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Monceren DS contains pencycuron.
Monceren IM contains pencycuron + imazalil.
Monceren is a registered trademark of Bayer.

Always read the label: use pesticides safely.

For more information visit the potato section at www.bayercropscience.co.uk



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Expert Guide: Tuber Treatment

www.bayercropscience.co.uk

Index

1. Introduction	2
2. The need for tuber treatment	3
3. Preparing to treat	5
4. On-planter application	8
5. Digimon control	13
6. Record keeping	16

Appendices

I. Crop safety	17
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Definition of terms

In this Expert Guide the following definitions apply to frequently used words:

Applicator: The Team Sprayers on-planter applicator for tuber treatment products.

Operator: Anyone employed or contracted to apply tuber treatment products.

Product: Powder formulation plant protection products for treatment of potato seed tubers at planting. Where not specifically stated this refers to the use of Monceren DS. Whilst the general principles advocated in this guide apply to all tuber treatments it should not be interpreted as instructions for use of any other products – always refer to the specific product label.

Treatment: Application of product to potato seed tubers via on-planter applicator.

Contact details

For more information on tuber treatment products please contact Bayer CropScience on **0845 6092266** or visit: **www.bayercropscience.co.uk**

For more information on the Team Sprayers on-planter powder applicator and Digimon control system please contact Team Sprayers on **01353 661211** or visit: **www.teamsprayers.co.uk**

1. Introduction

This Expert Guide has been published to assist growers and operators with the increasingly complex job of potato planting which today can involve application of up to three crop protection products from the planter. It follows the same practical step-by-step style of our nematicide stewardship expert guide published in 2005 and provides the definitive reference for safe and effective use of tuber treatments at planting. In addition, it is intended to help growers and operators comply with food chain requirements and achieve NPTC certification.

Operators applying tuber treatments on-planter are required to hold the NPTC's PA12 certificate of competence which covers 'application of pesticide to material as a continuous process'. As this guide has been designed to follow the PA12 assessment structure, hand sprinkling methods have not been included. Growers or operators applying tuber treatments manually should refer to the product labels for guidance on safe application techniques.

The best practice principles covered by this guide apply to all tuber treatment products, not just the Monceren products produced by Bayer CropScience, which we believe reflects our continuing commitment to setting the standard in crop protection product stewardship.



Dr Bill Lankford
Campaign Manager - Potatoes

2. The need for tuber treatment

Seed tubers can need treatment at, or just before planting, if they are found to be infected with *Rhizoctonia* or silver scurf.

Rhizoctonia

Of these two fungal diseases *Rhizoctonia* is the most common and even low infection levels can have a significant impact on crop yield and marketability.

Infection can easily be missed by visual inspection so current Potato Council advice is to submit seed for laboratory 'eye-plug' testing and treat tubers if any infection is detected. However, you should also check your customer's potato growing protocol as some only regard treatment as justified if an infection threshold is exceeded.

In addition to seed-borne infection *Rhizoctonia* can survive in the soil from previous crops waiting to infect the next one planted. *Rhizoctonia* infected seed is the primary source of contamination to previously disease free land and controlling *Rhizoctonia* in the soil is much more difficult than preventing a seed-borne infection.

Soil can also be tested for infection and if found, an in-furrow fungicide spray may be needed. However, it should be noted that in-furrow spraying targets soil infection and is not intended to control *Rhizoctonia* on infected seed.

If infected but untreated seed is planted the crop may display some or all of the following symptoms:



Sprout pruning

Seed sprouts infected prior to emergence may be killed off or pruned leading to uneven emergence and a gappy crop. This early disease development is favoured by cold, wet conditions after planting.



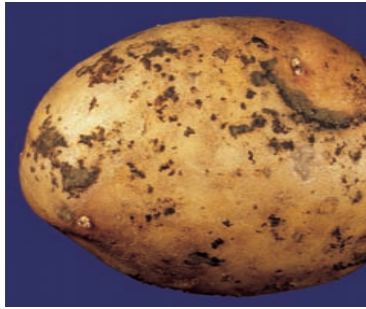
Stem canker

As the crop canopy grows, brown lesions develop on stems just below the soil surface. This canker can girdle the stem restricting the plant's growth and cause it to produce aerial tubers.



