INHIBITION ACTIVITY OF CLEOME SPECIES EXTRACT ON ONION GUEST ROOT

SUTTHIDUEAN CHUNHAKARN1*, PRAKAI DAO YINGSANGA2, LADA MATHURASA3

1Programme in Chemistry, Faculty of Science and Technology, Phranakhon Rajabhat University, Bangkok, Thailand. 2Programme in Agricultural Management Technology, Faculty of Science and Technology, Phranakhon Rajabhat University, Bangkok, Thailand. 3Programme in Environmental Science and Technology, Faculty of Science and Technology, Phranakhon Rajabhat University, Bangkok, Thailand. Email: sugar_sea@hotmail.com

Received: 16 February 2019, Revised and Accepted: 13 March 2019

ABSTRACT

Objective: Biological control is useful in agricultural. Allelopathy plays an important factor in crop productivity. The effect of allelopathy is able to produce and release allelochemicals or phytochemicals to inhibit or stimulate seed germination, seeding growth, shoot and root growth of other crops. The aim of this study was to evaluate the inhibitory activity of Cleome viscose and Cleome spinosa extracts on onion guest roots length.

Methods: The whole plants of C. viscose and C. spinosa were extracted with dichloromethane, ethyl acetate, methanol and distilled water, respectively. Each group of onion guests was sprayed at various concentrations as 100, 200, 400, 800 and 1600 parts per million for the treatment. The root growth was measured every day for 1 month.

Results: At concentration of 1600 ppm, methanol crude extract of C. spinosis showed the highest percent inhibitory activity value of 91.68%. Ethyl acetate and methanol crude extracts of C. viscose showed strong inhibitory activity with percentage values of 90.17 and 90.90, respectively, at concentration of 1600 ppm. Moreover, the methanol extract of C. viscose and C. spinosa evaluated higher inhibitory activity than other solvents. However, distilled water crude extract of C. spinosa showed weak inhibitory activity with the percentage value of 40.05 at concentration of 1600 ppm.

Conclusions: In this study, the methanol crude extract of C. spinosa showed potent inhibitory activity on root growth. Moreover, ethyl acetate and methanol crude extracts of C. viscose evaluated strong inhibitory activity. C. viscose and C. spinosa extracts possessed allelochemicals for postharvest biology and technology in plants.

Keywords: Cleome viscose, Cleome spinosa, Onion guests, Inhibitory activity.

MATERIALS AND METHODS

Plant materials
A. cepa L. was purchased from the local market (Si Mum Mueang Market), Pathum Thani Province, Thailand, in January 2018. The whole plants of C. viscose and C. spinosa were collected from the wilderness, Don Mueang, Bangkok Province, Thailand.

Chemicals
All solvents were analytical grade. Dichloromethane, ethyl acetate, and methanol were purchased from E. Merck (Germany). Absolute ethanol was purchased from E. Merck (Germany).

Preparation of plant extract
The whole plants of C. viscose and C. spinosa were dried in the oven at 60°C. Then, there were powdered by a mechanical grinder. The sample (5.0 kg) was extracted with dichloromethane for 3 days. Then, the extract was filtered and evaporated by the rotary evaporator to afford yellow gum (dichloromethane extract). The residue was extracted with ethyl acetate for 3 days. Then, the extract was filtered and evaporated by rotary evaporator to afford green gum (ethyl acetate extract). Finally, the residue was extracted with methanol for 3 days. The filtrate was evaporated by rotary evaporator to afford brown gum (methanol extract). The dried plant was extracted with distilled water at 40°C for 3 days. Then, the extract was filtered and evaporated by the rotary evaporator to afford brown gum (methanol extract).

Inhibitory activity of the extract on root length
Each of 20 onion guests was collected in the group of experimental. The concentrations of crude extracts were prepared at 100, 200, 400, 800, and 1600 ppm in 20% v/v ethanol in water for the treatment. The different
concentrations of crude extract sprayed to the group of treatments. The root growth was measured every day for 1 month. An untreated control and negative control (20% ethanol in water) were compared with the experimental. Inhibitory activity (%) was calculated from the equation below:

\[
\text{Inhibitory activity (\%)} = \left(1 - \frac{\text{Root length of sample}}{\text{Root length of control}}\right) \times 100
\]

Statistical analysis
The experiment was designed by a randomized complete block design. Results were recorded using analysis of variance (Duncan’s new multiple range test).

