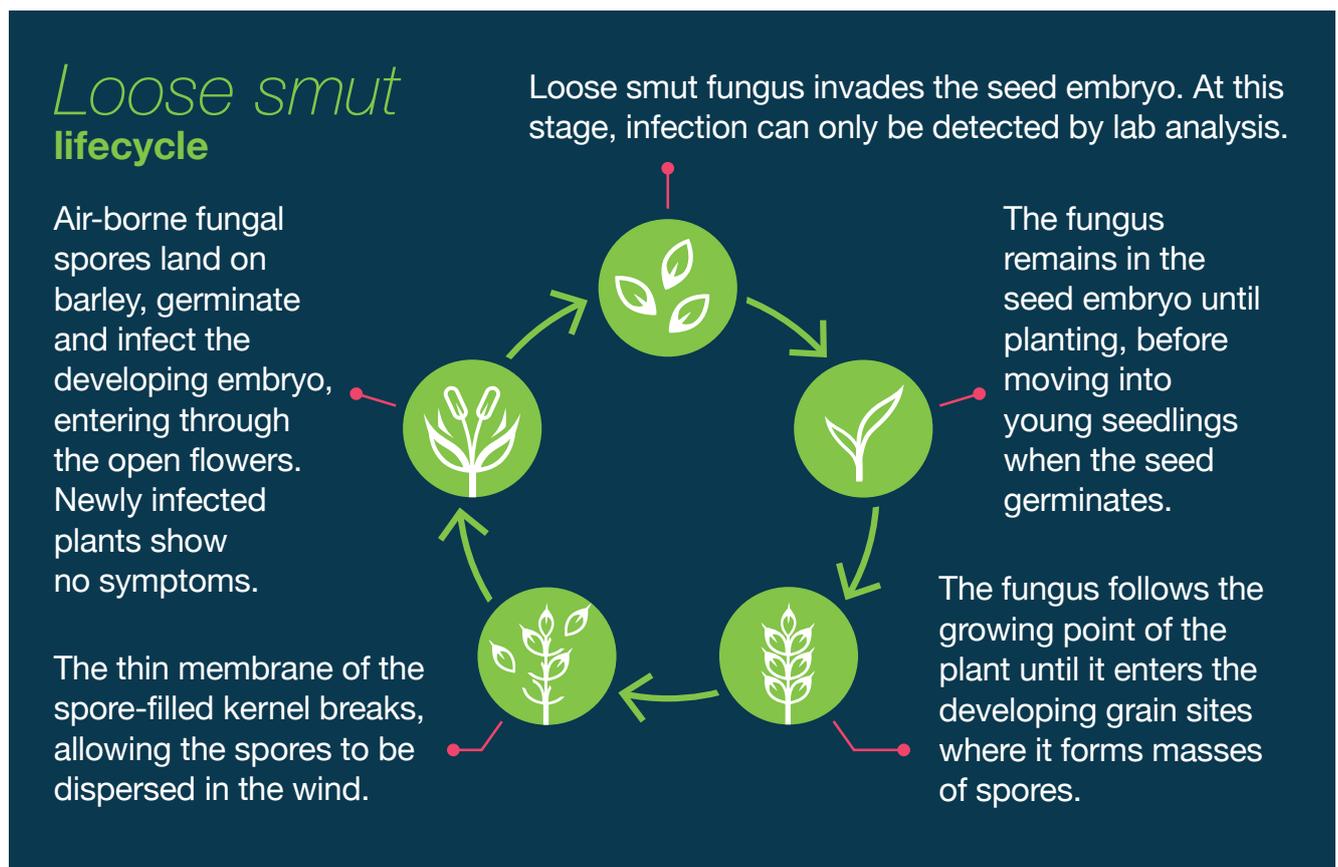
(*Ustilago nuda* – wheat f.sp. *tritici*;
barley f.sp. *hordei*; oats *U. avenae*)

Loose smut is a monocyclic ear disease (i.e. one infection a year) caused by the fungus *Ustilago nuda* and is most commonly found in barley in the UK. However, loose smut can also infect wheat and oats.

