International Journal of Advance Engineering and Research Development (IJAERD)
Special Issue, Volume 1,Issue 4, April 2014, e-ISSN: 2348 - 4470 , print-ISSN:2348-6406

# Detection Of Cotton Leaf Curl Disease

Kesha Viveki[1], Paras Rudani[2], Vatsal Shah[3]

[1]*IT Department, Birla Vishvakarma mahavidyalaya, vivekikesha93@gmail.com*
[2] *IT Department, Birla Vishvakarma mahavidyalaya,parasrudani24@gmail.com*
[3]*Assistant Professor, Birla Vishvakarma mahavidyalaya, vatsal.shah@bvmengineering.ac.in*

**Abstract:-**Cotton leaf curl disease is the most devastating natural calamity that reduces the quality and production of the cotton. This disease is caused by certain biotic and abiotic factors affecting the environment. It is basically caused by the single stranded circular Gemini Virus consisting of DNA- A and two satellites i.e. DNA-1 and DNA beta and transmitted by white fly.

**Keywords:-** Leaf disease, CLCuD, Gemini viruses, Begomoviruses.

## I. INTRODUCTION

Cotton is the most important kharif cash crop of north India. Among the various factors responsible for its low production, cotton leaf curl virus disease (CLCuD) has been found to be one of the major limiting factor. This disease is caused by recent advances made in development of new resistant varieties/hybrids, epidemiological studies including development of disease maps and detection of new weed hosts and breakdown of resistance due to development of new viral recombinants are discussed along with future management strategies.

## II. CAUSES OF CLCuD

A group of viruses that belongs to genus Begomovirus, cause major threat to cotton crop, which is well known as Cotton Leaf Curl Virus disease (CLCuD) and is transmitted by whitefly. Climatic conditions like rainfall, wind and temperature also influence the spread of CLCuD. Rainfall prior to seedling may result in the development of increased population of vector due to abundance in food.

.

## III. SYMPTOMS OF CLCuD

Cotton leaf curl disease (CLCuD) infected plants may show a variety of symptoms depending on the severity of disease. Typical symptoms include thickening and yellowing of small veins on the lower surface of young leave. Under severe attack of disease, leaves curl downward or upward and plant growth stunted due to reduction of distance between nodes. This is termed as Enation and it appears on the lower portion of the leaf. Cotton plant infected with CLCuD showing veins thickening and yellowing, upward curling (Fig. 1), down ward curling (Fig. 2), enations on the underside of the leaves, (Fig. 3) Stunting of cotton plant.

*Figure1.upward curling* [3]

*Figure2.down ward curling* [3]

*Figure3. Stunting of cotton plant*. [3]

## IV. EFFECTS OF CLCuD ON FIBER TRAITS

The cotton leaf curl disease effects the plant growth and quality to a great extent. Impact of CLCuD on fiber quality traits depicts that the CLCuD significantly affect traits like GOT, fiber length, fiber uniformity index, short fiber index, fiber fineness, fiber bundle strength yellowness and maturity ratio.

## V. IMAGE PROCESSING TECHNIQUES TO DETECT LEAF DISEASE

In this method, the images captured through digital cameras undergo the pre-processing techniques like image growing, feature extraction and classification purposes. Image processing techniques can be applied for purpose of detecting the diseased leaf, stem or fruit, find the area affected and its colour and to identify the object and its dimensions correctly.

Any leaf disease is indicated by the spots present on its surface. These spots have some salient features. These features can be extracted by employing various image processing methods. These features are very important for the colour and morphology of the leaf spots and they provide critical information about its visual representation. The colour pattern basically follows the RGB combination. The features that correspond to colour characteristics are the mean and variance of the gray level of the red, green and blue channel of the spots and other features correspond to morphological and geometrical characteristics of the spots. The main feature of any diseased leaf is that it has variations in its RGB values, which is certain, i.e. that variations of RGB values is not repeated with the RGB values of the another infected leaf. This can be detected using the sequence of following image processing steps.

