

Identification of Crop's Leaves Disease Using Deep Learning

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This project plays a vital role on recognizing the crops leaves image and finding out the diseases associated with the same. Due to space constraints, people prefer terrace garden, instead of growing in conventional methods. This application is very much useful for terrace garden in Metro cities and normal cities. This model is developed with client and server architecture. Client implemented software using HTML and database developed is developed in MySQL. Plant leaf images, session activities are stored in database. The person uploads the image of affected leaf. Training data are collected from agriculture websites. Testing data are collected from nearby places. The software compares the uploaded leaf's image with predefined data and identifies the type of disease with which it is affected. Growth of a plant may be mainly affected by deficiency in the soil and insect bites. Soil deficiency: Soil sample is collected from terrace garden / our native place and will be sent for analysis. Analysis report is taken from office of Joint Director – Agriculture office. The parameters in the report are fed on the database and proper natural compost will be suggested for that soil, to increase the productivity. Insect bites: Analysed image of the leaf is used to determine the insect bites and natural remedies will be suggested to avoid the same in future. Leaf diseases are identified using Convolution Neural Network model (CNN) in supervised learning algorithm. CNN algorithms are very suitable for image classification process. The input leaves data are collected from our terrace garden. Predefined data are collected from various agricultural websites. The application also uses weather report of any given location and uses the same for proper suggestion. The software is developed by python platform.

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1. INTRODUCTION

1.1 General

The application will be much beneficial for farmers and for people who are maintaining terrace garden. Presently chemical products are used for plant cultivation and growth. If leaf gets affected, whole plant growth is affected. This application gives natural remedies for the affected plant leaves and soil. These remedies were tried in our surrounding area, and they gave good reviews with high productivity. Saraansh Baranual and Anuja Arora, in their research came up with identification of apple plants leaf diseases. The risky part of their study was image segmentation. The algorithm used for them is K - means clustering model. The main constrain in this project is that the testing time taken is too high. Jubin Dipakumar Kothari, in their study utilize machine learning approach, to identify crop diseases. In this case, the testing time of CPU is high. In our proposed method, identification of plant diseases and remedies for the same will be given in comparatively lesser time duration.

1.2 Existing method

Ming-wang [2020] has proposed regression and artificial neural network models based on RBF network plant disease forecasting. This model predicts the disease well, but it failed to include weather report in soil analysis. D.A. Shah [2019] has proposed scalar-on-function regression, logistic regression models. In this model the accuracy of result is less. Sumit kumar [2021] has proposed faster region based convolution neural network. This model detects different types of diseases efficiently but it does include complex scenarios. The results are of 92% accuracy. Saraansh baranwal [2019] has proposed deep learning convolution neural network. This model focused mainly on detecting disease in apple tree leaves. Main constraints of this model are : It takes more training and testing time and leaf images in the dataset are not clearly visible.

1.3 Objective

- To develop a model for identification of crops disease
- To collect crops leaves images training data from agriculture website and input data are collected from surroundings.
- To classify the disease in varies crops leaves using classification methods.
- To collect sample soil and prepare a soil report.
- To assess the lack of soil nutrition's and deficiency from the soil report.
- To suggest the suitability of soil for crop cultivation.

1.4 Hardware and Software Specification

Hardware Specification

- Processor - Intel(R) Core (TM) i5-6200U CPU @ 2.30GHz,
○ 2401 MHz, 2 Core(s), 4 Logical Processor(s)
- OS Name - Microsoft Windows 10 Home Single language
- RAM - 4GB
- Internal memory - 930GB
- Virtual memory - 6.11
- RAM speed - 2400 MHz

Software Requirements

- Operating system - Windows 10.
- Language - PYTHON.
- IDE - Pycharm.
- Database - MySQL

1.5 Data for Study

In this study the training data is collected from agricultural websites and input data is collected from terrace gardens. The sample soil is collected from our surroundings and will be tested at Samathanapuram soil tests lab. Soil is analysed for parameters such as carbon, nitrogen phosphorous potassium, sulphur, zinc, iron,copper,manganese and salinity.

2. Literature Review

2.1 General

There were 10 papers reviewed referring to this study in which there were many deep learning algorithms developed and worked out such as convolution neural network in artificial intelligence and drawback of this study was training data takes more time. The base study had proposed convolution neural network method for this study. Since this is related to detection of leaf disease in convolution neural network , it is more suitable for this study.

2.2 Literature Review

Saraansh baranwal[2019] has proposed deep learning convolution neural network. This model focused mainly on detecting disease in apple tree leaves. Main constraints of this model are It takes more training and testing time and leaf images in the dataset are not clearly visible. Apple trees are one of the popular plants to growth in large plantations. At the same time apple are between the plants that are the prone to disease. Disease identification at an starting stage and prevention before spreading into other parts of the plants. An sufficient system was need to detect plant disease in starting stage. Convolution neural network to automatically detect the issue. Images of apple leaves covering different diseases. Plant village dataset had used to validate the result. Image filtering, image compression had used to train set of images. The study of this paper focus only detect the apple tree leaves only. Drawback of these paper to take much of training time and the testing time.

Ming-Wang SHI[2019] described regression and artificial neural network models based on RBF network plant disease forecasting. This model predicts the wheat sharp eyespot disease , but it failed to include weather report. Radial basis function Network has effective forward neural network, it realize via the non linear primary function's linear combination form space RN to the space RM nonlinear transformation. The result indicates with standard deviation of disease index. Based on RBF network plant disease forecasting model the simulation experiment showed that this model to the plant disease less and medium-term forecasting is possible effective. ANN provide an alternative to conventional approaches for model development. ANN had to perform better

then traditional multivariate approaches at classifying incidence and detecting infection time periods of tan spot of wheat and predicting wheat scab epidemics. The model approached had combined to develop models to predict the occurrence wheat sharp eyespot. Drawback of this study had contains error(weather,germ,environment so on)during prediction time.so they consider for future discussion.

Sumit kumar,veera Chaudhary et al.,[2021] has projected Regional based fully CNN to predict the leaf diseases. Early stage plant disease detection and to important for better yield also improve quality of crops. This paper focused on finding the plant disease and decrease the economic losses. Deep learning approached has used for image recognition. They had used village data set for classification. The village dataset has consists of 54303 healthy and un healthy leaf images divided into 38 categories. They tried to predict the class of diseases. They resize the image to 256X256 pixels and classification on this compressed image. Image pre-processing plays a role in building an effective image classifier. Data set contains anywhere from hundreds to couple of thousand training samples, the variety might still not be enough to build an accurate model. Drawback of this study difficult to protecting crop in organic farming. This depends on through knowledge of crop being growth. Plant yield increased by 40%.

Jubin Dipakumar [2020]has represented machine learning approach to detect the plant disease. The machine learning models can be applied to improve the cycle of plants disease detection in beginning phase to improve grain security and manageability of agro-biological system. Strategies of image preparing were utilized for precise discovery and grouping of harvest disease. Extract location and order of the plant disease significant for the productive development of the crop. Recognize the crop disease in well manner but yield of profitability is less.

Methodology

General

The study of these application has created by menus and submenus. Menus are user, office, about, contact. when click an office menu shows in Submenus are admin, client.

In User login a page menu is Home, upload image, plant disease, weather, soil, logout. when click a soil menu shows soil test and plant recommendation submenus.

User

Once the user enters the web page, the user can log in to their module. If the user is not registered, then the user needs to provide the required credentials. Then the user can enter into their module and upload the complaint details and images. the user sends those images to the admin to further process. Admin to their process and revert back to the user to view the results. Now users can view and download images from low, medium, high, and ultra-high.

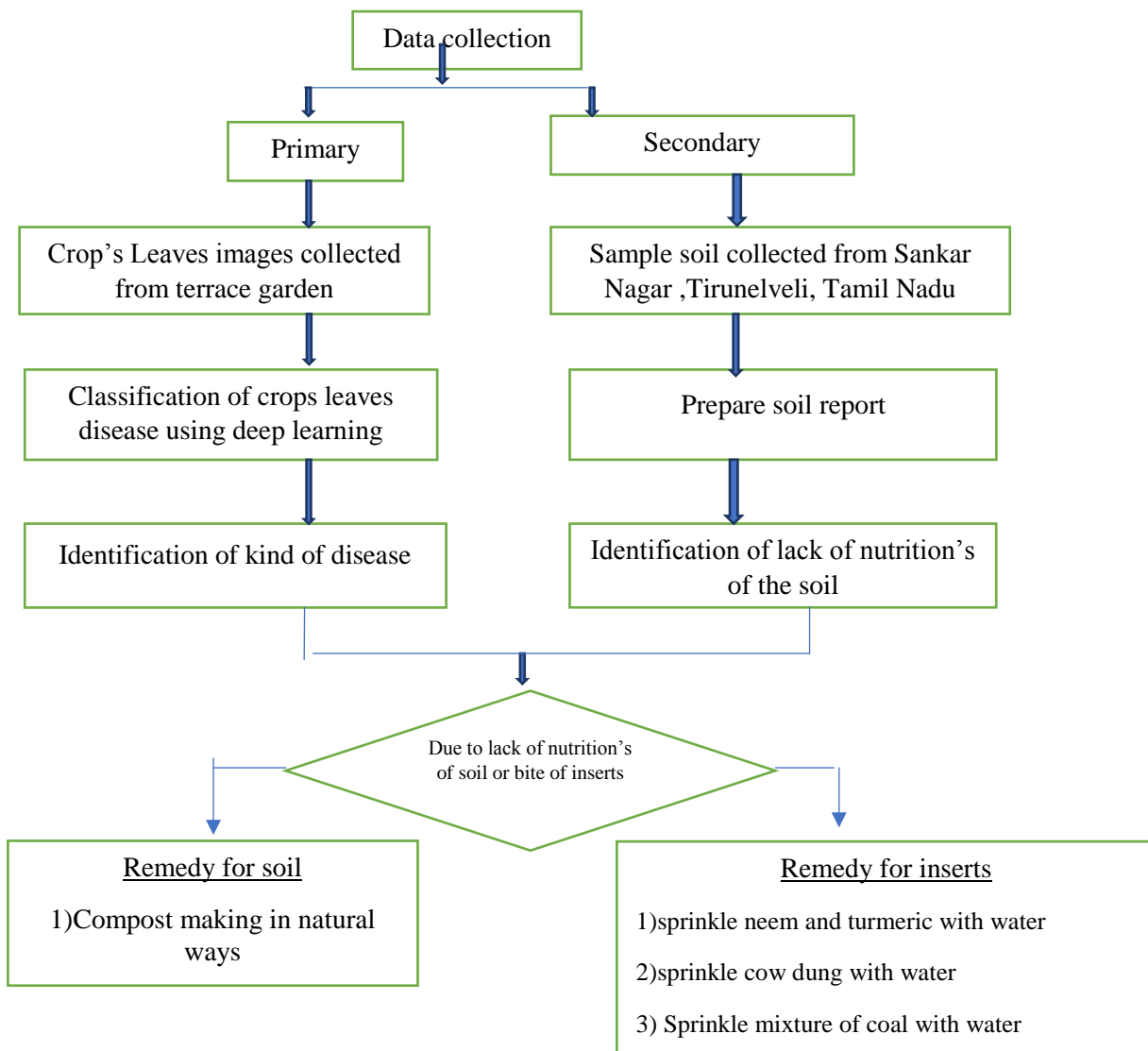
Admin

Admin doesn't need to register into their module. Once the admin login to their module they can view user details and their complaint details. Admin view and approve the complaints. Then admin sends those images to the data analyst. Analysts review the image review from admin approval then sends those to admin. Admin again sent it user, who requested analytics.

client

Once data analysts enter into the web page, they can log in to their module if they have already registered with the required credentials. Data analysts receive those images from the admin and check those images for the algorithm. Once the checking is over it can send those images for the algorithm. The output of those images is stored in their database. Then these outputs are passed to the admin where the admin sends those details to the user.

