EFFICACY OF PLANT EXTRACTS FOR MANAGEMENT OF POTATO BACTERIAL WILT (*Ralstonia solanacearum* Smith) IN RWANDA

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ABSTRACT

Potato (*Solanum tuberosum* L.) is one of staple foods for food security program and income generation in Rwanda. However, potato yield in Rwanda is still below the potential yield. Bacterial wilt caused by *Ralstonia solanacearum* (Smith) is one of the major pathogens limiting potato production. The use of plant extracts with antibacterial activities, which are locally available and environmental friendly, could be an alternative in the management of the disease. Thus, the aim of this study was to: (i) To screen different plant extracts for their efficacy in the control of potato bacterial wilt; (ii) To evaluate the effective concentration of plant extracts in management of *R. solanacearum*; (iii) To determine the effective application frequency of plant extracts in management of *R. solanacearum,* potato growth, yield, tuber quality, post-harvest infection and post-harvest yield losses; and (iv) To identify the bioactive compounds in effective plant extracts. An *in vitro* screening of the antibacterial activity of methanol, water and chloroform extracts of ten local plant materials against the pathogen was performed. Higher antibacterial activity was found in tobacco, wild marigold and garlic extracts (19.6, 18.6, and 18.3 mm inhibition zones, respectively). An *in vivo* study was also conducted to determine the effective concentration and frequency of application of selected bioactive plant extracts over potato bacterial wilt, potato growth, tuber yield, quality, and post-harvest-infection and yield loss due to the pathogen under field conditions in two growing seasons (Season A and B). The field experiments, were laid out in a Randomized Complete Block Design (RCBD) with factorial arrangements. In field experiments, weekly and bi-weekly application of plant extracts showed higher biological control efficacy (BCE) against pathogen in potato plants (58.3 and 57.4 %, respectively) than monthly application (47.6 %) at $p \leq 0.05$. Weekly and bi-weekly application of tobacco and wild marigold extracts at 50 mg mL^{-1} performed better all analysed parameters. Identification of bioactive compounds in methanol extract of tobacco was performed through high performance liquid chromatography (HPLC) technique with standards. It was detected that methanol extract of tobacco contains four bioactive compounds with activity against *R. solanacearum* (chlorogenic acid, rutin, unknown flavonoids, and 5-caffoylquinic acid). It is concluded and recommended that methanol extract from tobacco or wild marigold once applied weekly or bi-weekly at 50 mg mL^{-1} can be used in management of potato bacterial wilt and improvement of potato production and tuber quality in sustainable and organic horticulture.

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