Stolon pruning

When the crop starts to initiate tubers the stolons bearing them can be pruned by infection. This reduces the number of tubers and can cause much wider size variation in those remaining as well as misshapes.



Black scurf

In the run up to harvest, black sclerotia form on the daughter tubers. Even low levels of infection may mean the crop fails to meet pre-pack skin finish requirements.

From these symptom descriptions it might seem like a problem that only affects pre-pack crops, as supermarkets want to sell potatoes that are a consistent size with bright clean skins. But all crops will lose marketable yield from *Rhizoctonia* infection costing many times more than the cost of applying a treatment at planting.

Although skin finish is less of a concern for potato processors, high levels of misshapes may not be accepted and they demand a product that will give a good golden fry colour. *Rhizoctonia* can increase dry matter and lower reducing sugar content so that a sample does not meet this requirement.

Using a tuber treatment at planting enables the crop's yield potential to be maximised and to stand the best chance of meeting pre-pack and processor quality requirements. Monceren DS is the *Rhizoctonia*-specific tuber treatment from Bayer CropScience.

Silver scurf



Source: Potato Council Ltd

Silver scurf infected seed tubers planted without treatment can pass infection on to daughter tubers giving them a silvery appearance looking like dead skin. Depending on the severity, this skin blemishing can cause the crop to fail supermarket pre-pack quality requirements.

Disease symptoms worsen in ambient storage causing tubers to de-hydrate and wrinkle. But good store management – loading fast, dropping temperature quickly and keeping below 4°C - can go a long way to prevent symptoms escalating.

Current Potato Council advice is that where silver scurf is detected on more than 5% of seed tubers, development in the daughter crop could affect saleability so imazalil treatment pre-planting is likely to be beneficial.

Most Scottish seed currently receives an imazalil treatment either on its way into store or as it comes out of store, prior to being delivered to ware growers. This may well have controlled the disease effectively on your seed, but if you do detect presence above the threshold, always check the history of previous treatments applied by your seed supplier as this may limit your treatment options at planting.

Monceren IM is Bayer CropScience's tuber treatment for control of *Rhizoctonia* and reduction of silver scurf.

3. Preparing to treat

Before using a tuber treatment always carry out a risk assessment first, consider the safety implications of applying it, and read and interpret the product label.

Risk assessment

Before using any pesticide, you the operator are required to consider the effects it could have on people's health and the environment, to make sure you apply it in a way that is safe and effective and complies with the relevant legislation. Key considerations are the risk to and protection of:

- ▶ You and others around you, including co-workers and the public
- ▶ The Environment, including animals (livestock, domestic pets and wildlife), plants (natural plants and non-target crops) and water (surface waters, ditches, drains)
- ▶ Consumers

When assessing risk consider the specific nature of the product and where and how you intend to use it, as well as the more general risks associated with use of any plant protection product e.g. product spillage, security and used pack disposal. Control measures must be planned in advance to eliminate such risks.

Legal & Safety

The following control measures are required for on-planter application:

- ▶ Wear correct PPE when applying the product or handling treated tubers
- ▶ Before working on the applicator for maintenance or calibration ensure the place of work is safe. Consider; lighting, ventilation, warning signs, clear floor space, noise and temperature
- ▶ Check applicator is set up to apply the right rate of product
- ▶ Bury or remove any product spillage
- ▶ Do not fill hoppers near surface waters or ditches
- ▶ Keep product in original container, tightly closed, in a safe place
- ▶ Empty containers completely and dispose of safely
- ▶ Ensure you have access to a first aid kit including eye-wash



Suitable PPE specified on the Monceren DS label are:

- ▶ Protective gloves
- ▶ Dust mask to EN 149 FFP2 or FFP3

It is also advisable to wear a coverall to avoid contamination of clothing.

N.B. The control measures suggested above are generalised. Always take account of your specific situation and be sure you are complying with the code of practice for using plant protection products.

