

**PENGARUH LIMBAH CAIR INDUSTRI PERAK TERHADAP ANATOMI  
DAN KANDUNGAN METABOLIT SEKUNDER TANAMAN KENIKIR  
(*Tagetes erecta* L.)**

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**INTISARI**

Kerajinan perak merupakan salah satu industri yang terkenal di Indonesia. Proses pembuatan kerajinan perak menghasilkan limbah yang mengandung logam berat yang dapat mencemari lingkungan. Cara mengatasi pencemaran ini adalah fitoremediasi. Kenikir (*Tagetes erecta* L.) merupakan fitoremediator karena dapat mengakumulasi logam berat di lingkungan. Penelitian ini bertujuan untuk mengetahui pengaruh limbah cair industri perak terhadap anatomi dan pertumbuhan kenikir serta mengetahui pengaruh limbah cair industri perak terhadap metabolit sekunder kenikir. Terdapat 5 perlakuan yaitu kontrol, konsentrasi limbah 25%, 50%, 75%, dan 100%. Perlakuan diberikan 5 hari sekali selama 30 hari dan terdapat 5 ulangan pada tiap perlakuan. Data morfologis dan pertumbuhan diambil tiap minggu sedangkan data anatomis diambil saat tanaman berumur 2 bulan. Data yang diperoleh dianalisis dengan *ANOVA*. Uji kandungan metabolit sekunder dilakukan dengan metode histokimia. Hasil menunjukkan bahwa terjadi penurunan tinggi tanaman, panjang akar, jumlah, panjang serta lebar daun seiring dengan semakin tingginya konsentrasi limbah. Daun tanaman mengalami klorosis dan nekrosis pada konsentrasi 75% dan 100%. Parameter anatomis akar berupa ketebalan epidermis dan diameter stele yang terbesar adalah pada perlakuan kontrol. Limbah perak menyebabkan kerusakan epidermis serta berkurangnya diameter stele. Korteks akar yang paling tebal terdapat pada konsentrasi 75%. Sementara itu ketebalan epidermis dan berkas pengangkut terbesar adalah pada perlakuan kontrol, perlakuan konsentrasi 25% memiliki ketebalan korteks dan diameter empulur terbesar. Parameter anatomis daun berupa ketebalan epidermis dan berkas pengangkut terbesar adalah pada konsentrasi 50%, sedangkan ketebalan mesofil terbesar pada perlakuan kontrol. Ketebalan mesofil menurun seiring semakin tingginya konsentrasi limbah. Senyawa alkaloid dan fenolik terdeteksi lebih pekat pada perlakuan limbah perak daripada kontrol. Alkaloid dan fenolik terdistribusi pada korteks batang, mesofil daun, serta jaringan pengangkut batang dan daun kenikir. Terpenoid tidak terdeteksi dengan uji histokimia pada batang dan daun kenikir.

**Kata kunci :** anatomi, kenikir, limbah perak, metabolit sekunder

## EFFECT OF LIQUID WASTE FROM SILVER INDUSTRY TO ANATOMY AND SECONDARY METABOLITE COMPOUNDS OF MARIGOLD (*Tagetes erecta* L.)

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### ABSTRACT

Silver crafts are one of the famous industries in Indonesia. The process of making silver crafts produces waste containing heavy metals which can pollute the environment. The way to overcome this pollution is phytoremediation. Marigold (*Tagetes erecta* L.) is a phytoremediator because it can accumulate heavy metals in environment. This research aims to determine the effect of liquid waste from silver industry on the anatomy and growth of marigold and determine the effect of liquid waste from silver industry on secondary metabolite content of marigold. Marigold seedlings were divided into 5 groups, control, waste concentration of 25%, 50%, 75%, and 100%. Treatment was given every 5 days for 30 days and there were 5 repetitions of each treatment. Morphological and growth data were taken every week, while anatomical data was taken when plants were 2 months old. Data were analyzed using ANOVA. Secondary metabolite content was tested using histochemical method. The results showed that there was a decrease in plant height, root length, number, length and width of leaves as the waste concentration increased. Plant leaves experienced chlorosis and necrosis at concentrations of 75% and 100%. Root epidermis thickness and stele diameter were largest in control treatment. Silver waste causes damage to epidermis and reduces the diameter of stele. The largest root cortex thickness was found at concentration of 75%. Stem's epidermis thickness and transport bundles were largest in control treatment, while 25% waste treatment had the largest cortex thickness and pith diameter. Leaf's epidermis thickness and transport bundles were largest at concentration of 50%, while mesophyll thickness was largest in control treatment. Mesophyll's thickness decreases as the waste concentration increases. Alkaloid and phenolic were detected more concentrated in silver waste treatment than control treatment. Alkaloid and phenolic were distributed in stem cortex, leaf mesophyll, and transport tissue of marigold stems and leaves. Terpenoid was not detected by histochemical tests on the stems and leaves of *Tagetes erecta* L.

**Keywords** : anatomy, marigold, silver waste, secondary metabolites