The disease takes hold when air-borne fungal spores from infected plants land on the open flowers of healthy plants infecting the developing embryo. At this stage, infection can only be detected by lab analysis. Once the diseased seeds are sown, the fungus will move into the developing seedlings, and follow the growing point of the plant until it enters the developing grain site. Loose smut is easily recognised at this stage as each grain is replaced by a mass of black fungal spores.



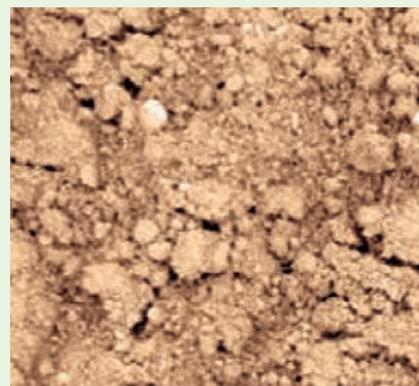
The below diagram explains the lifecycle of loose smut in more detail:



Preparing to drill

It is now a legal requirement that adequate seed drilling equipment shall be used to ensure a high degree of incorporation in soil, minimisation of spillage and dust emission. Always ensure that drills are properly maintained and calibrated. Before starting work, check that drill components and coulters are set up correctly.

Take time to prepare good seedbeds appropriate for the crop and the drill that is to be used. If a contractor is going to drill your crop, discuss seedbed preparation with them beforehand.



Poor seedbeds result in poor seed cover: start with good seedbed preparation

Always handle bags of seed with care to avoid abrasion

Handle large or heavy bags safely (fork lift operators must be trained). Before handling or drilling seed, take these precautions:

- Read seed tags and follow requirements
- Wear appropriate PPE when handling seed
- Wash hands immediately after use
- Handle large or heavy bags safely
- Ensure operators are appropriately trained
- Do not re-use seed sacks except for storage of unused seed
- Dispose of waste seed bags safely such as via an approved disposal contractor



Seed bags must be handled with care

Avoid dust from treated seed

In the past, the risk of dust emission from seed seldom received the same focus as spray drift. However, there are some situations where this comparison is relevant. Pneumatic precision drills with a vacuum-based sowing system are used for some crops such as maize; these can emit exhaust air into the environment. Dust can drift considerable distances on windy days, so you need to consider wind strength and direction. Abrasion of seed before loading and by the drill can result in low concentrations of seed treatment active substances being emitted in the dust.

To minimise this risk, it's important to avoid creating unnecessary dust and prevent discharge of any dust created by drills. The first step is to check that seed delivered on farm is not obviously dusty. If it is, don't use it, but return it to the supplier for exchange or reprocessing.



Do not drill too fast



Dust left in seed bag must be disposed of safely

Prevent dust discharge from drills

Mechanical and pneumatic pressure drills operate so that dust is not discharged into the air. They therefore don't pose a great risk when used as per manufacturers' recommendations.

However, older conventional vacuum-type pneumatic drills are likely to need adapting with an engineering control to discharge the drill's air stream into the soil or close to the surface. This will minimise emission of abraded seed treatment particles from drills. Drills now on the market are supplied ready adapted.

Help with drill modification

If you have an older vacuum drill, or one that you haven't used recently, please contact your drill manufacturer; they may provide a modification kit.

Avoid unnecessary dust

- Handle seed bags with care, especially when loading the drill
- When filling drills don't drop seed from height but pour carefully
- Don't tip any dust into the drill; leave it in the bag for safe disposal
- Don't drill too fast, particularly if the soil is dry, uneven or poorly prepared
- Use seed from a European Seed Association
- or Bayer-approved supplier

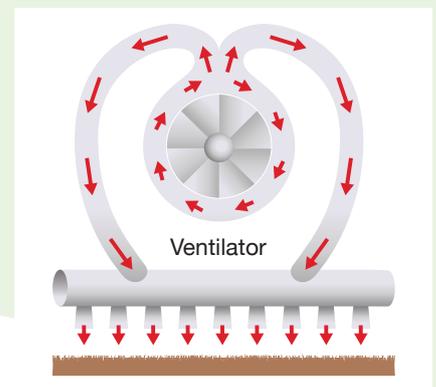
Seed spills

These are one of the greatest risks and usually caused by poor operational practice such as:

