

# Inventarization of Nematode-trapping Fungi in Terrestrial Area of Deli Serdang Regency, North Sumatera

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**Keywords:** Adhesive knob, Adhesive network, Biocontrol agent, Nematode-trapping fungi, Sprinkle method

**Abstract:** Nematode-trapping fungi have been isolated from terrestrial area of Deli Serdang regency, North Sumatera. The inventory of fungi was conducted by examining 44 random soil samples in decay litter and organic waste within 22 districts. Pour and sprinkle method were used to isolate nematode-trapping fungi from the soil. Three species were identified based on morphological characteristics namely *Dactylella* sp., characterized by the presence of adhesive knobs trapping organ; *Arthrobotrys* sp. and *Monacrosporium* sp., characterized by the presence of adhesive network. One species without any trapping organ, also known as entomopathogen was identified as *Lecanicillium* sp., and *Trichoderma* sp. known as opportunists.

## 1 INTRODUCTION

Plant parasitic nematodes (PPN) can cause severe problems in agriculture field and yield loss more than 60% especially in susceptible plant each year in Indonesia (Adnan, 1998). Disease control management caused by PPN used to rely on chemical pesticide that generally contain hazardous compound. Without good management control, the pesticide contain chemical hazardous compound will harm the environment. In order to diminish the environmental damage, it is important to all expert in biology and agriculture to seek for an alternate and advance method which is environmental friendly.

Nematode-trapping Fungi is well known to trap and kill nematode worms in the soil with their trapping organ (Swe, 2011). Their ability to trap and kill nematodes in the soil is potential to be developed as bio-control agent. Species diversity of NTF in Indonesia has not yet been well studied.

Nematode-trapping fungi (NTF) belongs to *Orbiliaceae* was first described by Nannfeldt in 1932 contains 288 species of fungi in 12 genera (Yu, 2011). Out of 288 species world wide, (Boedijn, 1929) reported one species namely *Monacrosporium megalosporum* in North Sumatera, while Rifai and Cooke (1965) found 2 species from genera *Dactylella* in West Java. Subsequently, (Hastuti,

2016) found 4 species Nematode-trapping fungi (NTF) from North Sumatera in vegetable plant and crop area (Hastuti, 2016).

The aim of this study was to explore and isolate NTF and from Deli Serdang district, North Sumatera. This study is highly beneficial to reduce the use of conventional pesticide commonly used in Indonesia.

## 2 MATERIALS AND METHODS

Soil sample was collected by random sampling method according to (Duddington, 1955) using thrown 0.5 m quadrats. The quadrats size or plots measuring 0.5 × 0.5 m are determined to be 0.25 m<sup>2</sup> from total area sampling and it should be covered 2% of all total area sampling.

Soil was collected from decay litter and organic garbage area. Soil was dug 10-15 cm depth by using sterilized small shovel. In each location soil sample was taken in 3 different plots. Soil samples were homogenized in a sterile plastic bag. After being homogenized, 100 gr of the soil sample was taken and stored in refrigerator at 4°C.

(Larsen, 1994) method combined with sprinkle method by (Eren, 1965) were used to isolate the nematode-trapping fungi. One gram of soil sample was sprinkled on top of the Chloramphenicol Water Agar (CHF-WA) medium and stored in 20°C. Three

days after incubation, approximately 500-1000 individu of free-living nematodes were transferred into the plate as baits.

Free-living nematode isolated from Sumatera soil was maintained in Nematode Growth Medium (NGM). One-hundred microlitre of *Escherichia coli* OP 50 was added to the NGM plate as food source for nematode (Stiernagle, 2006), plates were also supplied with 0.5 g peanut butter per litre media of NGM (Mendoza, 1999).

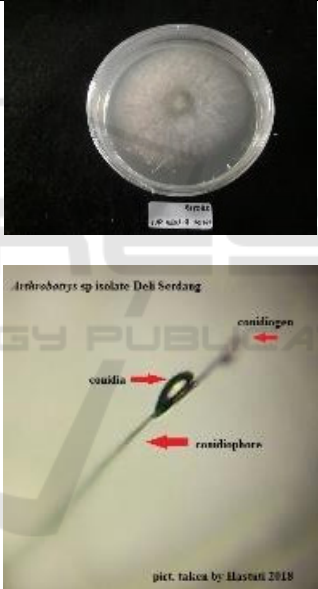

The presence of NTF can be detected by observing trapped nematodes under stereo-compound microscope. Observation was carried out each day for 3 months. Mycelium and conidia of

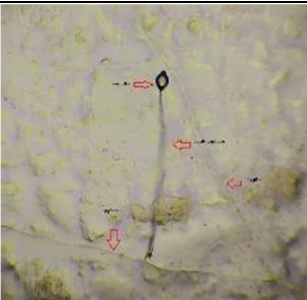
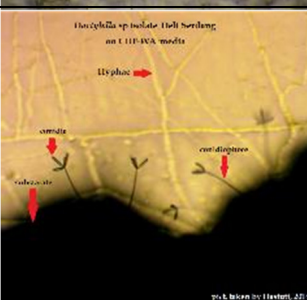


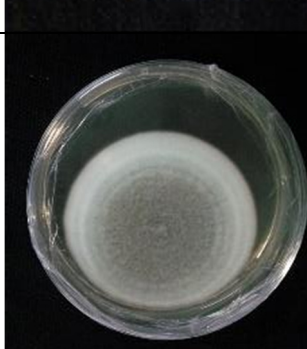
NTF was sub-cultured under microscope to Potato Dextrose Agar (PDA) medium until single culture was obtained. Identification and determination of NTF was carried out by observing and comparing the morphological characteristics to published monographs and identification books.

