Abstract

Vascular Streak Dieback (VSD) disease of cacao (Theobroma cacao) in North Sumatra is caused by Coccomyces theobromae. VSD nowadays causes damage to cacao seedlings, branches in mature cacao trees throughout North Sumatra and is one of the main constraints of cacao productions in North Sumatra. The first report of this pathogen in North Sumatra was in 1992, with limited. On 2010 it has occurred in 13 larger cacao plantations in North Sumatra. The most characteristic symptom of the disease are green-spotted leaf chlorosis, necrotic blotches, followed by senescence of leaves beginning on the second or third flush behind the shoot apex, and blackening of infected xylem in the vascular tissues at the leaf scars resulted from the abscission of infected leaves. Eventually the shoot apex is killed and infected branches die. In susceptible cacao the fungus may grow through the xylem down into the main stem and kill a mature cacao tree. VSD has been found in cacao plantation of the cacao central productions in North Sumatra with high disease incidence and disease severity.

Keywords: Cacao (Theobroma cacao), North Sumatra, Coccomyces theobromae, Vascular Streak Dieback (VSD)

Introduction

VSD is a major disease of cacao plant in Indonesia. This disease has spread in East Java, West java, Sulawesi and North Sumatra (Guest & Keane, 2007). In North Sumatra, the disease was first reported in the late 1990s, but the attack of the disease was not observed in field. The second time in 2010, was reported that the disease had almost spread to the all cacao plant in North Sumatra. The characteristic symptom of VSD is the existence of brown spots on the vascular streak (Figure 1a) that are seen on the longitudinal cross section, branches and twigs that dieback (Senegon, 2009). Usually the leaf that exists on the second or third flush from the growth point turns yellow with the green spots (Figure 1b). Finally the leaves fall after turning yellow. The following investigation the main cause of leaf is attacked by the disease, we will see three brown spots (Figure 1c). The surface of leaf becomes rough and stop. If the leaf in length visibly halved, we will see the brown lines. Based on the information above and to ensure the VSD disease attack in North Sumatra, then it is done a survey in several centres of cacao plantation, the purpose is to get information related to the distribution and the level of VSD disease attack in North Sumatra.

Methodology

The research was conducted with the method of survey in three regencies that become the centres of cacao plantation in North Sumatra - Deli Serdang Regency (3°31'30"LU, 98°28'186"BT) and Deli Sambrojo (3°30'46"LU, 99°27'04"BT) Kabupaten Langkat, Deli Sawah Sabah (3°31'287"LU, 98°35'585"BT) and Deli Sambrojo (3°23'213"LU, 98°37'609"BT) Kabupaten Deli Serdang, Deli Paseran (3°21'774"LU, 99°37'253"BT) and Deli Sambrojo (3°32'194"LU, 99°35'277"BT) Kabupaten Deli Serdang. The research was conducted from May until November 2012.

Result and discussion

The result of survey toward VSD disease on six locations that become the centres of cacao plantation in North Sumatra is that the six locations have been infected by VSD disease. This fact is known by finding the symptoms of VSD that infect the parts of plant - (Figure 1a, b, and c).

The highest disease incidence (Figure 2) and disease severity (Figure 3) occur on the land of cacao plantation in Deli Paseran Sabah and the lowest disease incidence exist on the land of cacao plantation in Deli Sambrojo. This result because the place is located on the highest position (the data is not shown), compared with other locations of cacao plantation. The higher location, the higher a level of humidity and the lower a temperature. The high humidity and the low temperature are very good for the VSD disease growth, while the high humidity and the low temperature will accelerate the spread of VSD disease. Guest and Keane (2007) stated that basidiospores are spread by wind.

Figure 1. The symptoms of VSD attack on field: a. the brown lines on vascular streak, b. the leaf turns yellow with the green spots, c. three brown spots

Figure 2. The disease incidence (%) on 6 location as the centres of cacao plantation in North Sumatera

Figure 3. Disease severity (%) on 6 locations as the centres of cacao plantation in North Sumatera

Conclusion

Vascular Streak Disease (VSD) has been detected and distribution in 6 locations as the centres of cacao plantation in North Sumatra they are Deli Paseran Sabah and Deli Sambrojo Kabupaten Langkat, Deli Sawah Sabah and Deli Paseran Kabupaten Deli Serdang, Deli Paseran and Deli Serdang Kabupaten Deli Serdang. The highest disease incidence and severity of VSD are found in the location of cacao plantation in Deli Paseran Sabah Kabupaten Deli Serdang: 64.92% and 30.60%, respectively.

