

Powdery Mildew Disease Identification in Karpoori Variety of Betel Vine Plants using Histogram Based Techniques

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ABSTRACT

The betel vine cultivation is very much affected by diseases and outcome of the farmer is big loss for betel vine cultivation. The aim of this paper is to detection of Powdery mildew disease in the betel vine plants using histogram based digital image processing techniques. The digital images of the uninfected or normal betel vine leaves and the digital images of the infected in powdery mildew diseased betel vine leaves at different stages are collected from different betel vine plants using a high resolution digital camera and collected betel vine images are stored with JPEG format. The digital image analyses of the leaves are done using the image processing toolbox in MATLAB. The RGB color betel vine images were converted into gray scale image. Histogram were plotted and stored as a database for uninfected and powdery mildew disease infected in first day to final day for all the Karpoori variety of betel vine leaves. Finally this investigation helps to recognize the powdery mildew disease can be identified before it spreads to entire crop.

Keywords: *Piperaceae; Piper betel; Powdery Mildew disease; Oidium Piperis*

1 Introduction

The betel vine leaves were popularly known as Vettilai in Tamil and also commonly known as Paan in Hindi. Biological name of betel vine leaves were known as Piper betel. It belongs to the family of Piperaceae. The Vitamins B and C is highly available in the betel vine leaves and they were mainly used in a tonic to the brain, liver and heart for human [95]. The fresh juice of betel vine leaves are used to many ayurvedic preparations. The betel vine plants were cultivated throughout India except the dry northwestern parts. The six betel vine leaves with a little bit of slaked lime are equal to 300 ml of cow milk particularly for the vitamin and mineral nutrition. The group of research work was going on in the field of betel vine disease analysis for various centers within the country under the name "All India Coordinated Research Project on Betel vine". 70 varieties of betel vine leaves are Cultivated in the world. Among these 70 varieties, 40 varieties of betel vine leaves are Cultivated in India. 30 varieties of betel vine leaves are Cultivated in West Bengal. Tamil Nadu, Uttar Pradesh, Bihar, Maharashtra, Karnataka, West Bengal, Andhra Pradesh and Kerala states are widely cultivated in the betel vine. In Tamilnadu, based on the color, size and taste, there are many varieties of betel vine leaves available and some of the most popular varieties are vellaikodi, Karpoori, pachaikodi and Sirugamani. Karpoori variety of betel vine leaves was considered in this research work paper. During the cultivation of betel vine, diseases were one of the most important causes that reduce quantity of the betel vine leaves. The most important betel vine plants diseases were powdery mildew disease, leaf rot disease, foot rot disease and leaf spot disease.

Powdery mildew disease is caused by *Oidium piperis*. The disease appears on the undersurface of the leaves as white to brown powdery patches. These patches gradually increase in size and often coalesce with each other. They vary in size from a few to 40mm in diameter and are covered by dusty growth which is fairly thick in cases of severe attack [95][96]. Areas on the upper surface corresponding to patches on the under surface appear yellowish, raised and irregular in outline. Young leaves when infected fail to grow and become deformed the surface being cracked and the margin turned inwards. The disease has been reported to be in the leaves only and it has been found to



Figure 1. Powdery mildew disease affected betel vine leaves

disappear during the hot season. Figure 1 shows the images of front and back view of powdery mildew infected betel vine leaves. In this research paper Powdery mildew disease were considered for Karpoori variety of betel vine plants.

2 Materials and Methods

For the Histogram based analysis, the front and back view normal or healthy betel vine leaves and powdery mildew disease infected in early stage to final stage betel vine leaves were individually collected at different plants using a high-resolution digital camera for all Karpoori betel vine plants from erode, karur and trichy district of Tamil nadu, India. The collected betel vine leaves back grounds were eliminated using photo shop and these digital images were stored in the system [103]. These stored betel vine images were resized. Digital imaging techniques were divided into two phases. Normal or uninfected betel vine leaves phase and Powdery mildew disease infected in early stage to final stage of betel vine leaves phase. The uninfected betel vine leaves phase consists of without any disease infected in the betel vine leaves. The same variety of front and back view betel vine leaves were collected at different betel vine plants and place. The RGB color betel vine images were converted into gray scale image. Histogram were plotted and stored as a database for all Karpoori variety of betel vine leaves.

