

# A Review on Image Processing in Plant Disease Detection

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**Abstract** - The most prominent way of combating diseases affecting the crops are by naked eye observation. This method is extremely time consuming and it requires someone to keep observing the crops on almost daily basis. With scarcity of labor, this is proving to be a tremendous task. Hence there is a real need of using technology to identify diseases at the earliest and with low cost. Hence in this paper, we have reviewed a few methodologies where image processing is used to detect disease in the plants based on the discoloration of leaves.

**Key Words:** Image Processing, Neural Networks, Pattern Matching, segmentation, enhancement....

## 1.INTRODUCTION

The agriculture sector is the main contributor to the Indian economy. According to APEDA in 2014 export of Indian agriculture was 5% of total production of the world and rank 10th in the ranking [1].

Having a satisfactory produce per unit of land i.e producing enough crop as per the demand in a country where the population is ever expanding along with an unpredictable rainfall is a real challenge to the farmers. India has been gifted with a wide range of physio-geographical conditions and climate. This environment is suitable for wide variety of horticulture crops like vegetable, fruits, flowers, nuts and plantation crops.

Also there is a need of rapid growth in agriculture sector not only for self-reliance, but also to bring about equitable distribution of income and wealth in rural areas as well as to reduce poverty and improve the quality of life of the farmers.

Out of the many problems faced by the farmers the most destructive one is pest infestation in plants. Many a times the plant tends to give indications such as discoloration of leaves, appearance of spots/blotches on the leaves, changes in the stem and so on. This happens because of 2 reasons

1. Pest infestation
2. Lack of nutrients in the soil

Both the above problems can be dealt with appropriate precautionary measures. If the problem is identified as lack of nutrition in then soil then it can be corrected by using respective fertilizers. If the problem is identified as pest infection it can be combated by using appropriate pesticide. But identifying which of the 2 mentioned reason is actual cause of problem is very important and usually is a cumbersome task.

For identifying the reason behind the changes in the plants appearance, It requires the farmer to take the sample i.e the leaf or soil or stem etc to the laboratory and wait for the results. This is expensive in terms of both cost and time.

This gives scope for tremendous technological improvement in this sector. There is scope for devising applications that could help the farmer in producing both quality and quantitative produce.

Image processing can be used in agricultural applications for following purposes:

1. To detect diseased leaf, stem, fruit
2. To quantify affected area by disease.
3. To find shape of affected area.
4. To determine color of affected area
5. To determine size & shape of fruits.

Hence there is a need of developing soft computing techniques which can be used to develop an expert system. This Expert system can be used to identify diseases in plants across different species. This system will be helpful for farmers to find the solutions to their farming problems. Also an mobile application could be developed to help farmers identify the problems in real time and with minimal effort.

## 1.1 Literature Survey

Disease is caused by pathogen which is any agent causing disease. In most of the cases pests or diseases are seen on the leaves or stems of the plant. Therefore identification of plants, leaves, stems and finding out the pest or diseases, percentage of the pest or disease incidence, symptoms of the pest or disease attack, plays a key role in successful cultivation of crops. Pests leave distinctive outward effects on plants like rolling the leaves or destroying the whole plant. The sucking pest reduces the moisture content of the leaves. All these effects change the chlorophyll content of a plant with corresponding variation in its spectral image. Ahsan and Umer studied the possibilities for detecting these effects by using various remote sensing techniques for acquisition of spectral image by satellite imagery, airborne images from chartered or model planes [2].

Paper [3] implements a leaf recognition algorithm using easy-to-extract features and high efficient recognition algorithm. A Probabilistic Neural Network (PNN) approach for plant leaf recognition is used. The features are extracted and processed by PCA to form input to PNN. It was found that algorithm works with an accuracy of 90% on 32 kinds of plants

A novel approach is proposed [4] for integrating image analysis technique into diagnostic expert system. A CLASE (Central Lab. of Agricultural Expert System) diagnostic model is used to manage cucumber crop. The expert system finds out the diseases of user observation. In order to diagnose a disorder from a leaf image, four image processing phases are used: enhancement, segmentation, feature extraction and classification. They tested three different disorders such as Leaf miner, Powdery and Downey. The proposed approach has greatly reduced error prone dialogue between system and user.

## 1.2 Scope For Research

The technical aspects proposed that are under the scope of this research work are as follows:

Image of the leaves of the infected plant is captured using a digital camera in natural light. Digital cameras or scanners in combination with computers and appropriate software can be used to photograph, scan, and evaluate leaves for colour with relative ease and at an affordable cost.

A database is created and maintained where various images taken over a period of time is stored. Also the image in consideration is read in MATLAB. There is always scope of occurrence of noise in the image. Hence different kind of

noise reduction technique is applied till the quality of image is up to the mark i.e. it can be used in further steps.

Next the image is partitioned into different segments. Then extraction of prominent features such as discoloured area or spots etc is done. In this step a large set of data is recovered. The recovered set of data is matched against a database where symptoms and the reasons for their occurrence is stored.

Once a match is found the reason is displayed to the farmer.

## 2. CONCLUSIONS

Disease management is a challenging task. Mostly diseases are seen on the leaves or stems of the plant. Precise quantification of these visually observed diseases, pests, traits has not been studied yet because of the complexity of visual patterns. Hence there has been increasing demand for more specific and sophisticated image pattern understanding. The scope in doing research in this field is as follow: 1. There are two main characteristics of plant disease detection using machine-learning methods that must be achieved, they are: speed and accuracy. Hence there is a scope for working on development of innovative, efficient & fast interpreting algorithms which will help farmers in detecting disease. 2. Various Algorithms can be developed for Automation of estimating the severity of detected diseases.

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