The Potential Test of Endophytic Fungi on the Growth of Cucumber Crops and the Pathogenicity of the Pathogen Fusarium

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ABSTRACT

Endophytic fungi are fungi that live inside healthy crops tissues and do not cause interference in crops. Some species of endophytic fungi are a source of anticancer and antidiabetic compounds. In addition, the endophyte fungus can also be used as control agents of insect pests as insecticides. Endophytic fungus can also produce metabolites that play a role in thermoprotective. But not many are examining its potential in enhancing crop growth and the ability to suppress the pathogens. This study aims to assess the ability of endophytic fungi in promoting crop growth and pathogenicity test endophytic fungi against pathogens *Fusarium*. Research conducted at the Screen House and Laboratory of Crop Protection, Faculty of Agriculture, University of Bengkulu. The research stage starting from exploration endophytic fungus from crop chilli and rice, testing the ability of endophytic fungi in spurring the growth of cucumbers, pathogenicity test endophytic fungi against crop cucumber and chilli, and testing Capabilities pressing endophytic fungus fusarium pathogens. The results showed that the fungus endophyte tested quite able to increase the growth of cucumber crops, but has not been able to demonstrate the ability of antagonism against fungal pathogens because based on test results of dual culture there is no zone of inhibition, so it is necessary to explore more intensively in order to be found fungal endophyte that has potency as a biological control agent.

Key words: fungi, endophytic growth, pathogenicity

INTRODUCTION

Endophytic fungi are fungi that live inside plant tissues healthy and do not cause interference to these plants, but excluding mycorrhizal (Carroll, 1986). Endophytic fungus has been isolated from various plant species, both wild and crop plants. Ecology of endophytic fungi are very specific. Endophytic fungus is commonly found in the leaves, and then the trunk, and a small portion are at the root. The existence of endophytic fungi on parts of the plant tissue providing a more sheltered conditions of extreme weather changes. Colonization and diversity of endophytic fungi on plants is strongly influenced by location, age of the plant, and any modification or human intervention. Plants at different locations will show different endophytic fungi diversity, as influenced by different nutrient conditions, rainfall and other environmental factors are different. Age of plants also affects the diversity and populations of endophytic fungi as it relates to nutrition and the crop conditions. Environmental changes caused by human intervention, among others, deforestation, creation of artificial forests, pollution and pesticide application also affects the diversity of endophytic fungi.

Endophytic fungi play an important role for the plants and for humans. Benefits of endophytic fungi are very diverse. Some species of endophytic fungi are a source of compounds anticancer and antidiabetic. In addition, the endophyte fungus can also be used as control agents of insect pests as insecticides. Endophytic fungus can also produce metabolites that play a role in termoprotektif, for example at the plant in volcanic regions in the USA found their colonization of endophytic fungi Curvularia sp. Some endophytic fungi association with host plants capable of protecting the host plants of some virulent pathogens from the class of fungi and bacteria (Asniah *et al*., 2014).

In the year 2012 has been carried out exploration and identification of endophytic fungi associated with chilli and rice crops in the highlands and lowlands provinces of Bengkulu (data not yet published). But until now no studies that assess the ability of the endophytic fungi in promoting growth and plant resistance to pathogens. In this study will be carried out the assessment capabilities of endophytic fungi in spurring the growth of cucumber plants and the ability to suppress the growth of pathogenic Fusarium sp. From the results of this study are expected to be an alternative control of pathogens that are environmentally friendly and sound ecology.

This study was aimed to: (1). Assessing the ability of endophytic fungi in promoting plant growth, (2). Assessing the ability of endophytic fungi in suppressing the growth of pathogenic Fusarium.

MATERIALS AND METHODS

This research was conducted at the Laboratory of Plant Protection and gauze semi-permanent home in the Kebun Kenanga Village, Bengkulu-Indonesia.

