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**PROCEEDING OF  
THE INTERNATIONAL SEMINAR AND THE 21ST NATIONAL CONGRESS  
OF THE INDONESIAN PHYTOPATHOLOGICAL SOCIETY**

**PROMOTING THE ROLE OF PHYTOPATHOLOGY BASED ON THE  
ADVANCED BIOTECHNOLOGY FOR ENHANCING THE SUSTAINABLE  
AGRICULTURAL PRODUCTION**

Faculty of Agriculture, the University of Sebelas Maret (UNS)  
Solo, December 3-5, 2011

**Published in 2014**



**Edited By :**

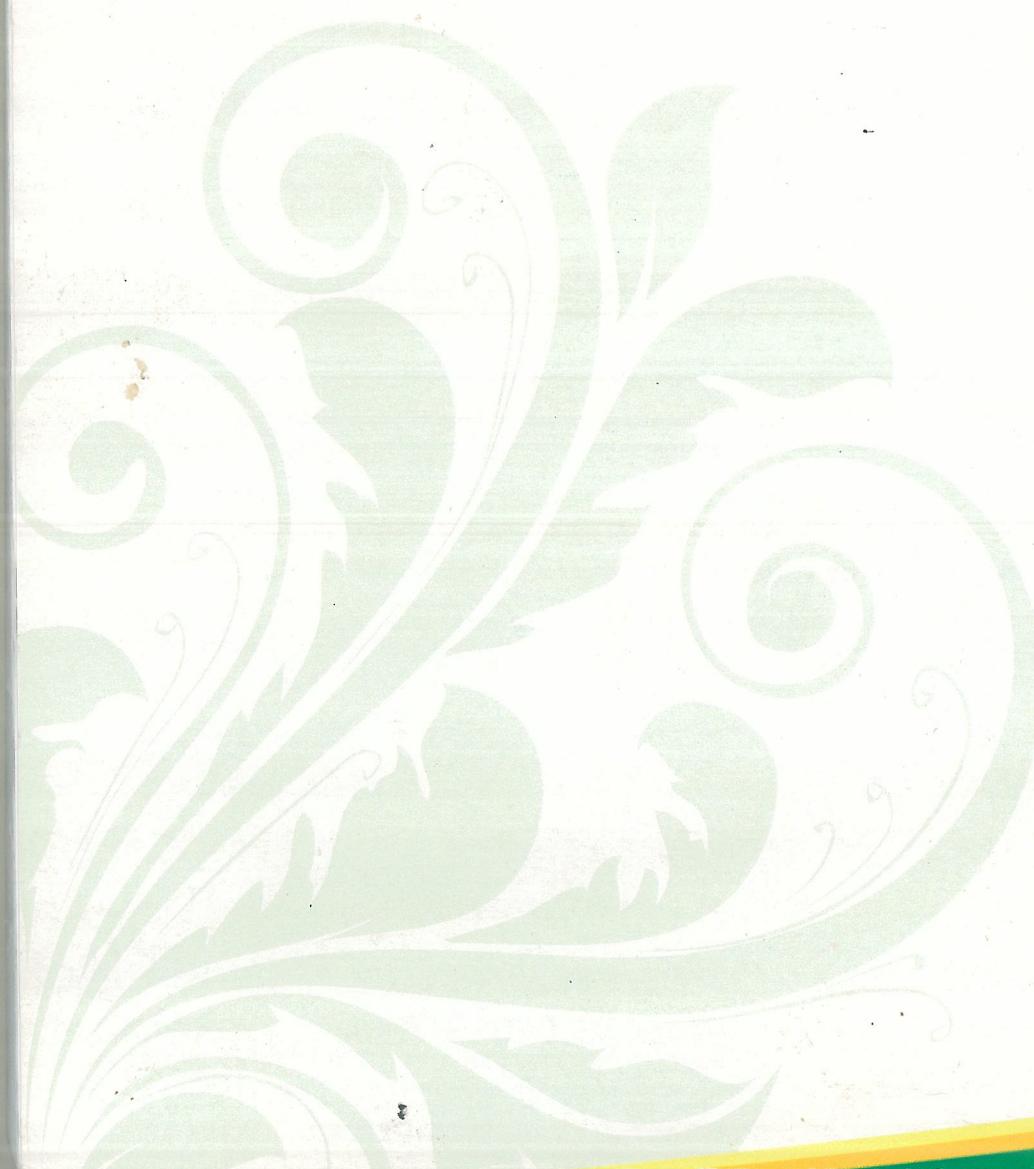
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**Presented By:**

