Journal of Agricultural Technology 2011 Vol. 7(5): 1427-1433
Available online http://www.ijat-aatsea.com
ISSN 1686-9141

Evaluation of Chaetomium-Mycephyt to promote the growth of Kale

Sibounnavong, Phonesavard[1*], Soytong, Kasem[2], Makhonpas, Chaiwat[1] and Adthajadee, Aram[1]

[1]Faculty of Agro-industrial Technology, Rajamangala University of Technology Tawon-ok (RMUTTO), Chanthaburi Campus, Thailand.
[2]Faculty of Agricultural Technology, King Mongkut's Institute of Technology Ladkrabang (KMITL), Bangkok, Thailand.

Sibounnavong, Phonesavard, Soytong, Kasem, Makhonpas, Chaiwat and Adthajadee, Aram (2011) Evaluation of Chaetomium-Mycephyt to promote the growth of Kale. Journal of Agricultural Technology 7(5): 1427-1433.

CM product is a new biological formulation and it is a combination of Chaetomium-biofungicide for plant disease control which consisted of 22 strains of *Chaetomium cupreum* and *Chaetomium globosum* plus Mycephyt, a metabolite from endophytic fungus for growth stimulant. Bio-amino is a new biological formulation for promoting plant growth which contains Actinomycetes and *Bacillus subtitis*. Result showed that applying CM product to Kale's seedlings at 4 cc gave significantly highest in plant height and fresh weight or yield which better than treated than CM product 2cc, bio-amibo 2 cc, Bio-amino 4 cc, CM product 2 cc plus Bio-amino 2 cc. Those treatments were significantly different in plant height when compared to the non-treated control.

Key words: CM product, Kale, *Chaetomium globosum* and *Chaetomium cupreum.*

Introduction

The vegetables are important to human life because it gives us the necessary nutrition needed by our body. Production of vegetables are started to cultivate by using chemical fertilizers, synthetic chemicals, chemical pesticides etc. The problem of cultivation has faced on low yield due to poor cultivated soil, insect and plant pathogens become resistant to toxic chemical pesticides and finally production cost increases. The alternative methods is introduced to reduce those chemicals that turns to be highly considered by many agencies. Charee (2005) reported that the cultivation of kale (*Brassica olreacea* var. *albograbra*) were studied to compare with different methods of good agricultural practices (GAP), pesticide- free production (PFP) and organic

* Corresponding author: Sibounnavong Phonesavard; e-mail: Kitoy_lk@hotmail.com

methods indicating that the organic method using the certified agricultural inputs from BioAgriCert, International Federation of Organic Agriculture Movement (IFOAM) that had been successfully produced organic kale and meet standard quality including low production cost (Sibounnavong *et al.,* 2006). Those certified agricultural inputs are Chaetomium-biofungicide, biofertilizer and microbial substances for plant immunity etc. *Chaetomium* is commercialized as a new broad spectrum biological fungicide that mixing 22-strains of *Chaetomium cupreum* and *Chaetomium globosum*. The mechanism of disease control is competition, antibiosis/lysis, antagonism, induced immunity in plants and hyphal interference. *Ch. cupreum* found to produce rotiorinol (Kanokmedhakul *et al.,* 2006) and *Ch. globosum* produces chaetoglobosin-c (Kanokhamedhakul *et al*., 2001), those antibiotic substances could inhibit several plant pathogens. It has been registered as patent rights namely: *Chaetomium* as a new broad spectrum mycofungicide: Int. cl.[5] AO 1 N 25/12. The main key is to prevent soil-borne plant pathogens eg. *Phytophthora* spp., *Pythium* spp (Pornsuriya *et al.,* 2010), and *Fusarium* spp (Soytong *et al*.,1992). etc. It is compatible for mixing with selected chemical pesticides which can alternative sprayed with many pesticides at the rate of 3-5 kg or L per hectare. Successful applications in the fields have been demonstrated in several countries, e.g. Thailand, P.R. China, Costa Rica, Vietnam, Laos, Philippines, Bangladesh, Cambodia, Georgia and Russia (Soytong, 1992 ;Shternshis *et al.,* 2005; Kaewchai, *et al*.,2009 and Sophea *et al.,* (2010). Soytong, *et al* (2010 a) reported that Mycephyt acts as plant growth stimulator that is a natural plant growth stimulator represents biologically active, naturally balanced complex, prepared from the growth medium of the mycorhizal fungi. Mycephyt contains phytohormones, amino acids, carbohydrates, unsaturated fatty acids, and microelements. Mycephyt is effective for seed treatment prior sowing, and for the plants at various stages of vegetation. Mycephyt enhances symbiotic nitrogen fixation; favors inorganic element consumption; and improve plant resistance to abiotic and biotic stresses. It can be applied as aqueous solutions are used for the seeds and plants treatments and working concentration of the Mycephyt in the solutions depends on the type of the plants. It is recommended to apply 100 ppm Mycephyt for the seeds and plants treatment. However, for some plants the concentration of Mycephyt as low as 10 ppm was shown equally effective. Mycephyt application is effective both outside and in greenhouses. Mycephyt is safe for humans and environment: non-toxic; non-mutagenic; does nit irritate skin and eyes. Mycephyt application easily fits to standard plant growth protocol. The preliminary test of formulated combination of Chaetomium bio-fungicide and Mycephyt was done in tomato that gave very good result. The combination of