Product Label

The main source of information to help you use a pesticide safely and effectively is the product label. Its safety points should have been considered in your risk assessment (described above) but it also contains important guidance on effective use. For example, the Monceren product labels contain the following information:

Seed quality

- ▶ Before deciding to apply a product always inspect for presence of *Rhizoctonia* and silver scurf and assess the level of infection to ensure treatment is justified
- ▶ Carefully check seed tuber health before application. Seed tubers should be of good quality and vigour (i.e. free from conditions such as bacterial rots, physical damage, virus infection etc). Crop establishment may be impaired where seed is affected by the conditions above irrespective of any subsequent seed treatment application. (Refer to Appendix I crop safety for further information on factors that can affect crop establishment when using tuber treatments.)
- ▶ Allow seed tubers coming out of cold store to achieve ambient temperature before planting in to cold and / or wet seed beds

Other tuber treatments

- ▶ Check history of previous treatments with your seed supplier. You need to know what product was applied and when before checking the product label of the treatment you intend to use at planting for any restrictions on sequences
- ▶ Monceren DS or IM should not be used on seed tubers previously treated with another dry powder seed treatment or where hot water treatment is used
- ▶ Seed tubers which have been treated with Fungazil 100 SL (or any other imazalil containing formulation recommended by Bayer CropScience) in accordance with the manufacturer's instructions may be treated with Monceren DS at planting
- ▶ There are no Bayer CropScience Limited recommendations for the use of Monceren IM in conjunction with any seed tuber treatment
- ▶ Check with Bayer CropScience or your supplier before use of any other chemical sequence with Monceren DS or IM at planting

Tuber handling damage

- ▶ Ensure that any sprouts are not so long that they could get damaged in the planter and never apply to damaged or cut tubers
- ▶ Any damage occurring to tubers or sprouts/chits during handling, treatment or planting may adversely affect their subsequent performance and cropping

Application

- ▶ Check conditions of use; maximum individual dose, number of treatments and latest time of application
- ▶ Check that seed tubers are free from soil deposits at treatment – see also seed quality above

Rain

- ▶ If seed tubers become damp from light rain, the distribution of powder on the tubers at planting should not be affected
- ▶ If, however, a rain shower interrupts planting, the tubers in the hopper should be covered in accordance with normal practice

Before using any product always check the manufacturer's current guidelines & your customer's potato growing protocol.

Final checklist

Before starting, ask yourself the following six questions:

- ▶ Do you need to use a crop protection product?
- ▶ Has the right product been selected?
- ▶ Have you read and understood the product label so the product can be applied safely and effectively?
- ▶ Have potential risks to people's health and the environment been considered and the necessary control measures put in place?
- ▶ If using a mechanical applicator, is it set-up to apply the right rate of product?
- ▶ Do you hold an NPTC PA12 certificate of competence?

Ensure you can answer 'Yes' to all the above questions before starting application.

4. On-planter application

With the Team Sprayers on-planter powder applicator, treatment is applied mechanically to seed tubers in the planter hopper effectively 'engineering out' much of the risk of operator exposure or loss to the environment. These applicators can be retrofitted to any cup type planter but do not currently suit belt type planters e.g. Structural.

Operating principles

As illustrated below, the three main components of the system are:

