RINGKASAN

Budiaya padi dapat dilakukan dengan menerapkan dua sistem pertanian yakni sistem pertanian organik dan sistem pertanian konvensional. Perbedaan kedua sistem tersebut terletak pada penggunaan bahan kimia sintetik sebagai *input* dalam proses budidayanya. Perbedaan *input* budidaya pertanian dapat mempengaruhi kondisi agroekosistem yang ada pada lahan. Budidaya padi sistem pertanian organik maupun konvensional menghasilkan limbah salah satunya adalah jerami padi. Jerami padi memiliki beragam manfaat apabila dikelola dengan baik seperti dapat menambah unsur hara tanah serta memperbaiki sifat-sifat tanah. Namun, jerami padi memiliki kendala dalam pengelolaannya yakni waktu dekomposisinya yang relatif lama karena kandungan selulosa yang tinggi. Penggunaan agen dekomposer bakteri selulolitik merupakan salah satu alternatif solusi yang dapat diakukan untuk mempercepat proses dekomposisi jerami padi. Penelitian ini bertujuan untuk 1) mengetahui populasi bakteri selulolitik pada limbah jerami padi organik dan konvensional, 2) mengetahui potensi isolat bakteri dalam mendegradasi selulosa dari limbah jerami padi organik dan konvensional.

Penelitian ini dilakukan di Laboratorium Agroekologi, Fakultas Pertanian, Universitas Jenderal Soedirman, Purwokerto. Sampel jerami padi diambil dari lahan budidaya padi organik di Desa Karanglewas, Kecamatan Kutasari, Kabupaten Purbalingga dan lahan budidaya padi konvensional di Desa Tambaksogra, Kecamatan Sumbang, Kabupaten Banyumas. Penelitian dilaksanakan pada bulan Mei-Oktober 2024. Pengambilan sampel jerami padi dilakukan secara *purposive sampling* pada tumpukan limbah jerami padi di dua lokasi. Sampel yang diperoleh kemudian dilakukan isolasi bakteri menggunakan metode *pour plate* pada medium *Nutrien Agar* dan *Carboxymethyl Cellulose* (CMC). Koloni bakteri dikarakterisasi secara makroskopis, sementara isolat yang didapatkan dikarakterisasi secara mikroskopis. Isolat yang didapatkan diuji kemampuan degradasi selulosanya dengan metode indeks selulolitik dan susut bobot.

Hasil penelitian menunjukan populasi bakteri selulolitik asal sampel jerami padi organik lebih tinggi, yaitu 99,47 x 10^8 CFU/mL dibandingkan dengan jerami padi konvensional 59,05 x 10^8 CFU/mL. Isolat bakteri yang didapatkan mayoritas memiliki karakter morfologi koloni yang berbeda, namun terdapat beberapa isolat yang sama dari sampel jerami padi organik (OR) dan konvensional (K). Hasil uji aktivitas selulolitik menunjukan terdapat 11 isolat bakteri yang mampu membentuk zona bening dengan nilai indeks selulolitik berada pada kategori rendah hingga sedang. Isolat bakteri OR11 asal limbah jerami padi organik memiliki nilai indeks selulolitik tertinggi 1,9. Hasil uji degradasi susut bobot menunjukkan delapan perlakuan isolat bakteri yang diujikan memiliki nilai susut bobot lebih tinggi dibandingkan dengan perlakukan tanpa isolat. Isolat bakteri dengan nilai susut bobot tertinggi yaitu isolat OR11 0,876 g atau setara 21,90%. Berdasarkan hasil tersebut dapat disimpulkan bahwa bakteri selulolitik yang berhasil didapatkan memiliki kemampuan mendegradasi selulosa.

SUMMARY

Rice cultivation can be done by implementing two agricultural systems, i.e. organic farming systems and conventional farming systems. The difference between the two systems lies in the use of synthetic chemicals as input in the cultivation process. Differences in agricultural cultivation inputs can affect the condition of the agro-ecosystem on the land. Rice cultivation using organic and conventional farming systems produces waste, one of which is rice straw. Rice straw has various benefits if managed properly, such as adding soil nutrients and improving soil properties. However, rice straw has constraints in its management, namely its relatively long decomposition time due to its high cellulose content. The use of cellulolytic bacterial decomposer agents is one alternative solution that can be done to accelerate the decomposition process of rice straw. This study aims to 1) determine the population of cellulolytic bacteria in organic and conventional rice straw waste, 2) determine the potential of bacterial isolates in degrading cellulose from organic and conventional rice straw waste.

This research was conducted at the Microbiology Unit of the Agroecology Laboratory, Faculty of Agriculture, Jenderal Soedirman University, Purwokerto. Rice straw samples were taken from organic rice cultivation land in Karanglewas Village, Kutasari District, Purbalingga Regency and conventional rice cultivation land in Tambaksogra Village, Sumbang District, Banyumas Regency. The study was conducted in May-October 2024. Rice straw samples were taken by purposive sampling on piles of rice straw waste in two locations. The samples obtained were then isolated for bacteria using the pour plate method on Nutrient Agar and Carboxymethyl Cellulose (CMC) media. Bacterial colonies were characterized macroscopically, while the isolates obtained were characterized microscopically. The isolates obtained were tested for their cellulose degradation ability using the cellulolytic index and weight loss methods.

The results showed that the population of cellulolytic bacteria from organic rice straw samples was higher, namely 99.475 x 10^8 CFU/mL compared to conventional rice straw which was only 59.05 x 10^8 CFU/mL. The bacterial isolates obtained mostly had different morphological characteristics, but there were several isolates that were the same from organic (OR) and conventional (K) rice straw samples. The results of the cellulolytic activity test showed that there were 11 bacterial isolates that were able to form clear zones with cellulolytic index values in the low to medium category. The OR11 bacterial isolate from organic rice straw waste had the highest cellulolytic index value of 1.9. The results of the weight loss degradation test showed that the eight bacterial isolate treatments tested had higher weight loss values compared to those carried out without isolates. The bacterial isolate with the highest weight loss value was the OR11 isolate 0.876 g or equivalent to 21.90%. Based on these results, it can be concluded that the cellulolytic bacteria that were successfully obtained have the ability to degrade cellulose.