

# Operating Instructions for the MycoHarvester Version 5b



March 2012

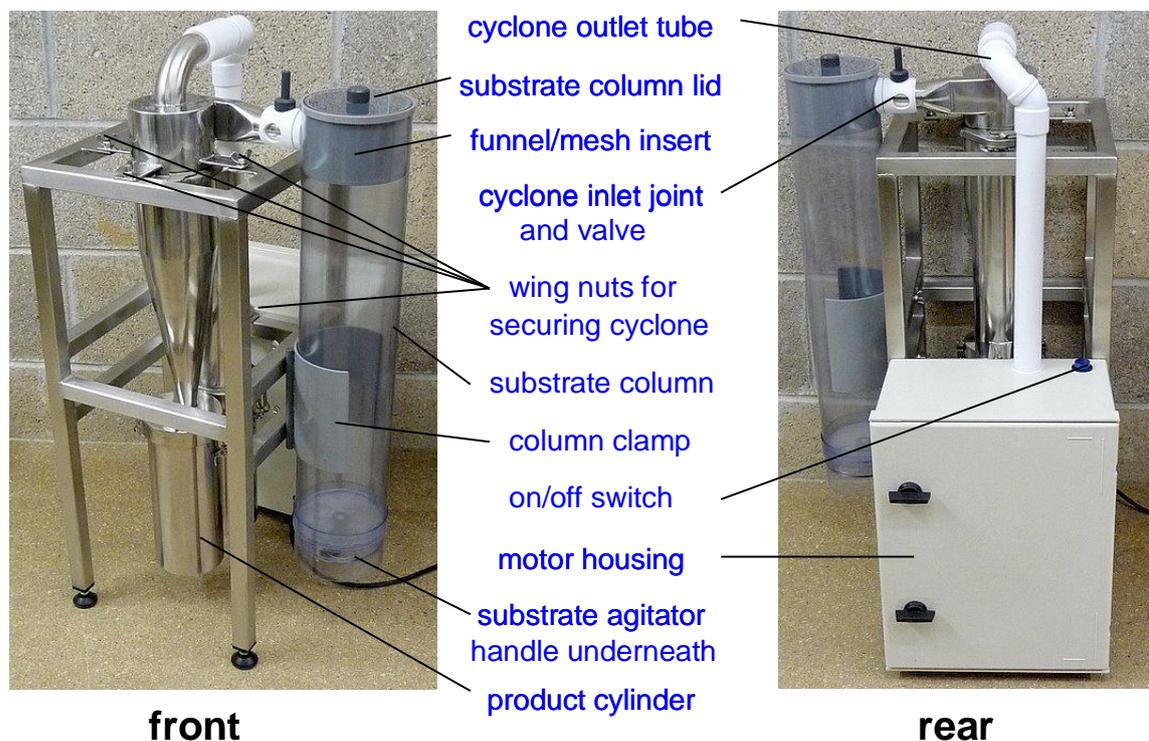
## APPLICATION

The MycoHarvester 5 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 beneficial microbial agents, in genera such as *Metarhizium*, *Beauveria*, *Paecilomyces* and similar powdery fungi; it has also been used with several species of *Trichoderma* that have hydrophilic cell walls. Spores (usually conidia) are concentrated to form preparations that are easy to desiccate, formulate and package. Extracts conform to the high quality particle size specification and should contain no large (>100 µm) particles, which may, for example, block sprayer filters and nozzles. See our web site ([www.mycoharvester.info](http://www.mycoharvester.info)) for regularly updated advice, specifications and further background information.