Infected betel vine leaves phase consists of Powdery mildew disease infected in early stage to final stage of betel vine leaves. The same varieties of betel vine sample leaves were selected from uninfected betel vine plant, which is nearest to the betel vine plant infected by Powdery mildew disease. The serial numbers were given to all selected betel vine sample leaves. The front and back view betel vine sample leaves was collected serial number wise at different plants and place. The RGB color betel vine images were converted into gray scale image. Histogram was plotted for all Karpoori variety of betel vine leaves and plotted histogram were compared with the stored data base values. If the calculated Histogram plot and stored Histogram plot were same range for all gray scale values, the selected betel vine leaves were included in samples otherwise samples were removed to the selected list.

The accepted same variety of betel vine sample leaves were collected serial number wise for next two three days. The RGB color betel vine images were converted into gray scale image. Histogram was plotted for all Karpoori variety of betel vine leaves and plotted histogram were compared with the stored data base values. If any difference were identified between calculated and stored database values on any particular day for the particular betel vine leaf, that particular day were counted as Powdery mildew disease infected in first day for the particular betel vine sample leaf. These Powdery mildew disease infected betel vine leaves were collected serial number wise for infected in first day to final day. The RGB color betel vine images were converted into gray scale image. Histogram was plotted for all Karpoori variety of betel vine leaves and plotted histogram were stored data base values.

3 Result

The histogram for front and back view normal betel vine leaves was shown in figure 2. The histogram for front and back view powdery mildew disease infected in first day betel vine leaves were shown in figure 3. The histogram for front and back view powdery mildew disease infected in second day betel vine leaves were shown in figure 4. The histogram for front and back view powdery mildew disease infected in third day betel vine leaves were shown in figure 5. The histogram for front and back view powdery mildew disease infected in fourth day betel vine leaves were shown in figure 6. The histogram for front and back view powdery mildew disease infected in fifth day betel vine leaves were shown in figure 7.

The gray scale value of the histogram for front view of uninfected betel vine leaf was between 100 and 250. However the initial gray scale value was near to 100. Final gray scale value was near to 200. Maximum frequency of occurrence of the gray scale value was between 150 and 200. The gray scale value of the histogram for back view of uninfected betel vine leaf was between 150 and 250. However the initial gray scale value was near to 150. Final gray scale value was near to 250. The maximum frequency of occurrence of the gray scale value was near to 200. The gray scale value of the histogram for front view of betel vine leaf with powdery mildew disease at first day of infection was between 50 and 200. However the initial gray scale value was near to 100 and final gray scale value was near to 150.