3. Methodology



1 Data Collection

Data collection is accomplished by two ways, primary data and secondary data. Primary data consists of leaf images. Sample primary data is collected from agriculture website and input primary data is collected from terrace gardens. Secondary data consists of soil reports. Sample soil is collected from the terrace garden. Analysis report is taken from office of Joint Director – Agriculture office.

2. Pre-processing

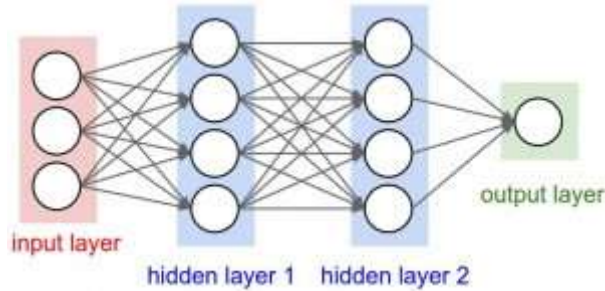
image pre-processing is must before its actual use. image pre-processing is the concept of changing the raw data into a clean data set. The dataset is pre-processed to check missing values, noisy data, and other inconsistencies before executing it to the algorithm. CNN algorithm is used for pre-processing the Image data. Pre-processing requirement is way low which makes time and energy-efficient and CNN is computationally efficient. It predicts Very High accuracy.

3. Classification Description of Convolution neural network

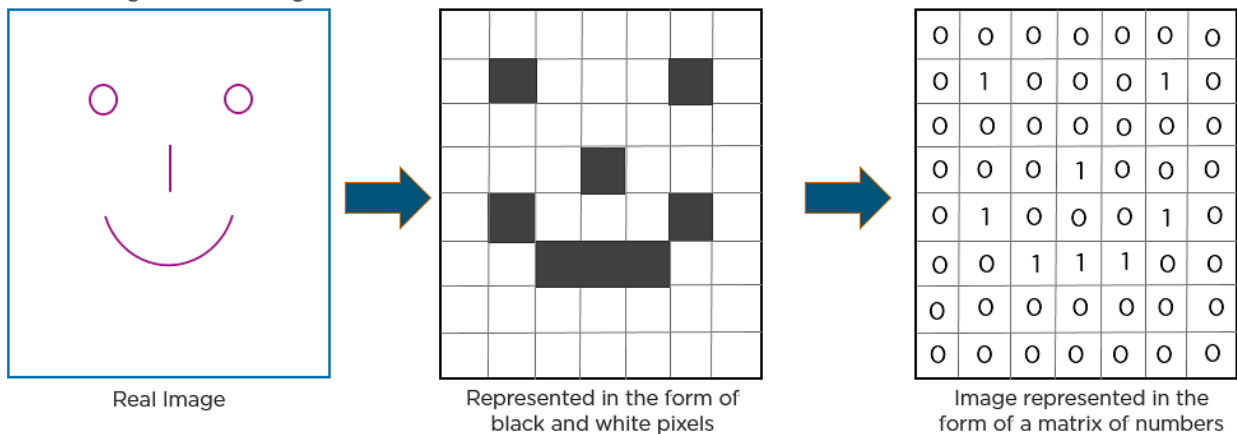
Deep Learning, a Convolutional Neural Network is a type of artificial neural network, which is widely used for image recognition and classification. Deep Learning thus recognizes objects in an image by using a Convolutional Neural Network. Convolutional Neural Network are playing a major role in diverse tasks like image processing problems.

In a regular Convolution Neural Network classified into 3 types.

1. **Input Layers:** The layer in which we give the input to our model. The number of pixels in this layer is equal to the total number of features in our data.
2. **Hidden Layer:** The input from the Input layer is then feed into the hidden layer. There can be many hidden layers depending upon our model and data size. Each hidden layer can have different numbers of neurons which are generally greater than the number of features. The output from each layer is computed by matrix multiplication of output of the previous layer with learnable weights of that layer and then by the addition of learnable biases followed by activation function which makes the network nonlinear.
3. **Output Layer:** The output from the hidden layer is then feed into a logistic function like sigmoid or SoftMax which converts the output of each class into the probability score of each class.



CNN recognizes an image



2 Identification of kind of disease

The leaf may affect disease by fungi, bacteria and virus. by uploading, their affected crops leave users to benefit by understanding the disease name. user to upload a affected tomato leaf image the CNN algorithm to classify the disease with the help of training data. For example, tomato leaf diseases are Alternaria Canker, Bacterial Canker, Bacterial Speck, Bacterial Spot, Early Blight, Gray Leaf Spot etc.,

3 Identifying of lack of nutrition's of Soil report

The sample soil taken from the terrace garden. Analysis report is taken from office of Joint Director – Agriculture office. the report contains carbon, nitrogen, Phosphorus, Potassium, Sulphur, zinc, iron, copper, manganese and salinity.

4 Suggestion

Remedies for healthy leaf growth sprinkle neem and turmeric with water, sprinkle cow dung with water, Sprinkle mixture of coal with water. Next remedies for improving soil nutrition prepare natural compost at home. Using vegetable water, coconut coir, curd.

4. Result and discussion

Home page

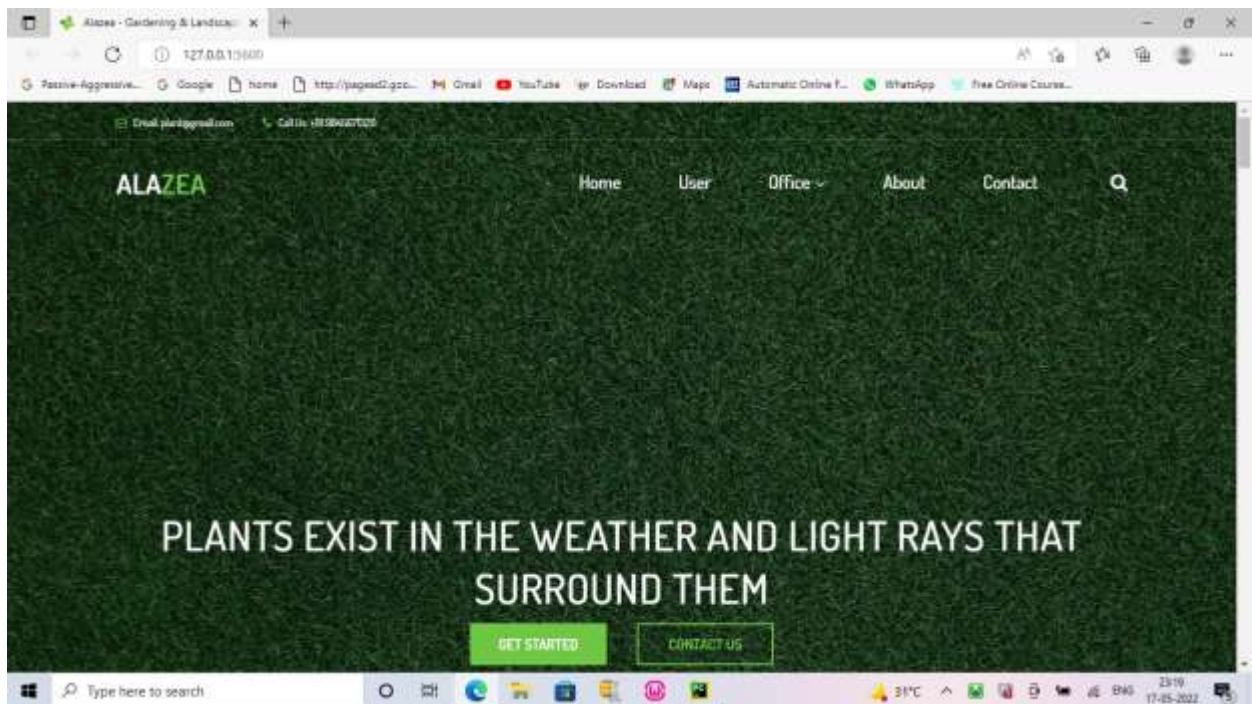
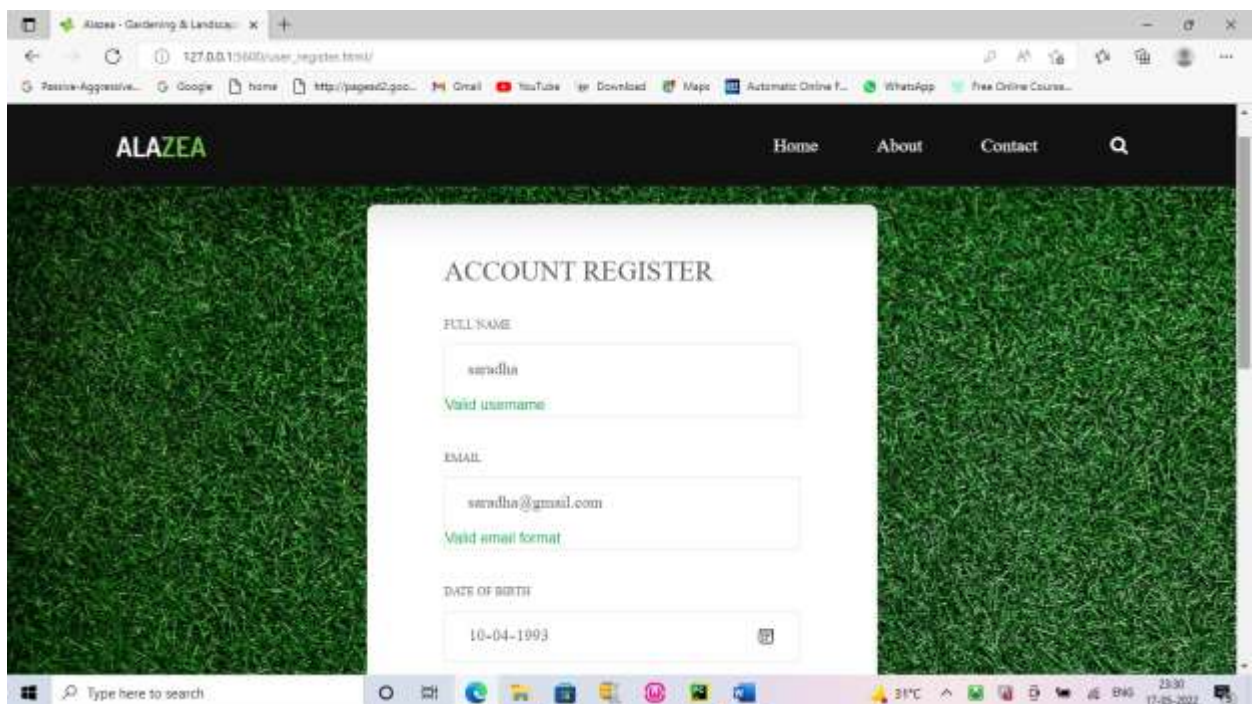