Applicators

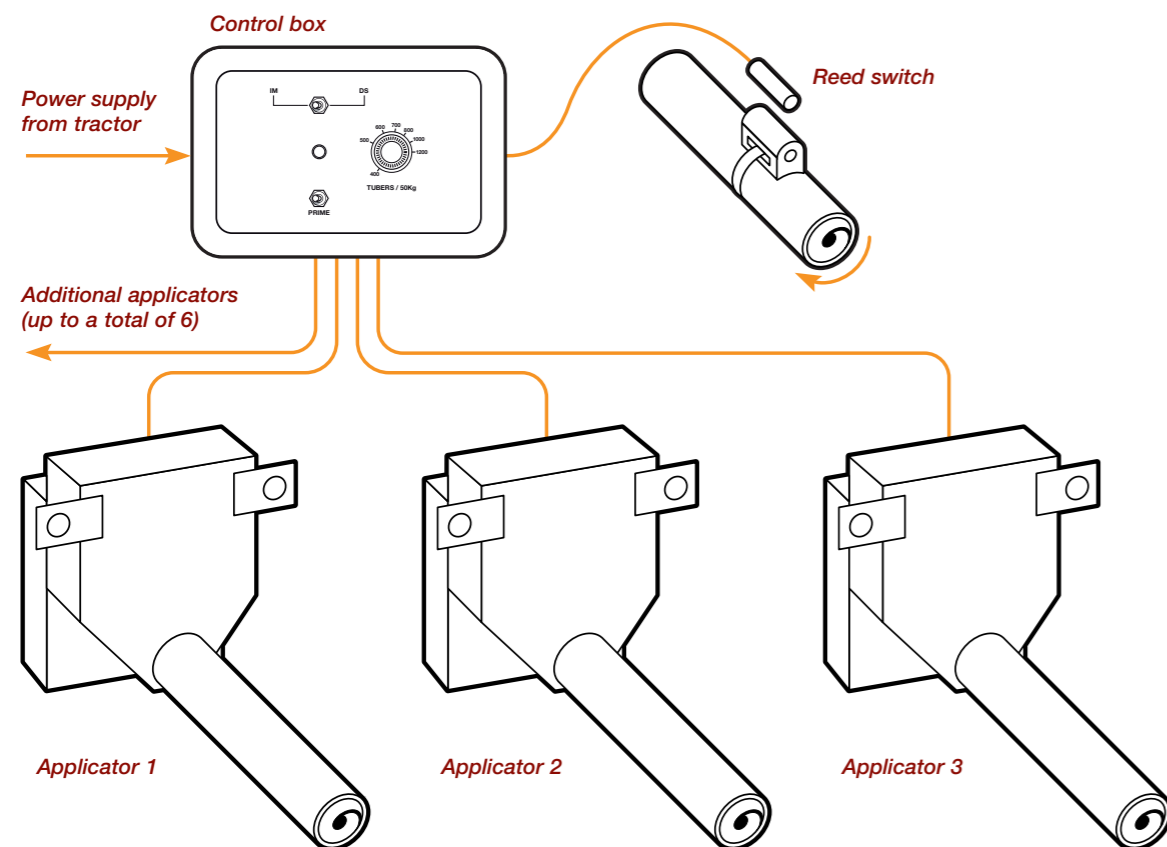
Positioned to dispense product into the tuber pick-up area, they include a dispensing auger and hopper with agitator paddle driven by a 12 volt motor. Every time the motor pulses product is dispensed and the 'bubbling' effect of seed tubers moving towards the cups facilitates even treatment of tuber surfaces.

Reed switch

A magnet saddle-mounted on the cup belt drive shaft creates a magnetic flux every time it passes the reed switch secured to the planter body. This triggers the applicator motor to pulse.

Control box

Remotely mounted, ideally in the tractor cab, this controls the power supply to the applicator motors, allows them to be primed and provides adjustment for product choice and seed tuber size.



On 2 and 3-row planters, applicators are fitted to the side of the planter hopper to dispense product horizontally.



On larger planters, quad and 6-row, the additional applicators, one per row, are fitted to the top of the hopper to dispense product downwards.



It is advisable to have the on-planter applicator system professionally fitted to ensure correct operation.

Calibration

The general principle of calibration is to get the applicator dispensing 0.143g of product per tuber with the control box set for the baseline tuber size of 700 tubers / 50kg of seed, the rationale being:

Application rate 2kg/tonne / 14,000 tubers/tonne = 0.143 g/tuber

Once this is achieved the dispense rate is fine-tuned by the tuber size control. This allows adjustment of the amount of product dispensed per pulse of the motor so that proportionately more is dispensed per tuber for larger seed and less for smaller seed. The end result is to maintain the overall application rate at 2kg per tonne of seed distributed evenly across all seed tubers.

