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NURNAWATI, Elisa, Dr. Langkah Sembiring, MSc

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ISOLASI DAN KARAKTERISASI KAPANG PENDEGRADASI KATEKIN DARI SERESAH PINUS

Elisa Nurnawati
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INTISARI

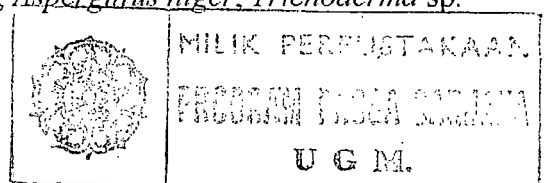
Seresah pinus lebih sulit terdekomposisi dari pada seresah daun jenis lain karena daun pinus mengandung senyawa kompleks, di antaranya tanin terkondensasi yang menghambat proses dekomposisi. Tanin terkondensasi merupakan polimer katekin. Telah dilaporkan bahwa ada kapang yang dapat menggunakan katekin sebagai satu-satunya sumber karbon dan energi. Berdasarkan pemikiran tersebut maka dalam penelitian ini dilakukan isolasi dan karakterisasi kapang pendegradasi katekin dari seresah pinus.

Isolasi kapang dilakukan dengan memakai medium selektif yang mengandung katekin sebagai satu-satunya sumber karbon dan energi. Sumber isolat adalah seresah pinus dari Kalikuning, Sermo dan Dlingo. Kapang pendegradasi katekin yang dapat diisolasi adalah sebanyak 53 tipe isolat. Kerapatan propagul kapang dalam seresah pinus dari Kalikuning, Sermo dan Dlingo berkisar antara $3,97 - 11,7 \times 10^4$ cfu/ g-berat kering seresah. Seluruh isolat kapang diseleksi melalui tiga tahap. Tahap pertama dilakukan dengan mengamati pertumbuhan isolat dalam medium padat yang mengandung 2 mM katekin. Seleksi tahap pertama menghasilkan 28 isolat kapang yang tumbuh lebih baik. Seleksi kedua dilakukan dengan mengamati pertumbuhan isolat dalam medium yang mengandung 4 mM katekin dan menghasilkan 14 isolat kapang terpilih. Seleksi ketiga dilakukan dengan menentukan kecepatan pertumbuhan dalam medium yang mengandung 4 mM katekin melalui pengukuran nilai konstanta kecepatan pertumbuhan rerata (k), *instantaneous growth rate constant* (μ) dan waktu generasi (g) bagi masing-masing isolat. Empat isolat terpilih hasil seleksi ketiga yaitu D9, K2, K11 dan S11.

Pertumbuhan isolat terpilih hasil seleksi ketiga dalam konsentrasi katekin yang bervariasi diamati dengan mengukur pertambahan diameter koloni untuk menentukan nilai μ . Isolat D9, K2 dan S11 tumbuh baik sampai konsentrasi katekin 40 mM, tetapi K11 terhambat pada konsentrasi di atas 10 mM. Isolat K2 memiliki nilai k , μ dan g tertinggi sehingga dipilih untuk uji kemampuan biodegradasi katekin bersama isolat K11 dalam medium cair. Hasil pengujian pada medium cair menunjukkan bahwa isolat K2 mampu mendegradasi katekin lebih cepat ($\mu = 8,556$) dari pada isolat K11 ($\mu = 7,174$).

Isolat terpilih dikarakterisasi berdasarkan karakter morfologi makroskopis, mikroskopis dan karakter fenotipik, kemudian diidentifikasi dengan menggunakan strain acuan. Isolat D9, K2 dan S11 diidentifikasi sebagai anggota *Aspergillus niger*. Isolat yang paling mirip dengan strain acuan (*Aspergillus niger* van Tiegh. IFO 6341) adalah isolat K2, sedangkan D9 dan S11 satu sama lain sangat mirip. Isolat K11 diidentifikasi sebagai anggota genus *Trichoderma*. Dengan demikian *Aspergillus niger* dan *Trichoderma* sp. pendegradasi katekin dapat ditemukan pada seresah pinus dari Kalikuning, Sermo dan Dlingo.

Kata kunci : biodegradasi katekin, seresah pinus, *Aspergillus niger*, *Trichoderma* sp.



ISOLATION AND CHARACTERIZATION OF CATECHIN-DEGRADING FUNGUS FROM PINE LITTER

Elisa Nurnawati
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ABSTRACT

Pine litter is more difficult to be decomposed than other litters because of its chemical constituents, such as tannin terkondensasi, that inhibits its decomposition. Condensed tannin is a catechin polymer. It has been widely reported that fungi can utilize catechin as its sole carbon and energy source. Based on this thought, isolation and characterization of catechin-degrading fungus from pine litter has been conducted.

*Selective medium, that contains catechin as sole carbon and energy source, was used for isolation of fungi. Samples of pine litter from Kalikuning, Sermo and Dlingo were used as fungal propagules. The result of isolation showed that 53 isolate types of catechin-degrading fungus from pine litter were obtained. Propagule density of fungi in pine litter from Kalikuning, Sermo and Dlingo were in a range of 3,97 to 11,7 x 10⁴ cfu/g-dry weight of the litter. All the isolates were screened for their ability to degrade catechin in three stages. In the first stage, the isolates were screened by observing their growth on minimal medium containing 2 mM catechin. It was found that only 28 isolates grew well on this medium. The second stage of screening was based on their qualitative growth on minimal medium containing 4 mM catechin resulting 14 selected isolates. Further screening based on their mean growth rate constant (*k*), instantaneous growth rate constant (μ) and generation time (*g*) on minimal medium containing 4 mM catechin resulting the selection of 4 isolates, i.e. D9, K2, K11, and S11.*

*The growth of selected isolates were assayed on various concentration of catechin by determining of their *k*, μ and *g*. The result of the experiment indicated that isolates D9, K2 and S11 were found to grew well on solid minimal medium containing catechin up to 40 mM. However isolate K11 was found to be inhibited by catechin concentration of higher than 10 mM. On the basis of the results, isolate K2 and K11 were finally selected for further test of ability to degrade catechin. The ability to degrade catechin was assayed on liquid medium containing catechin 20 mM catechin. Catechin concentration was followed by HPLC analysis it was found isolate K2 had higher ability to degrade catechin ($\mu = 8,556$) than K11 ($\mu = 7,174$).*

*Selected isolates in the third stage (D9, K2, K11 and S11) were characterized and identified based on their macroscopic and microscopic colonial characters as well as phenotypic tests. Subsequently, the identification of the isolates were carried out by profile matching method and comparing with reference strains. The result of identification showed that isolates D9, K2, K11 and S11 were identified as member of *Aspergillus niger* group. The isolate K2 was found to be the most similar with the reference strain *Aspergillus niger* van Tiegh. II'0 6341, while the isolate D9 was very similar to S11. Finally, K11 was assigned to the genus of *Trichoderma*. Therefore, the catechin-degrading fungus of *Aspergillus niger* and *Trichoderma* sp. could be found on pine litter from Kalikuning, Sermo and Dlingo.*

Keywords: catechin biodegradation, pine litter, *Aspergillus niger*, *Trichoderma* sp.



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