## ASSEMBLY (and transportation)

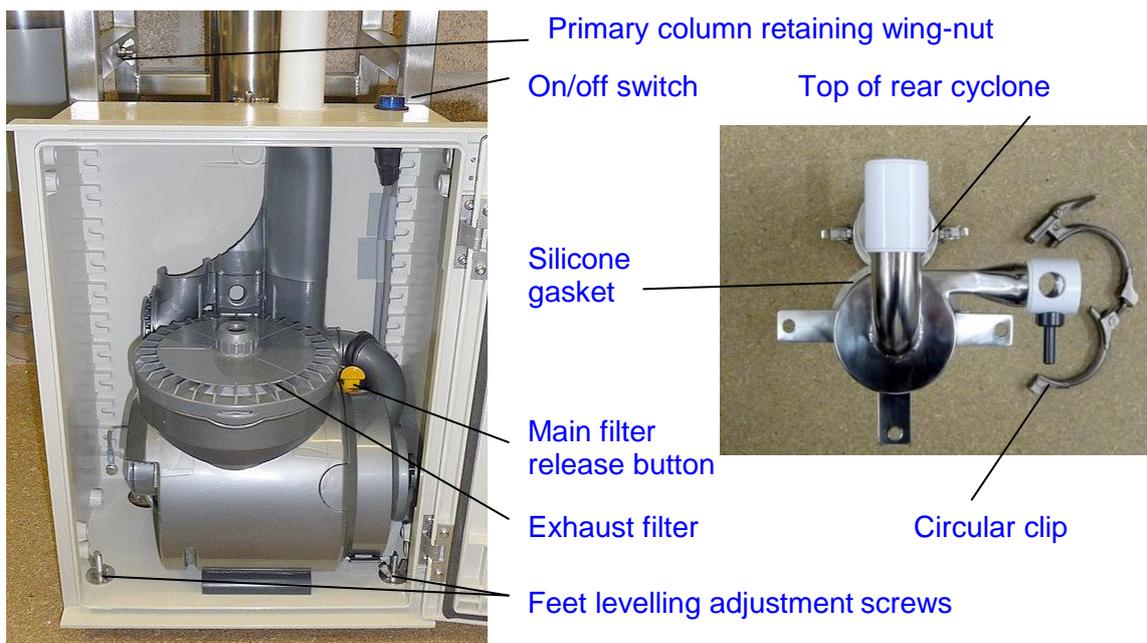
The MycoHarvester is supplied partially assembled. Ensure all packing material, spare filter and the top of the cyclone assembly are removed from inside the motor housing. The substrate (fluid-bed primary) column must be attached to the right hand side of machine via its removable half-tube clamp, using 2 wing nuts and countersunk screws provided.

Attach the top section of the cyclone to the body using the double C clip provided,



**Figure 1.** Assembly of the MH5 spore separator

ensuring that the silicone rubber seal is in position on either the flange on the top section or the flange on the main body. The correct orientation of the top relative to the main cyclone body will position the uppermost curved outlet tube over the flat top of the secondary cyclone section (Figure 2). When tightening the clamp, ensure the seal remains correctly positioned and is not 'pinched', as this may cause damage. The completed cyclone unit must then be lowered into the centre of the frame and fixed with 4 wing nuts: 3 at the top, 1 at the rear (Figure 1). The collecting bins are supplied with a silicone seal positioned on the top edge. With the seals correctly placed, two bins must be positioned in the lower housings and fastened using the two spring clips provided on each housing.



**Figure 2.** Detail inside fan motor housing (left) and alignment of cyclone mountings (right)

The cyclone outlet tube connecting to the motor enclosure should be fitted by positioning the end of the longest section of tube in the opening on the top of the motor enclosure. Turn the tube so that the other, short tube lines up with the outlet from the cyclone assembly and carefully ease it into the connector. Ensure both ends are a 'snug' fit to eliminate leaks.

The power cord which **MUST** have an **EARTH CONNECTION** is plugged into the socket on the rear of the motor enclosure. The final assembly should resemble Figure 1.

## OPERATION

**A respirator (filtering particle sizes of  $>1 \mu\text{m}$ ), 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. Make sure **all MycoHarvester parts are dry** before use.

2. Turn on unit: a push switch located top left-hand side of motor housing. **Do not operate the motor without the cyclone assembly, including all seals, bins and the primary substrate column in position.**
3. Remove the substrate column lid, leaving the funnel/mesh insert in place.
4. Open the valve on the joint between the primary substrate column and the cyclone inlet (handle pointing forward, top and bottom openings permitting air to pass directly into cyclone).
5. Slowly and carefully pour conidiated rice (maximum 500g) into the substrate column with the motor operating.
6. Slowly slide back the substrate column lid and close the valve on the cyclone inlet to a point which ensures satisfactory agitation appropriate to the substrate being used. Do not drop the lid into place with the cyclone inlet valve closed as this will cause a sudden surge in airflow through the column which may damage the equipment.
7. Operate fluid bed for a maximum of 5 min., or until conidial dust is no longer visible entering the cyclone unit. Shorter periods (1-2 minutes per batch) are typically required if rice is sufficiently dry. To ensure complete agitation of the substrate, the handle attached to the bottom of the fluid bed may be rotated as required.
8. **Pay special attention to the sound made by the motor during operation; a change in pitch may indicate that one of the passages or filter is becoming blocked and that the motor is labouring. Similarly if the maximum agitation of the substrate is inadequate, it is likely that the filter is becoming overloaded and clogged. If this occurs, switch off the motor and carry out the cleaning schedule (below).**
9. Turn off motor before emptying the substrate column. Remove the lid and mesh insert, then carefully remove it from the clamp and tip out cleaned substrate.
10. 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.
11. **IMPORTANT:** only use the **good quality spore powder:** which is deposited in the **front collecting cylinder.** Remove collecting cylinders by carefully pushing down 2 clips on each side. Then gently brush any spores from the top of the cyclone housing. Be careful to **replace the white rubber seal:** slotted on around the top of the collecting cylinders.
12. Larger particles such as substrate and mycelium collect in the **rear** cyclone, but this may also contain a high proportion of clumped spores. The contents of this cylinder should therefore be **reprocessed** (usually with the following batch of substrate). In exceptional cases, the residue may be used for preparations of certain fungi, or discarded.
13. Harvested spores may require further drying (using a desiccator or a dry room) to maximise storage (*e.g.* some *Metarhizium* isolates <5% moisture content) before packaging.

