

RINGKASAN

Penimbunan sampah organik dalam bentuk serasah daun kerap ditemukan pada lingkungan dan belum dimanfaatkan dengan baik serta dapat mencemari lingkungan. Salah satu pencegahan yang dapat dilakukan dalam mengelola sampah organik yaitu dengan mendegradasi sampah menggunakan mikroorganisme. Sampah organik seperti serasah daun memiliki kandungan selulosa 15-40%. Materi ini dapat terdegradasi oleh enzim selulase yang dihasilkan oleh bakteri selulolitik. Bakteri yang berasal dari kotoran sapi dan sampah dapur yaitu isolat KS1, KS4 dan SD5 diketahui mampu menghasilkan enzim selulase yang berpotensi sebagai agen biodegradasi sampah organik. Tujuan penelitian ini adalah untuk mengetahui sinergisme isolat bakteri selulolitik KS1, KS4 dan SD5 dan kemampuannya dalam mendegradasi serasah daun.

Penelitian ini menggunakan metode eksperimental dengan Rancangan Acak Lengkap. Perlakuan berupa isolat bakteri selulolitik dan kombinasinya dalam mendegradasi serasah daun. Masing-masing perlakuan dilakukan 3 kali pengulangan, sehingga terdapat 24 unit percobaan termasuk perlakuan kontrol, yaitu perlakuan berupa pengomposan tanpa penambahan isolat bakteri selulolitik. Variabel bebas penelitian adalah isolat bakteri selulolitik dan sebagai variabel terikat adalah kemampuan bakteri selulolitik dalam mendegradasi serasah daun. Parameter utama penelitian adalah rasio C/N, sedangkan parameter pendukung yaitu jumlah total bakteri, jumlah bakteri selulolitik, pH kompos, suhu kompos, dan pengamatan warna, tekstur, dan bau kompos. Data yang diperoleh dari uji sinergisme isolat dianalisis secara deskriptif. Data penghitungan rasio C/N pada kompos dianalisis menggunakan analisis ragam (ANOVA) dengan tingkat kepercayaan 95%.

Hasil penelitian menunjukkan bahwa isolat KS1, KS4, dan SD5 dapat tumbuh bersinergis yang ditunjukkan oleh tidak adanya zona hambat pada hasil interaksi ketiga isolat. Hasil pemberian perlakuan inokulum bakteri selulolitik KS1, KS4, SD5, dan kombinasinya mampu menurunkan rasio C/N kompos, yaitu rasio C/N awal sebesar 110 setelah inkubasi 60 hari menjadi 18,69-25,75. Pemberian inokulum bakteri dan kombinasinya tidak menghasilkan perbedaan penurunan rasio C/N kompos yang nyata ($F_{hitung} < F_{tabel}$) atau memiliki kemampuan selulolitik yang hampir sama. Rasio C/N kompos terendah ditunjukkan oleh perlakuan kontrol P0 (tanpa inokulum), yaitu sebesar 18, diduga dihasilkan oleh mikroorganisme *indigenous* yang dapat segera mendegradasi serasah daun. Sebaliknya, perlakuan inokulum memerlukan penyesuaian terlebih dahulu terhadap substrat serasah daun. Perlakuan inokulum bakteri P2 (isolat KS4), P3 (isolat SD5), dan P6 (isolat KS4 & SD5) menghasilkan rasio C/N kompos yang lebih rendah dibandingkan dengan perlakuan lainnya, yaitu 22-23.

Kata Kunci: *biodegradasi, rasio C/N, serasah daun, sinergisme.*

SUMMARY

Landfilling of organic waste in the form of leaf litter is often found in the environment and has not been utilized properly and can pollute the environment. One of the preventions that can be done in managing organic waste is to degrade waste using microorganisms. Organic waste such as leaf litter contains 15-40% cellulose. This material can be degraded by cellulase enzymes produced by cellulolytic bacteria. Bacteria derived from cow dung and kitchen waste, namely isolates KS1, KS4 and SD5, are known to be able to produce cellulase enzymes which have the potential to be biodegradable agents for organic waste. The purpose of this study was to determine the synergism of cellulolytic bacteria isolates KS1, KS4 and SD5 and their ability to degrade leaf litter.

This study used an experimental method with a completely randomized design. The treatment involved cellulolytic bacterial isolates and their combinations in degrading leaf litter. The treatments were repeated three times, therefore there were 24 experimental units, including the control treatment, which was composting without the addition of cellulolytic bacterial isolates. The independent variable was the cellulolytic bacterial isolates, and the dependent variable was their ability to degrade leaf litter. The main parameter of the study was the C/N ratio, while the supporting parameters were the total number of bacteria, the number of cellulolytic bacteria in the leaf litter, compost pH and temperature, and observations of compost color, texture and odor. The data obtained from the isolate synergy test were analyzed descriptively. The data involving the calculation of the C/N ratio in the compost was analyzed using analysis of variance (ANOVA) with a 95% confidence level.

The results synergistics interaction indicated by the absence of an inhibition zone in the interaction between the three isolates KS1, KS4, and SD5. The treatment of cellulolytic bacteria KS1, KS4, SD5, and their combinations were able to reduce the C/N ratio of compost, namely the initial C/N ratio of 110 after 60 days of incubation to 18.69-25.75. The application of bacterial inoculum and its combination did not result in a significant reduction in the C/N ratio of compost ($F_{\text{count}} < F_{\text{table}}$). The results of the analysis showed that the bacterial inoculum had almost the same cellulolytic ability. The lowest C/N ratio of compost was shown by the P0 control treatment (without inoculum), which was 18, thought to be produced by indigenous microorganisms which can quickly degrade leaf litter. In contrast, inoculum treatment requires prior adjustment to the leaf litter substrate. Treatment of bacterial inoculums P2 (KS4 isolate), P3 (SD5 isolate), and P6 (KS4 & SD5 isolates) resulted in a lower compost C/N ratio compared to the other treatments, namely 22-23.

Keywords: *biodegradation, C/N ratio, leaf litter, synergism.*