Figure 1: Home page

The figure 1 shows that home page of our application. It shows home, user, office, about and contact menus. **user registration module**



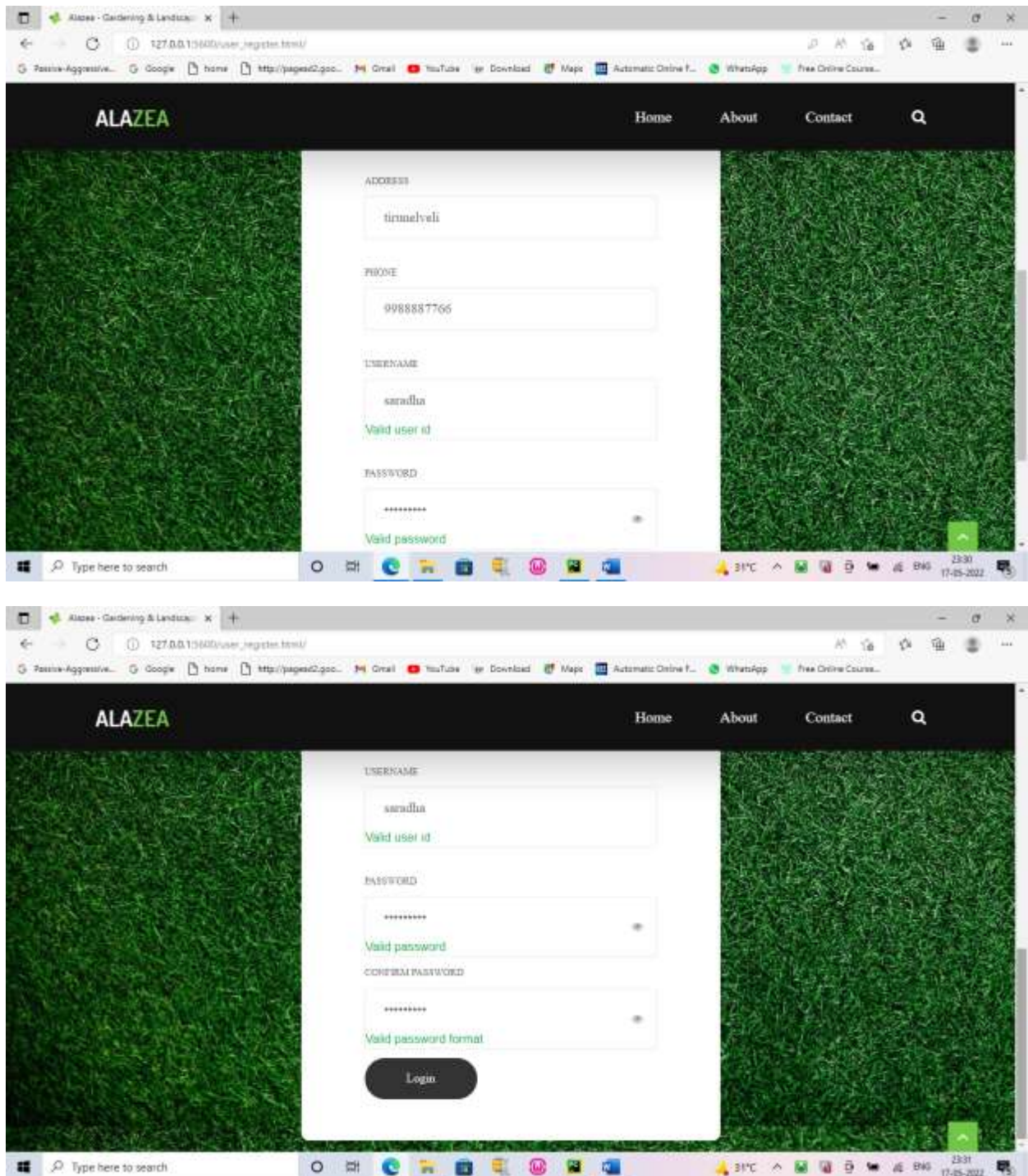


Figure 2: user registration module

Figure 2 shows that user registration page. User to give details are name, email address, date of birth, address, phone number, username, password and confirm passwords. Details are done then click a button. User to login a page using username and password.

User login module

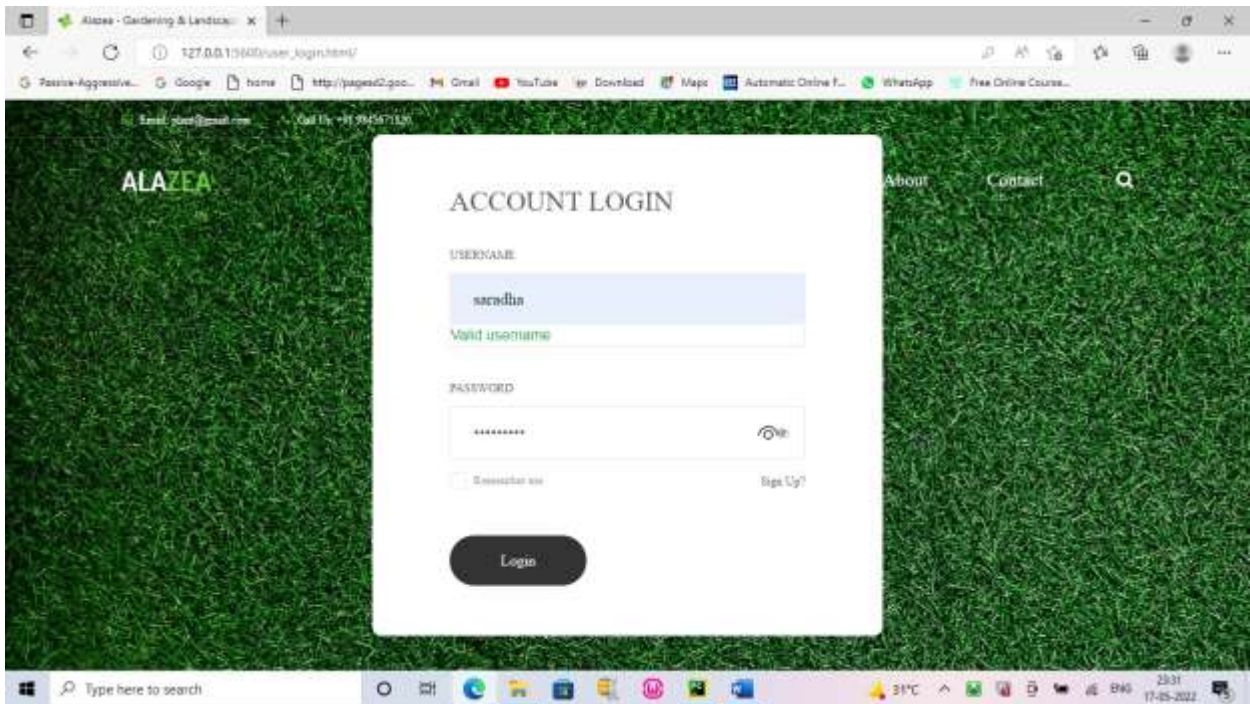


Figure 3: user login module

Figure 3 shows that login a user page.login using username and password. User page

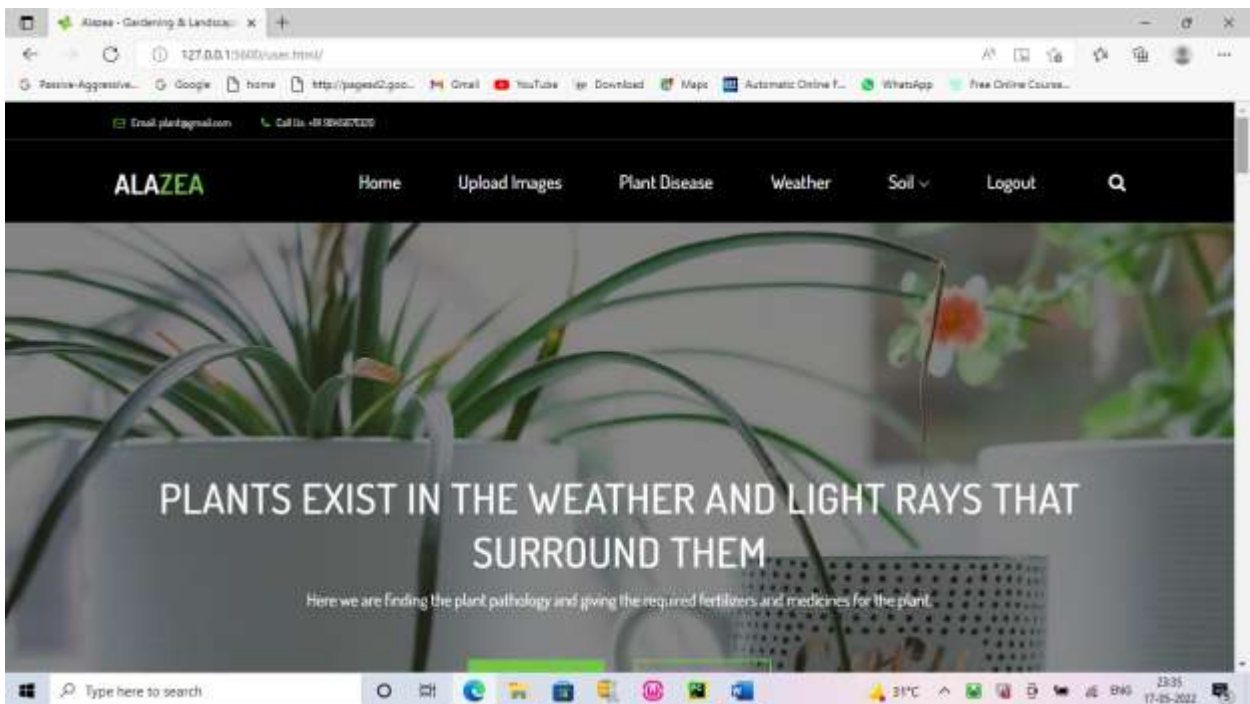


Figure 4: User page

Figure 4 shows that user page . once user login this page will be open.The page contains upload image,plant disease,weather,soil and logout submenus.

