

Operating Instructions for the MycoHarvester



(A spore separator using a fluidised bed and a dual cyclone¹:
Mk. I, version 2)

APPLICATION

The MycoHarvester is designed to remove powdery fungal spores safely and efficiently from conidiated grains such as rice. It is suitable for small-scale, non-continuous preparation of samples of mycoinsecticides (in genera such as *Beauveria*, *Metarhizium*, and *Paecilomyces* or similar powdery fungi) concentrating conidia in a form that is easy to desiccate and package. Extracts from the inner cyclone conform to the high quality particle size specification and contain no large (>100 µm) particles, which may for example block spray nozzles.

Note: This device is primarily designed for development of mycoinsecticides by small-medium scale sample preparation (typically processing up to 30 kg of substrate to produce approximately 1 kg of spores per day). Industrial-scale units (the Mk. III) are also available, which use different methods for substrate agitation and particle capture.

ASSEMBLY (and transportation)

The MycoHarvester is supplied completely assembled. For ease of transportation, the fluidised bed can be removed using a half-tube clamp attached to the right hand side of machine to which is clipped the fluid bed column (see Figure 1). The cyclone unit (left hand side as illustrated) can be removed using a button release mechanism at the top.

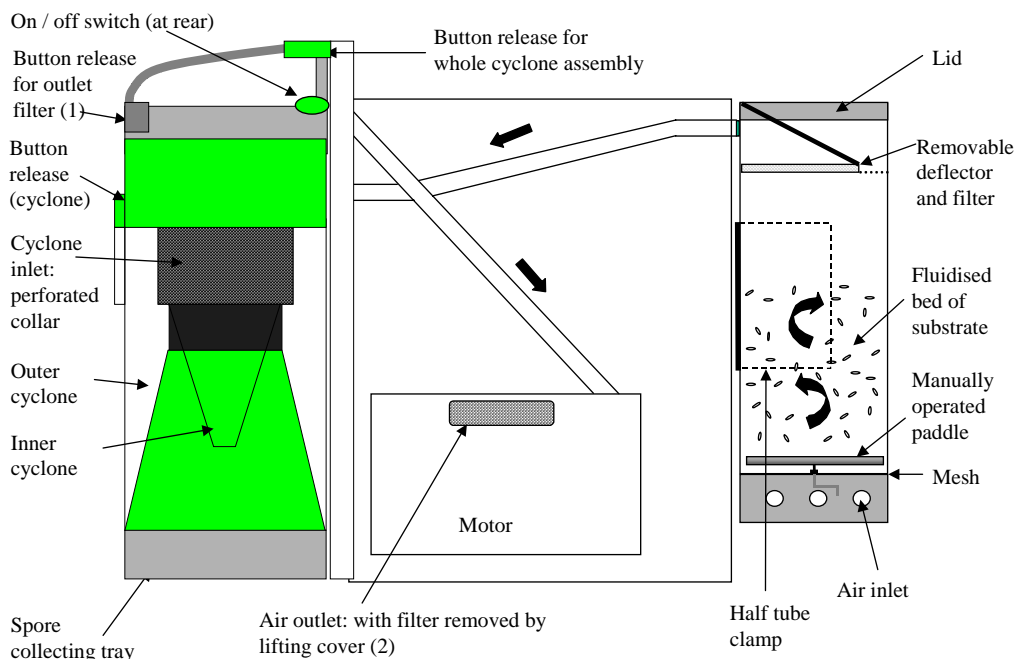


Figure 1. Assembly of the spore separator

¹ The 'Dysan' dual cyclone is a patented design and registered trade mark.

OPERATION

A respirator (filtering particle sizes of >1 µm), disposable/washable coveralls and gloves should be worn when working with fungal conidia or any other dusty, proteinaceous material.

The conidiated substrate should be air dried to between 10% and 20% moisture content to permit efficient extraction of conidia

- 1 Turn on unit, a green switch located top left-hand side of machine. **Do not operate the motor without the cyclone assembly and collecting tray in position.**
- 2 Remove the fluidised bed lid, leaving the mesh insert in place.
- 3 Slowly and carefully pour conidiated rice (maximum 500g) onto the fluidised bed with the motor operating.
- 4 Replace the fluidised bed lid.
- 5 Operate fluid bed for maximum of 5 min., or until conidial dust is no longer visible as a cloud in the outer cyclone. Shorter periods (1-2 minutes per batch) are typically required if rice is sufficiently dry. Agitate rice occasionally using the handle attached to the bottom of the fluid bed.
- 6 **Pay special attention to the sound made by the motor during operation; a change in pitch may indicate that one of the passages is becoming blocked and that the motor is labouring. If this occurs, switch off the motor and carry out the cleaning schedule (below).**
- 7 Turn off motor before emptying the fluidised bed. Remove the lid and mesh insert, then carefully remove it from the clamp and tip out cleaned substrate.
- 8 Depending on the conidial yield of the fungal isolates being produced, up to 4 kg (8 x 500 g batches) of substrate can be processed in sequence before emptying the cyclone. Remove the cyclone assembly by pushing the green button at the top of the cyclone body.
- 9 Good quality spore powder is found in the lower collecting tray. Remove collecting tray by turning. Then gently brush the spores from the inner walls of the cyclone and outer edge of the long inner cone.
- 10 Larger particles such as substrate and mycelium collect in the outer cyclone. This outer cyclone residue can be either discarded or reprocessed.
- 11 Harvested spores may require further drying to maximise storage (*e.g.* to 5% moisture content, using a desiccator) before packaging.