### 3 RESULTS AND DISCUSSION

Three species of NTF have been successfully isolated from 36 soil samples from 18 district in Deli Serdang, North Sumatera. Species of NTF isolated in this study can be seen in Table 1.

Table 1.

N	Code Isolate	Tentative Name	Substrates	Colony Image	Locality (District)
1	Sp.1 Serdang	<i>Arthrotrrys</i> sp.	Soil litter) (Decay		<ul style="list-style-type: none"> <li>• Pantai Labu</li> <li>• Patumbak</li> <li>• Lubuk Pakam</li> <li>• STM Hilir</li> <li>• STM Hulu</li> <li>• Batang Kuis</li> <li>• Sibiru-biru</li> </ul>
2	Sp.2 Serdang	<i>Monacrosporium</i> sp. ( <i>Dactylella</i> )	Soil litter) (Decay		<ul style="list-style-type: none"> <li>• Patumbak</li> <li>• Pantai Labbu</li> <li>• Namurambe</li> <li>• STM Hulu</li> </ul>

3	Sp.3 Serdang	<i>Monacrosporium eudermatum</i>	Soil litter (Decay)		<ul style="list-style-type: none"> <li>• Patumbak</li> <li>• Namurambe</li> <li>• Pantai Labu</li> <li>• STM Hilir</li> </ul>
4	Sp.4 Deli Serdang	<i>Dactylella javanica</i>	Soil litter (Decay)		<ul style="list-style-type: none"> <li>• Namurambe</li> </ul>
5	Sp.5 Serdang	<i>Lecanicillium</i> sp.	Decay litter		<ul style="list-style-type: none"> <li>• Pantai Labu</li> </ul>
6	Sp.6 Serdang	<i>Trichoderma</i> sp.	Decay litter		<ul style="list-style-type: none"> <li>• Pantai Labu</li> </ul>
7	Sp.7 Serdang	<i>Penicillium</i> sp.	Decay litter		<ul style="list-style-type: none"> <li>• Pantai Labu</li> </ul>

Six species isolated from several District of Deli Serdang Regency were recorded. Four species were identified as nematode-trapping fungi that belongs to genera, *Arthrobotrys*, *Monacrosporium* and *Dactylella*. *Monacrosporium eudermatum*, *Monacrosporium* sp and *Dactylella* sp were characterized by adhesive network trapping organ, and *Arthrobotrys* sp was characterized with adhesive knob. NTF isolated from Deli Serdang with adhesive knob has not yet been found in previous research. Previous research done by Hastuti (2016) found 4 species of NTF from Sumatera soil showed only adhesive network trapping organ.

The two species of non nematode-trapping fungi isolated in this study were identified as *Trichoderma* sp, *Penicillium* sp and *Lecanicillium* sp. *Penicillium* sp is well known as antagonist (John, 2011) and *Trichoderma* sp as opportunist fungi for nematode. *Lecanicillium* sp is well recorded as entomopathogen for some Arthropoda such as Aphids (Aphidoidea) and Thrips (Thysanoptera). To conclude, we found a very low number of NTF species diversity in Deli Serdang, North Sumatera, Indonesia. Recent research by Hastuti (2016) also reported a very low number of NTF from soil in crop plantation area in North Sumatera. NTF is well known as temperate species; they grow well in conditions where the soil temperature is between 15-20°C (Drechsler, 1954). Similar reserach done by John and Wright (2010) on 232 sampels soil from three climatic region in Botswana showed seven isolates identified as *Trichoderma* sp., *Penicillium* sp., *Dendriphiopsis* sp., *Fusarium chlamydosporium*, *Cochliobolus sativus*, and *Aspergillus fumigatus*. Indonesia, including Deli Serdang North Sumatera, has the temperature of 30 to 35°C in average, which could explain the less diversity of NTF species in North Sumatera. However, no scientific report stating the low number of NTF species in Indonesia is due to the tropical climate has been previously reported before, leaving the precise reason unknown.

## 4 CONCLUSIONS

There are very little number of NTF species found in Deli Serdang. Four species of NTF found in Deli Serdang recorded as *Arthrobotrys* sp, *Dactylella* sp and *Monacrosporium* sp. Adhesive knob trapping device belongs to *Arthrobotrys* sp is new record. *Trichoderma* sp as opportunistic fungi also identified and *Lecanicillium* sp well known as entomopathogen also identified.

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