Faculty of Agriculture, the University of Sebelas Maret  
Indonesian Phytopathological Society

**Published By :**

Faculty of Agriculture, the University of Sebelas Maret  
Jl. Ir. Sutami 36A 57126 Telp./Fax. (0271) 637457  
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ISBN : 978-602-14235-5-4

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Faculty of Agriculture, University of Sebelas Maret (UNS)

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Website : [www.fp.uns.ac.id](http://www.fp.uns.ac.id)

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Perpustakaan Nasional RI : Katalog Dalam Terbitan  
ISBN : 978-602-14235-5-4

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Published By : Faculty of Agriculture, The University of Sebelas Maret (UNS)  
Language : English

Layout By :

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## CONCENTRATION TEST OF MATICO LEAVES (*PIPER ADUNCUM*) WATER EXTRACT FOR CONTROLLING ONION PURPLE BLOTCH DISEASE CAUSED BY *ALTERNARIA PORRI*

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### ABSTRACT

Research on the concentration test of matico (*Piper aduncum* L.) leaves water extract for controlling onion purple blotch caused by *Alternaria porri* had been conducted at Phytopathology Laboratory and screen house belong to Faculty of Agriculture, Andalas University. The purpose of this study was to determine the most effective concentration of matico leave water extract in controlling purple blotch disease on onion. This research used randomized blocked design with 5 treatments and 4 replications. The treatments were the concentration of matico leaves water extract namely : 0, 30, 40, 50 and 60 ml/l of distilled water. The observed parameters were: the emergence of first symptom, the percentage of symptomatic leaves and the intensity of infected leaves. The results showed that administration of matico leaves water extract with a concentration 40 ml/l of distilled water was the most effective in controlling purple blotch disease on onion.

**Keywords :** onion, matico, *Alternaria porri*

### INTRODUCTION

Onion (*Allium ascalonicum* L.) is one of vegetables that is used as a complement and seasoning to flavor dishes. In addition, the onion can be used as traditional medicine because it contains antibiotic compounds [12]. Productivity of onion plants in West Sumatera tends to increase. In the year 2004 amounted to 7.89 tons/ha and in 2005 increased to 9.29 tons/ha [3]. Productivity is still low compared with the optimum productivity of onion by 15 tons/ha [1].

The low productivity of onion caused by various factors, one of them is *A. porri* causing purple blotch on onion. The disease intensity of purple blotch of onion in Indonesia was at the ranges 30-40%, and could reach 80% in the rainy season [13].

Control of purple blotch can be done by planting onions in fields that have good drainage, crop rotation and use of fungicides [14]. The use of fungicides in plant disease control showed satisfactory results, but on the other hand can cause problems to the environment, especially the effects of residuals. To control purple blotch is necessary to arrange a safe control alternative for the environment and consumers. One way of controlling currently being developed is the utilization

of plant based pesticides. Botanical pesticides is a pesticide which essentially derived from plant material. This pesticide is relatively easy to make with the skills and knowledge are limited, it is easy to decompose in nature so it does not pollute the environment [7].

A species of plant that can be used as botanical pesticide is matico (*Piper aduncum* L.). Matico leaves contain chemical compounds, among others: 0.1% volatile oil, benzoic acid ( 3-6 hydroxy, 3-7 dimethyl, 2-7 octadienyl) 4-methoxy benzoate. Benzoic acid derivative that had been isolated gives the activity as an antibacterial and antifungal [9]. French (1985) cit. Pasha [11] suggested that chemical compounds found in volatile oil could cause biological responses in fungi which could inhibit and suppress the growth of fungal conidia.

Ardi [2] reported that extract of matico leaves was able to suppress the growth and development of some pathogenic fungi such *Colletotrichum capsici* and *Sclerotium rolfsii*. The results of Nurmansyah's research [8] in the laboratory showed that matico leaf extract at concentration of 10% was able to inhibit growth of *S. rolfsii* isolated from peanut and chili, and *Fusarium oxysporum* from tomato. The result of Widiastuti's research [18] by using several

concentrations of matico leaves extract (10, 20, 30, 40, 50 ml/l of distilled water) proved that concentration of 30 ml/l of distilled water was effective in suppressing the growth of the fungus *Alternaria porri* in vitro. To determine the effectiveness of matico leaves in controlling onion purple blotch disease, it is necessary to test in planta.

