

## Abstract

Applications of bio-pesticides or growth hormone which produced from highland microorganisms and plants are the best process to approach a safety and reduce affectation of agricultural chemical occurring to farmers, consumers and environmental on highland. The objective of this study was to reach the high-quality of bio-substances for highland economic plantation follow by the government's policy of Driving Thailand toward the food safety. The research and development in the fiscal year 2018 of bio-substances are as follow:

1) *Botrytis* sp. is a causative agent of early rot and sweet pepper as a result, the yield and quality of sweet pepper in highland areas decreased significantly, particularly during the rainy season. Two hundred and sixty two isolates of bacteria were isolated from 51 medicinal plant species, plant root, and 29 fertilizer samples. To test the inhibition of fungal growth by dual culture in the laboratory. Antagonistic isolates 194 and 263 were effective in control of pathogens of 90 and 80 percent. The results showed that two antagonistic bacteria were able to grow well in soybean meal at pH 6 for 72 h. The highest contents of  $1.30 \times 10^{10}$  and  $9.30 \times 10^{10}$  cfu/ml were not significantly different 95% with soybean meal concentrations of  $6.30 \times 10^{10}$  and  $3.3 \times 10^{10}$  cfu/ml, respectively, with the cost of raw materials of 5.36 and 3.26 baht per liter.

2) Many farmer have problem of stem and trunk rot on avocado. The objective of this study was to select the application of bio-pesticide against rot of avocado. SDF isolates were expanded to liquid medium of molasses adding minerals formula and mixed with a powdered wheat flour. The effectiveness test of disease prevention showed 200 grams and 250 grams in 20 liters of water could inhibit hyphal growth of rot against as 72.6 percentage and it was not significant with 150 grams and 300 grams (71.8 percentage). The application of bio-product prototype in avocado farm indicated that 150 grams injection every 14 days controlled rot symptom in 60 percentage similarly with phosphonic acid recommendation. The bio-product prototype cost was 3.97 baht per season which lower than phosphonic acid so the inspection should be continually.

3) Development of biological fertilizer by adding plant growth promoting microorganisms (PGPM) was the once method to increase quantity and quality of yields including decrease chemical application. Bacteria MN6 as a nitrogen-fixing, phosphate and potassium solubilizing bacteria and FT2 as a high auxin producing bacteria were selected to

culture in Molasses medium and mixing in carrier. Wet table power of PGPM produced by perlite showed high bacterial cell prevention and easy to buy. Material cost per kilogram was 68 bath. MN6 and FT2 cell concentration after 2 month preservation at room temperature was 7.36 and 7.95 log CFU/g however diatomite formula was appropriate for economical production because of lower cost (5 bath) and induced cell at 6.8 and 6.34 log CFU/g. Expansion test of PGPM powder to bio-fertilizer indicated that MN6 mixing perlite could develop in fertilizer organic vegetable formulation at concentration of 10.40 CFU/g as good as the diatomite formula in Inthanon fertilizer (10.32 log CFU/g). FT2 in perlite and grow in organic vegetable formulation and Mae Tha Nuea showed 9.29 and 8.87 log CFU/g, respectively. Application of diatomite formula with Inthanon fertilizer had highest yield in baby cos plot.

4) Efficiency and satisfaction evaluation of farmers after using four research products is the last step development of bio-substances. The results are as follows: (1) bio-products include repellent and entomopathogenic fungi could prevent soybean stem miner better than other methods in green bean of GAP plot. Especially after 6 weeks, there was a statistically significant difference with the method of farmers. The average number of damaged plants was 4.44 while the cost of bio-products had 85.89 baht in area of 400 square meters. It also showed lower than the method of farmer (266 baht). However, these applications showed unsatisfactory results as farmers practice to prevent the damage in organic farm which had severe level in last year. (2) The use of paraffin gels lure and cross trap could reduce the highest number of flea beetles in the field of white cabbage. The collected number was up to 26,042 in 28 days, resulting in high satisfaction to farmers. (3) No outbreak of wilt disease in Siam Tulip so repeating of experiment was process in next crop season. (4) Pouring of aqueous solution 0.1% ferrous sulfate in soil followed by grounding 1 spoon of bio-substance Ars.29 powder mixing mortar per hole before planting for 2 season could decrease arsenic heavy metal.

**Keywords:** bio-substances, highland, sweet pepper, avocado, bio-fertilizer, bean fly, flea beetle, wilt disease, arsenic