According to the above process, the feature extraction is carried out using other technique called as colour segmentation. With the change in the leaf, its disease and the RGB values, its features also changes.

.

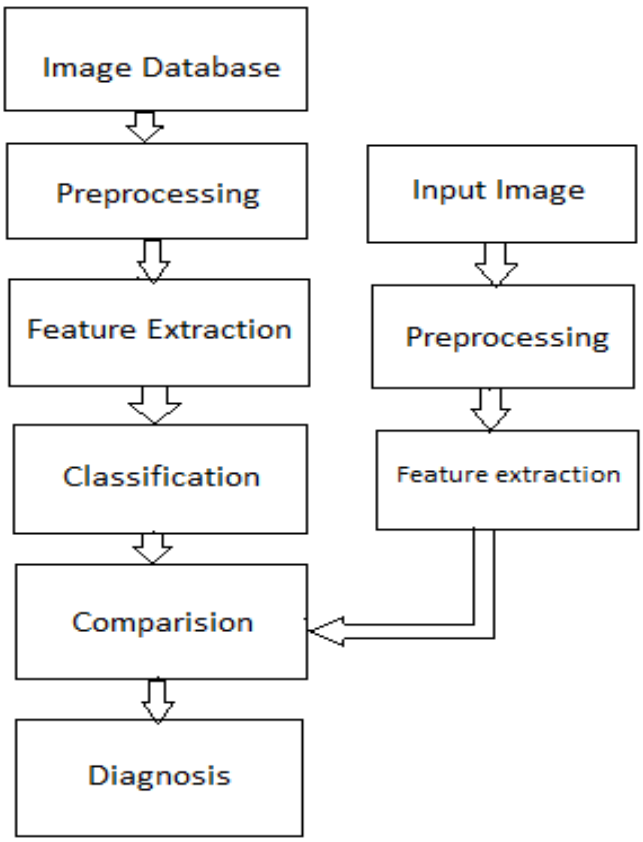
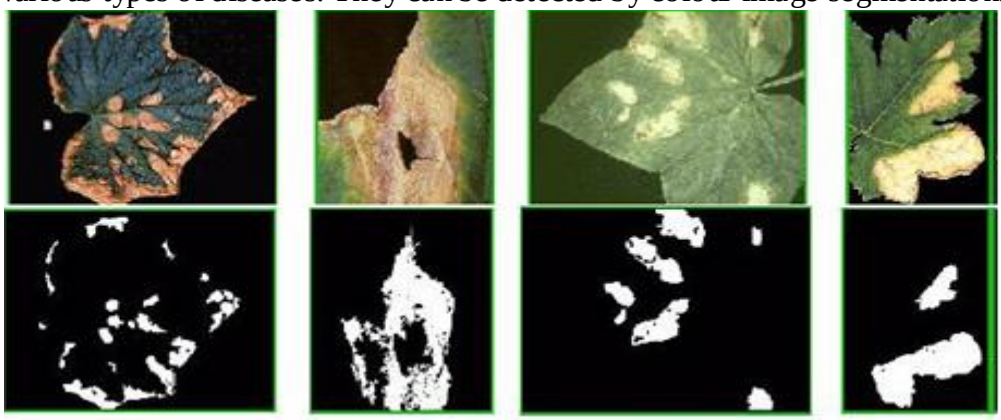



*Figure 4. Overview of Diagnosis system using feature extraction* [3]

### 5.1.1 COLOR IMAGE SEGMENTATION

This technique of colour image segmentation is used to detect the spots present on the leaf surface. Variety of spots on the surface of the leaf indicates various types of diseases. They can be detected by colour image segmentation.



