Title Effectiveness and molecular characterization of *Burkholderia spinosa*, a prospective biocontrol agent for controlling postharvest diseases of banana

Author D.M. De Costa, A.R.F. Zahra, M.D. Kalpage and E.M.G. Rajapakse

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Abstract

Prospective antagonists for controlling *Colletotrichum musae* were isolated from the fructosphere of a range of dessert and cooking type banana varieties grown in Sri Lanka. Out of the isolated microorganisms, 44 bacterial and 31 fungal isolates showed more than 50% *C. musae* colony growth inhibition *in vitro*. Among 32 bacterial isolates which showed inhibition zones against *C. musae* under *in vitro* conditions, four isolates were highly effective in controlling banana anthracnose, crown rot and blossom end rot *in vivo* when artificially infected banana (variety Kolikuttu) were dipped in an antagonist suspension (10^8 cfu/ml) containing Tween 20 (0.02% v/v) for 5 min. Of these four, *Burkholderia spinosa* was used for further studies as a prospective biocontrol agent/biopesiticide. A suspension of *B. spinosa* (10^5 cfu/ml) containing Tween 20 (0.02% v/v) was effective in controlling anthracnose and blossom end rot of a range of dessert banana varieties (87–95% and 81–82% disease reductions, respectively), while a concentration of 10^4 cfu/ml with Tween 20 (0.02% v/v) was sufficient to have a 86–98% control of crown rot. *B. spinosa* showed 45–73% colony growth inhibition of *C. gloeosporioides*, *Botryodiplodia theobromae* and *Thielaviopsis paradoxa* isolates causing anthracnose and stem end rot of avocado, mango and pineapple*in vitro*. Significant *in vivo* control of these diseases in avocado, mango and pineapple was also achieved with antagonist concentrations ranging from 10^4 to 10^6 cfu/ml (28% reduction of mango anthracnose by 10^5 cfu/ml, 38% reduction of avocado anthracnose by 10^4 cfu/ml, 17.5% reduction of mango stem end rot by 10^5 cfu/ml, 14% reduction of avocado stem end rot by 10^6 cfu/ml and 34% reduction of pineapple stem end rot by 10^5 cfu/ml). Molecular analysis of *recA* gene by PCR-RFLP revealed a unique genomic identity for *B. spinosa* which discriminated it from human pathogenic isolates of *Burkholderia*. No antagonists were present in edible parts of banana treated with the most effective postharvest treatment as determined by the present study. Based on these findings, it is concluded that *B. spinosa* which is an indigenous antagonist is a promising candidate to be used in biological control of postharvest diseases of banana.