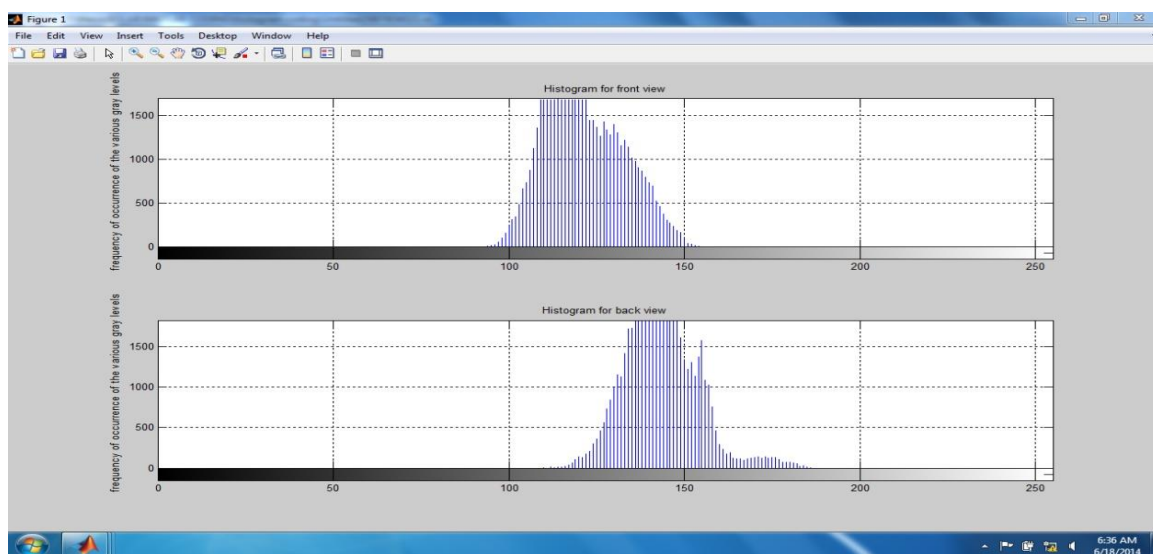


Figure 2. Histogram for front and back view normal betel vine leaves

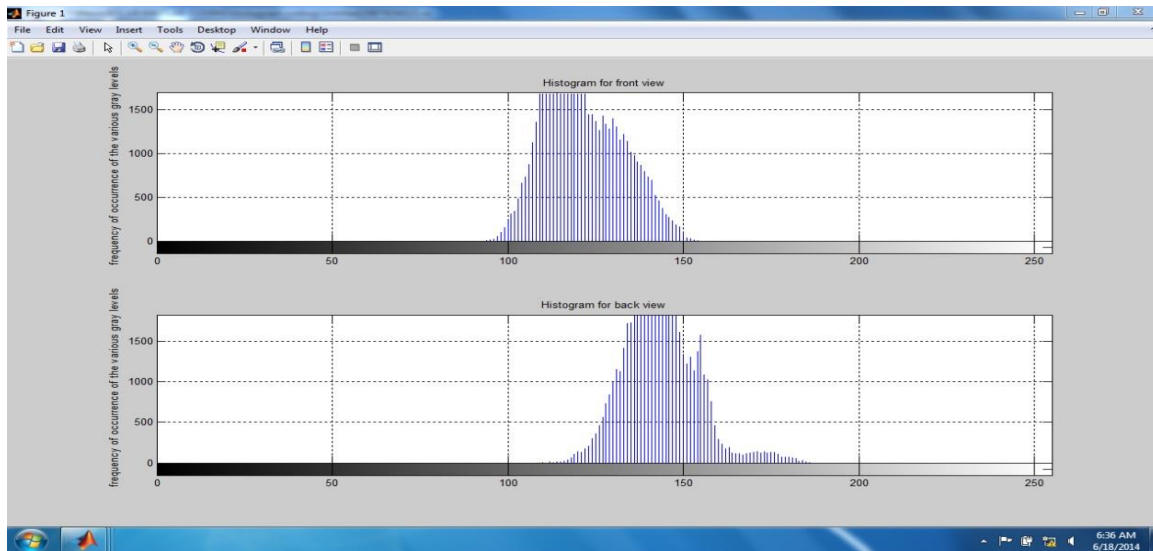


Figure 3. Histogram for front and back view powdery mildew disease infected in first day betel vine leaves

Maximum frequency of occurrence of the gray scale value was between 100 and 150. The gray scale value of the histogram for back view of betel vine leaf with powdery mildew disease at first day of infection was between 100 and 200. However the initial gray scale value was near to 100 and final gray scale value was near to 150. Maximum frequency of occurrence of the gray scale value was near to 150. The gray scale value of the histogram for front view of betel vine leaf with powdery mildew disease at second day of infection was between 0 and 150. However the initial gray scale value was near to 50 and final gray scale value was near to 150. Maximum frequency of occurrence of the gray scale value was near to 100. The gray scale value of the histogram for

