INTISARI

PENYAKIT DARAH PADA PISANG: INFEKSI DAN KEANEKARAGAMAN GENETIKA PATOGEN

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Penyakit darah pada pisang yang disebabkan oleh *blood disease bacterium* (BDB), anggota kompleks spesies *Ralstonia solanacearum*, merupakan penyakit penting di Indonesia. Teknik pengendalian yang tersedia belum efektif memecahkan permasalahan, karena masih kurangnya informasi tentang faktor-faktor yang menentukan infeksi BDB. Penelitian ini bertujuan mempelajari faktor-faktor yang menentukan infeksi meliputi sumber inokulum, tenpat infeksi, bakteri endofit, ketinggian tempat, dan keanekaragaman genetika BDB. Deteksi inokulum BDB dilakukan dari pisang sakit, sisa tanaman sakit, dan tanah terinfestasi. Studi tempat infeksi BDB dilakukan dengan inokulasi pada bunga dan sistem perakaran dengan dan tanpa pelukaan. Sebanyak 33,3-41,7 % pisang takbergejala positif membawa BDB. Analisis struktur komunitas bakteri endofit dengan *polymerase chain reaction-ribosomal intergenic spacer analysis* (PCR-RISA) dilakukan pada pisang terinfeksi yang bergejala dan yang takbergejala. Perkembangan infeksi pada ketinggian tempat yang berbeda dievaluasi dengan menginkubasi bibit pisang terinokulasi pada 100, 1.000, dan 1.600 m di atas permukaan laut. Keanekaragman genetika BDB didasarkan pada analisis *pulsed field gel electrophoresis* (PFGE) dengan enzim *Xba*I. Hasil penelitian menunjukkan bahwa infeksi BDB ditentukan oleh sumber inokulum, kemampuan penetrasi patogen, struktur komunitas bakteri endofit, dan ketinggian tempat. Semua bagian jaringan pisang sakit berpotensi sebagai sumber inokulum. Semakin lama diinkubasikan, potensi inokulum dalam sisa tanaman sakit dan tanah terinfestasi semakin menurun. Inokulum tersebut dapat menularkan selama 5-6 bulan setelah diinkubasikan. Infeksi BDB dapat terjadi melalui inokulasi pada bunga dan sistem perakaran pisang tanpa pelukaan, namun, pelukaan pada bonggol dapat meningkatkan infeksi BDB. Sebanyak *33,3-41,7 %* populasi pisang takbergejala dari daerah endemi, positif membawa BDB. Komunitas bakteri endofit pada pisang terinfeksi yang bergejala berbeda dengan yang takbergejala. Suatu bakteri endofit diduga berperan pada ketidakmunculan gejala tersebut, karena hanya dijumpai pada pisang yang takbergejala. Infeksi BDB pada pisang varietas Kepok Kuning dapat terjadi dari dataran rendah (100 m) sampai dataran tinggi (1.600 m) di atas permukaan laut. BDB di Indonesia merupakan patogen yang secara genetika relatif homogen. Meskipun demikian, ditemukan 5 kelompok galur pfg yang pengelompokannya tidak berhubungan dengan daerah dan varietas inang asal isolat. Berdasarkan kesimpulan tersebut maka pengendalian penyakit darah pada pisang dapat dilakukan secara terpadu dengan komponen pengendalian yang antara lain: 1) mencegah penyebaran melalui bahan tanaman sakit termasuk buah dan daun, 2) tidak menanam pisang pada lahan endemi tanpa eradikasi efektif atau rotasi tanaman minimum selama 1 tahun, 3) menurunkan atau menghilangkan sumber inokulum BDB dalam sisa-sisa tanaman sakit dengan cara mencacah dan mendekomposisikannya menjadi bahan organik, 4) mencegah penularan oleh serangga melalui bunga yang tidak membentuk buah dengan memotong jantung secepatnya setelah tidak membentuk buah, dan melindungi bunga agar tidak dihingapi serangga penular, misalnya dengan pengerudungan dengan plastik secepatnya saat jantung mulai keluar, 5) mencegah infeksi melalui sistem perakaran dengan eliminasi inokulum dalam tanah dan mengendalikan mikrob peluka akar, misalnya dengan pengendalian hayati dan pemberian pembenah tanah, 6) menghambat infeksi dengan menghindari pelukaan dan penularan melalui alat pemeliharaan tanaman, 7) menghindari penanaman bibit dari anakan pisang dari daerah endemi, meskipun dari induk yang tampak sehat.