The purpose of this study was to determine the most effective concentration of matico leaves water extract in controlling purple blotch disease on onion.

## MATERIALS AND METHODS

This research was conducted at Phytopathology Laboratory and screen house, Faculty of Agriculture, Andalas University from October 2006 until January 2007.

The experiment design used was Randomized Blocked Design (RBD) with 5 treatments and 4 blocks. The treatments were the concentration of matico leaves c water extract namely: 0, 30, 40, 50 and 60 ml/l of distilled water. Data were analyzed by using ANOVA and DNMRT at level 5 %

Isolation of Fungus *A. porri*, the source of inoculums is taken from the leaves of onion plants that were attacked by purple blotch pathogen in Alahan Panjang. Isolation of the pathogen used moist chamber method. Fungus that grew on the moist chamber isolated to PDA (Potato Dextrosa Agar) to obtain pure culture.

Conidia suspension of *A. porri* was prepared by releasing conidia growing on agar. Conidia are suspended in 10 ml distilled water. Dilution was the performed to obtain the density of  $10^6$  conidia/ml distilled water. For counting the number of conidia was used haemocytometer.

Matico leaves were collected from the area around Andalas University campus in Limau Manis. Leaves were weighed 500g then washed and added with 100 ml of distilled water. The leaves were pounded with a mortar until smooth and the water extract was filtered with cheesecloth. Then took

appropriate treatment (30, 40, 50, 60 ml). After that each treatment was added with distilled water by which the volume 1 l, and also with 0,5 g of detergent. Onion seeding used was Thai variety derived from farmer in Alahan Panjang. The bulbs were medium sized and uniform with diameter 1.5-2 cm, brightly colored and deformed.

Soil used for growing media from the faculty of Agriculture experimental garden in Limau Manis, soil mixed with manure (3:1 v/v), stirred evenly and then sterilized. Sterilization is performed using the method Tyndalization. Afterwards put into polybag 5 kg/polybag.

A bulb was planted in every polybag. Then doing maintenance namely: fertilizing, watering, and weed removal.

Treatments with several concentrations of matico leaves water extract was applied by spraying the entire plant at 15, 30, and 45 days old.

*A. porri* inoculation done at 21 days old plant by spraying conidia suspension with a density of  $10^6$  conidia/ml about 12 ml for each plant using a hand sprayer. After inoculation the plant covered with plastic bags.

## Observation

**Incubation Period.** Observation the first appearance of symptom was gone on everyday starting one day after inoculation until the first symptom emergence characterized by small spots of white to gray.

**Symptomatic Leaves.** Observation of symptomatic leaves percentage starting from the first day of symptom appearance until harvest at interval of 3 days.

**Disease intensity.** Observations made at interval of 3 days after the appearance of the first symptom until the harvesting. Observation time along with the observation of symptomatic leaves percentage. The calculation is done using the formula:

$$I = \frac{\sum(ni \times si)}{N \times S} \times 100\%$$

where I = disease intensity, ni= number of leaves on each category of disease, si= scale value of each category of disease, N= number of leave category of disease, N= number of were observed, S= the highest scale score of category.

Table 1. Scale of purple blotch (*A. porri*) on onion

Scale	Purple Bloch	Damage (%)
0	No	0
1	Too little	> 0—20
2	Little	> 20—40
3	Moderate	> 40—60
4	Heavy	> 60—80
5	Too heavy	> 80

Source: buletin penelitian hortikultura (1994) cit. Nurita [9], modified.

## RESULTS AND DISCUSSION

Treatment with various concentrations of matico leaves water extract on onion showed significant influence on when the first symptom emergence of purple blotch disease. Further test results can be seen in Table 2.

Table 2. Time the first symptom emergence of purple blotch disease on onion by treated by matico leaves water extract

Concentration (ml/l distilled water)	Time the first symptom emergence (dai=days after inoculation)	
C (40)	2.75	A
B (30)	2.50	Ab
E (60)	1.75	Bc
D (50)	1.50	C
A (0)	1.25	C

The mean located on the same column followed by same letters are non significantly different at the level of 5 % by DNMRT.