Literature Cited


Vascular streak dieback of cacao in North Sumatra

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Abstract

Vascular Streak Dieback (VSD) disease of cacao (Theobroma cacao) in North Sumatra is caused by Oncobasidium theobromae. VSD nowadays causes losses cacao seedlings, kills branches in mature cacao trees throughout North Sumatra and is one of the main constraint cacao productions in North Sumatra. The first report of this pathogen in North Sumatra was on 1992, with limited. On 2010 this disease had occured in all over cacao plantations in North Sumatera. The most characteristic symptoms of the disease are green-spotted leaf chlorosis, necrotic blotches, followed by senescence of leaves beginning on the second or third flush behind the shoot apex, and blackening of infected xylem in the vascular traces at the leaf scars resulting from the abscission of infected leaves. Eventually the shoot apex is killed and infected branches die. In susceptible cacao the fungus may grow through the xylem down into the main stem and kill a mature cacao tree. VSD has been found in 6 cacao plantation of the cacao central productions in North Sumatera with high disease incidence and disease severity.

Keywords: Cacao (Theobroma cacao), North Sumatera, Oncobasidium theobromae, Vascular Streak Dieback (VSD)

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INTRODUCTION

Cacao is the Amazon (America) original plant, (Bartaey, 2005) and grows in many tropical countries. As the source of chocolate, cacao is the plant that has significant economical value in where this plant grows. In Indonesia, cacao is one of the best agricultural commodities that has big role for the national economy, state income. Besides, Cacao also has a role in supporting the argioindustrial development. But in the cultivation of cacao, the attack of pathogen as the cause of disease is the main factor that can limit the increase of cacao production. One of them is Vascular Streak Dieback (VSD) disease, that is caused by Oncobasidium theobromae (Talbot & Keane, 1971 in Semangun, 2000).

VSD is the main disease of cacao plant in Indonesia. This disease has spread to East Java, West Java, Sulawesi and North Sumatera (Guest & Keane, 2007). In North Sumatera, the disease was reported for the first time in the year of 1992, but the attack of the disease was not found in field. For the second time in 2010, was reported that the disease had almost spread to the all cacao plants in North Sumatera. The characteristic symptom of VSD is the existence of brown lines on the vascular streak (Figure 1a) that are seen on the longitudinal cross section, branches and twigs that dieback (Semangun, 2000). Usually the leaf that exists on the second or third flush from the growth point turns yellow with the green spots (Figure 1b). Finally the leaves fall after turning yellow for several days. On the main vein of leaves that are attacked by the disease, we will see three brown spots (Figure 1c). The surface of twig becomes rough and stripe. If the twig is length wisely halved, we will see the brown lines.

Based on the information above and to ensure the VSD disease attack in North Sumatera, then it is done a survey to several centres of cacao plantation, that the purpose is to get information related to the distribution and the level of VSD disease attack in North Sumatera.
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Place and Time of Research

The research was conducted with the method of survey in three regencies that become the centres of cacao plantation in North Sumatera: Desa Tanah Seribu (3°33.347′LU, 98°28.814′BT) and Desa Sambirejo (3°39.686′LU, 98°27.074′BT) Kabupaten Langkat, Desa Sayum Sabah (3°21.280′LU, 98°36.165′BT) and Desa Bekukul (3°23.213′LU, 98°37.869′BT) Kabupaten Deli Serdang, Desa Citaman Jernih (3°31.774′LU, 98°57.724′BT) and Desa Pematang Setrak (3°32.194′LU, 99°05.277′BT) Kabupaten Serdang Berdagai. The research was conducted from May until November 2012.

![Figure 1. The symptoms of VSD attack on field: a. the brown lines on vascular streak, b. the leaf turns yellow with the green spots, c. three brown spots.](image)

Disease Incidence and Disease Severity

The taking of sample to survey disease incidence and disease severity are conducted by following the diagonal scheme. Each sample is looked at in order to know the existence of VSD infected symptom, then disease incidence was counted using Abbott’s formula (Abbott, 1925):

\[
DI = \frac{n}{N} \times 100 \%
\]

Where:

- DI = Disease Incidence (%)
- n = number of trees affected of VCD
- N = total number of trees observed
Meanwhile the disease severity was conducted using the 0-6 scoring (Tabel 1) (Kamil et al. 2006) than is substituted into below formula described by Townsend & Heuberger, 1943:

\[
DS = \frac{\sum (n \times v)}{N \times Z} \times 100\%
\]

\(DS\) = Disease Severity (%)  
\(n\) = number of leaves per category  
\(Z\) = maximum grade  
\(N\) = total number of leaves observed

**Tabel 1. The scales of VSD disease severity**

<table>
<thead>
<tr>
<th>Scale</th>
<th>The main symptoms</th>
<th>The other symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Not infected, healthy</td>
<td>The bark is smooth</td>
</tr>
<tr>
<td>1</td>
<td>The infected leaves start showing the symptoms</td>
<td>The bark is smooth and the lenticel starts swelling</td>
</tr>
<tr>
<td>2</td>
<td>Several or Most of the infected leaves start becoming chlorosis</td>
<td>The lenticel of the bark suffers from a little swelling</td>
</tr>
<tr>
<td>3</td>
<td>Most of the infected leaves suffer from chlorosis and necrotic, it is still sticking</td>
<td>The bark is fairly rough</td>
</tr>
<tr>
<td>4</td>
<td>The infected leaves start falling</td>
<td>The bark is very rough</td>
</tr>
<tr>
<td>5</td>
<td>Most of the infected leaves start falling, the growth seems stopped</td>
<td>The bark is very rough, with the existence of fruiting body</td>
</tr>
<tr>
<td>6</td>
<td>Closed to the defoliation part, the part that is attacked by dieback or infection dies</td>
<td>The bark is very rough with the existence of bud, with the existence of fruiting body</td>
</tr>
</tbody>
</table>
RESULTS AND DISCUSSION

