

## Allelopathy Test of the Love-Vine's (*Cassytha Filiformis L.*) Extract as A Bioherbicide Against Seed Germination of Amaranth (*Amaranthus Spinosus L.*)

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**Abstract:** The purpose of this experiment is to study the allelopathy effect of Woevine's (*Cassytha filiformis L.*) extract and potential test as a bioherbicide against Seed Germination of Amaranth (*Amaranthus spinosus L.*). Experiment have been conducted in Laboratory of Plant Breeding, Faculty of Agriculture, University of Brawijaya, Malang. Experiment was conducted on February until April 2015. Experiment uses Randomized Complete Block Design with LSD (0.05) test, consist of 8 levels dosages as follow : 0%, 5%, 10%, 15%, 20%, 25%, 30% and 35% or each dosages are equilibrium with 0 g L<sup>-1</sup>, 50 g L<sup>-1</sup>, 100 g L<sup>-1</sup>, 150 g L<sup>-1</sup>, 200 g L<sup>-1</sup>, 250 g L<sup>-1</sup>, 300 g L<sup>-1</sup> dan 350 g L<sup>-1</sup>. Result shows that extract from *C. filiformis* inhibit seed germination of *A. spinosus* and reduce percentage of germination until 89,2% of reduction ( on treatment 30%) and 93,3% of reduction (on treatment 35%).

**Keyword :** Extract of *Cassytha filiformis (L.)*, *Amaranthus spinosus*, - inhibition and germination.

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### I. Background

*Cassytha filiformis (L.)* or "Love-vine or Woe vine" is a leafless, climbing, twining, vine-like, autoparasitic and plant hyperparasitic phanerogam (seed bearing plant) in the plant family Lauraceae (Nelson, 2013). It infests a wide variety, it is one of many higher flowering plant species that have, through evolutionary divergence, become parasitic on various organs of other higher plants. Having long ago lost certain metabolic processes and physical structures to support it and remain independent, Love-vine or Woe-vine (*C. filiformis*) clings to other, mainly woody, plants for physical support, nutrition, and water. Nugroho (2010) reported that the flowers of *C. filiformis* are borne in small panicles, and the fruit is small, fleshy, berry-like, bearing a single, spherical seed.

Sustainable agriculture have to support by an exact agroecosystem management for environment safety. Using alternative some technique and resources for production with environment safety must be growing well and optimized. Allelopath compounds from plants and microorganisms is one of several potentials which is can increase effectively when using it in agricultural production system. Because, it seems making environment safety, selection to use this alternative must to obtain with a criteria technically and economically as need as for commercially in agriculture production system (Chung, 2002, and Junaedi *et al.*, 2005).

Allelopathy refers to the beneficial or harmful effects of one plant on another plant, both crop and weed species, from the release of biochemicals, known as allelopath or allelochemicals, from plant parts by leaching, root exudation, volatilization, residue decomposition, and other processes in both natural and agricultural systems.

Allelochemicals are a subset of secondary metabolites not required for metabolism (growth and development) of the allelopathic organism (Stamp, 2003). One of using allelopathy potential from this plant is as agent to biological control for species invasives or weed (Nelson, 2013).

Allelopathy is evident of releasing the compounds toxic from plant which is harmful for the other plants growth (Kristanto *et al.*, 2003). Singh *et al.* (2003) and Junaedi *et al.* (2006) defines that allelopath is directly or indirectly effect from plants to the other plants with good or positive relationship or contrary is negative throughout by chemical compound released into environment. Kinds of allelopath from plants released as like as exudat from root and pollen, organes delay and decomposition, volatile from leaf, stem and root, also through leaching from organes outer (Reigosa *at al.*, 2000; Qasem and Foy, 2001).

Recently, method of weed control often use sintetically chemical, with the results very effective, but on the other hand, using chemical synthetics in directly or indirectly have dilution effect and destruction for environment in physic and biological. Resently, gouvernement still promotes the program for sustainable agriculture, so. for supporting this program, deminished chemical synthetics or chemicals weed control have replaced with the other alternatives safety way.