User upload a leaf image

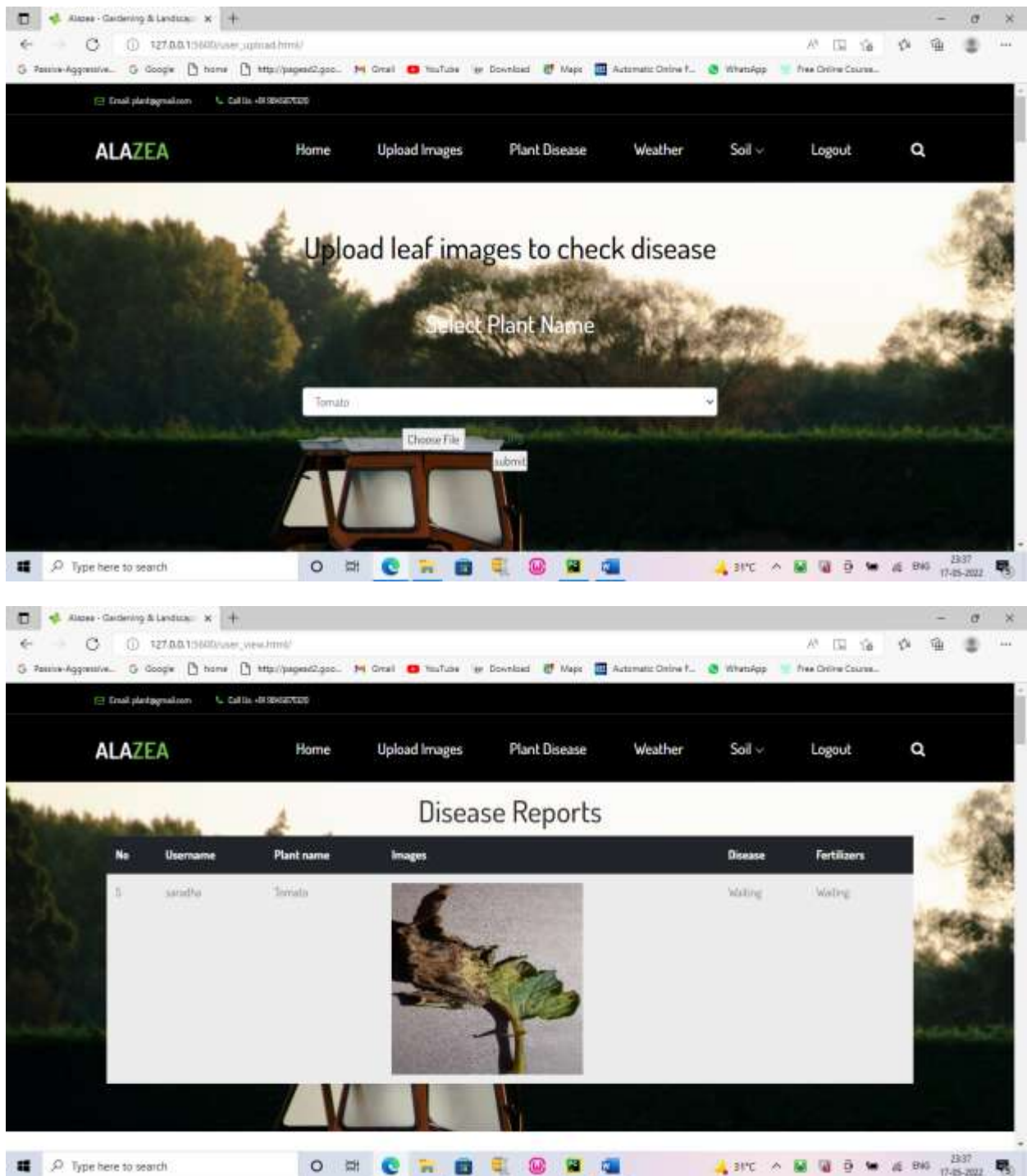


Figure 5: upload a leaf image

Figure 5 shows that user upload a leaf image. disease affected leaf is collected and uploaded to this page. Once uploaded a image then click logout

Admin page

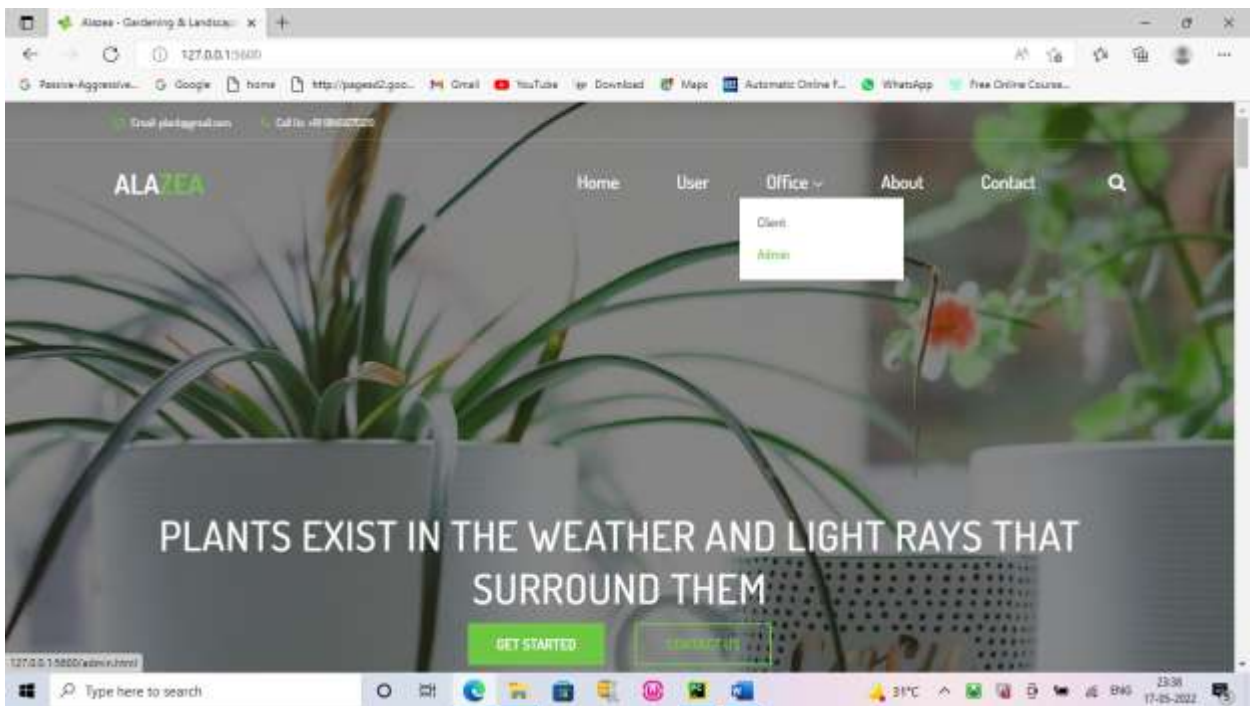


Figure 6: admin page

Figure 6 shows that office submenus. Submenus are client and admin.