The result of survey toward VSD disease on six locations that become the centres of cacao plantation in North Sumatera is that the six locations have been infected by VSD disease. This fact is known by finding the symptoms of VSD that infect the parts of plant such as the leaves turn yellow, there are brown lines on the vascular streak, and there is the characteristic symptom of VSD disease: there are 3 brown spots on the base of leaf or on the branch of the main vein of leaves.

Figure 2. The disease incidence (%) on six locations as the centres of the cacao plantation in North Sumatera.

Based on the survey of disease incidence on Figure 2, is known that the highest disease incidence exists on the land of cacao plantation in Desa Sayum Sabah, that is 84.62%. It can be meant that 84.62% of the trees on the land are attacked by VSD disease. At the contrary, the lowest disease incidence exist on the land of cacao plantation in Desa Citaman Jernih, that is 46.47%. It can be meant that 46.47% of trees on the land are attacked by VSD disease. The high VSD disease incidence in Desa Sayum Sabah is because the place is located on the highest position (the data is not shown), compared with the other locations of cacao plantation. The higher a location, the higher a level of humidity and the lower a temperature. The high humidity and the low temperature are very good for the VSD disease growth, where the high humidity and the low temperature will accelerate the spread of VSD disease. Guest and Keane (2007) state that basidiospora is spread by wind. Even though the spread of spore is effective, but it is limited in only several
hours in the morning. Basidiospora comes out with the high humidity. The effect is, only a small infection that occurs beyond 80 m distance from the cacao that is attacked by the disease. The spread level of this disease is also limited by the relatively low sporulation level of fungus. Basidiocarps only grows in the autumn leaves falling during the wet season. Basidiocarps that is formed has a short time of life and the spore is only formed at night, and in the afternoon when it rains.

The same thing is also found in the observation of the disease severity (Figure 3). The highest disease severity is found in the area of cacao plantation in desa Sayum Sabah with the VSD disease severity 31.60% and the lowest disease severity is found in the area of cacao plantation in desa Citaman Jernih with the VSD disease severity 8.60%.

Figure 3. The disease severity (%) on 6 locations as the centres of cacao plantation in North Sumatera

Maybe it is because the area of cacao plantation in desa Sayum Sabah, Kabupaten Deli Serdang has the environment that is in accord with the VSD growth. In this area, the cacao that has grown for 10 years, the branches meet and cover one to another. This makes the humidity in this area become high; 79%, as the effect, the VSD growth becomes very fast if it is compared with the other cacao plantations. It is in accord with the statement of Frison et al. (1991) and Purdy (2000) in Rosmana, (2005) that this fungus produces basidiospor inside the basidium that grows on the branch of cacao that is attacked and formed after late at night with the very humid weather. Basidiospora is spread by wind and if this spora comes on the dry surface, basidiospora will lose its viability. On the
mushy leaf and contains the water drops, the basidiospora germinates very fast and sprout tube penetrates the epidermis and then enters the xylem. During 6 until 16 weeks, that depends on the age of cacao, the symptom will appear on the second and the third flushes of the shoot. On the contrary, the cacao plant in desa Citaman Jernih is still young that has probably grown for 3.5 years with spacing 3 x 3 m. In this case the twigs among the cacao trees do not meet one to another. This condition makes the temperature around the garden relatively higher; 28.30°C with the humidity; 68%, as the effect, it can make the environment not in accord with the VSD growth.

The result above proves that the VSD has spread in the centres of cacao plantation in North Sumatera with the serious disease incidence and severity. Therefore, this result becomes the significant information in order to do the exact control to prevent the spread of VSD on the other cacao plantations that exist in North Sumatera.

CONCLUSIONS

1. *Vascular Streak Disease* (VSD) has been detected and distribution in 6 locations as the centres of cacao plantation in North Sumatera, they are Desa Tanah Seribu and Desa Sambirejo Kabupaten Langkat, Desa Sayum Sabah and Desa Bekukul Kabupaten Deli Serdang, Desa Citaman Jernih and Desa Pematang Setrak Kabupaten Serdang Berdagai.

2. The highest disease incidence and severity of VSD are found in the location of cacao plantation in Desa Sayum Sabah Kabupaten Deli Serdang; 84.62% and 30.60%, respectively.
REFERENCES


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