Based on that reasons, using bioherbicide must be increased, one of this is using allelopath from plant (*C. filiformis*). Until now there is no information about how much strongest the potential of the active ingredient

or allelopath from *C. filiformis* could inhibit against seed germination of amaranth (*A. spinosus*). Testing phytotoxicity for the allelopath's compound could be done by measuring percentage of seed germination, growth and length of radicle, and several functional processes in plant (Einhellig, 1995<sup>b</sup>). This work was done and can measure the potential of allelopath from *C. filiformis* in quantity. Source of allelopath collected from digestion all organs plant. Testing of allelopath inhibition for seed germination was used the sensitive weed species as like as an Amaranth. Using allelopath can occur with indirect or direct effect on weed (Lancar and Karake, 2002).

## II. Method

Preparing the *C. filiformis* extract for bioactive's contains retention, using the technique as following : 1) Take and balancing of fresh plants (start from 50 g until 350 g with intervals 50 grams); 2) Cutting them in 1 cm apart; 3) Crushing them into the blender in 10 minutes; 4) Each of materials was stored in beaker glass.

Take 32 petridishes (Ø = 9 cm) and placed with 4 papers as a basal into each petridish for seed germination. For helping germination of amaranth's seed was soaked into 0.03% KNO<sub>3</sub> (3 g 100 ml<sup>-1</sup>) during 5 minutes. Putting Amaranthus spinosus seeds in petridish, 20 seeds on each petridish after 4 papers as basal and saturated with 4 ml *C. filiformis* extract solution depend on each dosages (treatments). 2) All of petridish was stored in germinator with temperates 20-25<sup>o</sup>C.

Experiment uses Randomize Complete Block Design with 8 levels dosage (0%, 5%, 10%, 15%, 20%, 25%, 30% and 35% that is equilibrium with 0 g L<sup>-1</sup>, 50 g L<sup>-1</sup>, 100 g L<sup>-1</sup>, 150 g L<sup>-1</sup>, 200 g L<sup>-1</sup>, 250 g L<sup>-1</sup>, 300 g L<sup>-1</sup> and 350 g L<sup>-1</sup>) and 4 replications. Experiment was conducted on February until April 2015. Using statistic for different between treatments with LSD 5%.

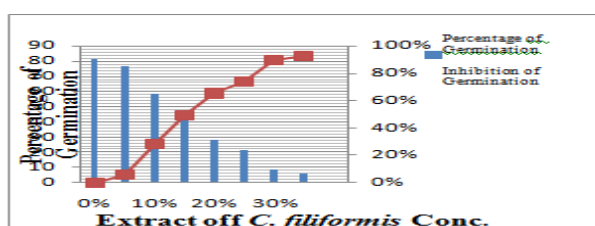
## III. Results And Discussion

Result shows that extract of *C. filiformis* can inhibit to percentage of *A. spinosus* seed germination and it's inhibition increases with high concentration as following : treatment 5% have 76% of seed germination (germination reduced 8,1%); treatment 10% have 58% of seed germination (germination reduced 28,1%); treatment 15% have 41,50% of seed germination (germination reduced 49,0%), treatment 20% have 28,25% of seed germination (germination reduced 65,2%, treatment 25% have 21,25% of seed germination (germination reduced 73,8%, treatment 30% have 8,75% of seed germination (germination reduced 89,2%); and treatment 35% have 6,25% (germination reduced 93,3%). Percentage of Amaranth's seed germination without extract of *C. filiformis* is highest (81,25%) shows that extract of have a potential as bioherbicide against seed germination of *A. spinosus* by evident that it's seed germination reduced as long as application of extract concentration of *C. filiformis* increasing. Although statistically there is significant difference between treatment using concentration 30 % and 35%, but it was improved that using concentration 30 % is optimal dosages for weed control or suppress Amaranth's seed germination, let's see to Table 1 and Picture 1.

Table 1. Average of percentage seed germination of *A. spinosus* and it's percentage reductions at 12 dap by using several concentration extract from *C. filiformis*

Treatment (Conc.)	Percentage of Seed germination	Reduction (%)
0%	81.25 f	0
5%	76.25 f	6.1
10%	58.25 e	28.1
15%	41.50 d	49.0
20%	28.25 c	65.2
25%	21.25 b	73.8
30%	8.75 a	89.2
35%	6.25 a	93.3
LSD 5%	6.77 <sup>*)</sup>	
CC (%)	11,53	

Note : <sup>\*)</sup> number which is followed by different letter is significantly different (p = 0.05).