Admin login

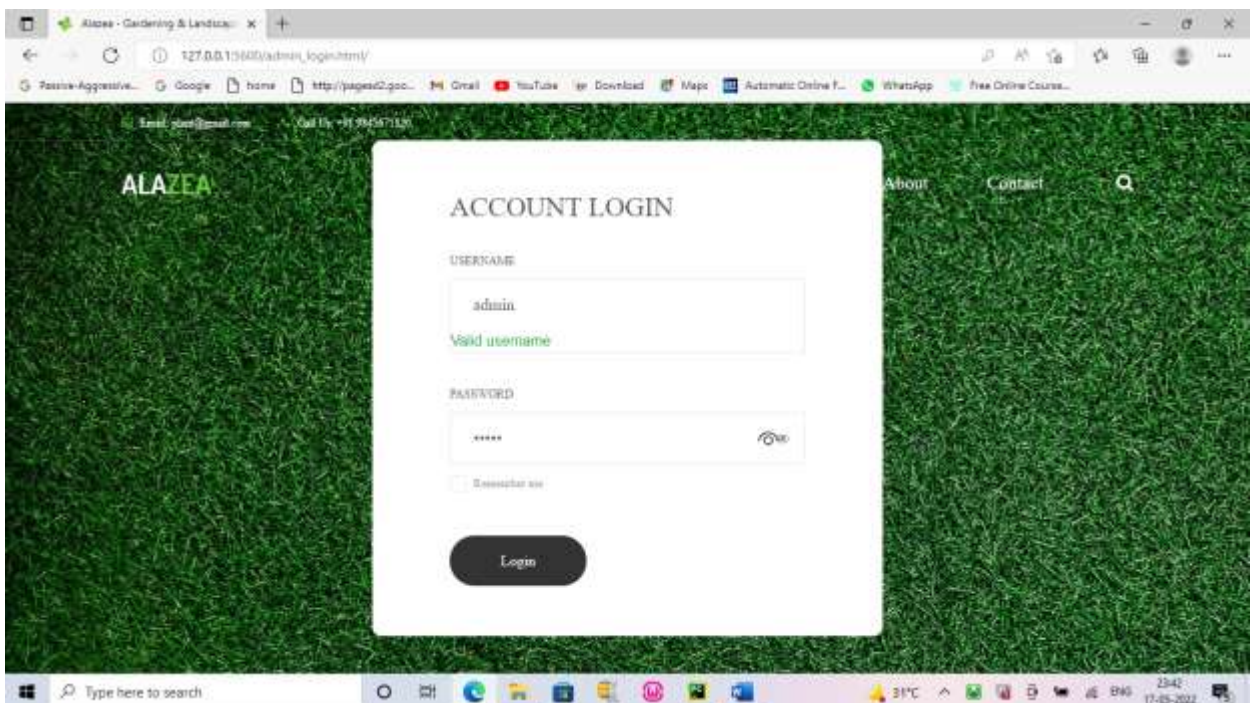
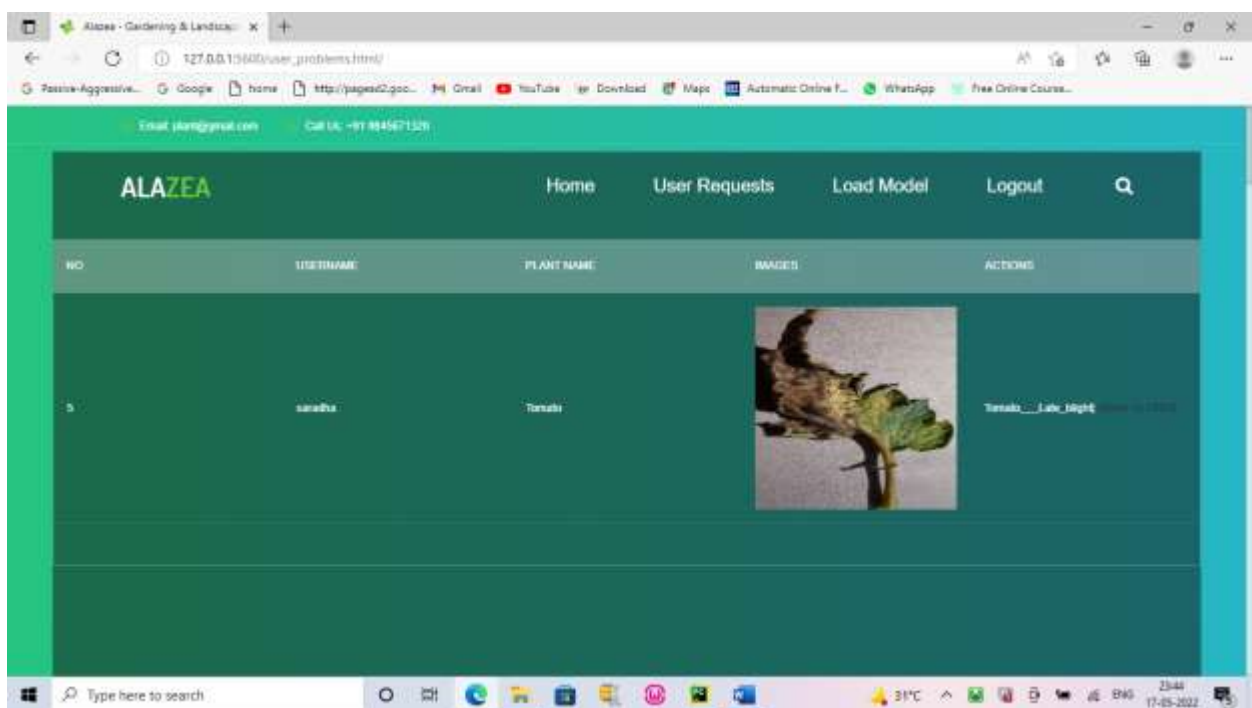
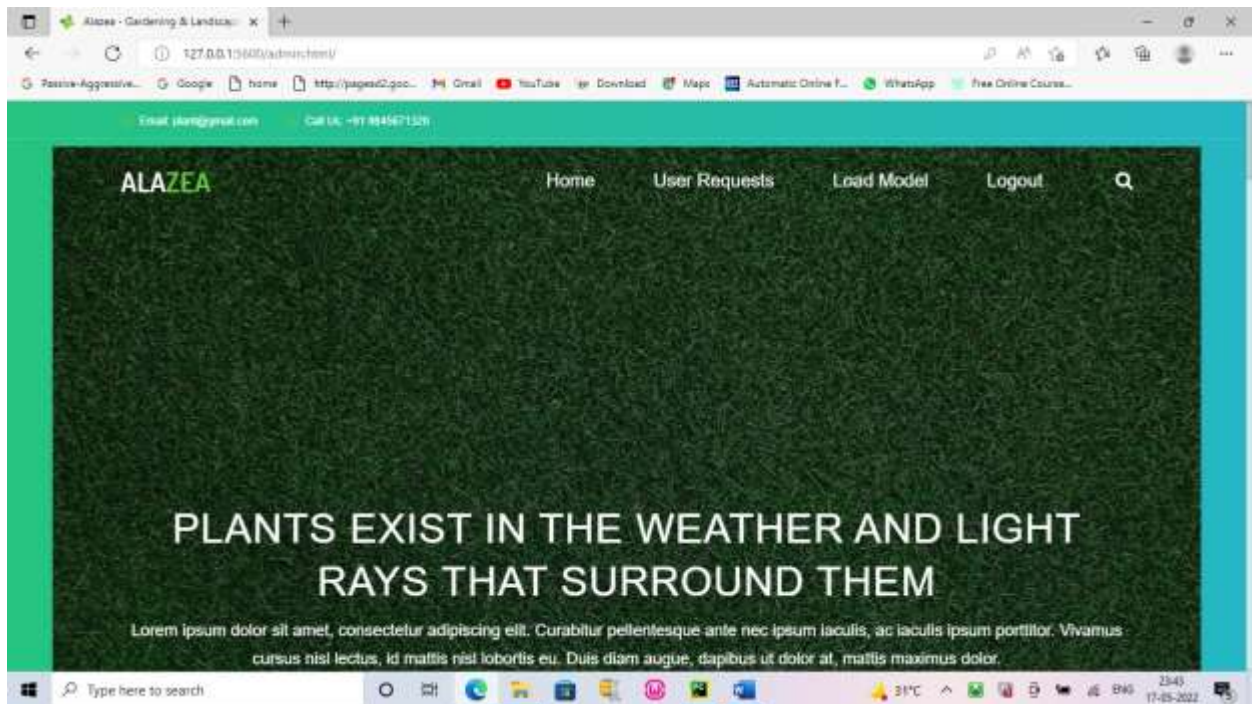


Figure 7 shows that admins login page. Admin login using username and password.



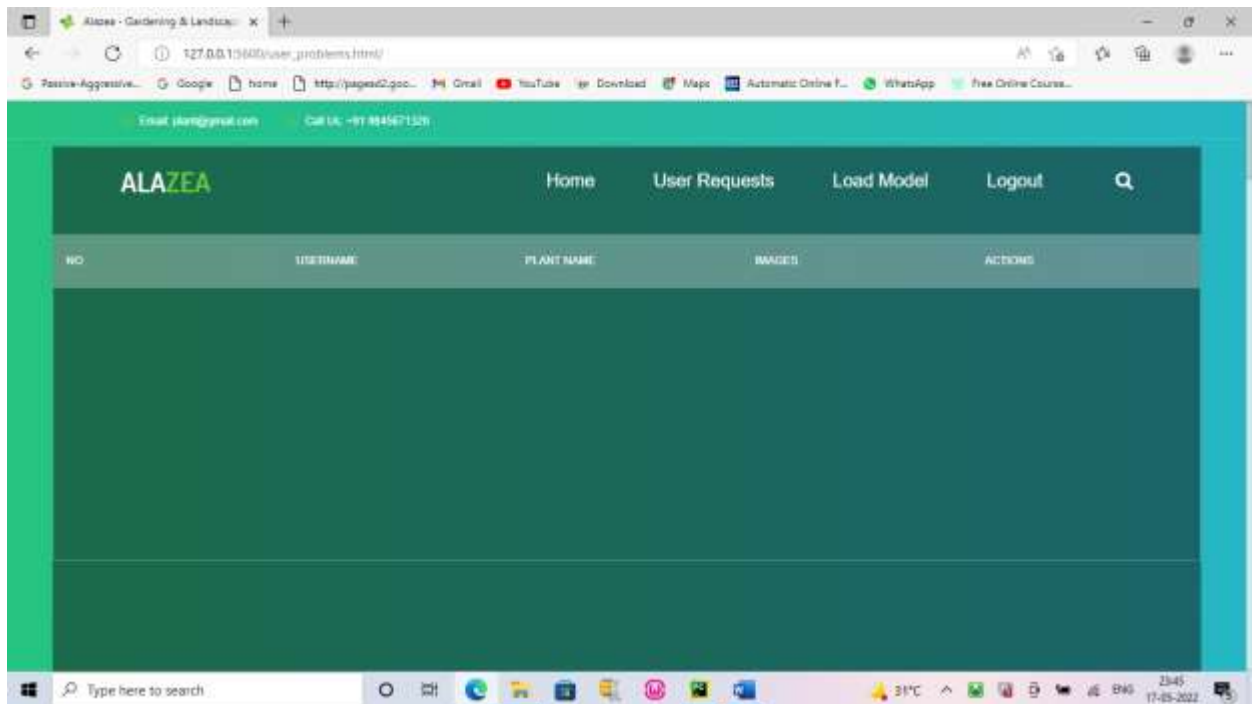


Figure 8 shows that admins page. Admins to verify the user uploaded leaf image and move to client