## REPROCESSING LOW GRADE SPORE EXTRACTS

1. The specifications of crude spore extracts can often be improved if reprocessed after mixing with a dry, non-dusty granular substrate such as uncooked grain.
2. Switch on motor and pour in the spore mixture slowly and carefully.
3. Replace lid carefully and leave motor on for one minute (or until all material has been drawn out of the fluid bed primary column).
4. Continue from Operation step 8 (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 and 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. Be careful not to lose or damage any of the seals: these are essential for satisfactory operation.

After operation, remove cyclone unit and substrate 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. Scientists at CABI and other collaborating institutes have also found 'Virkon'<sup>®</sup> to be a useful product. It is always important to check that the material used is compatible with the plastics and effective. If required, the stainless steel cyclone unit (and the silicone gasket) can be autoclaved, but it is important to remove the UPVC plastic inlet joint and outlet connector. The cyclone can be opened by releasing the circular clip (shown in Fig. 2); when re-assembling it is important to align the two halves as shown and also ensure the seal is not 'pinched' as this may permanently damage the seal. Ensure **all parts are dry** before use.

There are two filters in the MycoHarvester motor unit (Fig. 2). In normal use only the main fan motor filter requires inspection frequently (after every 5 hours of use), and must be cleaned regularly. However, when processing very fine spores (1 – 3µm) we recommend that the filter be inspected and if necessary, washed on a daily basis. If there is any evidence of spores on the motor side of the filter on the motor housing, the filter must be cleaned. A spare filter is provided so that spore processing may continue whilst the other filter is being cleaned and dried. The filter may be washed in cool water but **MUST** be allowed to thoroughly dry before reusing. In normal use the outlet filter does not need attention. If you suspect it may have become clogged, please contact your supplier for advice. 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 and product yield will be significantly reduced. The motor has an automatic thermal cut-out; should it over-heat, switch off at mains, wait at least 20 minutes for it to cool and check for any blockages (*e.g.* are all the pipes and filters clean?) before restoring power.

### **Accessories**

The MycoHarvester V is supplied with an extra collecting cylinder, spare seal and one pre-motor filter. Further collecting cylinders of different capacities, filters, seals and spare parts are available on request.

## Specifications

Weight: 21.5 kg (including spare spore cylinder)

Dimensions (unpacked, assembled): 430 x 500 (deep) x 830 mm high

Materials used in construction in contact with spores: PVC, nylon, aluminium, stainless steel, ABS and silicon rubber (food grade).

Particle classification: Based on analysis of extractions of aerial conidia of *Metarhizium anisopliae*, the MHV 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:

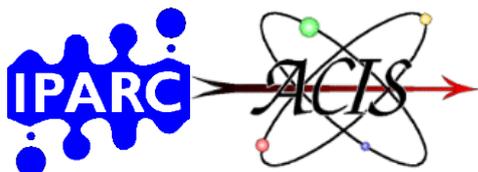
- <10 µm: >80%
- <100 µm: 100%

Power supply: 220-240 v. a.c. Mk V MycoHarvesters are normally supplied either with 13 amp (rectangular pin<sup>1</sup>) or European standard (CEE 7/7) plugs. Other standards can be fitted on request, otherwise equipment will be supplied with a European style plug.

### 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 production (*e.g.* 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 on a regular basis.

The manufacturers and distributors accept 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. Use of appropriate safety equipment, including ear defenders, is also recommended.



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Visit our web site:

<http://www.mycoharvester.info>

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



<sup>1</sup> BS1363 standard for: Hong Kong, Ireland, Kenya, Malaysia, UK, Zambia, Zimbabwe and other countries; more information on electrical connectors can be found on [http://en.wikipedia.org/wiki/Electrical\\_plug](http://en.wikipedia.org/wiki/Electrical_plug)