Scopus

## Documents

Ishak, A.A.[a] , Zulkepli, F.R.A.[a] , Hayin, N.F.M.[a] , Md Zain, N.H.[b] , Sapak, Z.[a c]

**Effect of high inlet temperature of spray dryer on viability of microencapsulated trichoderma asperellum conidia**
(2021) *IOP Conference Series: Earth and Environmental Science*, 757 (1), art. no. 012023, . Cited 2 times.

**DOI:** 10.1088/1755-1315/757/1/012023

[a] Centre of Postgraduate Studies, Faculty of Plantation and Agrotechnology, Universiti Teknologi MARA, Jasin Campus, Merlimau, Melaka, 77300, Malaysia
[b] Kulliyyah of Science, International Islamic University Malaysia (IIUM), Kuantan, Pahang Darul Makmur, 25710, Malaysia
[c] Crop Protection Research Group, Faculty of Plantation and Agrotechnology, Universiti Teknologi MARA (UiTM), Shah Alam, Selangor, 40450, Malaysia

**Abstract**
In recent years, the use of spray drying for microencapsulating beneficial microbes has gained the interest of researchers, mainly due to dried powder formulation could prevent contamination and prolong self-life of the microbes. The major constraint of spray drying is conidia could lose viability during the drying process due to heat. In this present study, the effect of spray drying inlet temperature on viability of microencapsulated Trichoderma asperellum conidia was assessed. A blend biopolymer of gum Arabic and maltodextrin in ratio of 1:1 was used to microencapsulate the conidia at 150, 160 and 170oC inlet temperatures of spray drying process. Assessment of conidia viability was performed based on conidia percent survival of spray dried (PSsd) and survival increase (SI) unit values. Viability of the microencapsulated conidia was also evaluated their shelf life stored at two different temperatures which were at 28 ±2C and 4±2C for 40 weeks. The finding showed that viability of microencapsulated conidia was optimum obtained at inlet temperature of 170C with 68.2% of PSsd and SI and 17.7 units of SI compared to 15.9% and 1.5 unit respectively obtained for 160oC and 0.2% and 0.7 unit for 150oC. The highest inlet temperature has showed the highest viability compared to lower temperatures. Conidia stored at low temperature of 4 ±2C has survived longer up to 40 weeks that were confirmed via the viability test. High inlet temperature of 170oC was desirable to enhance survivability and viability of the conidia to be used as biocontrol agent up to 40 weeks at low temperature storage. These microencapsulated conidia could be further tested on their capability to inhibit the pathogen of pineapple disease. 

**Author Keywords**
High Inlet Temperature; Microencapsulation; Spray Drying; Trichoderma asperellum

**Index Keywords**
Agriculture, Bacteria, Biopolymers, Microencapsulation, Spray drying, Temperature; Biocontrol agent, Drying process, Inlet temperature, Low temperatures, Low-temperature storage, Lower temperatures, Maltodextrins, Spray drying process; Fungi

**References**

- Coppens d'Eeckenbrugge, G, Leal, F.
**Chapter 2: Morphology, Anatomy, and Taxonomy**
(2003) *The Pineapple: Botany, Production, and Uses*, p. 21.
Bartholomew, DP; Paull, RE; Rohrbach, KG (eds). Wallingford, UK: CABI Publishing. ISBN 978-0-85199-503-8

- Marcellin, M.L., François, M.E., Valteri, V.A., Endali, E.M.J., Begoude, B.A.D.
**In vitro study of the compatibility of six fungicides with two strains of Trichoderma asperellum, biocontrol agents used against cacao black pod disease in Cameroon**
(2018) *International Journal of Innovation and Applied Studies*, 24 (4), pp. 1834-1848.

- Veenstra, A., Rafudeen, M.S., Murray, S.L.
**Trichoderma asperellum isolated from African maize seed directly inhibits Fusarium verticillioides growth in vitro**
(2019) *European Journal of Plant Pathology*, 153 (1), pp. 279-283.

- Go, W.Z., H'ng, P.S., Wong, M.Y., Chin, K.L., Ujang, S., Noran, A.S.
**Evaluation of Trichoderma asperellum as a potential biocontrol agent against Rigidoporus microporus Hevea brasiliensis**
(2019) *Archives of Phytopathology and Plant Protection*, 52 (7-8), pp. 639-666.