Client login

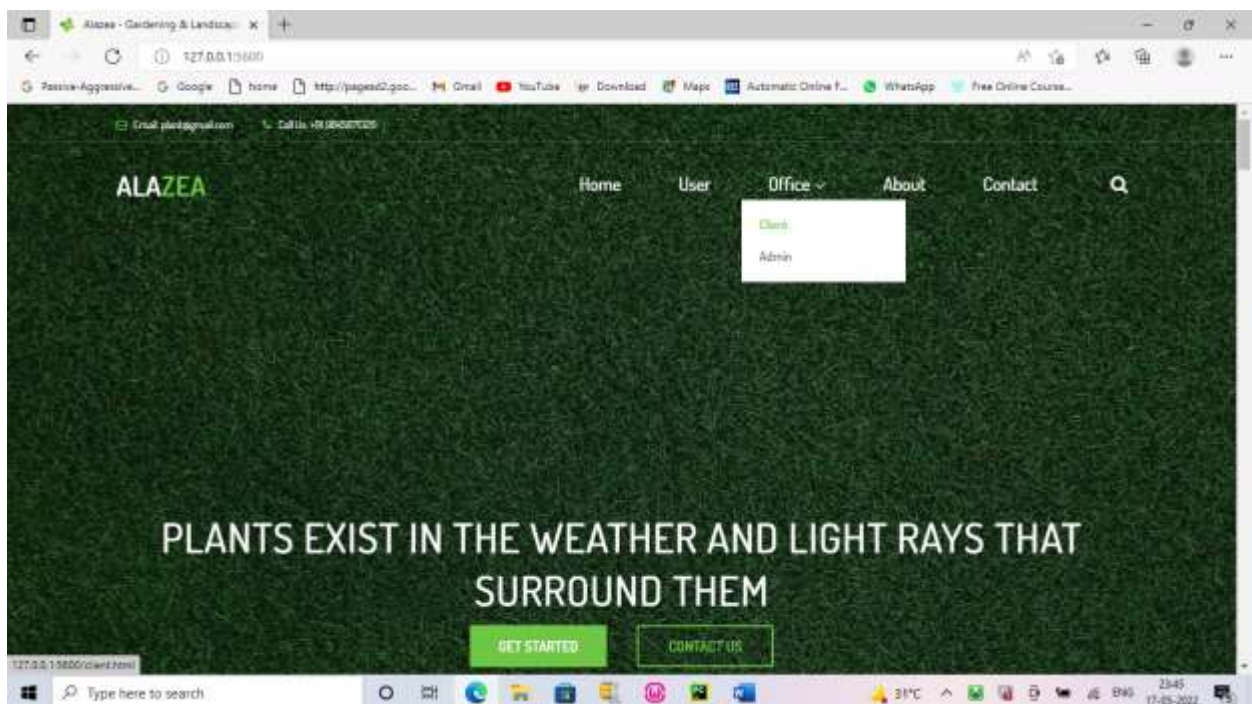


Figure 9 shows that client login submenu.

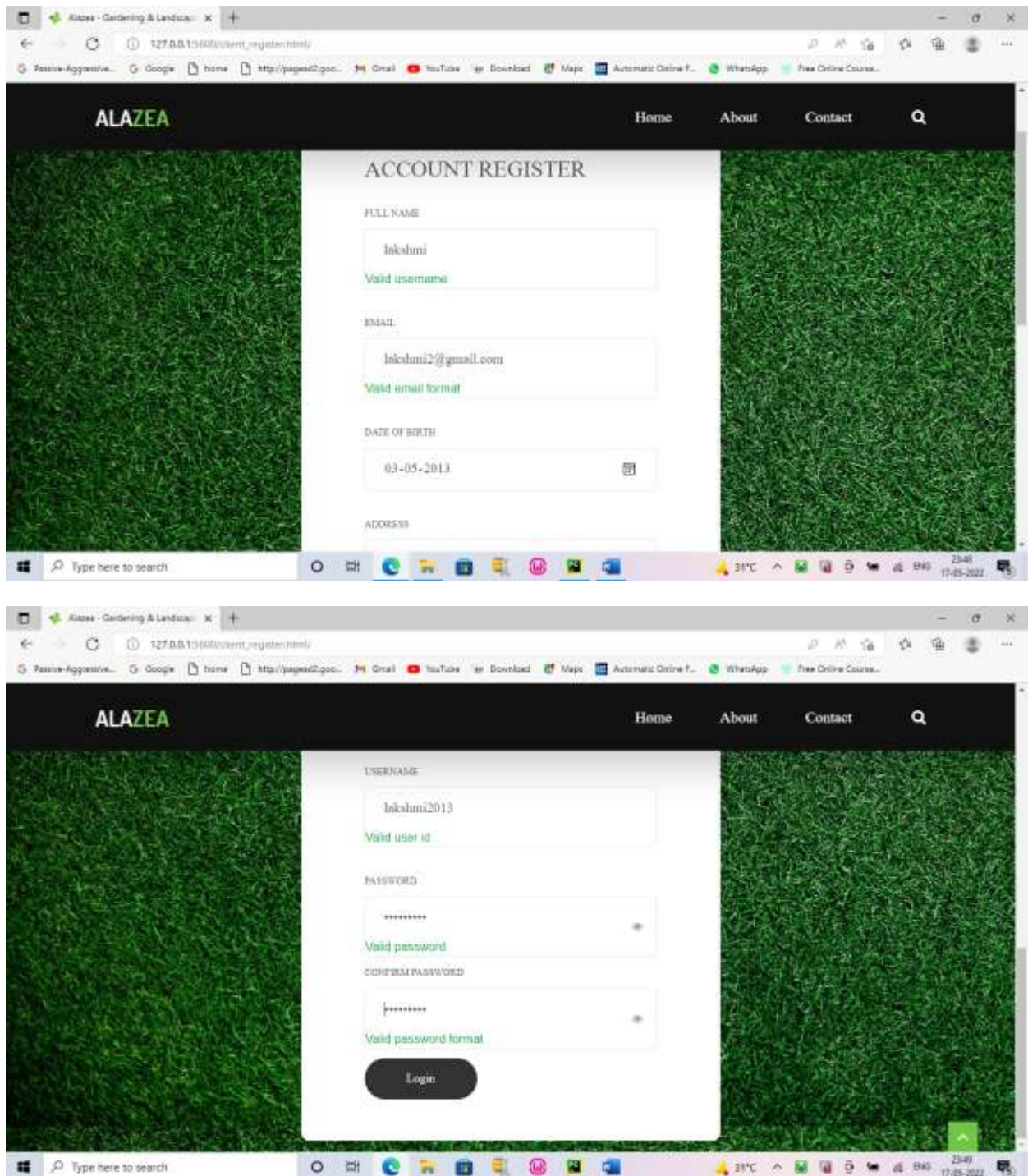


Figure 10 shows that client registration page. Client to enter all details then click a login button.

Client home page

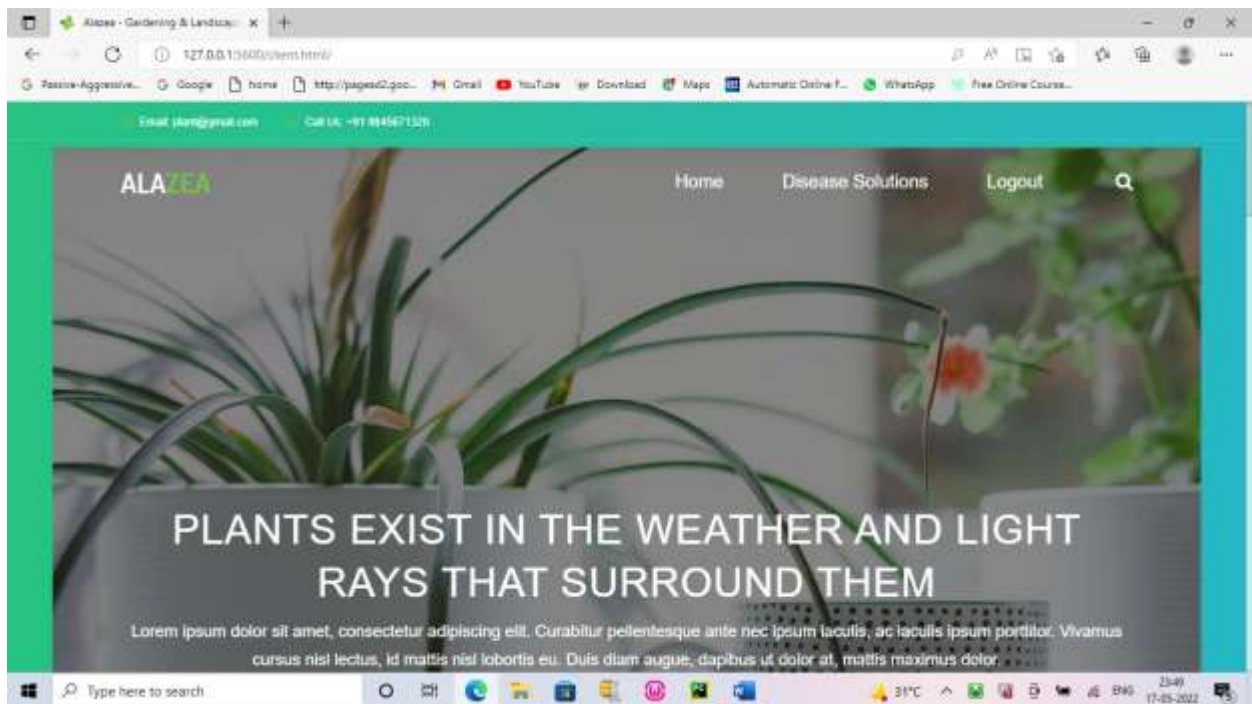


Figure 11 shows that client home page.

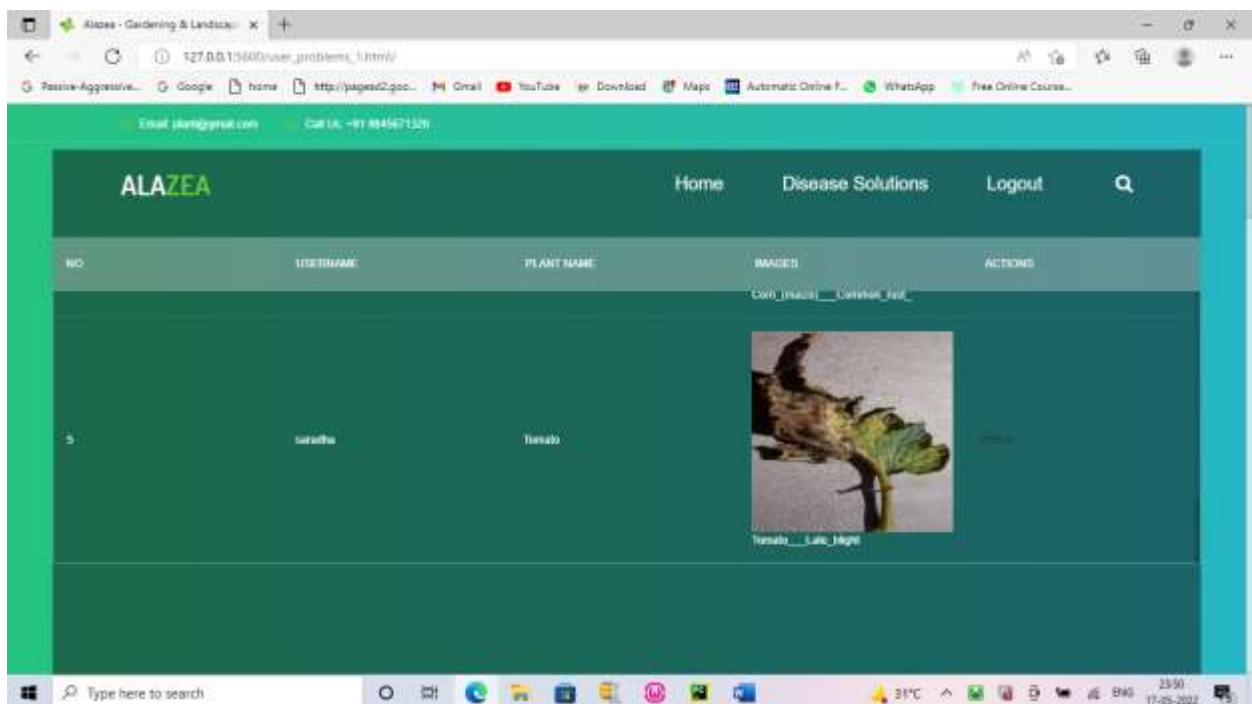


Figure 12 shows that shows that Client verifies the disease of the leaf image from admin.

