

INTISARI

Rehabilitasi lahan terdegradasi yang dilakukan di Hutan Pendidikan Wanagama 1 yang dilakukan dengan penanaman vegetasi pionir telah menyebabkan terbentuknya tanah bertekstur lempung dengan ketebalan yang relatif tipis (< 20 cm). Penelitian ini mengkaji peran vegetasi Gamal terhadap pembentukan tanah, yang didekati melalui 3 peran Gamal, yaitu Gamal sebagai sumber bahan organik tanah, sebagai pengatur iklim mikro dan populasi mikroorganisme dan peran Gamal dalam menambah komponen inorganik tanah.

Penelitian dilakukan pada plot pengamatan yang dibuat di petak 5 (penanaman Gamal tahun 1969) dan petak 6 (penanaman tahun 1985). Peran Gamal sebagai sumber bahan organik tanah diamati melalui estimasi produksi seresah menggunakan metode *litter trap*, laju dekomposisi seresah menggunakan metode *litter bag* dan akumulasi seresah serta akumulasi bahan organik tanah. Pengamatan iklim mikro meliputi intensitas cahaya, suhu udara, kelembaban udara dan tanah, sedangkan populasi mikroorganisme yang diamati meliputi bakteri dan jamur terutama jamur pendekomposisi seresah. Peran Gamal dalam menambah komponen inorganik tanah didekati melalui karakterisasi mineralogi tanah dan analisis pelarutan kalsium dari batuan induk.

Tegakan Gamal di petak 5 memiliki kerapatan yang lebih rendah sehingga menghasilkan seresah Gamal ($5,02 \text{ ton ha}^{-1} \text{ tahun}^{-1}$) yang lebih rendah dibandingkan dengan di petak 6 ($6,12 \text{ ton ha}^{-1} \text{ tahun}^{-1}$). Proses dekomposisi seresah Gamal sangat dipengaruhi oleh musim. Laju dekomposisi di musim hujan lebih cepat kemungkinan karena kelembaban yang tinggi dan pencucian senyawa fenolat. Selama 12 minggu masa dekomposisi di musim hujan terjadi kehilangan biomasa seresah daun, generatif dan ranting sebesar, berturut-turut, sebesar 74%, 41% dan 42%. Hal tersebut menyebabkan akumulasi seresah yang rendah tetapi akumulasi bahan organik tanah yang sangat tinggi (0 – 20 cm: $154,5 - 169,2 \text{ ton ha}^{-1}$). Populasi mikroorganisme juga dipengaruhi oleh musim, pada umumnya tinggi pada musim hujan. Tanah-tanah di bawah tegakan Gamal memiliki warna coklat gelap sampai abu-abu sangat gelap, berat volume yang relatif rendah ($1,01 - 1,1 \text{ g cm}^{-3}$), pH alkali dan memiliki proporsi fraksi lempung 87 – 90% yang didominasi mineral smektit. Kandungan lempung dan mineral smektit pada lapisan tanah 0 – 10 cm lebih tinggi. Tanah di bawah tegakan Gamal yang lebih tua memiliki kandungan mineral smektit yang lebih tinggi. Lempung yang didominasi oleh mineral smektit terbentuk secara *in situ* melalui pelarutan batuan gamping dan presipitasi dari larutan tanah. Pelarutan terjadi melalui reaksi antara kalsium karbonat dengan asam organik. Jamur memiliki kemampuan menghasilkan asam dan pelarutan kalsium yang lebih tinggi dari mikroorganisme lain.

Kata kunci: Gamal, bahan organik, batuan gamping, lempung, smektit

ABSTRACT

Rehabilitation of degraded lands in Wanagama I Education Forest which was conducted by planting pioneer vegetations has resulted in the development of shallow clayey soils (< 20 cm depth). This study evaluated the roles of Gamal on soil development, which were approached through the role of Gamal as source of soil organic matter, as regulator of micro climate and microorganism population, and in formation of soil inorganic components.

Observation was conducted in plots established in compartment 5 and 6 which were rehabilitated in 1969 and 1985, respectively. Roles of Gamal as source of soil organic matter was estimated by its litter production using litter trap method, rates of litter decomposition using litter bag method and accumulation of litter and soil organic matter. Micro climate observation included light intensity, air temperature and air and soil moisture. Microorganisms studied were bacteria and fungi particularly the decomposer. Addition of soil inorganic components was approached by characterizing soil mineralogy and analyzing calcium dissolution from limestone.

Gamal stand in compartment 5 had lower stand density, therefore produced less litter ($5.02 \text{ ton ha}^{-1} \text{ year}^{-1}$) than compartment 6 ($6.12 \text{ ton ha}^{-1} \text{ year}^{-1}$). Decomposition processes of Gamal litter were affected by season. Rapid litter decomposition occurred in rainy season which was probably related to high humidity and loss of phenolic compounds. In the 12 weeks decomposition period in rainy season, biomass of leaf, twig and fruit pod litter decreased by as much as 74%, 41% and 42%, respectively. This condition caused litter accumulation was low but very high content of soil organic matter (0 – 20 cm: $154.5 - 169.2 \text{ ton ha}^{-1}$). Population of microorganisms was also affected by season, generally it was greater in rainy season. Soils under Gamal stands colored dark brown to very dark grey, had relatively low bulk density ($1.01 - 1.1 \text{ g cm}^{-3}$), alkaline pH, and had high content of clay (87 – 90%) which was dominated by smectite. Clay and smectite contents in 0 – 10 cm layer were higher than the deeper soil layer. Soils under the older Gamal stand also had higher clay and smectite contents. Smectite-dominated clays were formed *in situ* through dissolution and subsequent precipitation of limestone. Dissolution of calcium occurred through reaction of calcium carbonate with organic acids. Fungi possessed greater organic acids production and calcium carbonates dissolution then other microorganisms.

Keywords: Gamal, organic matter, limestone, clay, smectite