- Das, S.K., David, S.R.N., Rajabalaya, R., Mukhopadhyay, H.K., Halder, T., Palanisamy, M.
**Microencapsulation techniques and its practice**
(2011) *Institute of Pharmacy*, 6 (2), pp. 1-23.
Khanam. J. and Nanda. A

- Morgan, C.A., Herman, N., White, P.A., Vesey, G.
**Preservation of micro-organisms by drying; a review**
(2006) *Journal of microbiological methods*, 66 (2), pp. 183-193.

- Braga, A.B., Costa, C.J., Pomella, A.W., Ribeiro, E.J., Santos, L.D., Zotarelli, M.F.
**Evaluation of lethality temperature and use of different wall materials in the microencapsulation process of Trichoderma asperellum conidias by spray drying**
(2019) *Powder Technology*, 347, pp. 199-206.

- Jin, X., Custis, D.
**Microencapsulating aerial conidia of Trichoderma harzianum through spray drying at elevated temperatures**
(2011) *Biological Control*, 56 (2), pp. 202-208.

- Munoz-Celaya, A.L., Ortiz-Garcia, M., Vernon-Carter, E.J., Jauregui-Rincon, J., Galindo, E., Serrano-Carreon, L.
**Spray-drying microencapsulation of Trichoderma harzianum conidias in carbohydrate polymers matrices**
(2012) *Carbohydrate Polymers*, 88 (4), pp. 1141-1148.

- Zaiton, S., Sariah, M., Zainal Abidin, M.A.
**Isolation and Characterization of Microbial Endophytes from Oil Palm Roots: Implication as Biocontrol Agents against Ganoderma**
(2006) *The Planter, Kuala Lumpur*, 82, pp. 587-597.

- Smith, N.R., Dawson, V.T.
**The Bacteriostatic Action of Rose Bengal in Media Used for the Plate Counts of Soil Fungi**
(1944) *Soil Science*, 58, pp. 467-471.

- Fernandez-Sandoval, M. T., Ortíz-García, M., Galindo, E., Serrano-Carreón, L.
**Cellular damage during drying and storage of Trichoderma harzianum spores**
(2012) *Process Biochemistry*, 47, pp. 186-194.

- Takeiti, C. Y., Kieckbusch, T. G., Collares-Queiroz, F. P.
**Morphological and Physicochemical Characterization of Commercial Maltodextrins with Different Degrees of Dextrose-Equivalent**
(2010) *International Journal of Food Properties*, 13 (2), pp. 411-425.

- Faria, M., Hajek, A.E., Wraight, S.P.
**Imbibitional damage in conidia of the entomopathogenic fungi Beauveria bassiana, Metarhizium acridum, and Metarhizium anisopliae**
(2009) *Biological Control*, 51, pp. 346-354.

- Simonin, H., Beney, L., Gervais, P.
**Sequence of occurring damages in yeast plasma membrane during dehydration and rehydration: Mechanisms of cell death**
(2007) *Biochimica et Biophysica Acta*, 1768, pp. 1600-1610.

- Jin, X., Taylor, A.G., Harman, G.E.
**Development of media and automated liquid fermentation methods to produce desiccation-tolerant propagules of Trichoderma harzianum**
(1996) *Biological Control*, 7, pp. 267-274.

- Pérez-Alonso, C., Báez-González, J. G., Beristain, C. I., Vernon-Carter, E. J., Vizcarra-Mendoza, M. G.

**Estimation of the activation energy of carbohydrate polymers blends as selection criteria for their use as wall material for spray-dried microcapsules**
(2003) *Carbohydrate Polymers*, 53, pp. 197-203.

**Correspondence Address**
Sapak Z.; Centre of Postgraduate Studies, Malaysia; email: zaiton3338@uitm.edu.my

**Publisher:** IOP Publishing Ltd

**Conference name:** 3rd International Conference on Sustainable Agriculture and Biosystem, ICSAB 2020
**Conference date:** 25 November 2020
**Conference code:** 169101

**ISSN:** 17551307
**Language of Original Document:** English
**Abbreviated Source Title:** IOP Conf. Ser. Earth Environ. Sci.
2-s2.0-85107217267
**Document Type:** Conference Paper
**Publication Stage:** Final
**Source:** Scopus