*(A) Phosphoras Def. (B) Gummy stem blight (C) Scab (D) High temp.*

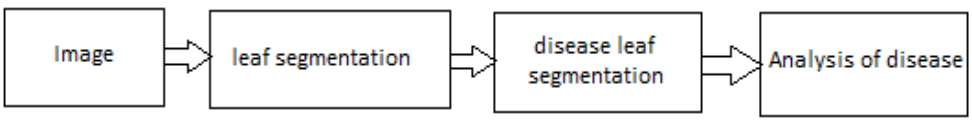



*Figure 5. cotton leaf diagnosis system* [3]

In this phase, the input image is enhanced by using anisotropic-diffusion technique. This technique is deployed before extracting the cotton leaf colour from the background to preserve the information of extracted pixels. Extracting B components from HIS and LAB colour space, respectively, are used to reduce the effect of illumination. The resulting colour pixels are clustered by the unsupervised SOFM network to obtain a group of colour in the image. The back propagation neural network is then applied to extract cotton leaf colour from diseased part of image.

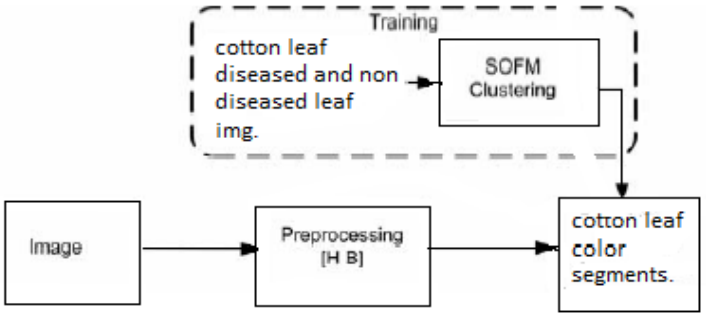



*Figure.6 Cotton leaf colour extraction system diagram* [3]

## 5.2 Cotton Leaf Disease Colour Extraction

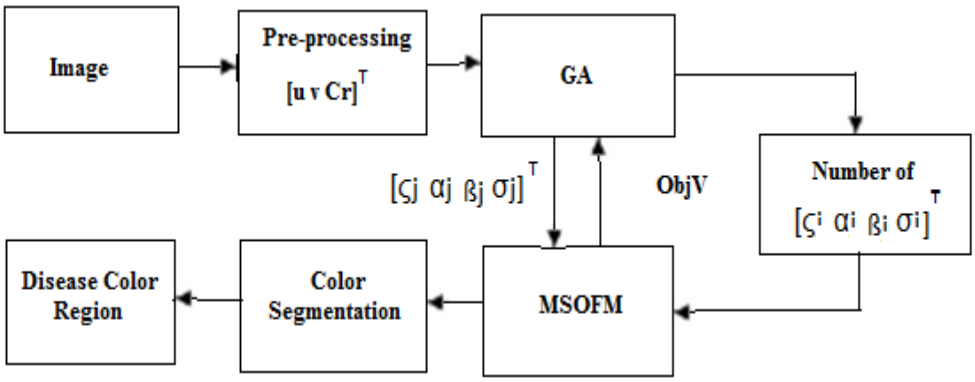



*Figure 7. Cotton leaf disease colour extraction* [3]

The image background is also processed to remove the edge pixels to preserve the actual affected pixels as many as possible. The remaining colour pixels are then extracted for cotton leaf disease colour by using modified self organization feature map. The clustering process does not require any training nor predefined number of colour groups. This network is also adjustable allowing similarity of each colour group to be fine tuned.

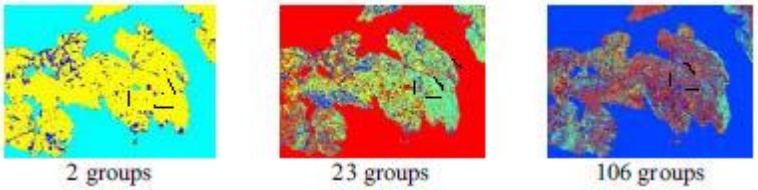



*Figure 9. Example of different no of colour group from MSOFM* [3]

The cotton leaves disease colour are segmented according to the number of group of colour. The information from both the diseased and non-diseased pixels are used for training with support vector machines(SVSM) for cotton leaf disease segmentation. We consider SVMs are trained using only 20 cotton leaves disease samples and 25 non disease samples. The resulting segmented pixels are then processed for classification of cotton leaves disease.