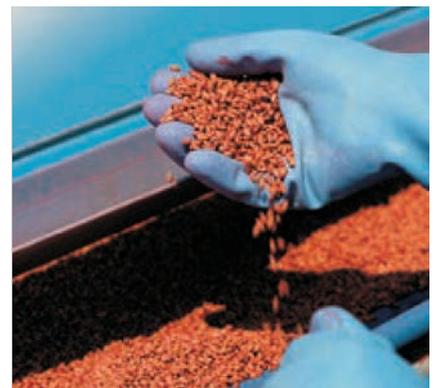
- Sloppy filling of the drill
- Poorly maintained machinery
- Checking drill operation or calibrating without catching seed
- Failing to ensure seed is not being released when drill is in transit or not in work



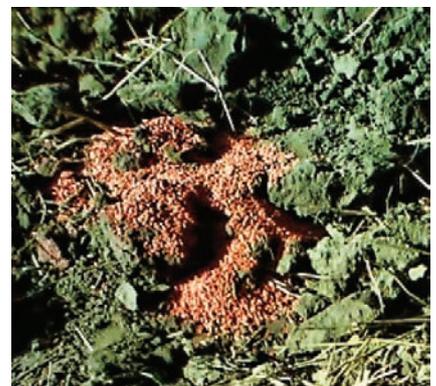
Vacuum drills must be manufactured or adapted to prevent dust being released into the air



Drill modification principle



Always wear PPE when handling treated seed



Clear up seed spills immediately*

To avoid spills:

- Take time and care when loading or emptying drills and when calibrating
- Load drill on field area to be drilled or in yard where spill can easily be collected but ensure this is away from drains. Also avoid areas with public access
- Do not fill drill or calibrate on grass or over other vegetation as spilt seed cannot be recovered
- Ensure no seed can be spilt while travelling outside the field
- Use the most appropriate drill for the task in hand



Fill drills in areas where spills can be cleared up



Remove bags from field as soon as drilling is completed or field unattended

Any size of spill is important. Deal with it immediately.

Always catch seed when checking drill.

Dealing with spills

- Small in-field spill – bury where it is
- Large spills and any spill outside field – collect **immediately** and store in original bag for disposal. Never leave until later
- Don't dispose of treated seed in margins or non-crop area

Carry a spill kit, which should comprise:

- Spade to cover or retrieve spilt seed
- Spare bag including label to save seed recovered
- Canvas sheet for use when calibrating the drill



Sowing the crop

Set up and check drill operation on a part of field yet to be sown – never check over grass where any spilt seed is difficult to clear up. Be aware of the risky conditions ahead of drilling, such as stony or cloddy soils, or where there might be a lot of surface trash.

Seed not covered by the drill

Drills cannot perform properly on poor seedbeds. Even on better-prepared fields, conditions on headlands and **especially in corners** can be less than ideal, causing the drill to leave seed uncovered.

Always use a drilling technique that places treated seed into the soil and never broadcast or autocast (this is not permitted on seed treatment labels).

Best drilling practice – top tips

- Never drill around tight corners; this will force coulters out of the soil
- Select drilling speed according to the manufacturer's recommendations; drilling too fast can leave seed uncovered
- Ensure that the drill is moving forwards before lowering coulters into the ground; this will ensure that all seed is covered
- Take care when lifting the drill in and out of work. Shut off seed mechanism a metre before row ends so that no seed will spill from the coulters as the drill is lifted

After drilling

Before leaving a drilled field, check areas where there is greatest risk of seed remaining uncovered. In particular, check cobbly areas of fields, headlands and corners. Also recheck areas where the drill was filled, set up and emptied. Bury any visible seed.