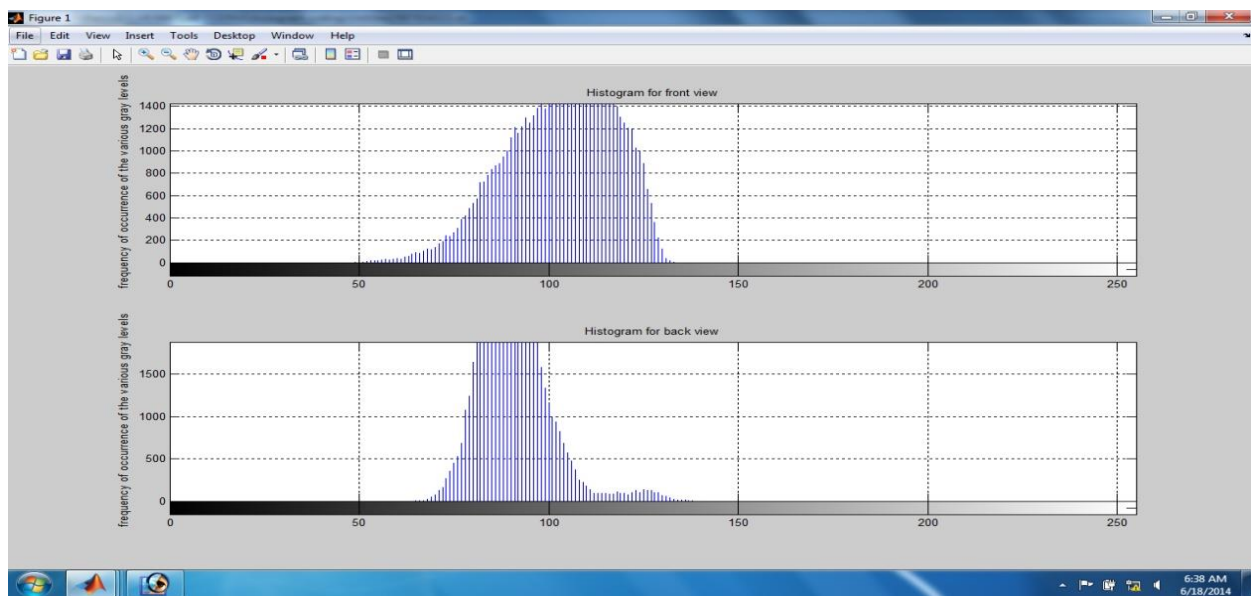


Figure 4. Histogram for front and back view powdery mildew disease infected in second day betel vine leaves