Chaetomium bio-fungicide and Mycephyt plant growth stimulant for testing plant growth e.g. water convolvulus (*Ipomoea aquatica*), Coriander *(Coriandrum sativum*) and Kale were successfully tested (Soytong *et al*, 2010b). The research finding was to evaluate the application of CM product to promote the growth of Kale (*Brassica oleracea* var *albograbra*).

Materials and methods

The experiment was conducted by using Randomized Completely Block Design (RCBD) with 4 replications and 6 treatments as follows:- T1 = non-treated control, T2 = CM product 2cc/2L, T3 = CM product 4cc/2L, T4 = Bio-amino 2cc/2L, T5 = Bio-amino 4cc/2L and T6 = CM product 2cc + Bio-amino 2cc/2L. Seeds were soaked at application rate in each treatment before planting. Thereafter for two weeks, each treatment was interval sprayed at every 15 days until harvest.

CM product is a new biological formulation that have been developed by Thai and Russian Scientists. It is a combination of Chaetomium-biofungicide plus Mycephyt, a metabolite from endophytic fungus for growth stimulant. Bio-amino is a new biological formulation for promoting plant growth which contains actinomycetes and *Bacillus subtitis*.

Data were collected as plant height (cm) and plant fresh weight (g). Data were statistically computed analysis of variance and treatment means were compared using Duncan's Multiple Range Test(DMRT) at P=0.05 and P=0.01.

Results and discussion

Result showed that applying CM product to Kale's seedlings at 4 cc gave significantly better in plant height (31 cm) than treated than CM product 2cc, bio-amibo 2 cc, Bio-amino 4 cc, CM product 2 cc plus Bio-amino 2 cc which plant heights were 28,27, 28 and 25 cm., respectively. Those treatments were significantly different in plant height when compared to the non-treated control (20 cm) as seen in Table 1, Fig.1. Pumsing (2005) reported that treated CM product 4 ml/2 L to Kales could be given significantly highest in plant height, root length and plant fresh weight which were 29 cm, 17 cm and 24 g/plant, respectively and followed by treated with CM product 2 ml/2L which were 23 cm, 15 cm and 16 g, respectively. In this study, applying CM product to Kale's seedlings at 4 cc gave significantly better in plant fresh weight or yield (29 g) than treated than CM product 2cc, bio-amibo 2 cc, Bio-amino 4 cc, CM product 2 cc plus Bio-amino 2 cc which plant heights were 28, 24, 25 and 2 g, respectively. Those treatments were also significantly different in plant fresh weight or yield when compared to the non-treated control (15 g). As a result,

Soytong, *et al.,* (2001, 2004) also stated that Chaetomium could be promoted several plant growth and increased in yields of egg plants and tomato etc. Moreover, Soytong *et al*, (2010b) reported that treated CM product 4 ml/2 L in Kale gave significantly highest in plant height (19 cm) and followed by treated with CM product 2 ml/2L and chitosan 4 ml/2L which were 22 and 19 cm, respectively at 49 days. The research finding is similar resulted in the part of application of Chaetomium that could increase the growth of *B. olreacea* var. *albograbra* in good agricultural practices (GAP), Pesticide-Free Production (PFP) and organic crop production (Charee, 2005).

