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Image Processing Based Leaf Rot Disease, Detection of Betel Vine (*Piper Betle*L.)

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Abstract

This paper deals with leaf rot disease detection for betel vine (*Piper betel* L.) based on image processing algorithm. The measurement of plant features is a fundamental element of plant science research and related applications. The information related to plant features is especially useful for its applications in plant growth modeling, agricultural research and on farm production. Few methods have been applied in leaf rot disease detection for betel vine leaf (*Piper Betel* L.). Traditional direct measurement methods are generally simple and reliable, but they are time consuming, laborious and cumbersome. In contrast, the proposed vision-based methods are efficient in detecting and observing the exterior disease features. In the present investigation, image processing algorithms are developed to detect leaf rot disease by identifying the color featureof the rotted leaf area.Subsequently, the rotted area was segmented and area of rotted leaf portion was deduced from the observed plant feature data. The results showed a promising performance of this automatic vision-based system in practice with easy validation. This paper describes the steps to achieve an efficient and inexpensive system acceptable to the farmers and agricultural researchers as well for studying leaf rot disease in betel vine leaf.

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Keywords: *Segmentation, Betel vine, Digital image processing, HVS, Thresholding.*

1. Introduction

The betel vine (Piper Betel L.) has a life span of about 2-3 years[1]. During their short life span they are

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offensubjected to various fungal and bacterial diseases. Such as leaf rot, leaf spot and powdery mildew. Both the quality and quantity of agriculture product degrade due to the presence of various diseases found in betel vine plants. Moreover, the disease adversely affects the mechanism such respiration, photosynthesis essential for the growth of the betel vine plant.

This highly sustainable crop is capable of generating high revenue and is of greater importance for national economy[2]. The betel vine garden is subjected to high yield loss when it is attacked by Leaf rot[3]. A 30-100% leaf yield loss was reported due to leaf rot disease in betel vine[4]. Leaf rot disease caused by pathogens, *Phytophthoraparasitica*results in major constraints for cultivation of the crop[5]. Relative humidity increases the chance of the leaf rot disease[6].

Thus, a sincere attempt is required to overcome the adverse effects of leaf rot on betel vine cultivation.The conventional method applied to overcome the leaf disease problem is basically a human vision based approach. Usually the farmer itself or a skilled person or an expert is hired to explore the disease symptoms or to find some visual cues in order to identify the disease type and severity[7]. The grid counting method can be used to improve the accuracy, but this method has a cumbersome operation process and time consuming[8].

In these cases seeking the expert advice is very expensive and time consuming. Hence, electronic expert systems are needed. Electronic expert systems enable farmers in identifying types of diseases; making the right decision and selecting the proper treatment. The expert systems are intelligent computer programs that are capable of offering solutions or advices related to specific problems in a given domain, both in a way and at a level comparable to that of human experts in a field. One of the advantages of using Electronic expert systems is its ability to reduce the information that human users need to process, reduce personnel costs and increase throughput. Another advantage of expert system is that it performs tasks more consistently than human experts[5].

The human vision approach suffers many drawbacks. The prime drawback is that the process is time consuming and highly labor intensive. Other than this the accuracy and precision of human vision approach is dependent on the eyesight of the person or expert hired.

Therefore, to overcome the drawbacks of conventional method there is a need for a cognitive machine vision approach. Very few recent developments were recorded in the field of leaf disease detection using machine vision approach and that too for betel vine leaf is the rarest.

Digital image analysis technology focuses on color feature of objects and can be used to recognize the edge of pests in order to identify the pests and to obtain the number of pests in pest infestation detection. The major advantage of the machine vision approach is that it is quick, perfect, and very precise as compared to human vision approach. Fast and accurate method based on the image processing algorithm is proposed in this study.

2. Materials and Methods

2.1. Study site

Fig.1. (a) Farmer showing the effect of leaf rot in the betel vine garden (b) Field acquired image of the rotten Betel leaf sample.