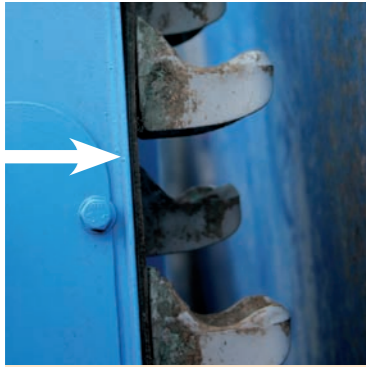
The system should be re-calibrated:

- ▶ At the beginning of planting
- ▶ When changing from one product to another
- ▶ If there is a significant change in weather conditions, as the flow of powder treatments is influenced by temperature and humidity

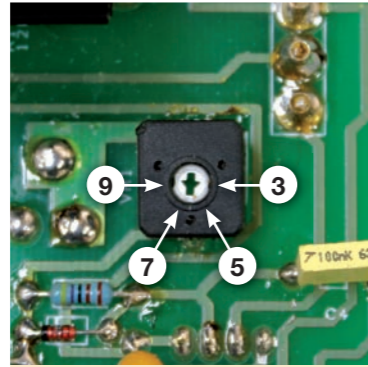
Before starting on the calibration procedure:

- 1 Ensure you are equipped with the correct PPE
- 2 Open the control box to access the trim potentiometer (trim pot) which you will need to adjust
- 3 Check the accuracy of your scales, for example with a 1kg bag of sugar

The calibration procedure is then as follows:



1 Count the number of cups to pass any point during one revolution of the cup drive shaft.



2 Refer to the table opposite and adjust the trim pot to the required position.



3 Fill applicator hoppers with product.



4 Set control knob to 700 tubers/50kg and DS/IM switch to match the product being used.



5 Press and hold the prime button so the motors run continuously until both augers dispense product.



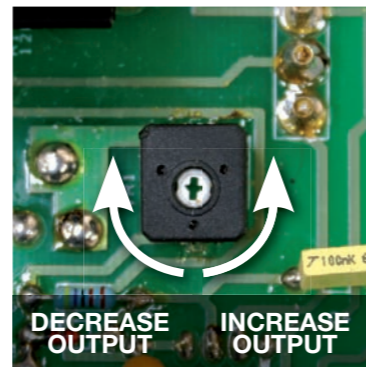
6 Position receptacles to collect output from augers.



7 Operate the applicator for 50 pulses by turning the landwheel or generating pulses with the spare magnet.



8 Collect, weigh and record output from applicators.



9 If the average weight collected differs from that shown in the table opposite, adjust the trim pot to correct it.

Now repeat steps 7 & 8 to double-check the applicators are dispensing at the target calibration rate

Trim potentiometer initial settings

Tubers planted per pulse	Number of magnets	Trim pot position
5	1	9 o'clock
6	1	7 o'clock
7	1	5 o'clock
8	1	3 o'clock
10	2	9 o'clock
12	2	7 o'clock
14	2	5 o'clock
16	2	3 o'clock