Testing Capabilities Endophytic Fungus in Spur Plant Growth

Endophytic fungi obtained from roots, stems, and leaves of pepper plants tested for its ability to stimulate the growth of cucumber plants. Cucumber seeds are used as test plants as cucumber plant age is shorter than pepper plants so that response to treatment faster than chili. Cucumber seeds to be used surface sterilized with sodium hypochlorite 1% and then rinsed with sterile distilled water, then planted in the planting medium. Planting medium used is a mixture of soil and compost that have been sterilized. Endophytic fungi inoculation is done by sprinkling 1 ml of conidial suspension with a density of 105 conidia / ml near the roots of cucumber seedlings beumur 10 days after sowing (HSS). Observation of plant growth plant height, root weight, fresh weight stover 10 days after inoculation of endophytic fungi. Endophytic fungal isolates were able to increase plant height and root length used in the next stage of research.

Pressing Endophytic Fungus Testing Capabilities Pathogen Fusarium

Endophytic fungi suppress Fusarium ability test will be performed with a dual culture on PDA. Endophytic fungi and 5 mm colony diameter of *Fusarium*is placed on PDA medium in a petri dish with a distance of 3 cm between them. Observations development of the colony diameter is calculated at 3, 5, and 7 HSI. The parameters observed variables cucumber plant growth and endophytic fungi suppression capability against *Fusarium*. The data obtained are shown descriptively to compare any data obtained from all observations .

RESULTS AND DISCUSSION

Potential Test Endophytic Fungus against Cucumber Growth

Cucumber plant is used as an indicator plant to test the potential of endophytic fungi on growth because the cucumber plants are very sensitive to inoculation treatments were performed. Endophytic fungi are known to have the ability to induce the plant to produce the growth hormone auxin (Thakuria *et al.*, 2004) and this is in line with the results of testing the potential of endophytic fungi on the growth of cucumber plants . Based on observations of plant height (cm), root length (cm), and plant fresh weight (g) are performed at 10 days after inoculation (DAI) endophytic fungus known positive treatment effect on the growth of cucumber and shown in Figure 1 .

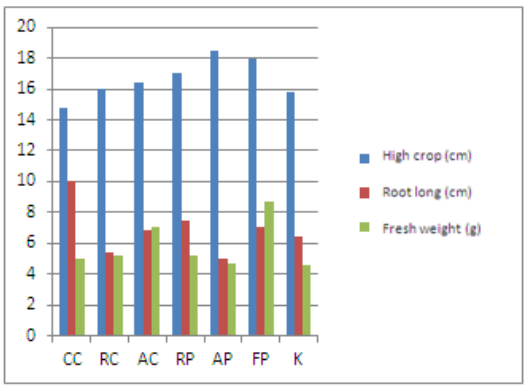

Figure 1. Effect of treatment of endophytic fungi on plant height (cm) , root length (cm) , and plant fresh weight (g) at 10 days after inoculation (DAI)

Description : CC: Curvularia from chili , RC : Rhizopus from Cabe, AC: Aspergillus from chili, RP: Rhizopus from rice, AP: Aspergillus from Rice, FP: Fusarium from rice, K: control

The results showed that the fungus endophyte Aspergillus of Rice showed high growth best of fungal endophyte other, and fungal endophyte Curvularia of chili showed growth of root length highest and fungal endophyte Fusarium of Rice showed fresh weight of most plants either from the fungus endophyte or others. This shows that endophytic fungi can improve plant growth cucumbers.

This is in line with the results Petrini *et al*., (1992) and Ramdan *et al*., (2013) that the fungus endophyte can increase the number of hair roots and branching root hairs that can help improve the absorption of nutrients needed by plants for photosynthesis so the optimal result of photosynthesis that can spur the growth of plants. Endophytic fungi' s ability to improve plant growth depends on its ability to produce metabolites, growth promoters such as auxin, gibberellins or cytokinins (Ramdan, 2013) .

Pressing Endophytic Fungus Testing Capabilities Pathogen *Fusarium*

Fusarium is a genus of soil borne pathogens that cause disease in some plants such as plants of the *Solanaceae* group. A disease that is usually caused by *Fusarium i*s Fusarium wilt disease. Test the ability to suppress the growth of endophytic fungus *Fusarium* pathogens carried lab scale with a dual culture method.

Observations on Dual culture test showed that in terms of the growth of the radius of the second colony of mold or fungus known that endophytic fungi grow faster than the pathogen , but could not conclude whether endophytic fungus is able to suppress the growth of pathogenic because there is no zone of inhibition. Colony growth in dual culture test is shown in Figure 2 and the long fingers of both microbes shown in Table 1.

