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Early Detection of Powdery Mildew Disease for Betelvine Plants Using Digital Image Analysis

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Abstract: The fresh leaves of betelvine are generally known as paan in India. Betelvine plants are infected variety of diseases in the entire plantation without any early indications of the diseases. The aim of this paper is to recognize powdery mildew disease in the betelvine plants using digital image analysis techniques. The digital images of the betelvine leaves at various stages of the powdery mildew disease are collected from different plants using a high resolution digital camera and it is stored with JPEG format. The digital image analyses of the leaves are done using the image processing toolbox in MATLAB which provides the standard patterns of the digital images. Using RGB encoding technique the red, green and blue components of the preprocessed image were separated, which forms the pattern to be compared. These patterns and images of various healthy betelvine leaves at different stages in various days are collected and stored in the system. The standard deviation for all sample leaves is computed and calculated values are stored in the system. The standard deviation of test leaves are computed and compared with the stored values. As the result of this comparison, it is identified whether test leaves are affected by powdery mildew disease or not. Finally this analysis helps to recognize the powdery mildew disease can be identified before it spreads to entire crop.

Keywords: Keywords: Betelvine, Powdery mildew Disease and Oidium piperis

I. Introduction

Piper Betel L generally known as Vettrilai in Tamil. The Piper betle is a glabrous climbing vine belonging to the family *Piperaceae* The betelvine leaf is used in a number of traditional medicines for the treatment of stomach complaints, infections and as a general refresher. Some evidence suggests that betelvine leaves have immune boosting properties as well as anti-cancer properties. Lots of research is going on in the field of betelvine diseases analysis for various centers within the country under the name "ALL INDIA NETWORKING PROJECT IN BETELVINE".During cultivation betelvine is very much affected by diseases and insects that outcome in big loss for the farmers. The most important diseases of betelvine leaf are Powdery mildew, Foot Rot, Leaf Rot and Leaf Spot. It occurs in a very virulent form and if not controlled, causes widespread injure and even total demolition of the entire of betelvine plantations. The farmer is not able to identify the disease at an early stage to initiate preventive action due to the non-availability of modern technology. So for each farmer, to have access to the modern technology there is a need to construct modern commercial farm. This has been the base to develop a new tool to identify the disease well in advance to enhance the cultivation. Digital Image processing is used as a tool for early identification of the Powdery mildew disease.

II. Computerized Betelvine Plant Powery Mildew Disease Identification

Basically when a farmer visualizes the disease, seen as a change in the form of color or appearance the disease is in the matured stage after which diagnosis cannot save the plant. The disease spreads to the entire crop and the entire plantation gets destructed within few days. Powdery mildew disease emerges on the undersurface of the leaves as white to brown powdery patches. Human eye cannot predict the disease at an early stage. So we are using computerized image analyzing system in which minute change in the form of color in leaves can be detected at an early stage.

III. POWDERY MILDEW DISEASE

Powdery mildew is sourced by Oidium piperis. The disease shows on the undersurface of the leaves as white to brown powdery patches. The photograph is shown in figure 1 and figure 2 for front and back view of Powdery mildew infected betelvine leaf. These infected areas gradually increase in size and repeatedly combine 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 sever attack. Areas on the upper surface corresponding to patches on the under surface appear yellowish, raised and irregular in outline. Young leaves when attacked fail to grow and become deformed, the surface being cracked and the margin turned inwards.

Figure1:Front view

Figure 2: Back view

Such leaves present a pale appearance and drop with slight disturbance. The disease is more prevalent in old plantations. The disease has been reported to be in the leaves only and it has been found to disappear during the hot season.

IV. METHODS FOR DISEASE IDENTIFICATION

The betelvine leaves are properly washed to remove the dust components. Digital imaging technique is divided in three phases respectively as,

Normal or uninfected leaves phase,

Fully Infected leaves phase

Test leaves phase

Normal or uninfected leaves phase consists of without any disease infected in the betelvine leaf. Fully Infected leaves phase consisted of visually identifiable infected leaf, samples are collected for normal leaves and various stages of Powdery mildew disease. Test leaves phase consists of visually unidentifiable infected leaf, samples are collected at various stages of the Powdery mildew disease. Fifteen samples from each phase were taken for this paper. The size of all the digital images are 256 x 256.To eliminate the background using photo shop 7.0 and background was chosen to be white and these digital images are stored in the system. This stored digital images are given as input to the MATLAB file and the R,G,B colour components are seperated and find the mean values for all healthy and infected leaves and calculated values are stored in the system. For the test leaf, compute standard deviation and compare all the stored values, to recognize the diseased betelvine leaf affected by powdery mildew disease.