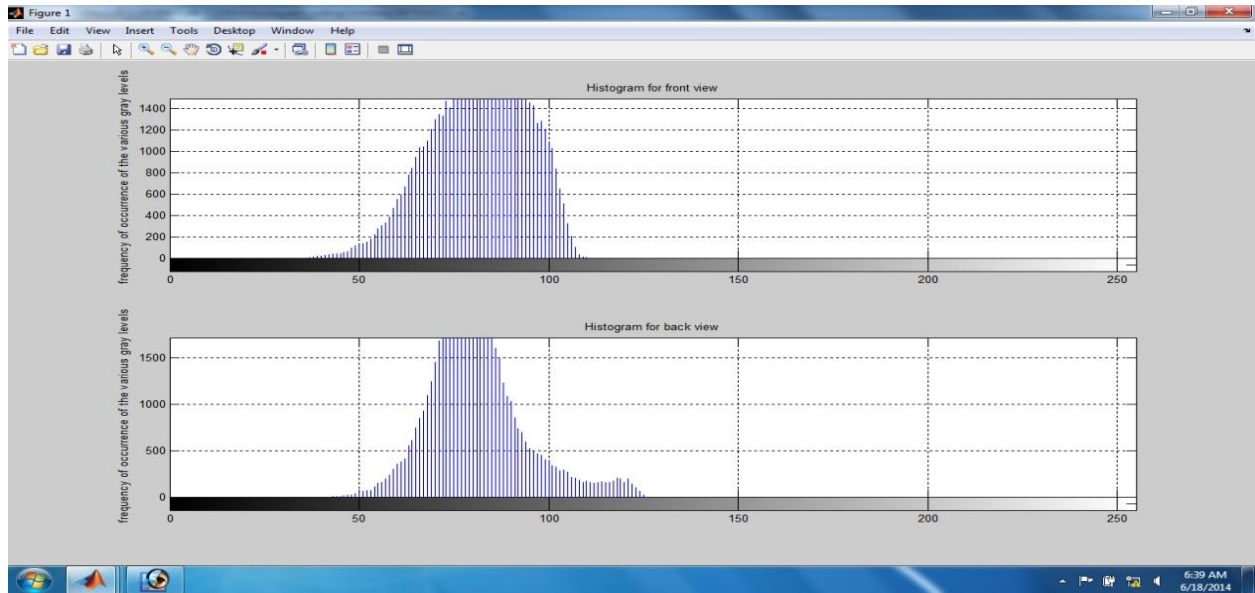


Figure 5. Histogram for front and back view powdery mildew disease infected in third day betel vine leaves

back view of betel vine leaf with powdery mildew disease at second day of infection was between 50 and 150. However the initial gray scale value was near to 50 and final gray scale value was near to 150. Maximum frequency of occurrence of the gray scale value was near to 100. The gray scale value of the histogram for front view of betel vine leaf with powdery mildew disease at third day of infection was between 0 and 150. However the initial gray scale value was near to 50 and final gray scale value was near to 100. Maximum frequency of occurrence of the gray scale value was between 50 and 100. The gray scale value of the histogram for back view of betel vine leaf with powdery mildew disease at third day of infection was between 50 and 150. However the initial gray scale value was near to 50 and final gray scale value was between 100 and 150.

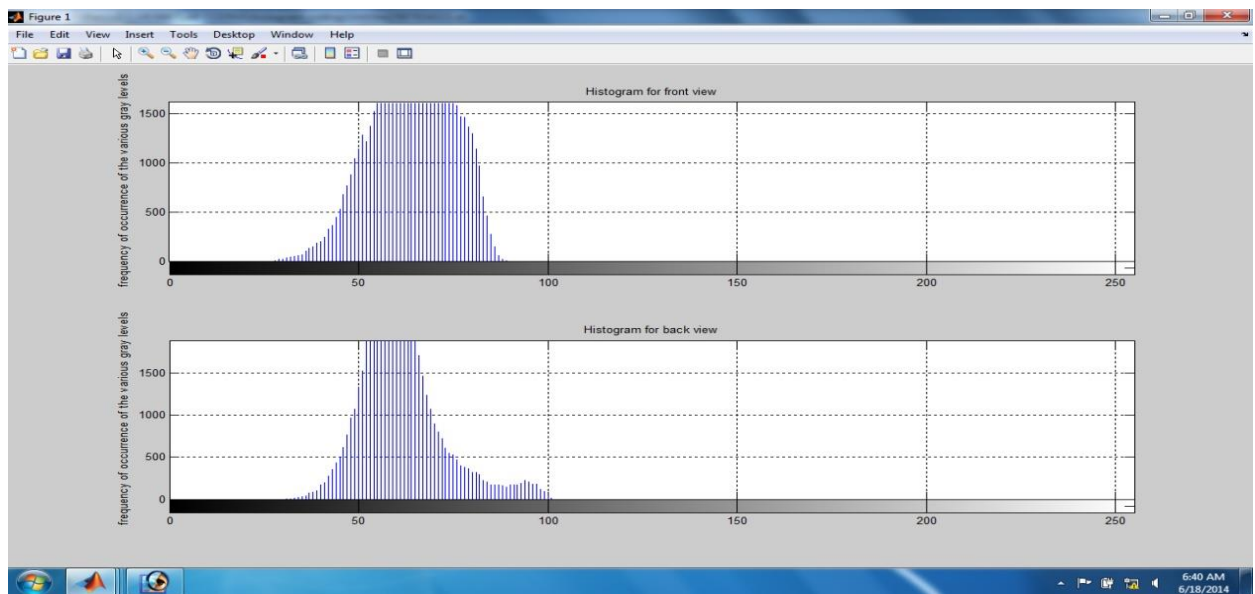


Figure 6. Histogram for front and back view foot rot disease infected in fourth day betel vine leaves