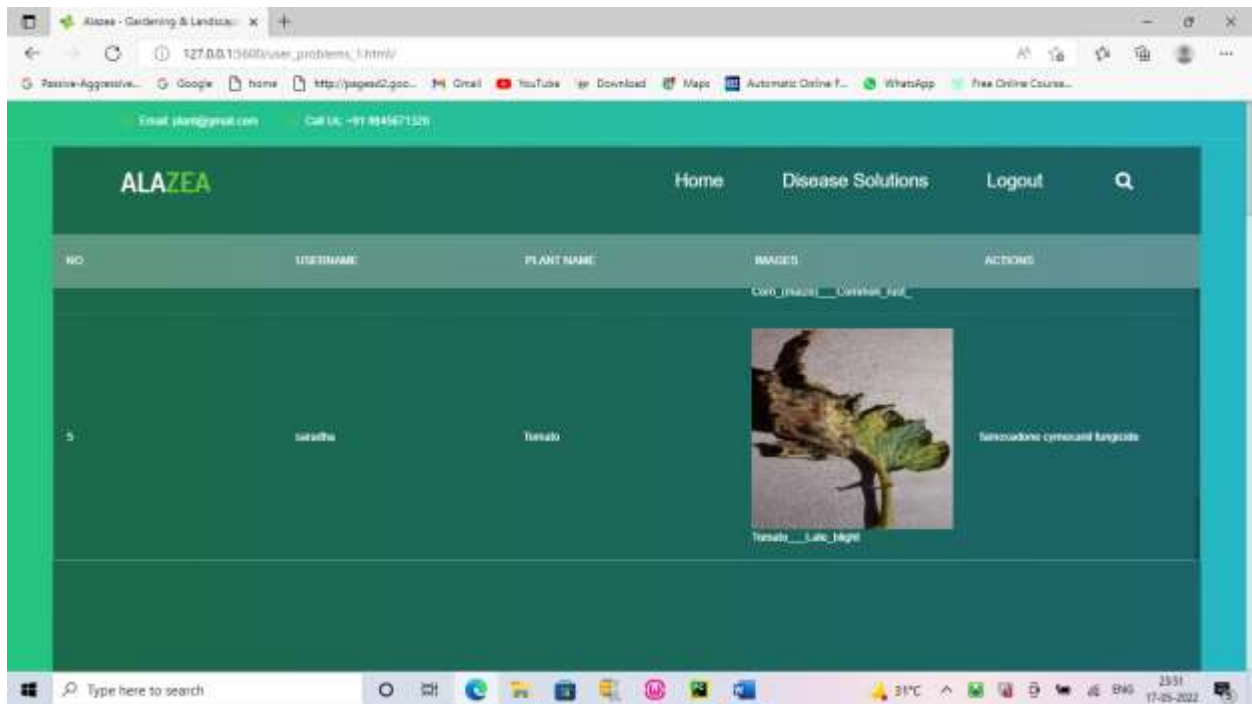


Figure 13 disease verification page & and forwarded to user page

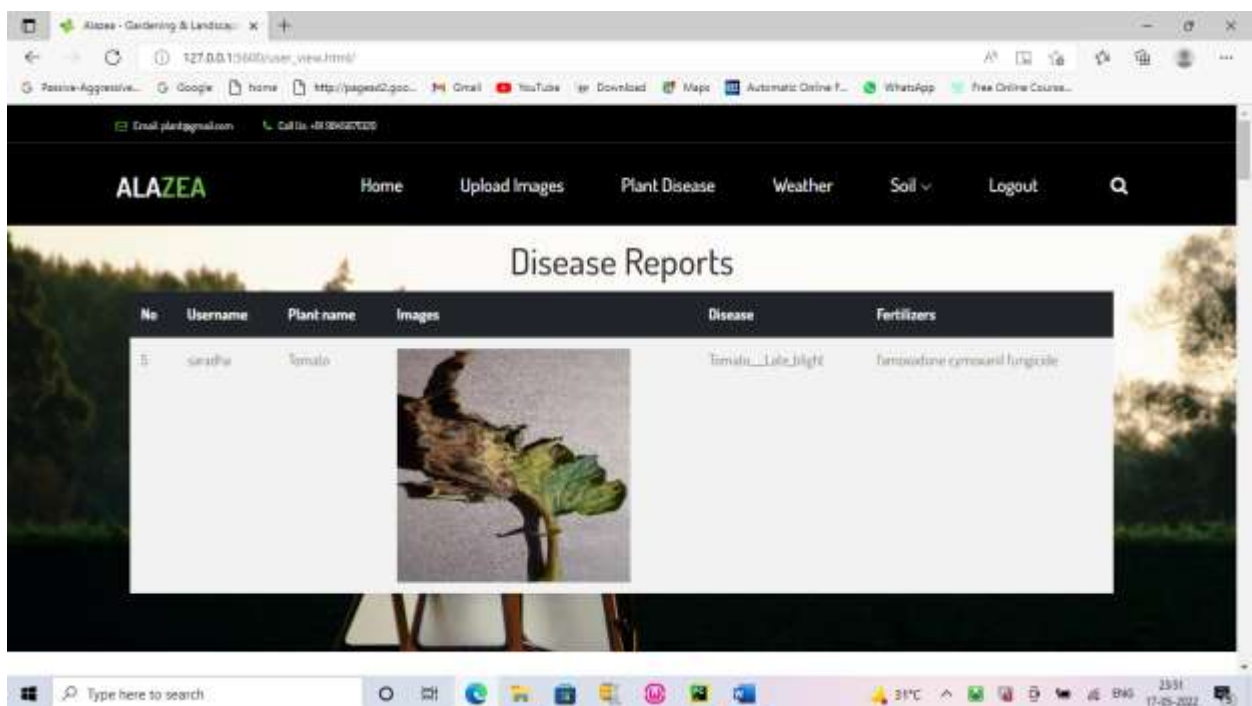


Figure 13 shows that user to identify the uploaded leaf image.

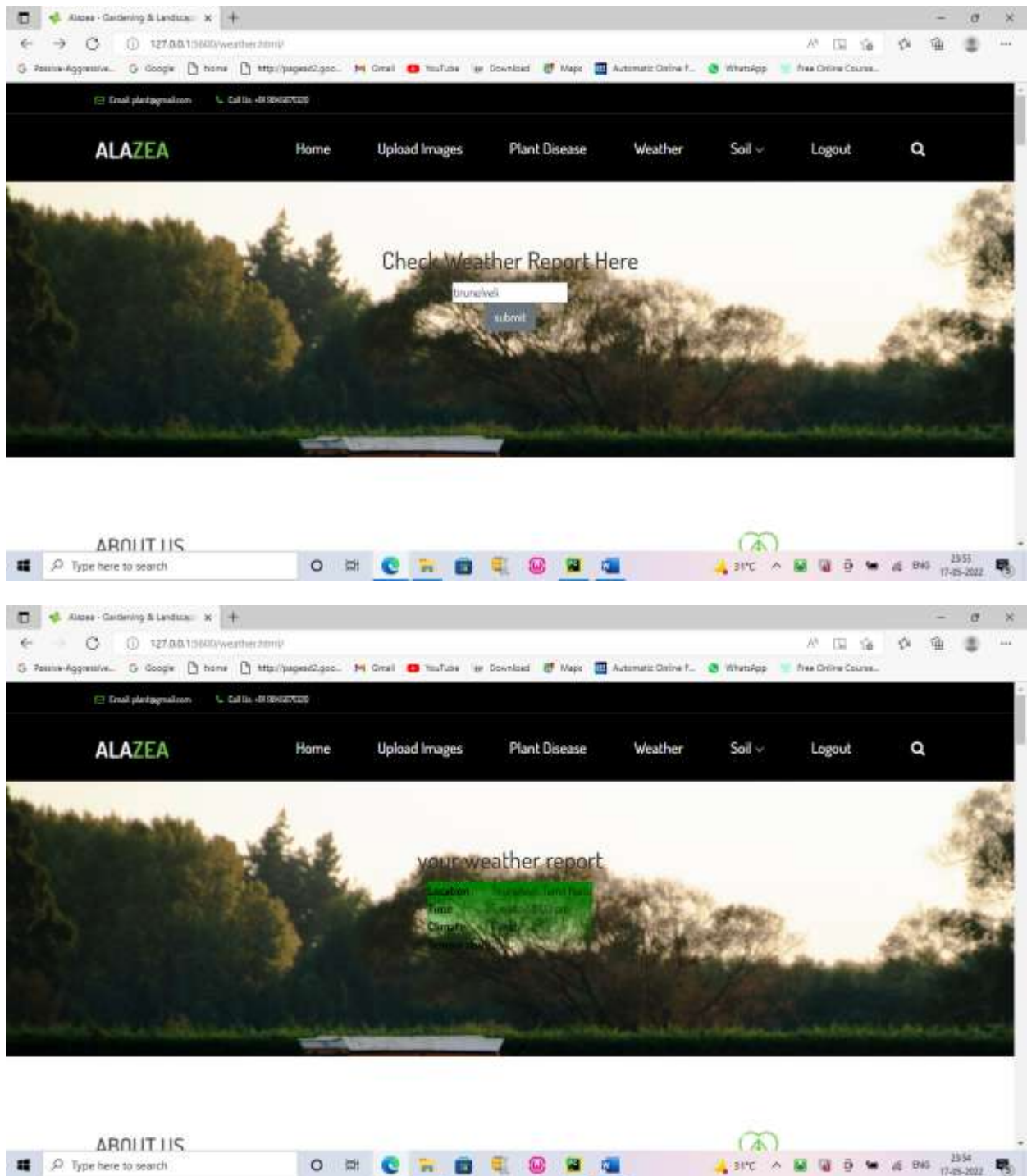


Figure 14 shows that weather report for specified place.