Picture 1. Histogram of average seed germination percentage of *A. spinosus*, and it's percentage inhibition by using several concentrations of *C. filiformis* extract.

Inhibition of Amaranth's seed germination maybe caused by several reason as follow: 1). Substances or compounds likes phenol was absorbed into the amaranth seeds and it effect on metabolism process inhibition, especially in endosperm catabolism and than it occur reduction or inhibition on the cells devision and development. Seed germination which absorbs compound of phenolic as like as tanins, this compound could destruct the capability of catalytic enzymes which relationship with catabolism of carbohydate and this condition can effect on cells root growth. Einhellig (1995<sup>a</sup>) reported that tanin can inhibit activity of germinating enzymes as like as cellulase, polygalacturonase, proteinase, dehydrogenase and decarboxylase. Lambers *et al* (2000), suggest that inhibition by the phenol compound occur on the process of ATP formation, and hence can suppress almost of metabolisme in the cell. ATP is one of component which is an important roll in CO<sub>2</sub> capturing, and CO<sub>2</sub> decreasing will effect to the amount of carbohydrates as an energy function and construction of cell structure will decrease or there is not enough energy for cell devision.

Inhibition on germination can effected by disturb to mitosis process in embryo which occur in amaranth seed and hence the process of cell devision is abnormal. Einhellig (1995<sup>b</sup>) suggests that compound of phenol and it's derivates as like as coumarine, cinamic acid, benzoit acid will effect to several important processes as like as cell devision, minerals absorption, water balance, respiration, photosynthesis, protein synthesis, chlorophyll and phytohormones. Mitosis destruction by phenol compound can occur on dilution of spindle lines during metaphase in plants after absorption some substances phenol (Wattimena, 1987).

Fitter dan Hay (1991) alelopathy can effect to enzyme degradation which occurs on the cell wall, it could inhibit to enzyme activities or functions. Inhibition on these enzyme functions as follow:  $\alpha$ -amylase and  $\beta$ -amylase at carbohydrate degradations, enzyme proteinase at protein degradation, enzyme lipase at lipid degradation in seed. All of these degradations effect to supplay on growth energy which results during germination was less and low in accelerating, hence the process of germination decrease which was identified by percentage of germination reduce and duration time seed to germinate increase. The compound of allelopath can inhibit to cell devision, hence it can decrease to the percentage of germination of many seed plants (Sastroutomo, 1990 and Kristanto *et al.*, 2003).

Inhibition amaranth seed germination caused by inhibition to water absorption. Water diffusion inhibit caused by there is water potential pressure difference among outer and inner cell. Increasing with osmotic potential in extract will decrease water potential in cell make seed not enough in water received and it known that increasing of particle in concentration can effect on water potential value decreasing (Loveless, 1991).

Imbibition the compound of allelopath together with water into the seed will inhibit to induction of hormones growth, as like as GA (Gibberalic Acid) and IAA (Indole Acetic Acid) (Yuliani, 2000). Inhibition of GA synthesis will support enzyme  $\alpha$ -amilase, it makes process of starch hydrolisis to glucosa in the endosperm or cotyledon decreases, and hence the amount of glucosa which translocated to the growing point cells is less than small (Rice, 1984). Decreasing of macro molecule component effect to inhibition of protein synthesis will lead and affect to inhibition of protoplasm syntesis (Yuliani, 2000).

#### IV. Conclusion

Results of this experiment can concluded that increasing concentration of *C. filiformis* extract followed by decreasing in percentage germination on weed seed *A. spinosus* and increasing in inhibition weed's seed germination,

Extract fresh plant from *C. filiformis* have a potential as a bioherbicide for *A. spinosus* (weed) control.

Optimal concentration of extract fresh plant from *C. filiformis* to suppress on *A. spinosus* (weed) control is 30 % or 300 g L<sup>-1</sup> and it can suppress weed seed germination until 89,2%

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