The most rapid of the first symptom emergence could be found at treatment without matico leaves water extract (0 ml/l) that was 1.25 days after inoculation (dai), and the slowest was treatment with matico leaves water extract 40 ml/l of distilled water (2.75 dai). Increasing the concentration to 40 ml/l of distilled water could retard the first symptom

emergence of purple blotch disease on onion. Treatment with various concentration of matico leaves water extract gave real different effect on symptomatic leaves percentage of purple blotch on onion. Further's test results are presented on Table 3.

Table 3. The percentage of purple blotch symptomatic leaves on onion by treated by matico leave water extract

Concentration (ml/l distilled water)	The percentage af symptomatic leaves (%)	Effectiveness (%)
A (0)	46.875 a	0
D (50)	36.965 ab	21.14
E (60)	35.415 b	24.45
B (30)	28.075 bc	40.11
C (40)	26.183 c	44.14

The numbers located on the same column followed by the same small letters are non significantly different at the level of 5% by DNMRT.

The highest percentage of purple blotch symptomatic leaves on onion found at treatment without matico leaves water extract (0 ml/l) amount to 46.875%, while the lowest was treatment with 40 ml/l matico leaves water extract amount to 26.183% with 44.14 effectiveness. Increasing the concentration to 40 ml/l could suppress percentage of symptomatic leaves.

Treatment with various concentration of matico leaves water extract showed significant influence on the intensity of purple blotch disease. The result of further test on purple blotch disease intensity can be seen in Table 4.

Table 4. The intensity of blotch disease on onion by treatment with various concentration of matico leaves water extract

Concentration (ml/l distilled water)	Intensity of purple blotch (%)	Effectiveness (%)
A (0)	9.375 a	0
D (50)	7.393 ab	21.14
E (60)	7.085 b	24.43
B (30)	6.365 bc	32.11
C (40)	5.238 c	44.13

The numbers located on the same column followed by same letters are non significantly different at the level of 5% by DNMRT.

The highest intensity of purple blotch disease on onion was obtained in treatment without matico leaves water extract that was 9.375%. while the lowest was treatment with 40 ml/l matico leaves water extract amount to 5.238% with 44.13 effectiveness.

### Discussion

Time the first symptom of purple blotch on onion appeared by treatment with various concentration of matico leaves water extract differed significantly among treatments. In treatment A (0 ml/l) without giving matico leaves water extract, the pathogen infected plant faster compared with other treatments. This is due to the absence of compounds that can suppress the growth of pathogen. Treatment with 50 ml/l of symptom was more quickly than the treatment with 30 ml/l and 40 ml/l. This due to chemical compounds that contained too much in matico leaves water extract. Consequently the onion plant organs were damage and matico leaves water extract was no longer effectively to suppress the growth of pathogen. According to Triharso (16), too much treatment of fungicide on the plant could damage its provision of 40 ml/l of matico leaves water extract. This is due to chemical compounds contained in matico leaves water extract most effective in suppressing the growth of pathogen. Orjala et al. [10] reported that in addition to benzoic acid, matico leaves also contained carboxylic and phenolic acid, those three compound are very active to inhibit and suppress the growth of microbes such as fungi and bacteria.

Treatment with matico leaves water extract were able to reduce percentage and intensity of infected leaves. Treatment without matico leaves water extract (0 ml/l) had the highest percentage and intensity of infected leaves. It is caused by the most rapid of symptom emergence of the treatment, with the result that the pathogen infected the plant more rapidly and continued growing in plant tissue. The lowest percentage and intensity of infected leaves

on the treatment was with 40 ml/l because the symptom emergence was the latest, so that the pathogen infected plant tissue more slowly. The essential oil that contained in matico leaves water extract also can inhibit and suppress the growth of fungal conidia. Heyne [5] stated that matico suggested that chemical compounds found in essential oil can cause biological responses in fungi of which can inhibit and suppress the growth of fungal conidia.

### CONCLUSIONS AND SUGGESTION

On the research that has been done can be concluded that administration of matico leaves water extract with a concentration 40 ml/l of distilled water is the most effective in controlling purple blotch disease on onion. It is recommended to conduct further research on the use of matico leaves water extract to control *A. porri* purple blotch disease on the field.

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