REPUBLIK INDONESIA
KEMENTERIAN HUKUM DAN HAK ASASI MANUSIA

# SURAT PENCATATAN
# CIPTAAN

Dalam rangka pelindungan ciptaan di bidang ilmu pengetahuan, seni dan sastra berdasarkan Undang-Undang Nomor 28 Tahun 2014 tentang Hak Cipta, dengan ini menerangkan:

| | | |
|---|---|---|
| Nomor dan tanggal permohonan | : | EC00202337610, 23 Mei 2023 |
| **Pencipta** | | |
| Nama | : | **Syaiful Amri Saragih, SP., M.Sc** |
| Alamat | : | Sibungabunga, Simalungun, Sumatera Utara, 21172 |
| Kewarganegaraan | : | Indonesia |
| **Pemegang Hak Cipta** | | |
| Nama | : | **Universitas Muhammadiyah Sumatera Utara** |
| Alamat | : | Jl. Kapten Muchtar Basri No. 3 Glugur Darat II, Medan, Sumatera Utara, 20238 |
| Kewarganegaraan | : | Indonesia |
| Jenis Ciptaan | : | **Karya Tulis Lainnya** |
| Judul Ciptaan | : | **Foto Penampang Melintang Batang Acer Amoenum Yang Diinokulasi Oleh Jamur Raffaelea Cyclorhipidia** |
| Tanggal dan tempat diumumkan untuk pertama kali di wilayah Indonesia atau di luar wilayah Indonesia | : | 23 Mei 2021, di Medan |
| Jangka waktu pelindungan | : | Berlaku selama hidup Pencipta dan terus berlangsung selama 70 (tujuh puluh) tahun setelah Pencipta meninggal dunia, terhitung mulai tanggal 1 Januari tahun berikutnya. |
| Nomor pencatatan | : | 000470531 |

adalah benar berdasarkan keterangan yang diberikan oleh Pemohon.
Surat Pencatatan Hak Cipta atau produk Hak terkait ini sesuai dengan Pasal 72 Undang-Undang Nomor 28 Tahun 2014 tentang Hak Cipta.

a.n. MENTERI HUKUM DAN HAK ASASI MANUSIA
Direktur Hak Cipta dan Desain Industri

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Disclaimer:
Dalam hal pemohon memberikan keterangan tidak sesuai dengan surat pernyataan, Menteri berwenang untuk mencabut surat pencatatan permohonan.

**Beetle attacks on weakened trees.** Ambrosia beetle attacks on three weakened *Acer amoenum* trees (trees A, B, and C) were determined based on observation of holes found on trunk surfaces and boring dust pushed out onto the bark surface (as a result of the boring activity of the beetles penetrating the xylem). Beetle attacks were recorded on 29 November 2017. Beetle holes on trunk surfaces were recorded at 0 to 1.8 m above ground level. The attack density was calculated by dividing the number of holes by the surface area and converting to the number of holes per 100 $cm^2$.

**Statistical analysis.** A linear mixed model (LMM) was used to compare the differences in discoloration widths and nonconductive areas among fungal species and controls in the cut main trunk and sapling branch inoculation tests. The fungal species were treated as a fixed effect and the cut main trunk and sapling identity as random effects. Discoloration widths and nonconductive areas were treated as response variables. The "lme4" package (Douglas et al. 2018) was used for the LMM. The isolation frequency (IF) of fungal reisolation from branches was calculated by the following formula: IF = (Bi/Bt) × 100 (%), where Bi and Bt are the total number of branches on which the fungus was isolated and the total number of inoculated branches, respectively. Isolation frequencies were compared using the $\chi^2$ test to evaluate whether frequencies of reisolation differ between the fungal species. The statistical analysis was performed using R software version 3.6.3 (R Development Core Team 2020).

## Results

After surface sterilizations, four fungal species were isolated from the bodies of *Euwallacea fornicatus*, *Euwallacea interjectus*, and *P. calamus* ambrosia beetles (Table 1). The fungus *F. euwallaceae* was isolated from both *Euwallacea fornicatus* and *Euwallacea interjectus* with a 100% isolation frequency, whereas the other three fungal species, *Arthrinium phaeospermum*, *R. cyclorhipidia*, and *Epicoccum nigrum*, were isolated from *P. calamus*, with 35, 15, and 5% isolation frequencies, respectively. No fungi were isolated from 11 of the 20 *P. calamus* bodies.

The tangential widths of discolored sapwood produced by inoculation with the four fungal species and the control in the cut main trunks are shown in Figure 1. The mean tangential width of discolored sapwood induced by the control was 0.06 mm. *F. euwallaceae*, *R. cyclorhipidia*, *Epicoccum nigrum*, and *Arthrinium phaeospermum* were 0.38, 0.26, 0.20, and 0.19 mm, respectively. Of these, only *F. euwallaceae* and *R. cyclorhipidia* induced significantly greater sapwood discoloration width compared with that of the control ($P < 0.001$ by the LMM; Table 2).