RESULTS AND DISCUSSION
Observation of roots length measured on onion guest is presented in Table 1 and Fig. 1. Methanol, ethyl acetate, and MV crude extracts at 1600 ppm showed the highest percent inhibitory activity values of 91.68, 90.17, and 90.90, respectively. While, dichloromethane and distilled water crude extracts of C. viscosa displayed weak inhibitory activity with percentage values of 53.21 and 56.78, respectively, at concentration of 1600 ppm. The concentration of WS crude extract showed no significant inhibitory activity. The methanol extract of C. viscosa and C. spinosa evaluated higher inhibitory activity than other solvent. Ethyl acetate and methanol crude extracts of C. viscosa and C. spinosa possessed an inhibition activity on the root length of onion guest after postharvest that compared negative and untreated controls. The percentage inhibitory activity depended on the concentration and type of solvents. When the increased concentration of the extract results in the percentages, inhibitory activity was raised. Aloe vera gel extracts reduced root length of onion root tip [15]. In contrast, water extract of C. viscosa showed inhibition of roots of Sesamum indicum [16]. Moreover, the methanol extract of C. arabica inhibited root length of lettuce and isolated active compounds from this plant [14]. However, licorice and seaweed extract increased onion production [17,18].

CONCLUSION
In this research, C. viscosa and C. spinosa extracts inhibited root length of onion guest. The research is further to be isolate and purify allelochemicals of C. viscosa and C. spinosa.

ACKNOWLEDGMENT
This work was supported by grants from Phranakhon Rajabhat University. The authors would like to appreciate Phranakhon Rajabhat University for providing financial support to this research.

CONFLICTS OF INTEREST STATEMENT
We declare that we have no conflicts of interest.

REFERENCES
1. Maharjan S, Shrestha BB, Jha PK. Allelopathic effects of aqueous extract of leaves of Parthenium hysterophorus L. seed germination and seedling growth of three cereal crops of some cultivated and wild herbaceous species. Sci World 2007;5:33-9.
2. Han CM, Pan KW, Wu N, Wang JC, Li W. Allelopathic effect of ginger on seed germination and seedling growth of soybean and chive. Sci Horric 2008;116:330-6.
3. Ali HH, Taveer A, Nadeem MA, Javed MM, Kashif MS, Chadhar AR. Allelopathic effects of Rhyhchosia capitata on germination and seedling growth of Mungbean. Planta Daninha 2013;31:501-9.
4. Arowosegbe S, Wintola OA, Afolayan AJ. Phytochemical constituents and allelopathic effect of Aloe ferox Mill. Root extract on tomato. J Med Plants Res 2012;6:2094-9.
5. Amb MK, Ahluwalia AS. Allelopathy: Potential role to achieve new milestones in rice cultivation. Rice Sci 2016;23:165-83.
6. Yousaf Z, Umer A, Younas A, Khan F, Wang Y. Allelopathic Plants: 24. Genus Allium. L. Allelopathy J 2012;29:1-12.
7. Wang Y, Tian WX, Ma XF. Inhibitory effects of onion (Allium cepa L.) extract on proliferation of cancer cells and adipocytes via inhibiting fatty acid synthase. Asian Pac J Cancer Prev 2012;13:5573-9.
8. Vajipurkar SG, Agarwal D, Chaudhuri SK, Senwar KR, Bhatnagar PK. Gamma-irradiated onions as a biological indicator of radiation dose. Radiat Meas 2001;33:833-6.
9. Devi BP, Boominathan R, Mandal SC. Evaluation of antipyretic potential of Cleome viscosa Linn. (Capparidaceae) extract in rats. J Ethnopharmacol 2003;87:11-3.
10. Sungh H, Ali SS, Khun NA, Mishra KA, Mushra AK. Wound healing potential of Cleome viscosa Linn. seeds extract and isolation of active constituent. S Afr J Bot 2017;112:460-5.
11. Parimala D, Boominathan R, Mandal SC. Evaluation of anti-diurehal activity of Cleome viscosa L. extract in rats B. Phyto medicine 2002;9:739-42.
12. Bose U, Bala V, Ghosh TN, Gunasekaran K, Rahman AA. Antinociceptiv, cytotoxic and antibiotic activities of Cleome viscosa leaves. Rev Bras Farmacogn 2011;21:165-9.
13. Mali RG, Mahajan SG, Mehta AA. In vitro screening of Cleome viscosa extract for anthelmintic activity. Pharm Biol 2007;45:766-8.
14. Ladhari A, Omezzine F, Greca MD, Zarrelli A, Zuppolini S, Haouala R. Phytotoxic Activity of Cleome arabica L. and its principal discovered active compounds. S Afr J Bot 2013;88:341-51.
15. Ilbaš AJ, Gönen U, Yılmaz S, Dadanlı MY. Cytotoxicity of Aloe vera gel extracts on Allium cepa root tip cells. Turk J Bot 2012;36:263-8.
16. Anbarasan R, Prabhakaran J. Allelopathic potential of weed species Ageratum conyzoides L. and Cleome viscosa L. on germination and growth of Sesamum indicum L. Kong Res J 2015;2:114-7.
17. Babirle R, Ibouir M, Trabi BA. Effect of folic spraying with licorice root and seaweed extraction growth and seed production of onion (Allium cepa L.). Int J Chem Tech Res 2015;8:557-63.
18. Dogra BS, Mandradia RK. Effect of seaweed extract on growth and yield of onion. Int J Farm Sci 2012;2:59-64.