Also check the main body of the field for areas of poor seed cover. If there are large areas of exposed seed, the only solution is to harrow and then roll as advised by product labels.

* Source: FERA



Clear up or bury spills; catch seed when calibrating*



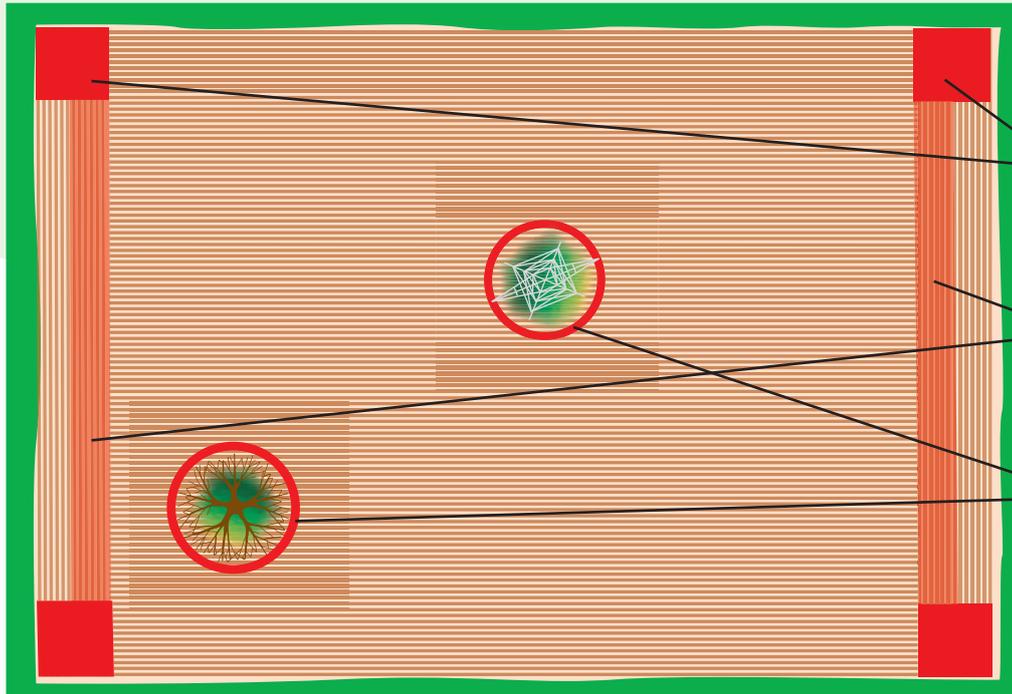
Cover exposed seed*



Do not fill the drill in public access areas*



Drilling into trashy seedbed risks leaving seed on surface



These row ends remain, but there are fewer of them. These areas must always be checked to ensure no exposed seed left.

These row ends are removed and any seed on the surface incorporated when the headland rows are sown.

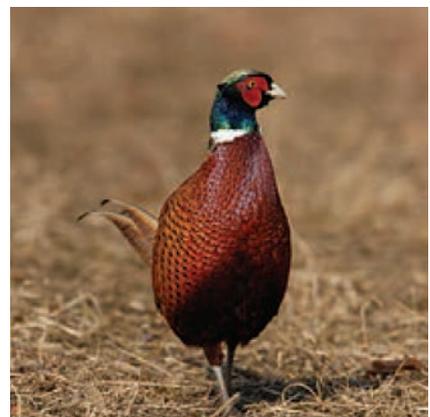
Areas that must also be checked for uncovered seed.

Advantages of sowing headlands last when using cereal drills.