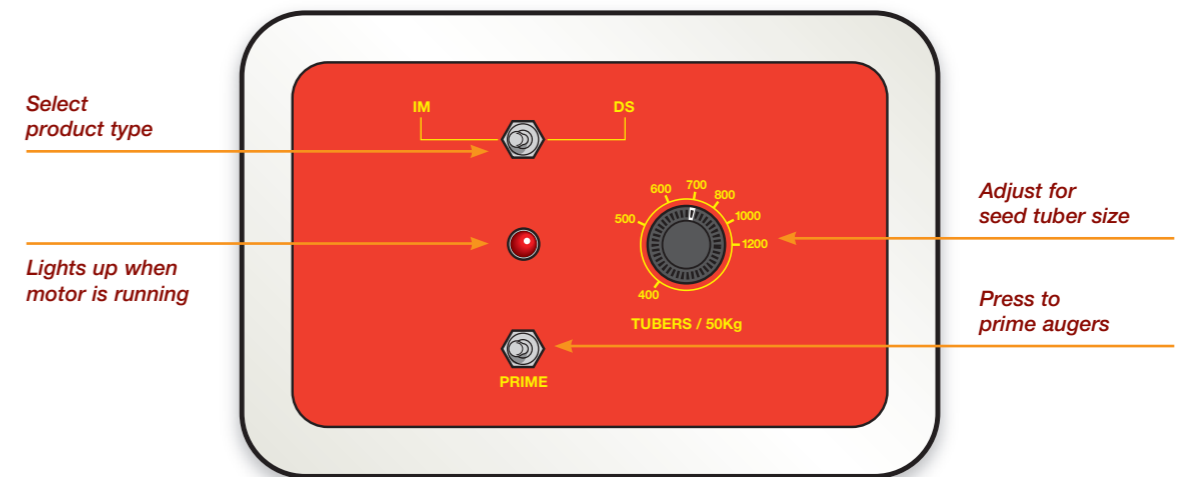
Target dispense rates for calibration

Tubers planted per pulse	Average weight collected from each dispenser
5	36g
6	43g
7	50g
8	57g

Operation

Before starting a day's planting, fill hoppers with product and check:

- 1 Augers are primed, and if not, press and hold prime button until product is discharged from augers
- 2 Tubers / 50kg dial is set correctly for the size of seed to be planted
- 3 DS / IM switch is set correctly for the product to be used



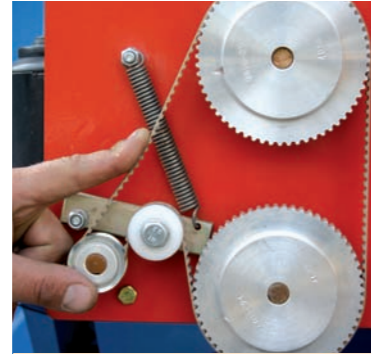
During planting / operation keep an eye on product usage and area covered and if application rate varies from the target, re-calibrate.

Daily maintenance

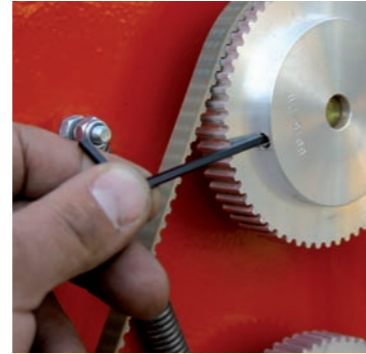
At the end of a day's planting make the following checks:



- 1 Aim to finish the day with the hopper empty and clean the machine.



- 2 Check drive belt for wear



- 3 Check all grub screws (requires 3mm allen key).

If at any time an applicator does not appear to be operating correctly refer to the troubleshooting guide below. But before working on it ensure you are equipped with the correct PPE and that it is thoroughly cleaned first.

Troubleshooting guide

Fault	Possible cause	Action required
Loss of Power	Blown Fuse	Replace Fuse
	Lead Disconnected	Reconnect Lead
No Powder Being Dispensed	Blockage in Auger	Clear Blockage
	Loss of Magnet	Replace Magnet
	Power Loss	See Above
	Magnet Sensor Out of Line	Realign Magnet (see manual)
Paddle Not Turning	Loss of Grub Screw	Tighten or Replace Grub Screw

Storage

When planting is finished prepare the applicators for storage as follows:



- 1 Remove the applicators from the planter



- 2 Clean machine thoroughly and store in a dry place



- 3 Ensure control box is protected in storage

5. Digimon control

Developed jointly by Bayer CropScience and Team Sprayers the Digimon digital control box simplifies calibration of the on-planter application system and maintains its accuracy automatically. Upgrading to Digimon control is a straightforward job of replacing the previous analogue control box with the new Digimon control box.

Operating principles

By upgrading to Digimon control you are equipped to:

- ▶ Maintain application rate within +/- 5% of the target
- ▶ Adjust application rate at the push of a button
- ▶ Comply fully with all food-chain requirements

One Digimon control box will operate up to three applicators. For 4 or 6-row planters, two Digimon controllers are required operating two and three applicators respectively. Calibration and operation of Digimon controlled applicators differs from the traditional analogue system as described below. Daily maintenance and storage procedures are as described in section 4 above.

Calibration


An automated calibration method is incorporated into the controller. During this process the hoppers are automatically driven at a typical speed and the current application rate for a fixed number of pulses using the pre-existing internal calibration factor. The collected weight of powder discharged from each hopper is then entered into the controller using the pushbuttons. These weights are compared internally with the expected output and the calibration factors for each hopper are then updated. All hoppers are thus calibrated simultaneously.

