MULTIVESSEL (MV) BIOREACTOR FOR LIQUID TISSUE CULTURE SYSTEM

AHMAD TARMIZI HASHIM; ROSLI MD YUNUS and ZANARIAH REDUAN

722

MPOB INFORMATION SERIES • ISSN 1511-7871 • JUNE 2016 MPOB TT No. 593

Improvement to the oil palm liquid culture system is a continuous process. This led to the development of an innovative technology, namely the MultiVessel (MV) bioreactor, for the simultaneous multiplication of cell aggregates of various clones and/or application of various treatments. This is a convenient alternative to the conventional shake flask system. Multiplication of cultures in the MV bioreactor do not require any shaker or a large area. With a working volume of 300 – 700 ml, this system uses a simple impeller and a pump for agitation and aeration purposes. Basically, the MV bioreactor is an improvement of the MPOB Simple Impeller (2-in-1 MoSLIM) system, previously developed using commonly available Schott bottles (Tarmizi *et al.*, 2009). However, the 2-in-1 MoSLIM system can only multiply cultures of a single clone or for the application of a single treatment. To overcome this problem, improvements were made to the system to enable more vessels to be connected to single pump(s). Moreover, this system is more cost effective than a commercial laboratory scale multi-fermenter whereby the preparation for culture inoculation is also tedious. This new system can be applied to liquid culture systems of any crop with further potential for automation.

NOVELTY OF THE TECHNOLOGY

- Economical system for liquid culture multiplication.
- Simultaneous testing of various clones and treatments.

MV4 and MV6: DESCRIPTION

The MV4 (*Figure 1a*) and MV6 (*Figure 1b*) are systems for the multiplication of cultures in liquid media. Each system consists of an appropriately-sized tubing, a magnetic stirring bar and top plate. The magnetic stirring bar is located inside the lower end of a short tubing and is attached to another short tubing (upper part) via a connector. The free end of this short tubing is then attached to the inner port of the top plate. The short tubing with a magnetic stirring bar is perforated at appropriate points (*Figure 1c*) throughout the tube. Alternatively, two short tubings could also be attached to the inner port of the top plate. One tubing with a magnetic stirring bar for agitation while the other, without a magnetic bar, is for aeration (*Figure 1d*). This tubing is then placed inside an individual graduated Schott bottle containing the inoculum and tissue culture medium. Each vessel is then placed on a magnetic stirrer for agitation (80 rpm). The end of the long tubing is attached to the outer port of the top plate of all vessels (four or six) and connected to pump(s) for aeration. The aeration process, which supplies oxygen, improves the culture's growth rate and biomass. The impeller provides both agitation and aeration simultaneously when the system is switched on.

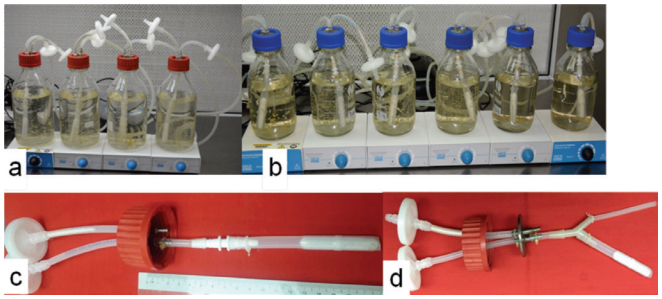

Figure 1. The MV 4 (a) and MV6 (b) for multiplication of culture aggregates. (c) Connector with magnetic stirring bar and (d) connector for aeration without stirring bar.

OBSERVATION

Two- to 14-fold increments in fresh weight of cultures were obtained after about 30 days (*Figure 2*) for oil palm clones when multiplied in MV4 and MV6 systems. Normal regeneration of cell aggregates was observed (*Figure 3*).

ISSN 1511-7871
9 771511 787001

Malaysian Palm Oil Board, Ministry of Plantation Industries and Commodities, Malaysia
6 Persiaran Institusi, Bandar Baru Bangi, 43000 Kajang, Selangor, Malaysia. *Tel:* 03-8769 4400 *Fax:* 03-8925 9446 *Website:* www.mpob.gov.my

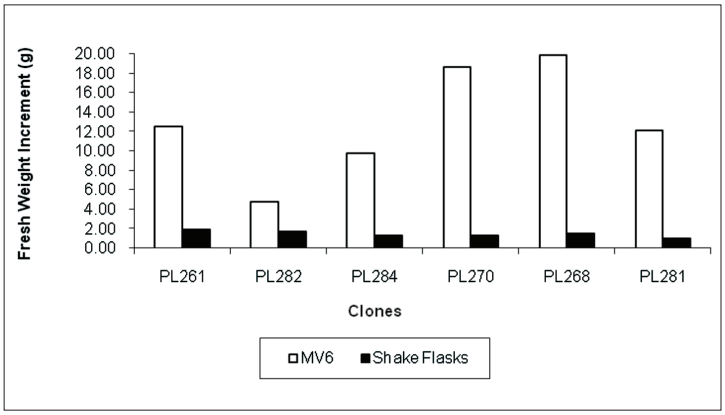

Figure 2. Fresh weight increment of cultures for clones after approximately 30 days of multiplication in MV6, compared to the shake flask system (conventional method).

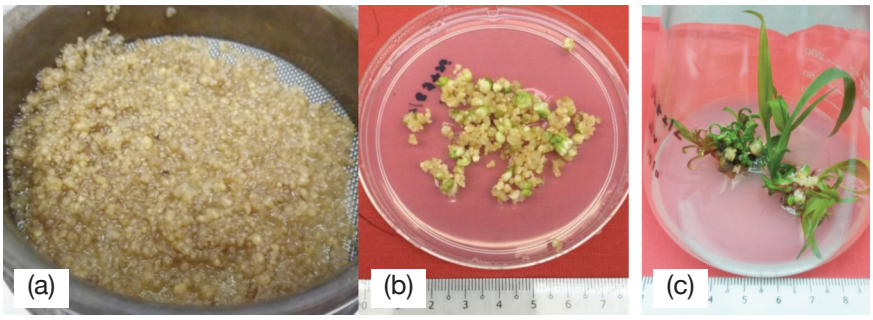

Figure 3. (a) Cell aggregates of clone PL 261 generated using the MV6 system, (b) regeneration of cell aggregates and (c) development into embryoids and shoots.

BENEFITS

The benefits of the MV4 and MV6 systems are:

- Economical;
- various oil palm clones and treatments can be tested simultaneously;
- can be applied to liquid culture systems of other crops; and
- potential for automation.

PATENT

Agitation and aeration apparatus and system: patent granted MY-141702-A.

REFERENCE

TARMIZI, A H; ZAITON, R and ROSLI, Y (2009). Multiplication of oil palm liquid cultures in the two-in-one MPOB Simple Impeller System (2-in-1 MoSLIM). *Proc. of the PIPOC 2009 International Palm Oil Congress (Agriculture Conference)*. MPOB, Bangi. p. 641-649.

For more information, kindly contact:

Director-General
MPOB
6, Persiaran Institusi,
Bandar Baru Bangi,
43000 Kajang, Selangor,
Malaysia
Tel: 03-8769 4400
Fax: 03-8925 9446
www.mpob.gov.my