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SHORT COMMUNICATION

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PROSPECTS FOR CONTROL OF BACTERIAL WILT OF POTATO (*Ralstonia solanacearum)* THROUGH SOIL INCORPORATION OF AERIAL PART OF CONFREY (*Symphytum officinale uplandicum*)

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Bacterial wilt caused by *Ralstonia solanacearum* is a widespread soilborne disease in the tropical, subtropical and warm-temperate zones of the world [1]. The disease occurs in almost every potato-growing area of Madagascar and causes severe losses under favourable environmental conditions [2]. The control is difficult since the causal agent has its disseminating and survival stages in the soil and it remains viable for long periods of time [3]. Various soil amendments including urea and green manure have been reported to suppress bacterial wilt of potato but they promoted excessive vegetative growth at the expense of tubers development [4] [5]. The effects of soil incorporation of aerial part of comfrey, a boraginaceous crop with high content of nitrogen and potassium on the incidence of bacterial wilt of potato and the survival of *Ralstonia solanacearum* were investigated under field conditions. The study was conducted on a sandy silt soil naturally infested with *Ralstonia solanacearum* race 1 biovar 1 at the Agricultural Station of Nanisana (1400m above sea level), in Madagascar. The experiment was carried out in a randomized complete block design comprising two treatments and three replications. The experimental plot was composed of 28 susceptible potato plants (cv *Pota*). The fresh leaves of comfrey were cut and incorporated to the soil at the rate of 16 000kg ha-1 (87kg N ha-1, 158kg K ha-1) in two splits with three-week interval, at the planting time and the earthing up to a depth of about six inches. The control treatment consisted of the fertilizer recommendation of 74kg N, 66kg P, 48kg K, 15 tons of cattle manure and 250kg of ground dolomite per ha [6]. The bacterial wilt symptoms were evaluated for a period of six weeks and the bacterial exudation test was performed on potato plants with

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wilting. Soil samples consisting of ten 6-inch cores were collected from each treatment at zero, three, and six weeks starting before potato was planted. The colony forming units (CFU) per gram of soil of *Ralstonia solanacearum*, bacteria and fungi were measured. For the enumeration of *Ralstonia solanacearum* in soil, serial dilutions were made from a soil/sterile distilled water extract and then aliquots (100µL each) were spread on modified triphenyl tetrazolium chloride TTC-medium with cyclohexamide [7] [8]. The plates were incubated at 30°C, and presumptive *Ralstonia solanacearum* colonies were counted 48 hours after incubation. Identification of presumptive *Ralstonia solanacearum* colonies was confirmed by physiological and carbohydrates tests [9]. The peptone-dextrose-rose Bengal (PDA) medium with streptomycin and the soil extract medium were used for quantification of fungi and bacteria, respectively [10] [11]. The cultures were incubated at temperature of 28ºC and the colonies of bacteria and fungi were counted after seven days. The number of CFU per gram of dry soil was transformed (log10 [x]) for statistical analysis. Analysis of variance (ANOVA) using statistical software Genstat was completed for each sampling date and differences of population of *Ralstonia solanacearum*, bacteria and fungi between control and comfrey amended treatment were tested. Six weeks after plantation of potato, comfrey manure promoted 25% control of bacterial wilt and the growth of potato. A slight decrease of the *Ralstonia solanacearum* population was observed at three weeks after soil incorporation of the first part of comfrey manure. However, at three weeks after application of the last part of comfrey, based on ANOVA separation of means by the least significant difference (LSD) test ($P < 0.05$), the decline of the pathogen population (72%) in the amended treatment was significant. Higher values of bacteria and fungi CFU were observed in the soil incorporated with comfrey manure over the experiment when compared with the control. The stimulation of vegetative and tubers growth in the treatment with comfrey was probably the result of improved nutrient status and balance within the plant due to soil incorporation of the green manure. Incorporation of organic matter to soil causes improvement of its physical condition and adds a source of exogenous energy which stimulates the microbial activity [12]. Higher counts of bacteria and fungi in the treatment with comfrey give support to the hypothesis that the soil microbial activity increases with the incorporation of green manure. This condition explains the suppression of *Ralstonia solanacearum* population and the control of potato bacterial wilting in the present work. Organic residues increase soil microbial activity and competition which can cause the lysis of pathogen cell components and the promotion of plant growth [13]. The incorporation of comfrey manure (16 000 kg ha-1) into soil at planting and earthing up of potato promoted 25% control of bacterial wilt and suppression of growth of *Ralstonia solanacearum* which worked slowly; further work can determine the adequate level and method of application for efficient control. Green manure is an inexpensive source of organic matter and it improves the chemical, physical and microbial soil characteristics and promotes plant growth.

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