REPROCESSING LOW GRADE SPORE EXTRACTS

- 1 The crude spore extract is often best mixed with a dry, non-dusty granular substrate such as uncooked grain.
 - 2 Switch on motor.
 - 3 Remove fluid bed lid. Pour in the spore mixture slowly and carefully.
 - 4 Replace lid and leave motor on for one minute (or until all material has been drawn out of the fluid bed column).
 - 5 Continue from step 7 (above).
- N.B. The particle size of reprocessed material may be of lower quality than standard extraction directly from grain surfaces. Product quality is most likely to be impaired if the material to be reprocessed is introduced too quickly.**

CLEANING and MAINTENANCE

Ensure that this is done with adequate ventilation, the use of appropriate protective clothing and dust masks.

All pipe work and the area around the cyclone inlets should be inspected regularly for build-up of powdery deposits. Spore deposits commonly build-up around the perforated collar of the cyclone inlet (see Figure 1). They may be cleared by giving the unit a sharp tap, the use of bottle brushes, or by using a vacuum cleaner.

After operation, remove dual cyclone and fluidised bed column. Wash using an effective sterilising cleaning fluid; rinse and dry thoroughly. A 5% sodium hypochlorite solution is commonly suitable; alternatively, proprietary bleaches can also be used, but concentrations vary between different products. CABI scientists have also found 'Virkon'[®] to be a useful product. It is always important to check that the material used is compatible with the plastics and effective.

There are two filters on the MycoHarvester and their positions are indicated in Figure 1. One filter is attached to the motor (2) and the other can be found between the cyclone and the main head (1). The motor filter should be inspected frequently (after every 10 hours of use), and must be replaced regularly. The cyclone filter is reusable and should also be inspected regularly. This may be washed in cool water but must be allowed to thoroughly dry before reusing. Typical washing cycles are every 2-3 months with motor filters replaced every year.

Motors should give at least 100 hours of use (and almost certainly much longer). However their life span will be impaired seriously if operated with a clogged machine for long periods. The motor has an automatic thermal cut-out; should it over-heat, switch off at mains, wait for it to cool and check for blockages (especially in the cyclone) before restoring power.

All contaminated waste must be autoclaved prior to disposal.

NOTICE

The equipment is covered for a period of one year for manufacturing faults or faulty materials. Use of the equipment in hazardous environments or for purposes other than experimental spore extraction (*i.e.* non-commercial work) is excluded from this warranty. Similarly, damage caused by incorrect servicing or mishandling, normal wear and tear (e.g. damage or wear of the motor due to excessive and persistent operation) is also excluded. Filters must be cleaned and/or changed on a regular basis.

CABI Bioscience accepts no responsibility for any damage either to the equipment or any other item or personnel in the environment of the unit occurring during operation. Users must be made aware of the possibility that hazardous micro-organisms may contaminate mass production processes, and spore extraction should always take place under the supervision of trained microbiologists. Due to the hazardous nature of dusty material (including the risks of inhalation, allergy and explosion), appropriate safety precautions must be exercised at all times.

Accessories

The MycoHarvester is supplied with two spore collecting trays. Further collecting trays, filters and spare parts are available on request.

Specifications

Dimensions: approx. 650 mm high, 750 mm wide, 210 mm deep (25¾" x 29½" x 8¼").
Weight (unpacked): 13.9 kg (30lb 10oz).

Particle classification: Based on analysis of extractions of aerial conidia of *Metarhizium anisopliae*, the MH1 easily conforms to the particle size specifications established during research by the LUBILOSA Programme. Analysis is most effectively carried out with a laser particle size analyser (*e.g.* the Malvern 'MasterSizer'). For production of stable formulations, the size spectrum of extracted material (by volume) should be:

- <10 µm: >80%
- <60 µm: >99.9%
- <100 µm: 100%

Power supply: 220-240 v. a.c. Mk I MycoHarvesters are normally supplied with 13 amp (rectangular pin²) plugs. Other standards can be fitted on request, otherwise equipment will be supplied without plug.



Visit our web site: <http://www.mycoharvester.info>

Advice and installation of industrial-scale equipment is available on request.

² Standard for: Hong Kong, Ireland, Kenya, Malaysia, UK, Zambia, Zimbabwe and other countries.