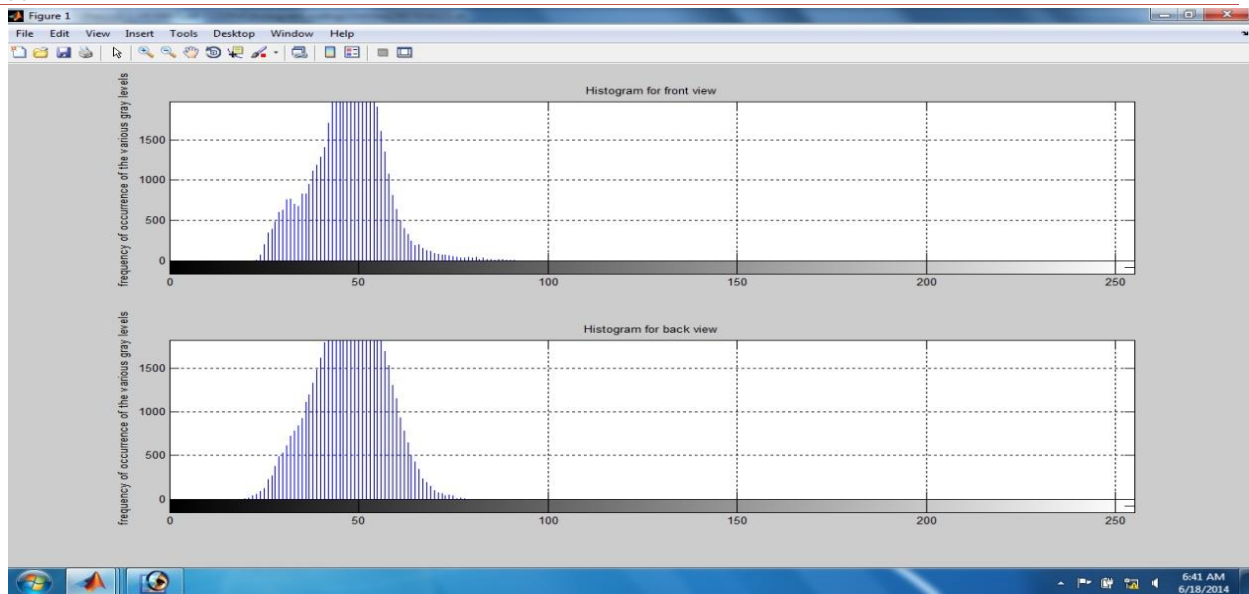


Figure 7. Histogram for front and back view powdery mildew disease infected in fifth day betel vine leaves

Maximum frequency of occurrence of the gray scale value was between 50 and 100. The gray scale value of the histogram for front view of betel vine leaf with powdery mildew disease at fourth day of infection was between 50 and 100. However the initial gray scale value was between 0 and 50 and final gray scale value was near to 100. Maximum frequency of occurrence of the gray scale value was between 50 and 100. The gray scale value of the histogram for back view of betel vine leaf with powdery mildew disease at fourth day of infection was between 50 and 100. However the initial gray scale value was between 0 and 50 and final gray scale value was 100. Maximum frequency of occurrence of the gray scale value was near to 50. The gray scale value of the histogram for front view of betel vine leaf with powdery mildew disease at fifth day of infection was between 0 and 100. However the initial gray scale value was between 0 and 50 and final gray scale value was near to 100. Maximum frequency of occurrence of the gray scale value was near to 50. The gray scale value of the histogram for back view of betel vine leaf with powdery mildew disease at fifth day of infection was between 0 and 100. However the initial gray scale value was between 0 and 50 and final gray scale value was near to 100. Maximum frequency of occurrence of the gray scale value was near to 50.

4 Conclusion

The above research techniques express that the karpoori variety of betel vine plants *Oidium piperis* fungus can be recognized in starting stage of betel vine plantation and saved before the *Oidium piperis* fungus starts to reach complete karpoori variety of betel vine crop. The method of detecting the *Oidium piperis* fungus cost is effective. This technique can also be extended to detect fungus or diseases of all kind plants to recognize starting stage preventive action.

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