To calibrate, the weighing scales and polythene collecting bags supplied with the Digimon will be needed. You should also be equipped with the correct PPE.

Before starting:


- 1 Zero the scales by 'taring' the collecting bag weight
- 2 Attach bags to auger outlets
- 3 Start tractor so that engine supplies full working voltage
- 4 Fill hoppers with at least 4kg of product each
- 5 Switch Digimon on to start from the home screen

Now you are ready to run through the following automated calibration procedure:




1 Prime augers

Push switch on underside of Digimon control box to the left and hold until product is dispensed from all augers.




2 Select 'output check' mode

Press ● + ● together.




3 Start 'output check'

Press ● to run hoppers for 80 pulses.




4 Record output

Weigh and note output from each applicator.




5 Enter hopper 1 actual weight

Use ● plus and ● minus buttons to enter correct weight.
Press ● to save and move on to hopper 2.



6 Enter hopper 2 actual weight

Use buttons as described above.
If 3 applicators are fitted, repeat this step for the third hopper.
Press ● to save and return to home screen.




7 Home screen

Initial calibration is now complete but procedure should be repeated to double-check weight collected is close to figures displayed on hopper calibration screens.

Operation


Before starting a day's planting, fill hoppers with product and run through the following set-up procedure:



Screen 1: Home

Press:

- To begin the set-up sequence




Screen 2: Tuber Size

Automatically shows last used tuber size setting.

To adjust press:


- To increase
- To reduce
- To save and move on



Screen 3: Product

Press:


- To select Monceren DS
- To select Monceren IM
- To save and move on



Screen 4: Application Rate


Shows last used application rate in kg/tonne of seed. Press:

- To increase application rate
- To reduce application rate
- To save and move on



Prime augers

Push switch on underside of Digimon control box to the left and hold until product is dispensed from all augers.



Screen 1: Home / AUTO screen

You are now set-up. The controller must be in this default AUTO mode during planting. The controller will automatically return to this screen if left for a short time.

6. Record keeping

As with crop spraying a full daily record of tuber treatment should be kept. The table below provides a template, which can be amended according to the recording requirements of your customer's specific potato growing protocol.

Operator's name	_____
Job reference	_____
Date	_____
Application method	_____
Variety	_____
Field name	_____
Field size (ha)	_____
Reason for treatment	_____
Product and MAPP or HSE number	_____
Application rate (kg per tonne of seed)	_____
Total amount of product used (kg)	_____
Quantity of seed treated (tonnes)	_____
Start time	_____
Finish time	_____
Total hours	_____
Weather conditions (such as wind speed and direction)	_____
Other relevant information	_____

Appendix I – Crop safety

Factors that can affect crop establishment

Seed quality and vigour

Before using any seed treatment always check that seed is of good quality and vigour. Crop establishment may be impaired where low quality or low vigour seed is planted, irrespective of any seed treatment application. Growing conditions and subsequent harvesting, handling and storage can weaken seed e.g.

- ▶ Disease, stress or physical damage during crop growth
- ▶ Wet conditions during harvest that increase the risk of bacterial infection developing during storage
- ▶ Physical damage during lifting and subsequent movement of tubers increases the risk of infection and internal bruising

Seed can be significantly weakened by exposure to these factors without showing any visible signs and may also be inherently weak due to genetic reasons. Growers are therefore advised to have seed tuber health checked professionally and discuss the results with their agronomist before making the decision to apply a seed treatment.

Application practices

There is always the potential for seed treatments to interact with seed tubers and/or other chemical treatments (used in co-application or sequence), particularly if the seed is not dormant when treated. Tuber cutting or desprouting may also influence the performance of seed treatment adversely.

Planting conditions

Planting into cold wet seedbeds, especially at excessive depth, will delay and reduce crop emergence. Subsequent heavy rainfall on soils likely to 'cap' will have a similar effect. Seed treatments can exacerbate these effects if slow growing 'eyes' remain in prolonged contact with the chemical. These effects may be exacerbated when seed is planted soon after removal from cold storage.