Table 1. Plant growth parameters of Kale at 70 days.

Treatments	Plant Height	Plant Fresh Weight
Control	20 c	15 c
CM product 2cc	28 ab	28 ab
CM product 4cc	31 a	29 a
Bio-amino 2cc	27 ab	24 ab
Bio-amino 4cc	28 ab	25 ab
CM product 2cc + Bio-amino 2cc	25 b	23 b
CV(%)	8.24	11.55

[1]Average of four experiments. Means followed by a common letter are not significantly different at P=0.01.

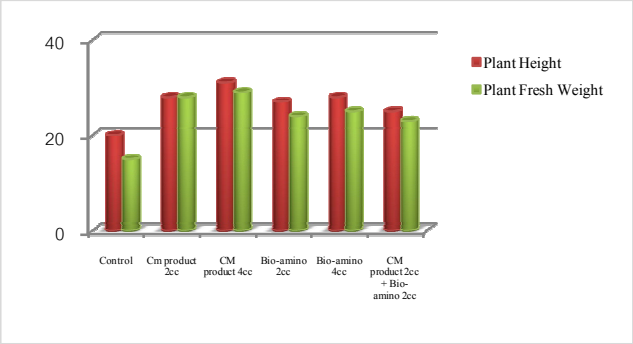

Fig 1. Plant height and fresh weight after harvesting at 70 days

This finding is confirmed that using CM product and Bio-amino or mixture of CM product plus Bio-amino could increase plant height and fresh weight or yields of Kale. Applying CM product at 4 cc gave the highest in plant height percentage of 35.48, and followed by CM product 2 cc, Bio-amino 2 cc, Bio-amino 4 cc and a combination of CM product 2 cc plus Bio-amino 2 cc which the per cent of increased plant height were 28.57, 25.92, 28.57 and 20.00, respectively. Moreover, Kale treated with CM product 4 cc also gave the highest fresh weight or yield which increased 48.27 % and followed by CM

product 2 cc, Bio-amino 2 cc, Bio-amino 4 cc and a combination of CM product 2 cc plus Bio-amino 2 cc which the per cent of increased plant fresh weight or yields were 46.42. 57, 37.50, 40.00 and 34.74, respectively (Table 2, Fig. 2, 3 and 4).

Table 2. Percentage of increased in plant growth parameters of Kale.

Treatments	Plant height (%)	Plant fresh weight (%)
Control	-	-
Cm product 2cc	28.57	46.42
CM product 4cc	35.48	48.27
Bio-amino 2cc	25.92	37.50
Bio-amino 4cc	28.57	40.00
CM product 2cc + Bio-amino 2cc	20.00	34.74

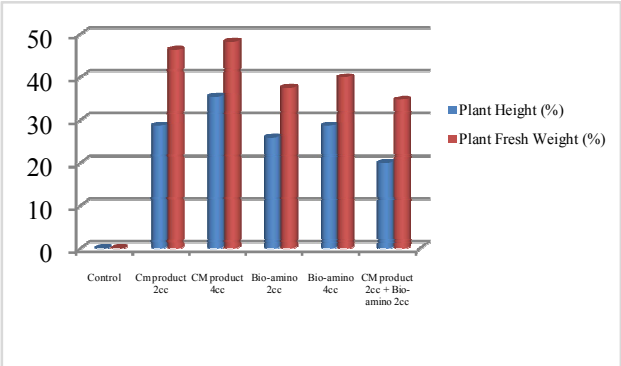

Fig 2. Per cent of increased plant height and yield of Kale

Fig 3. Growth parameters of Kale after treated bio-products in pot experiment
T1 = non-treated control, T2 = Cm product 2cc/2L, T3 = CM product 4cc/2L, T4 = Bio-amino 2cc/2L, T5 = Bio-amino 4cc/2L and T6 = CM product 2cc + Bio-amino 2cc/2L

Fig 4. Growth parameters of Kale after treated bio-products at harvesting T1 = non-treated control, T2 = Cm product 2cc/2L, T3 = CM product 4cc/2L, T4 = Bio-amino 2cc/2L, T5 = Bio-amino 4cc/2L and T6 = CM product 2cc + Bio-amino 2cc/2L.