V. RESULT

The result of the paper is all the normal and infected leaves are given as input to the MAT LAB and RGB color components are separated. The standard deviation are calculated for front and back view of each component and calculated standard deviation values are stored in the system and test leaves are given as input to the MAT LAB and RGB color components are separated and the standard deviation values are calculated for front and back view of each component and calculated standard deviation values are stored in the system. To compare all the stored results and identify either disease infected or not in the test betelvine leaf, the standard deviation values of Red component for normal leaves, infected leaves and test leaves front and back views are shown in figure 3 and figure 4 . The standard deviation values of green component for normal leaves, infected leaves and test leaves front and back views are shown in figure5 and figure 6 . The standard deviation values of Blue component for normal leaves, infected leaves and test leaves front and back views are shown in figure 7 and figure 8.

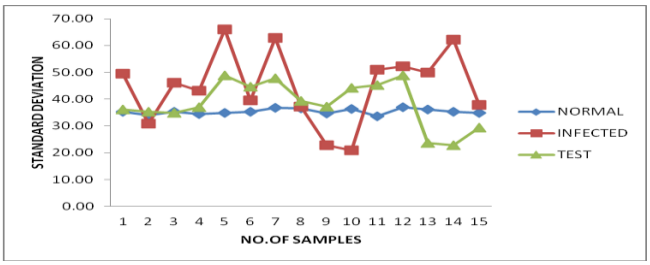

Figure 3: Front View for Red Component

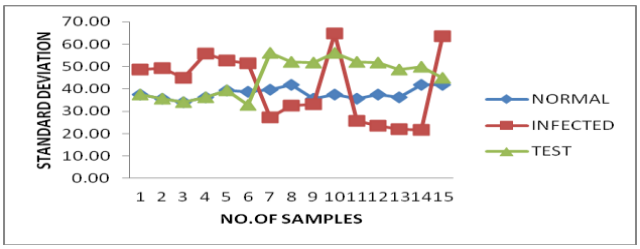

Figure 4: Back View for Red Component

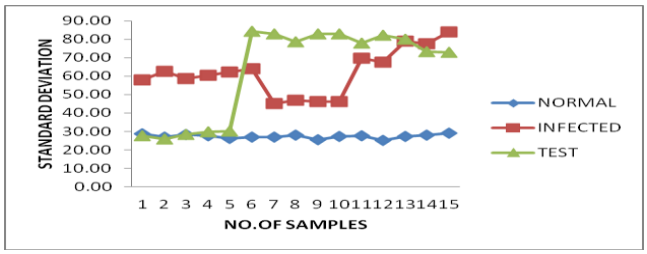

Figure 5: Front View for Green Component

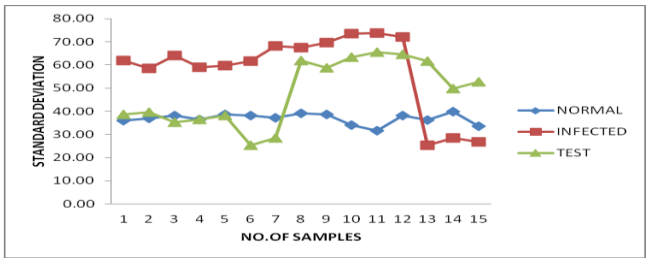

Figure 6: Back View for Green Component

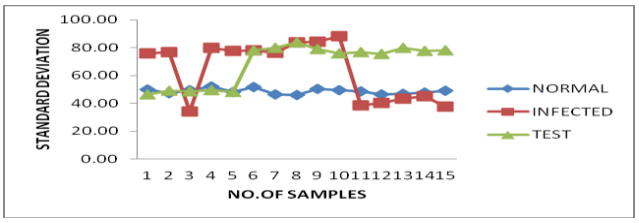

Figure 7: Front View for Blue Component

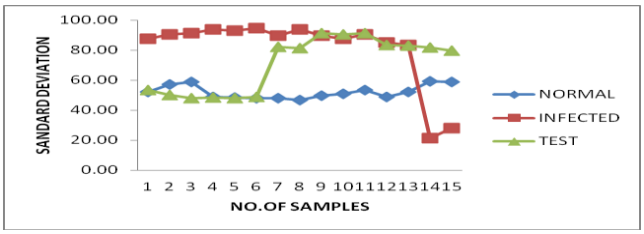

Figure 8: Back View for Blue Component

In normal leaves, front view of Red component standard deviation value ranges from 33.53 to 36.89 and back view of Red component standard deviation value ranges from 34.07 to 41.89. In infected leaves, front view of Red component standard deviation value ranges from 20.97 to 65.96 and back view of Red component standard deviation value ranges from 21.61 to 64.84.In test leaves, first five samples of front view Red component standard deviation value ranges from33.53 to 36.89 and back view of Red component standard deviation value ranges from 34.07 to 41.89 and last ten samples of front view Red component standard deviation value ranges from 20.97 to 65.96 and