After drilling, continued:

It is good practice to keep a record of the drilling operation to show diligence and to confirm that seed coverage has been checked. There's an example form overleaf. You can also download it from cropscience.bayer.co.uk

- When you have completed drilling, remove all seed from drill, ensuring that all seed and dust is collected for safe disposal. Never burn treated seed on farm – it's illegal
- Collect up all empty sacks before leaving field
- Never re-use bags that have contained treated seed for any other purpose than storing original treated seed
- Store left-over seed in original bags with labels, in a secure store for later use or safe disposal
- Use seed in season of treatment and do not store treated seed more than three months unless label states otherwise
- Ensure dry, safe storage of seed that prevents access by pets, livestock, birds and small mammals
- Wash hands immediately after use and before eating or drinking
- Use bird scarers where necessary to deter bird feeding activity soon after drilling
- Take special care to avoid spills and collect empty bags near footpaths and areas of public access



Drilling stewardship – checklists

Three important reminders about handling and using treated seed:

1. Wear appropriate PPE (personal protective equipment) including gloves and coverall. Seed treatments are pesticides and should be handled as such. In addition, read seed tags
2. Prevent the accidental emission of dust into the atmosphere from seed during loading and drilling
3. Don't leave treated seed exposed on the soil surface for birds and wildlife to eat

Major points to remember:

- Don't broadcast or autocast any treated seed
- Handle bags of seed with care – abrasion results in dust; damage may result in spilt seed
- Check that the drill has been properly maintained, calibrated and cultivators set up properly
- Critically assess the prepared seedbed; does it have stony, cloddy or trashy areas which might limit the coverage of the seed?
- Don't tip dust into the drill – leave it in the seed bag
- Keep bags secure, and dispose of waste seed bags and their contents safely
- Clean up spills immediately – do not fill drills on grassy areas as spills will be harder to clear up
- Ensure the drill will not drop seed when transported or when lifting in and out of work at headlands
- Ensure the drill (especially if precision vacuum drill) does not vent into the air – if necessary fit an air deflector system
- After you've finished drilling, check fields carefully – particularly headlands and turning areas to ensure seed is well covered. If any seed is exposed, cover it

Drilling stewardship record

Basic details

Farm: Crop:
 Field name/no: Variety:
 Date drilled: Seed treatment:
 Drill type: Seed rate:
 Maize drill adapted to emit air to soil: Yes No Weather during drilling:

Preparing to drill						
	Any spill?		Remedial actions			
			Spill buried		Spill collected and bagged for disposal	
Filling in yard:	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Transport to field:	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Filled outside field margin:	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Filled on cultivated area:	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Calibration check						
Seed condition (dust):	<input type="checkbox"/> No dust		<input type="checkbox"/> Low dust		<input type="checkbox"/> Dusty	
Seed bag condition:	<input type="checkbox"/> Excellent		<input type="checkbox"/> Acceptable		<input type="checkbox"/> Some splits	

Field and soil			
Soil moisture level:	<input type="checkbox"/> Dry	<input type="checkbox"/> Moist	<input type="checkbox"/> Wet
Soil preparation:	<input type="checkbox"/> Plough/cultivate	<input type="checkbox"/> Minimal tillage	<input type="checkbox"/> Direct drill
Seedbed conditions:	<input type="checkbox"/> Excellent	<input type="checkbox"/> Acceptable	<input type="checkbox"/> Difficult
Seedbed notes:	<input type="checkbox"/> Stony	<input type="checkbox"/> Surface trash	<input type="checkbox"/> Cloddy

Drilling results				
	Excellent	Good	Partial	Remedial action
Seed coverage in field:	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes <input type="checkbox"/> No
Seed coverage on headland:	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes <input type="checkbox"/> No
Seed coverage on corners:	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes <input type="checkbox"/> No

Additional comments
 (Including details of remedial actions taken)

Drill operator name (CAPS): Signed:

BLE HYBRIDE • HYBRIDWEIZEN • HYBRID WHEAT

1 DOSE
1 UNIT = 750.000 GRAINS
KORNER
SEEDS

750.000

BLE HYBRIDE • HYBRIDWEIZEN • HYBRID WHEAT

1 DOSE
1 UNIT = 750.000 GRAINS
KORNER
SEEDS



To find out more visit:
cropscience.bayer.co.uk/bayer-stewardship-guide

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Use plant protection products. Always read the label and product information before use. Pay attention to the risk indications and follow the safety precautions on the label. For further information, please visit cropscience.bayer.co.uk.

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