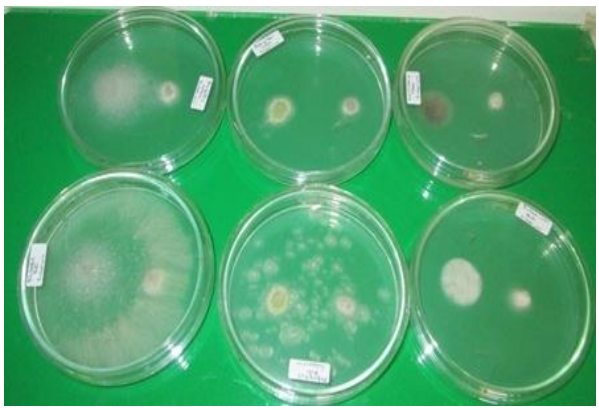

Figure 2. Dual culture of endophytic fungi and pathogens *Fusarium* on 2 DAI

Based on the results obtained known that endophytic fungus has the ability to grow faster than the pathogens tested, it can be seen from most of the length of the fingers fungus longer than the radius of *Fusarium* colonies. However, the results of dual culture no visible inhibition zone, so it can not be known whether the fungus endophyte antagonists have potential as an agent against *Fusarium*. Microbes can be regarded as antagonistic agent if it has the ability to inhibit the growth of pathogens and in a dual culture test usually appear inhibition zone on PDA medium.

This contrasts with the results Asniah *et al.*(2014) who obtained the results that the endophytic fungus is able to compete with endophytic fungi to space and nutrients as indicated by the ability of endophytic fungus that covers the surface of the PDA quickly and inhibit the growth of pathogens in a petri dish. Thus the potential of endophytic fungi in inhibiting pathogenic pertmbuhan need to be re-examined in order to obtain better results. According to a study Tondok *et al.,* (2012) there endophytic fungus capable of suppressing the development of black pod disease and capable of forming a barrier zone to produce antifungal compounds that inhibit the development of pathogens in multiple trials.

Likewise, the results of research Qadri *et al.*, (2013) who obtained results that endophytic fungi tested very active nature inhibit the growth of five of the seven pathogens tested. Thus, future research needs to be carried further by combining several types of endophytic fungi are able to work synergistically in suppressing the development of pathogens which can be one of the recommendations of environmentally friendly control.

Table 1. Long fingers endophytic fungus culture and *Fusarium* on dual culture

Code	No	Fingers long cultures (mm)											
		2 DAI				5 DAI				8 DAI			
		CE		F		CE		F		CE		F	
		r1	r2	r1	r2	r1	r2	r1	r2	r1	r2	r1	r2
CC	1	15	10	8	10	22	25	20	22	24	25	20	28
	2	7	10	12	12	23	24	18	20	23	28	18	28
RC	1	35	25	10	10	60	27	10	22	68	27	15	30
	2	27	27	7	7	60	27	20	23	63	27	20	30
AC	1	11	12	8	10	17	18	21	20	20	20	21	20
	2	10	10	6	6	30	26	10	10	30	27	20	20
RP	1	27	25	2	10	30	25	10	10	21	29	15	28
	2	27	28	2	10	23	25	10	10	30	31	15	27
AP	1	15	10	8	7	15	18	10	7	28	23	10	10
	2	10	10	11	10	10	17	10	10	15	18	20	10
FP	1	10	10	8	8	25	27	15	23	25	28	15	32
	2	13	11	10	10	17	21	25	25	25	28	25	25

Description : r1: Long fingers towards the middle of the petri colony , r2 : long fingers toward the edge of the petri colony. CC: *Curvularia* from chili , RC : *Rhizopus* from Cabe, AC: *Aspergillu*s from chili, RP: *Rhizopus* from rice, AP: *Aspergillus* from Rice, FP: *Fusarium* from rice, K: control

CONCLUSION

Endophytic fungi tested quite able to increase the growth of cucumber plants but has not been able to demonstrate the ability of antagonism against pathogenic fungi, so we need a more intensive exploration in order to be found endophytic fungi that have potential as a biological control agent .

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