back view of Red component standard deviation value ranges from 21.61 to 64.84.In normal leaves, front view of green component standard deviation value ranges from 25.21 to 29.14 and back view of green component standard deviation value ranges from 31.66 to 39.78.In infected leaves, front view of green component standard deviation value ranges from 45.24 to 84.09 and back view of green component standard deviation value ranges 25.30 to 73.72.In test leaves, first five samples of front view green component standard deviation value ranges from 25.21 to 29.14 and back view of green component standard deviation value ranges from 31.66 to 39.78 and last ten samples of front view green component standard deviation value ranges from 45.24 to 84.09 and back view of green component standard deviation value ranges from 25.30 to 73.72.In normal leaves, front view of blue component standard deviation value ranges from 46.02 to 52.31 and back view of blue component standard deviation value ranges from 46.78 to 59.27. In infected leaves, front view of blue component standard deviation value ranges from 34.25 to 88.34 and back view of blue component standard deviation value ranges from 21.06 to 94.66. In test leaves, first five samples of front view blue component standard deviation value ranges from 46.02 to 52.31 and back view of blue component standard deviation value ranges from 46.78 to 59.27 and last ten samples of front view blue component standard deviation value ranges from 34.25 to 88.34 and back view of blue component standard deviation value ranges from 21.06 to 94.66.

To compare all the fifteen test sample leaves of standard deviation values from stored standard deviation values of normal and infected leaves. The result is first five test sample leaves are uninfected or normal leaves and the remaining ten test sample leaves are infected leaves.

VI. CONCLUSION

The above proposed methods convey that the betelvine plants disease can be identified disease infected or not in the betelvine leaf and thus preventive action can be taken well in advance such that the entire plantation can be saved before the disease starts to spread. The method of detecting the disease is cost effective and non-destructive as it only requires the digital photograph of the leaf samples in random. The efficiency of the system can be increased by taking the camera parameters, as the camera parameters are considered constant in this project. Periodic inspection of the farm is required to prevent the disease. This method can also be extended to detect diseases of all kind to initiate early preventive action.

References

[1] Sathyabrata Maiti and K.S. Shivashankara ”Betelvine Research Highlights”. (1998).
[2] Dastur.J.F. “Diseases of pan (piper betle) in the general provinces”.(1935)
[3] B. Dasgupta, B.Mohanty, P. K. Dutta and Satyabrata Maiti “*Phytophthora* Diseases of Betelvine (*piper betle* l.)” SAARC Jn. of Agri.,(2008), pp (1-19).
[4] Nikhil Kumar “Betelvine (piper betle l.) Cultivation: A Unique Case Of Planstablishment Under nthroprgenically Regulated Microclimatic Conditions” Indian Journal of History Of Science (1999), pp(19-32).
[5] Bibekananda Mohanty, Partha Datta, B. Dasgupta and Dalim Kumar Sengupta ntegrated Management Of Foot And Leaf Rot Of Betelvine” SAARC Jn. of Agri.,(2011), pp (83-91).
[6] Shete M. H., Dake G. N., Gaikwad A. P. and Pawar N. B. “Chemical Management of Powdery Mildew of Mustard” Journal of Plant Disease Sciences, Volume:3, Issue: 1 (2008),pp(46-48).
[7] P.Guha “Betel Leaf: The Neglected Green Gold of India” Journal of Human Ecology (2006), pp (87-93).
[8] J.Vijayakumar and Dr.S.Arumugam “Study of Betelvine Plants Diseases and Methods of Disease Identification using Digital Image Processing” European Journal of Scientific Research Vol.70 No.2 (2012), pp(240-244).
[9] J.Vijayakumar and Dr.S.Arumugam “Foot Rot Disease Identification for the Betelvine Plants using Digital Image Processing” Journal of Computing,Volume 3,Issue 2,February 2011,pp (180-183).
[10] B. Seetha Lakshmi and K. C. Naidu “Comparative Morphoanatomy of *Piper betle* L. cultivars in India” Annals of Biological Research, 2010, pp(128-134).
[11] Annual Report of All India Coordinated Research Project on Betelvine ICAR (Indian Council of Agricultural Research,New Delhi) India (1997).

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