



Level of Damage and Spread of Stewart's Wilt Disease in Corn in Banyumas District

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Abstract. Stewart's wilt disease is caused by *Pantoea stewartii* subsp. *Stewartii* is an important disease of maize. Information about the level of damage and the pattern of spread of the disease is needed to design a management strategy for Stewart's wilt. This study aimed to obtain the level of damage and the pattern of spread of Stewart's wilt disease on maize in the Banyumas area. A survey of Stewart's wilt disease was carried out using multistage purposive random sampling. The observed variables were disease incidence and AUDPC (area under the disease progress curve). Results showed that level of damage of sweet corn caused by *P. stewartii* subsp. *Stewartii* in Wangon, Pekuncen, Rawalo, Patikraja, and Purwojati sub-districts, Banyumas district ranged from 0.15% to 1.67%. This value was classified as very mild. The distribution pattern of Stewart's wilt includes a gradient distribution pattern that collects in one place close to the inoculum source.

Keywords: Survey · spread · Stewart's wilt · corn · Banyumas

1 Introduction

Corn is an important commodity in the world after rice. Corn is cultivated in Northern Europe, Russia, East Asia, the Himalayas, China, South Asia, and the Pacific Island. Maize productivity in developed countries reaches 8 tonnes/ha while in developing countries it is around 3 tonnes/ha [1].

Stewart wilt disease caused by *Pantoea stewartii* subsp. *Stewartii*, soil fertility and high aluminum saturation hinder the increase in corn production [2]. Maize yield loss caused by Stewart's wilt disease is around 40–100% [3]. Stewart's wilt disease in corn was found in Indonesia first time in Bogor in 2014. Identification of the pathogen was based on 16s RNA sequences and the cpsD gene [4]. Stewart's wilt disease was found in several areas in Banyumas Regency recently.

Information about the development and distribution pattern of Stewart's wilt disease is needed to design a management strategy for Stewart's wilt disease. A study of crop damage and patterns of disease spread can be used to predict disease control precisely [5].

Based on the above thoughts, it is necessary to study the extent of damage and the distribution pattern of stewart's wilt disease which can be used for designing a management strategy for controlling stewart's wilt disease in Banyumas Regency.

The study aimed to obtain the extent of damage and the pattern of spread of Stewart's wilt disease in corn in the Banyumas area.

The benefit of the research results is that the pattern of the spread of Stewart's wilt can be used to design a strategy for controlling Stewart's wilt in the Banyumas Regency.

2 Materials and Methods

The research was carried out using a survey. The multistage random sampling method is by taking samples of corn planting from the Banyumas regency area, several sub-districts from 27 sub-districts, and several sub-districts several villages are taken, then from the existing villages, ownership of corn planting land owned by farmers is taken.

The observed variables are:

1. incidence of STEwart's Wilt (DI) [6]

$$DI = \frac{\text{The number of symptomatic plants}}{\text{The number of plants observed}} \times 100\% \quad (1)$$

2. AUDPC

AUDPC is calculated using the formula stated by [7] as follows.

$$AUDC = \sum_{i=1}^n \left(\frac{X_{i+1} + X_i}{2} \right) \times (t_{i+1} - t_i) \quad (2)$$

where

X_i = severity of the disease at the time of observation.

t = time of day after infection appears in the field.

n = number of observations.

3 Results and Discussion

Results showed that the incidence of diseases that caused corn damage by *P. stewartii* subsp. *Stewartii* in the five subdistricts shown in the Fig. 1.

Figure 1 shows that the damage to the maize crop caused by *P. stewartii* subsp. *Stewartii* can be categorized as very mild [8] i.e. from 0.15%–1.67%. It is suspected that climatic conditions did not favor the development of Stewart's wilt disease. In the month of June-August are dry season. No rain fell during the time of study. This condition was not favorable for the development of Stewart's wilt disease.

AUDPC (area under the disease progress curve) in sweet corn crops in five sub-districts is shown in Figs. 2, 3, 4, 5, and 6. Figure 2 shows that the AUDPC value of Wangon is 31.6%-day. This shows that Wangon Subdistrict, the damage to maize plantations due to Stewart's wilt disease is the highest.