CM product and Bio-amino are proved to be a new biological formulation that can be used for plant disease control and plant growth stimulants. It concluded that applying CM product or Bio-amino to promote the growth of Kale that would be possible became one of the agricultural inputs for the growers. It is recommended to test these bioproducts to other economic plants.

Acknowledgement

I would like to thank Biocontrol Research Unit and Mycology Section, Faculty of Agriculture, King Mongkut's Institute of Technology Ladkrabang (KMLIT) and Association of Agricultural Technology in Southeast Asia (AASET) to offer all facilities to this research study.

References

Charee Pumsing. 2005. Cultivation of *Brassica olreacea* var. *albograbra* in Good Agricultural Practices (GAP), Pesticide-Free Production (PFP) and Organic Agriculture (OA). Special Problem. Faculty of KMITL, Bangkok. Thailand.

Kanokmedhakul, S., Kanokmedhakul, K., Phonkerd, N., Soytong, K., Kongsaree, P. and A. Suksamrarn. 2001. Antimycobacterial anthraquinone-chromanone compound and diketopiperazine alkaloid from the fungus *Chaetomium globosum* KMITL-N0802. Planta Medica 68:834-836.

Kanokmedhakul, S., Kanokmedhakul, K., Nasomjai, P., Loungsysouphanh, S., Soytong, K., sobe, M., Kongsaeree, K., Prabpai, S. and Suksamran, A. 2006. Antifungal Azaphilones from the fungus*, Chaetomium cupreum* CC3003. J. Natural Products (69):891-895.

Kaewchai, S., Soytong, K. and Hyde, K.D. 2009. Mycofungicides and Fungal Biofertilizers. Fungal Diversity 38:25-50.

Pornsuriya, C., Soytong, K., Kanokmedhakul, S. and Lin, F.C.2010. Efficacy of antifungal metabolites from some antagonistic fungi against *Pythium aphanidermatum*. Journal of Agricultural Technology 6(2):299:308.

Shternshis, M., Tomilova, O., Shpatova, T. and Soytong, K. 2005. Evaluation of Ketomium-mycofungicide on Siberian isolates of phytopathogenic fungi Journal of Agricultural Technology 1(2):247-253.

Sibounnavong, P., Sysouphan, P., Xay Ly, Phoutsay, P., Soytong, K., Promrin, K., Pongnak, W., and K. Soytong. 2006. Application of biological products for organic crop production of kangkong (*Ipomoea aquatica*). An International Journal of Agricultural Technology 2(2):177-189.

Sophea, Kean, Soytong, K. and To-anun, C. 2010. Application of biofungicide to control citrus root rot under field condition in Cambodia. Journal of Agricultural Technology 6(2):219:230.

Soytong, Kasem, Sibounnavong, Phonesavrad, Utthajedee,Aram , Sibounnavong Phoutthasone , Karpov, Vladimir , Mitrohin, Maxim. 2010. Testing of CM Products to Promote the Growth and Control *Fusarium* Wilt of Tomato . Proc of the 16 th Asian Agricultural Symposium and the 1st International Symposium on Agricultural Technology . August 25-27,2010, KMITL, Bangkok, Thailand.

Soytong, K. 2004. Application of biological products for agriculture. Proc. of the 1st International Conference on Integration of Science and Technology for Sustainable Development, KMITL, Bangkok, Thailand, 25-26 August.

Soytong, K. (1992). Biological control of tomato wilt caused by *Fusarium oxysporum* f. sp. *lycopersici* using *Chaetomium cupreum*. Kasetsart J. (Nat. Sci.) 26 : 310-313.

Soytong, K., Kanokmedhakul, S., Kukongviriyapan, V. and M. Isobe. (2001). Application of *Chaetomium* species (Ketomium) as a new broad spectrum biological fungicide for plant disease control: A review article, Fugal Diversity 7:1-15.

Soytong, Kasem, Sibounnavong, Phonesavard and Adthajadee, Aram.2010. Evaluation of CM product to promote plant growth. Journal of Agricultural Technology 7(1):105-113.

(Received 19 January 2011; accepted 30 July 2011)