Photographs of the inoculation point cross-sections and the percentage of conductive area lost after the inoculation of the sapling branches are shown in Figures 2 and 3, respectively. The mean conductance-area losses in branches inoculated with *F. euwallaceae*, *R. cyclorhipidia*, and the control were 12.6, 10.8, and 6.4%, respectively. Both *F. euwallaceae* and *R. cyclorhipidia* induced significant differences in the loss of conductive area compared with that of the control ($P < 0.01$ by LMM; Table 3).

All saplings were alive after a 13-month observation period. No branches showed symptoms of dieback or wilting as a result of the inoculations through the end of the experiment. *R. cyclorhipidia* was successfully reisolated from all inoculated branches, whereas

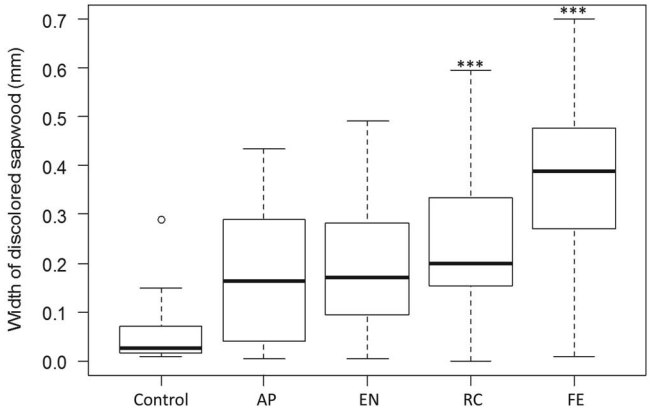


**Fig. 1.** Box plot of the tangential widths of discolored sapwood after the inoculation of *Acer amoenum* cut main trunks with four fungal species. AP = *Arthrinium phaeospermum*, EN = *Epicoccum nigrum*, RC = *Raffaelea cyclorhipidia*, and FE = *Fusarium euwallaceae*. ***$P < 0.001$ (significantly different from control, according to a linear mixed model.

**Table 2.** Model of partitioning of variance from linear mixed model comparing the differences in discoloration widths by four fungi to the control

| Fixed effects | Estimate | Standard error | *df*[a] | *t* value | *P* value[b] |
|---|---|---|---|---|---|
| Intercept | 0.06 | 0.04 | 22.67 | 1.04 | 0.30 |
| *Arthrinium phaeospermum* | 0.13 | 0.05 | 65.09 | 1.47 | 0.14 |
| *Epicoccum nigrum* | 0.13 | 0.05 | 64.98 | 1.59 | 0.12 |
| *Raffaelea cyclorhipidia* | 0.19 | 0.05 | 64.98 | 3.86 | <0.001*** |
| *Fusarium euwallaceae* | 0.32 | 0.05 | 64.98 | 6.26 | <0.001*** |

[a] *df* = degrees of freedom.
[b] ***$P < 0.001$.


**Fig. 2.** Cross-sections of the inoculated branches of *Acer amoenum* saplings inoculated with **A,** *Fusarium euwallaceae*, **B,** *Raffaelea cyclorhipidia*, and **C,** a control. Xylem stained with acid fuchsin indicates the water-conductive area. White arrows indicate discolored and nonconductive areas (unstained areas; excluding the area of inserted excised tip of the toothpick or bored area).

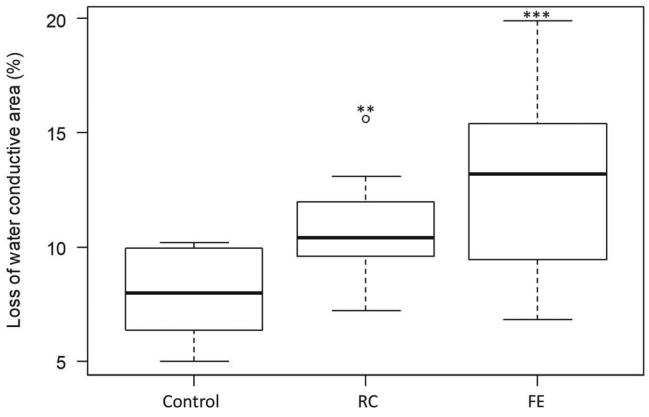


**Fig. 3.** Box plot of the loss of conductive area (%) after the inoculation of *Acer amoenum* sapling branches with two fungal species. RC = *Raffaelea cyclorhipidia* and FE = *Fusarium euwallaceae*. **$P < 0.01$; ***$P < 0.001$ (significantly different from control, according to a linear mixed model).