

## Pengaruh Suhu Pirolisis Terhadap Sifat Fisiko-Kimia dan Komponen Kimia Asap Cair Limbah Kering Ranting dan Daun Pengolahan Minyak Kayu Putih

Caesar Kartika Yoga <sup>1)</sup>, dan Sigit Sunarta <sup>2)</sup>

### Abstrak

Tanaman kayu putih (*Melaleuca cajuputi*) merupakan tanaman penghasil minyak atsiri yang penting bagi industri di Indonesia. Pengolahan minyak kayu putih di Pulau Jawa dilakukan oleh Perum Perhutani dan Dinas Kehutanan DIY, salah satunya adalah PMKP Sendang Mole. Sisa dari pengolahan berupa limbah kering biasanya digunakan untuk bahan bakar boiler. Alternatif pemanfaatan lain yang berprospek bagus yaitu sebagai bahan baku asap cair. Penelitian ini bertujuan untuk mengetahui karakteristik bahan baku limbah minyak kayu putih, sifat fisiko-kimia, komponen kimia asap cair, dan aplikasi pengawetan bambu legi terhadap serangan rayap kayu kering.

Bahan baku penelitian ini berupa limbah kering ranting dan daun pengolahan minyak kayu putih di Pabrik Sendang Mole yang ditumpuk di bawah naungan selama lebih dari 6 bulan. Rancangan penelitian berupa acak lengkap dengan faktor tunggal yaitu suhu dengan 5 aras (tiga ulangan untuk setiap aras). Karakteristik bahan baku seperti selulosa dan hemiselulosa serta lignin diuji proximat. Sifat fisiko-kimia asap cair seperti volume dan rendemen, berat jenis, pH, indeks bias, viskositas, kadar asam, fenol dan karbonil. Komponen kimia asap cair diuji dengan GC-MS, dan aplikasi asap cair sebagai pengawet bambu legi terhadap serangan rayap kayu kering diuji dengan mortalitas rayap.

Hasil pengukuran kadar air ranting dan daun sebesar 11,66% dan 9,67% secara berurutan. Hasil uji proximat ranting didapatkan kadar holoselulosa, alpha selulosa, dan lignin sebesar 59,20%; 31,30%; dan 38,07% secara berurutan. Uji proximat daun didapatkan kadar holoselulosa, alpha selulosa, dan lignin sebesar 25,10%; 40,89%; dan 45,35% secara berurutan. Sifat fisiko-kimia asap cair limbah PMKP Sendang Mole pada berbagai suhu pirolisis didapatkan hasil volume berkisar antara 495-577,5 ml; rendemen antara 37,81-44,64%; berat jenis antara 1,14-1,16; pH antara 4,07-5,66; indeks bias sebesar 1,34 nD; viskositas antara 4,33-4,45cP; kadar asam asetat antara 4,14-5,81%; kadar fenol asap cair hasil pirolisis antara 0,34-0,89%; serta kadar karbonil antara 1,08-1,36%. Komponen kimia asap cair yang terdeteksi pada GC-MS pada suhu antara 300°C-500°C menunjukkan hasil yang mirip. Senyawa yang menyusun asap cair antara lain adalah : m-cresol, o-guaiacol, p-cresol, 2 cyclopenten-1-one, carboic acid, asam asetat, syringol, xylenol, asam ptalat dan acetyl furan. Mortalitas rayap kayu kering pada pengawetan bambu legi dengan asap cair limbah pengolahan minyak kayu putih konsentrasi 5% berkisar antara 47,33-52,67% dan persen penurunan berat bambu legi berkisar antara 10,4% - 13,61%. Asap cair yang dihasilkan dari suhu pirolisis 500°C memiliki sifat fisiko-kimia dan aplikasi sebagai pengawet bambu legi dari serangan kayu kering paling besar nilainya dibandingkan suhu yang lain.

Kata kunci: asap cair, limbah, fisiko-kimia, pengawetan, rayap kayu kering

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<sup>1)</sup> Mahasiswa Fakultas Kehutanan, Universitas Gadjah Mada

<sup>2)</sup> Dosen Fakultas Kehutanan, Universitas Gadjah Mada

## Effect of pyrolysis temperature on the physico-chemical properties and chemical components of liquid smoke of dry waste branch and leaf cajuput oil processing

Caesar Kartika Yoga <sup>1)</sup> and Sigit Sunarta <sup>2)</sup>

### Abstract

Kayu putih (*Melaleuca cajuputi*) is an essential oil producer plant which is important for Indonesian industry. The cajuput oil processing in Java Island was carried out by Perum Perhutani and Provincial Forestry Service of Special Region of Yogyakarta. PMKP Sendang Mole is one of factories that conducting cajuput oil processing in Yogyakarta Province. The process has a huge dry waste which requires serious handling. Usually, this waste is used for boiler fuel. Another alternative that has a good prospect is to turn it to liquid smoke raw material. The objectives of this study are to find out the characteristic of cajuput oil waste raw material, physico-chemical and chemical components of liquid smoke, and the application of legi bamboo preservation towards drywood termite attack.

The raw materials of this study were dry waste from branch and leaf of cajuput oil processing at Sendhang Mole Factory which was stacked under a shelter for more than six months. The research design was complete randomized with a single factor was temperature (five levels) and three repetitions for each level. A proximate analysis was conducted for raw material to know the contents of cellulose, hemicellulose, and lignin. Physico-chemical parameters were volume and yield, are tested with specific gravity, pH, refractive index, viscosity, acid level, phenol and carbonyl compound content. Chemical components of liquid smoke were tested by GC-MS. The application methods used no choice test of drywood termite attack on legi bamboo with two parameters, termite mortality and mass loss.

The result showed that moisture content of cajuput branch and leaf were 11.66% and 9.67% respectively. A proximate test of branch yielded holocellulose, alpha cellulose, and lignin were 59.20%; 31.30%; and 1.43% respectively. Meanwhile for leaf, the holocellulose, alpha cellulose, and lignin were 40.89%; 25.10%; and 1.48%. Physico-chemical characteristics of liquid smoke from PMKP Sendang Mole waste varied from 495-577.5 ml of volume; yield between 37.81-44.64%; specific gravity between 1.14-1.16; pH values between 4.07-5.66; refractive index of 1.34 nD; viscosity between 4.33-4.45cP; acetic acid level between 4.14-5.81%; phenol level of liquid smoke from pyrolysis result between 0.34-0.89%; and carbonyl level between 1.08-1.36%. Detected chemical components of liquid smoke on GC-MS at the temperature of 300-500°C shows a similar result. The main compounds of liquid smoke were: m-cresol, o-guaiacol, p-cresol, 2 cyclopentane-1-one, carbolic acid, acetic acid, syringol, xylenol, phthalic acid, and acetyl furan. Dry wood termite mortality on legi bamboo preservation with liquid smoke with concentration rate of 5% varied 47,33-52,67% and mass loss varied from 10,4-13.61%. Generally liquid smoke from cajuput oil processing waste produced in pyrolysis temperature at 500°C had good physico-chemical characteristic and the best result for application as anti-termite preservation

Keyword: waste, liquid smoke, physico-chemical, preservation, drywood termite

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<sup>1)</sup> Student at Faculty of Forestry, Universitas Gadjah Mada

<sup>2)</sup> Lecturer at Faculty of Forestry, Universitas Gadjah Mada