

RINGKASAN

Ubi jalar (*Ipomoea batatas* L.) merupakan salah satu komoditas pangan sumber karbohidrat non beras yang berpotensi sebagai pangan alternatif selain beras bagi masyarakat Indonesia, namun potensi ini belum didukung dengan produktivitas ubi jalar yang baik akibat degradasi lahan dan penggunaan pupuk sintetik yang berlebihan, sehingga diperlukan inovasi teknologi budidaya berbasis bahan organik. Salah satu upaya yang dapat dilakukan adalah dengan penggunaan *biochar* sebagai pembenah tanah ramah lingkungan yang mampu memperbaiki sifat fisik, kimia, dan biologi tanah. Oleh karena itu, penelitian ini dilakukan untuk mengetahui respon fisiologis dan hasil tiga varietas ubi jalar terhadap ragam *biochar*, dengan tujuan memperoleh perlakuan *biochar* terbaik yang dapat meningkatkan produktivitas tanaman sekaligus menjaga kualitas tanah.

Penelitian ini akan dilaksanakan di Desa Bobosan, Purwokerto Utara, Kabupaten Banyumas, Balai Benih Padi dan Palawija, Desa Bojongsari, Kecamatan Kembaran, Kabupaten Banyumas, Laboratorium Riset dan Laboratorium Agroekologi, Fakultas Pertanian, Universitas Jenderal Soedirman. Waktu penelitian dimulai pada bulan September 2024 sampai dengan bulan Agustus 2025. Penelitian ini menggunakan Rancangan Acak Kelompok Faktorial dengan dua faktor dan tiga ulangan. Faktor yang dicoba dalam penelitian ini yaitu U_1 =Ubi Kuning, U_2 =Ubi Ungu, U_3 =Ubi Putih, B_1 =*Biochar* 8 t/ha, B_2 =*Biochar* kombinasi POC 8 t/ha, dan B_3 =*Biochar* kombinasi Azolla 8 t/ha. Variabel yang diamati pada penelitian ini, antara lain kerapatan stomata, kadar kemanisan, kadar klorofil a, kadar klorofil b, kadar klorofil total, jumlah ubi, bobot per ubi jalar, bobot ubi jalar per tanaman, panjang ubi, diameter ubi, dan indeks panen. Analisis data yang dilakukan menggunakan analisis keragaman dengan Uji F pada taraf kepercayaan 95%. Apabila hasil uji ragam menunjukkan perbedaan yang nyata akan dilanjutkan dengan Uji Berganda Duncan's (*Duncan's Multiple Range Test/DMRT*) pada taraf 95% untuk membandingkan perlakuan *biochar* tongkol jagung dan varietas ubi jalar terhadap karakter fisiologis dan hasil tanaman.

Hasil penelitian menunjukkan bahwa varietas ubi jalar memberikan pengaruh yang lebih dominan dibandingkan perlakuan *biochar* terhadap sebagian besar variabel pengamatan. Ketiga varietas ubi menunjukkan respon fisiologis yang berbeda pada karakter fisiologis tanaman ubi jalar. Varietas ubi ungu dan kuning berbeda sangat nyata pada nilai kadar kemanisan ubi dibandingkan varietas ubi putih, dengan nilai kadar kemanisan masing-masing 11,01°brix dan 10,55°brix. Ketiga varietas ubi jalar memberikan pengaruh yang berbeda pada variabel hasil ubi jalar, yaitu jumlah ubi, bobot per ubi, panjang ubi, diameter ubi, dan indeks panen. Varietas ubi kuning berbeda sangat nyata pada variabel jumlah ubi dibandingkan varietas ubi ungu dan putih, sebesar 4,81 buah. Varietas ubi ungu dan ubi putih berbeda nyata pada variabel bobot per ubi dibandingkan varietas ubi kuning, dengan nilai rata-rata bobot per ubi masing-masing 229,02 g dan 216,12 g. Varietas ubi kuning dan ubi putih berbeda sangat nyata pada variabel panjang ubi dibandingkan ubi ungu, dengan nilai rata-rata panjang ubi masing-masing 16,23 cm

dan 16,25 cm. Varietas ubi ungu berbeda nyata pada variabel diameter ubi dibandingkan ubi kuning dan ubi putih, dengan nilai rata-rata diameter 3,66 cm. Varietas ubi ungu berbeda nyata pada nilai indeks panen dibandingkan ubi kuning dan ubi putih, dengan nilai indeks panen 0,41.

