

INHIBITION ACTIVITY OF *CLEOME* SPECIES EXTRACT ON ONION GUEST ROOT

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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 viscosa* and *Cleome spinosa* extracts on onion guest roots length.

Methods: The whole plants of *C. viscosa* 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. spinosa* showed the highest percent inhibitory activity value of 91.68. Ethyl acetate and methanol crude extracts of *C. viscosa* 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. viscosa* and *C. spinosa* evaluated higher inhibitory activity than other solvent. 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. viscosa* evaluated strong inhibitory activity. *C. viscosa* and *C. spinosa* extracts possessed allelochemicals for postharvest biology and technology in plants.

Keywords: *Cleome viscosa*, *Cleome spinosa*, Onion guests, Inhibitory activity.

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INTRODUCTION

Agricultural products have produced for the requirement of population. Thus, irradiation technology and agrochemicals such as fertilizers, herbicides, liming and acidifying agents, and pesticides have used to produce crop yields [1,2]. Nowadays, biological control is one of an alternative to use 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 [3-5].

Onion guest (*Allium cepa* L.), belongs to the family Alliaceae, is an industrial crop of the tropical. Onion guest is grown for food ingredients. They are mostly valued for aroma flavor and nutritional as minerals and trace elements [6,7]. One method of the postharvest cultivar is gamma-irradiated [8]. It is the most popular method but the root length of an onion guest is grown. This problem results in low cost in the market.

Cleome viscosa and *Cleome spinosa* belong to the family Capparidaceae. It is a common weed and distributes in the tropical of the world. This plant possesses Ayurveda medicine such as seed used for anthelmintic, leaves used in wound healing, and fever [9,10]. Moreover, pharmacological of this plant is evaluated as an anesthetic, anti-diarrhea, anti-inflammatory, antimalarial, and antipyretic activities [11-13]. Moreover, the phytotoxic activity of *C. viscosa* showed inhibitory effect on germination and growth in agricultural product [14]. The aim of this research was to evaluate the inhibitory activity of *C. viscosa* and *C. spinosa* extracts on onion guest roots length.

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. viscosa* 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. viscosa* 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



Fig. 1: Inhibitory activity of *Cleome viscosa* on roots length, (a) untreated control, (b) ethyl acetate extract at 1600 ppm, (c) negative control

Table 1: Inhibitory activity of *C. viscosa* and *C. spinosa* on roots length of onion guest

Extract	Concentration of extract (ppm)				
	100	200	400	800	1600
Dichloromethane (DS)	27.52 ^a	39.15 ^a	50.26 ^b	51.85 ^b	63.20 ^b
Ethyl acetate (ES)	12.98 ^a	23.46 ^a	51.23 ^b	52.31 ^b	83.21 ^c
Methanol (MS)	20.25	24.02	43.66	48.29	91.68
Distilled water (WS)	10.03 ^a	10.01 ^a	10.51 ^a	11.01 ^a	40.05 ^b
Dichloromethane (DV)	12.59 ^a	13.35 ^a	35.46 ^b	50.17 ^c	53.21 ^c
Ethyl acetate (EV)	20.10 ^a	22.10 ^a	40.17 ^b	71.30 ^c	90.17 ^c
Methanol (MV)	18.61 ^a	20.50 ^a	50.30 ^b	51.25 ^b	90.90 ^c
Distilled water (WV)	17.02 ^a	29.04 ^a	45.30 ^b	52.34 ^b	56.78 ^b
Negative control	0.33 ^a	0.36 ^a	0.31 ^a	0.32 ^a	0.39 ^a
Untreated control	0.01 ^c	0.05 ^b	0.05 ^b	0.01 ^c	0.01 ^c

C. viscosa: *Cleome viscosa*, *C. spinosa*: *Cleome spinosa* Values with different letters in a column show significant differences ($P < 0.01$) as determined by Duncan's multiple range test.

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.

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

Statistical analysis

The experiment was designed by a randomized complete block design. Results were recorded using analysis of variance (Duncan's new multiple range tests). The significant value of $p < 0.01$ was considered.

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 different 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 inhibition 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.

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