

Abstract

Selection of antagonistic microorganisms from high land plants found that there were 2 isolates of antagonistic bacteria consisting of AK-MCL5, isolated from peppermint, and KW-CAR17, isolated from centella, which had the high efficacy on controlling white rust disease of chrysanthemum caused by *Puccinia horiana*. Bio-pesticides formulations of these 2 isolates were developed and revealed among of all 7 formulations, there were 2 formulations including talcum-1 and talcum-2 that suitable for AK-MCL5 by had bacterial concentration at immediately after production as 1.08×10^8 and 1.01×10^8 cfu/ml, respectively. For KW-CAR17, corn powder and talcum-1 formulations were appropriated and had bacterial concentration at immediately after production as 3.67×10^7 and 6.67×10^6 cfu/ml, respectively. Four bioformulations consisting of talcum-1 and talcum-2 of AK-MCL5, rice powder and talcum-2 of KW-CAR17 were selected based on the high efficacy on controlling chrysanthemum white rust disease under laboratory and low cost of ingredients for bioformulation production. The efficacy on controlling white rust disease by using detached leaf technique of bio-pesticide after 1 month of storage was evaluated and found that talcum-1 and talcum-2 bio-pesticide of AK-MCL5 had 87.50 and 71.51% of inhibition at 7 days after treatment. Rice powder and talcum-2 bio-pesticide of KW-CAR17 had 48.33 and 43.25% of inhibition, respectively. Moreover, when study of toxicity or effects after use of each bio-pesticide on leaves and flowers of chrysanthemum found that all of tested bio-pesticide had no negative effects on chrysanthemum. The results of study on utilization rate of bio-pesticide after 1 month of storage and chemical substitute by using detached leaf method showed that at 7 days after testing talcum-1 and talcum-2 bio-pesticide at utilization rate of 40 g/ 20 L of water had 83.63 and 77.58% of inhibition, respectively, while application of 5 and 3% petroleum oil had 95.00 and 90.00% of inhibition, respectively. Therefore, talcum-1 and talcum-2 bio-pesticide at utilization rate of 40 g/ 20 L of water and 3% petroleum oil, which all of these had the efficacy higher than 70%, were selected to test under field condition. The bio-pesticide and petroleum oil were sprayed on all of both sides of leaves and the test was conducted since after

transplanting until reached at 42 days after spraying. The results showed that talcum-1 bio-pesticide at utilization rate of 40 g/ 20 L of water with repeat spraying every 7 days had 86.67% of disease control and 3% petroleum oil with repeat spraying every 14 days had 68.89% of disease control, while pyraclostrobin, a commercial chemical, had 51.11% of disease control.

Talcum-1 bio-product of antagonistic bacteria isolate AK-MCL5 at utilization rate 40 g/20 L of water and used every 7 days and 3% petroleum oil used every 14 days were selected for testing the efficacy on control of chrysanthemum white rust disease and compared to commercial pesticides including commercial bacterial bio-product, *Bacillus subtilis*, at utilization rate 100 g/20 L of water used every 7 days, mild soap at utilization rate 1.25 ml/1 L of water used every 7 days and pyraclostrobin at utilization rate 15 ml/20 L of water used every 7 days. The results showed that no disease and symptoms were found from all treatments at 56 days after application. When considering on the cost of bio-product production and petroleum oil which were selected for using in the field condition per unit area (Baht/ 300 plants/ 5 months of plantation). When considering in the laboratory scale and 2 types of commercial chemicals found that 3% petroleum oil used for 8 times had the lowest cost of laboratory scale as 2,506.64 Baht/ 300 plants/ 5 months of plantation and had the cost of commercial scale as 2,544.00 Baht/ 300 plants/ 5 months of plantation. The application of talum-1 bio-product of the antagonistic bacterium AK-MCL5 at utilization rate of 40 g/ 20 L of water with 16 times of application had the cost of laboratory scale as 4,814.63 Baht/ 300 plants/ 5 months of plantation and had the cost of commercial scale as 4,819.66 Baht/ 300 plants/ 5 months of plantation.