In connection with the incidence of the disease and AUDPC, Stewart's wilt in the sweet corn plant showed that there had been an infection of *P. stewartii* subsp. *Stewartii*

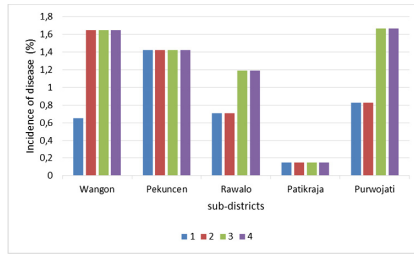


Fig. 1. Incidence of disease in five sub-districts of Banyumas Regency.

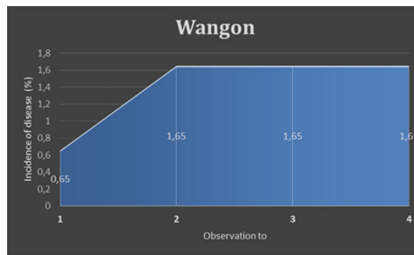


Fig. 2. AUDPC in Wangon District.

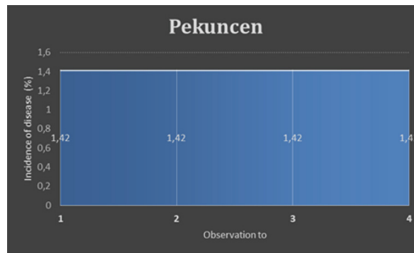


Fig. 3. AUDPC in Pekuncen District.

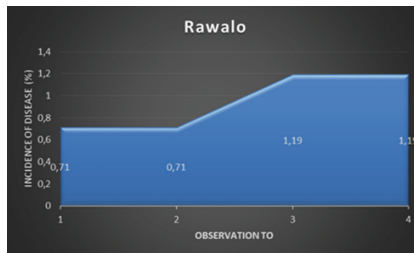


Fig. 4. AUDPC in Rawalo District.

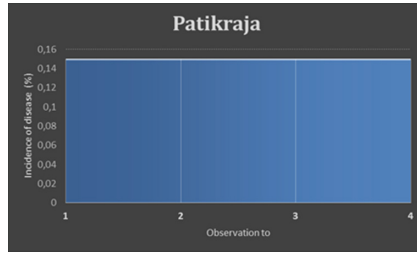


Fig. 5. AUDPC in Patikraja District.

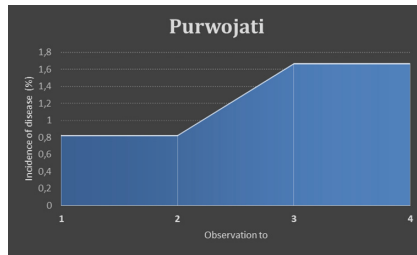


Fig. 6. AUDPC in Purwojati District.

in the field although relatively light, *Chaetocnema pulicaria* vector in the field has not been found. Stewart's wilt disease in five sub-districts in Banyumas Regency has existed in Banyumas.

The existence of *P. stewartii* subsp. *Stewartii* in Indonesia is still relatively new. In 2015, the pathogen was declared as OPTK (*Quarantine Plant Disturbing Organism*) category A1 (quarantine plant pest organisms that do not yet exist in Indonesia) (*Regulation of the Minister of Agriculture of the Republic of Indonesia Number 93 / Permentan / Ot.140 / 12/2011*) and based on the Regulation of the Minister of the Republic of Indonesia Number 51 / Permentan / Kr.010 / 9/2015 designated as OPTK category A2 (quarantine plant pest organisms that already exist in the territory of the Republic of Indonesia) [9].

The distribution pattern of Stewart's wilt disease is included in the gradient distribution pattern. The results showed that the gradient distribution pattern is a distribution pattern that gathers in one place close to the inoculum source [10]. Vectors greatly influence this pattern of spread.

4 Conclusions

Damage to sweet corn due to Stewart's wilt disease caused by *P. stewartii* subsp. *Stewartii* in Wangon, Pekuncen, Rawalo, Patikraja and Purwojati sub-districts, Banyumas district ranged from 0.15% to 1.67% classified as very mild. The distribution pattern of Stewart's wilt disease is a gradient distribution pattern.

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