Kata kunci: pisang, *blood disease bacterium*, infeksi, keanekaragaman genetika.

ABSTRACT

BLOOD DISEASE OF BANANA: INFECTION AND GENENIC DIVERSITY OF THE PATHOGEN

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Blood disease of banana caused by blood disease bacterium (BDB), the member of Ralstonia solanacearum *species complex, is an important disease in Indonesia. There is no available technique to control the disease completely, due to by the lack of information about the factors determining BDB infection. This research was aimed to study the factors affecting the infection especially the source of inoculum, infection sites, endophytic bacteria, altitude, and the genetic diversity of BDB. Detection of BDB inocula was conducted from disease banana, disease plant residue, and infested soil after incubation. The study on the infection site of BDB was conducted by BDB inoculation through the flowers and root system with and without wounding. Community structure analysis of endophytic bacteria by polymerase chain reaction-ribosomal intergenic spacer analysis (PCR-RISA) was conducted on the symptomatic and the asymptomatic infected banana. The infection development at different altitude was evaluated by incubating root inoculated banana seedlings at 100, 1,000, and 1,600 m above sea level. The experiment of the disease infection was conducted at different altitude at 100, 1,000, and 1,600 m above sea level. The genetic diversity of BDB was analysed by using pulsed field gel electrophoresis (PFGE). The results suggested that BDB infection was affected by the source of inocula, penetration capability of the pathogen, community structure of the endophytic bacteria and the altitude. All parts of the diseased banana were potential as source of inocula. The longer incubation period the lesser of the potential inoculum source of diseased plant residues and infested soils. The inocula in diseased plant residue and infested soil were infectious for 5-6 month after incubation. BDB was able to infect through inoculation on the flowers and root system, without wounding. However inoculation on the root system with wounded corm could increase the infection. Amount of 33,3-41,7 % of asymptomatic banana clusters positively contain BDB. The community structure of endophytic bacteria in the asymptomatic infected banana was different from that of the symptomatic one. One DNA band was frequently found from the asymptomatic banana but not from the symptomatic one, it might be involved in the symptom inhibition. BDB infection on cultivar Kepok Kuning could establish at altitude of 100 to 1.600 m above sea level. BDB isolates in Indonesia were genetically homogeneous. However, the isolates were able to be grouped into 5 pfg strains which were not related to host cultivars and area of origin of the isolates. Based on the results, the blood disease of banana could be controlled through integrated system with some available control components. Among of the control components are: 1) avoidance of BDB spread brought in diseased plant organs including the fruits and leaves, 2) avoidance of planting in endemic land without effective eradication or plant rotation at least for a year. 3) elimination of inocula in diseased plant debris through chopping into fine bits and accelerating decomposition of the debris, 4) prevention of insect transmitting with cutting the bud immediately after no flowers developing fruits and protecting the flowers from visiting transmitter insects, such as by bagging the bud immediately using plastic before the flowers are opened, 5) prevention of infection through the root system with elimination of inocula in the soil and control of the wounder microb, such as by biological control and soil amendment, 6) decrease of infection with avoiding of wounding on the root system and through cultivation tools, such as by disinfestations the tools, 7) avoidance of sucker use from endemic area for propagating materials, although the banana clusters are looking healthy.*

Keywords: *banana, blood disease bacterium, infection, genetic diversity.*