Now before the classification process, some irrelevant pixels are eliminated by the method of convolution and thresholding applied. Here H and S components (from HIS colour space) and Cr component (from YCbCr colour space) are used to extract salient colour features of diseased cotton leaf.

**5.3 Equations**

$$d_{wx} = \frac{1}{N_w}\sum_{g=1}^{N_w}\frac{1}{N_g}\sum_{i=1}^{N_g}\sqrt{(x_{g1}-w_{g1})^2+(x_{g2}-w_{g2})^2} \quad (1)$$

$$d_{ww} = \frac{1}{N_d}\sum_{j=1}^{N_d}\sum_{i=j+1}^{N_w}\sqrt{\sum_{k=1}^{n}(w_{ik}-w_{jk})^2} \quad (2)$$

$$ObjV = d_{wx} + \frac{N_w}{d_{ww}} \quad (3)$$

Where,
X = colour component of input pixel
W = weight vector
$N_w$ = Number of weight vector
Ng = Number of colour pixels within the weight vector
Nd = Number of measures between weight vectors
n = Number of input x
dwy =distance between input and weight vector
dww = Distance between weight vector
ObjV = Objective value.

With the help of above equations, the model of cotton leaf disease detection can be formulated that equations suggests the model of the SVM(support Vector Machine) which is used for clustering of cotton leaves pixels using GA(Genetic Algorithm).

**CONTROL MEASURES AND RECOMMENDATIONS**

The solution of various diseases is the development of disease tolerant varieties. In cotton, host plant resistance is the best long term and explored strategy to protect the plants from CLCuD (Solomon-Blackburn and Bradshaw, 2007). Cotton leaf curl disease spread from the primary inoculum that is present in off season in the form of weeds and other hosts. The management of CLCuD includes control of vector whitefly and eradication of weeds that contribute the hospitality of Cotton leaf curl virus. The seed treatment with appropriate and consistent insecticides may prevent the cotton crop up to 50-60 days. By using insecticides even if infection occurs at later stage the severity of losses can be avoided considerably, as symptoms appearance will begin after 65-90 days and plants avoid the most susceptible stage.

## VI. CONCLUSION

The above mentioned detailed study of cotton leaf disease clearly depicts that this device is a disastrous catastrophe for the decreasing productivity and quality of cotton leaf. The yield of this great source of income can be prevented by producing various disease resistant hybrids and by the use of insecticides, pesticides, fertilizers and other biotechnical materials.

## VII. REFERENCES

[1]. J. Farooq, A. Farooq, M. Riaz, M.R.Shahid, F. Saeed, M.S.Iqbal, T. Hussain, A.Batool and A.Mahmood, "Cotton leaf curl virus disease a principle cause of in cotton productivity in Pakistan", Canadian Journal of Plant Protection. Volume 2, Number 1, Pages 9-16 ©2014 Canadian Science and Technology Press Inc.

[2]. D Monga, P K Chakrabarty and K R Kranthi Central Institute for Cotton Research (C.I.C.R.), "Cotton leaf curl virus disease in India-Recent status and management strategies"

[3]. Mr. Viraj A. Gulhane, Dr. Ajay A. Gurjar," Detection of Diseases on Cotton Leaves and Its Possible Diagnosis"

[4]. Arti N. Rathod, Bhavesh Tanawal, Vatsal Shah," Image Processing Techniques for Detection of Leaf Disease", ISSN: 2277 128X ,Volume 3, Issue 11, November 2013