Perlakuan *biochar* tidak berpengaruh nyata terhadap sifat fisiologis tanaman ubi jalar, dan berpengaruh nyata pada komponen hasil yaitu panjang ubi jalar. Perlakuan *biochar* kombinasi azolla 8 t/ha berbeda nyata dengan perlakuan *biochar* 8 t/ha dan *biochar* kombinasi POC 8 t/ha, dengan rata-rata panjang ubi 16,06 cm. Varietas ubi jalar dan perlakuan *biochar* tidak menunjukkan interaksi terhadap karakter fisiologis dan hasil tanaman ubi jalar. Secara fisiologis, perbedaan respon antar varietas menunjukkan bahwa faktor genetik berperan penting dalam menentukan efisiensi fisiologis dan hasil ubi jalar. Sementara itu, pengaruh *biochar* yang terbatas menunjukkan bahwa perannya lebih banyak sebagai pembenah tanah jangka panjang daripada penyedia hara secara langsung. Hasil ubi jalar yang diaplikasikan *biochar plus* pada penelitian ini termasuk ke dalam golongan A dan golongan B menurut SNI 01-4493-1998.



SUMMARY

Sweet potato (*Ipomoea batatas* L.) is one of the non-rice carbohydrate food commodities that has great potential as an alternative food source for the Indonesian people. However, this potential has not been fully supported by good productivity due to land degradation and excessive use of synthetic fertilizers. Therefore, it is necessary to develop innovative cultivation technologies based on organic materials. One possible approach that can be applied is the use of biochar as an environmentally friendly soil amendment capable of improving the physical, chemical, and biological properties of the soil. Hence, this study was conducted to determine the physiological responses and yield of three sweet potato varieties to different types of biochar, aiming to identify the best biochar treatment that can enhance plant productivity while maintaining soil quality.

The study will be conducted in Bobosan Village, North Purwokerto, Banyumas Regency; at the Seed Center for Rice and Secondary Crops in Bojongsari Village, Kembaran Subdistrict, Banyumas Regency; and in the Research Laboratory and Agroecology Laboratory, Faculty of Agriculture, Jenderal Soedirman University. The research period will run from September 2024 to August 2025. This study employs a factorial randomized block design with two factors and three replications. The factors tested in the study include U1 = Yellow Sweet Potato, U2 = Purple Sweet Potato, U3 = White Sweet Potato, B1 = Biochar at 8 t/ha, B2 = Biochar combined with Liquid Organic Fertilizer (POC) at 8 t/ha, and B3 = Biochar combined with Azolla at 8 t/ha. The observed variables include stomatal density, sweetness level, chlorophyll a content, chlorophyll b content, total chlorophyll content, number of tubers, tuber weight per sweet potato, tuber weight per plant, tuber length, tuber diameter, and harvest index. Data analysis will be carried out using analysis of variance (ANOVA) with an F-test at a 95% confidence level. If the ANOVA results show significant differences, the analysis will be followed by Duncan's Multiple Range Test (DMRT) at the 95% confidence level to compare the effects of corn-cob biochar and sweet potato varieties on physiological characteristics and yield.

The results showed that the sweet potato varieties had a more dominant effect than biochar treatments on most observed variables. The three sweet potato varieties exhibited different physiological responses across the plant's physiological characteristics. The purple and yellow varieties differed significantly from the white variety in terms of sweetness level, with °Brix values of 11.01 and 10.55, respectively. The three varieties also had distinct effects on yield variables, including number of tubers, tuber weight, tuber length, tuber diameter, and harvest index. The yellow variety differed highly significantly from the purple and white varieties in tuber number, with an average of 4.81 tubers. The purple and white varieties differed significantly from the yellow variety in tuber weight, with mean tuber weights of 229.02 g and 216.12 g, respectively. The yellow and white varieties differed highly significantly from the purple variety in tuber length, with mean

lengths of 16.23 cm and 16.25 cm, respectively. The purple variety differed significantly from the yellow and white varieties in tuber diameter, with an average diameter of 3.66 cm. The purple variety also differed significantly in harvest index compared with the yellow and white varieties, with a harvest index value of 0.41.

Biochar treatments had no significant effect on the physiological traits of sweet potato plants but had a significant effect on one yield component, namely tuber length. The biochar–azolla combination at 8 t/ha differed significantly from the 8 t/ha biochar treatment and the biochar–POC combination at 8 t/ha, with an average tuber length of 16.06 cm. Sweet potato varieties and biochar treatments did not show any interaction effects on physiological or yield characteristics. Physiologically, the differing responses among varieties indicate that genetic factors play a crucial role in determining physiological efficiency and sweet potato yield. Meanwhile, the limited influence of biochar suggests that its role is more that of a long-term soil amendment rather than a direct nutrient source. The sweet potato yields obtained from the biochar-plus treatments in this study fall into categories A and B according to SNI 01-4493-1998.