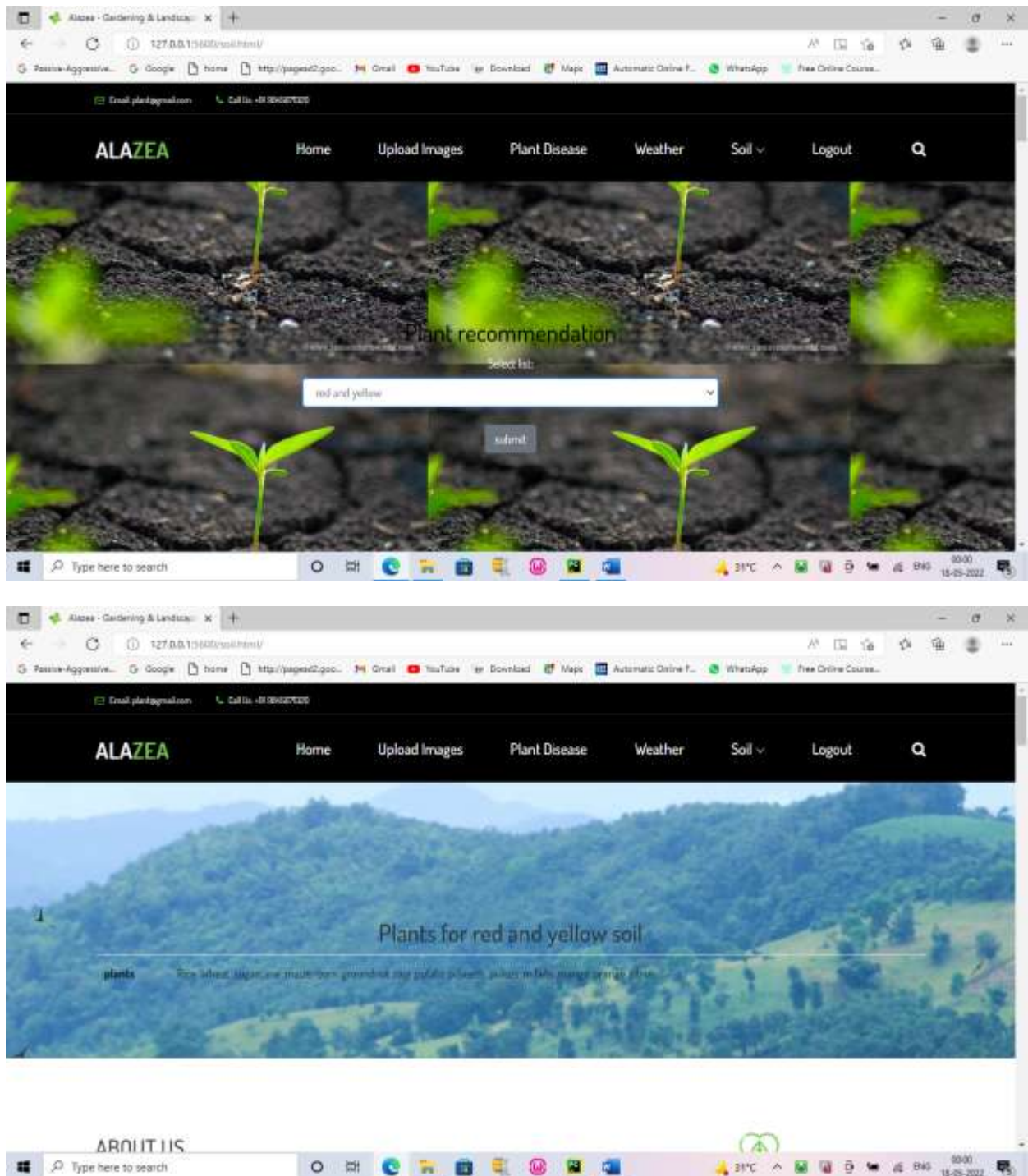


Figure 15 shows that plant cultivation. To select a soil in drop down menu and click, the result is based on selected soil.

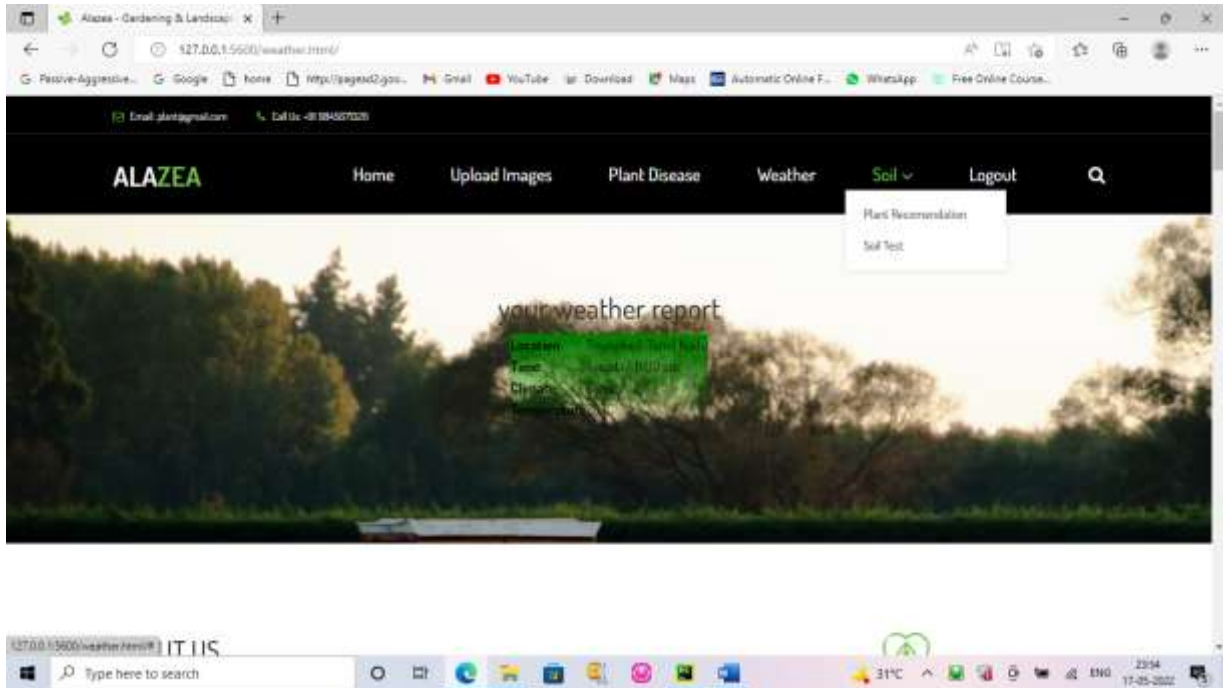


Figure 15 shows that to select soil test menu.

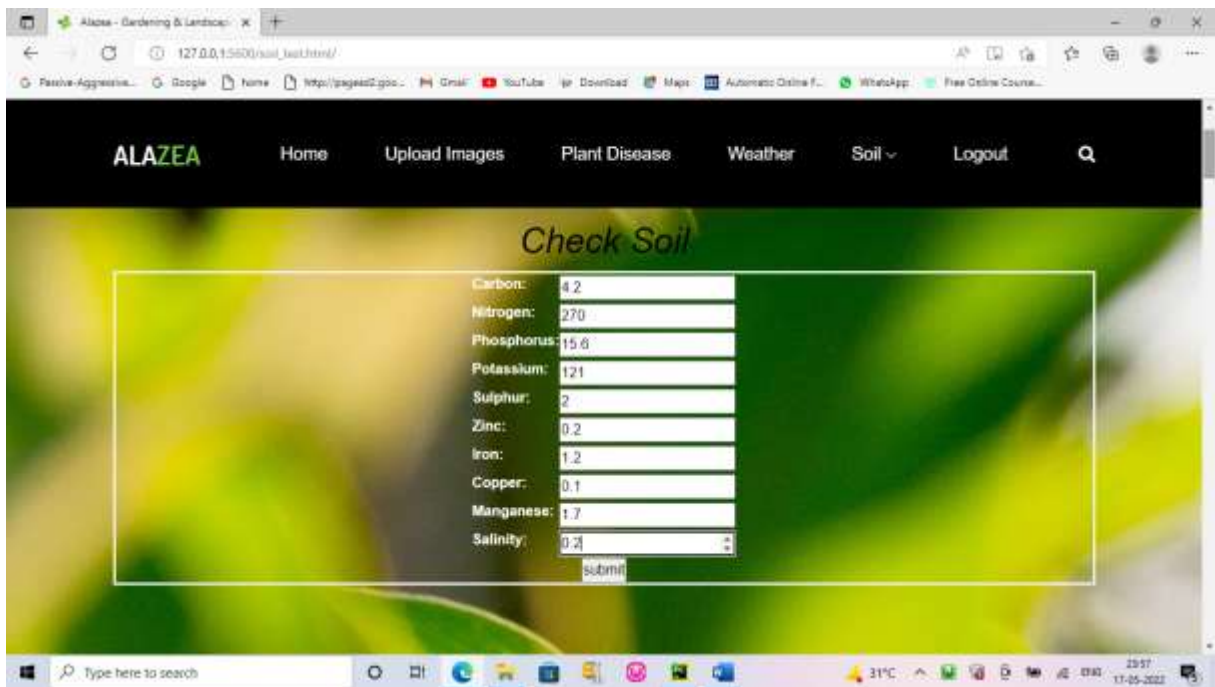


Figure 16 shows that to enter a soil report .

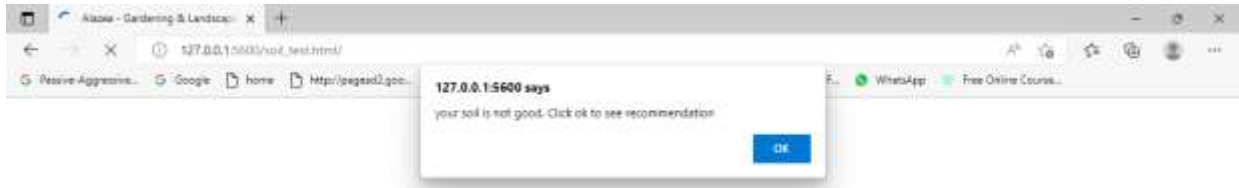
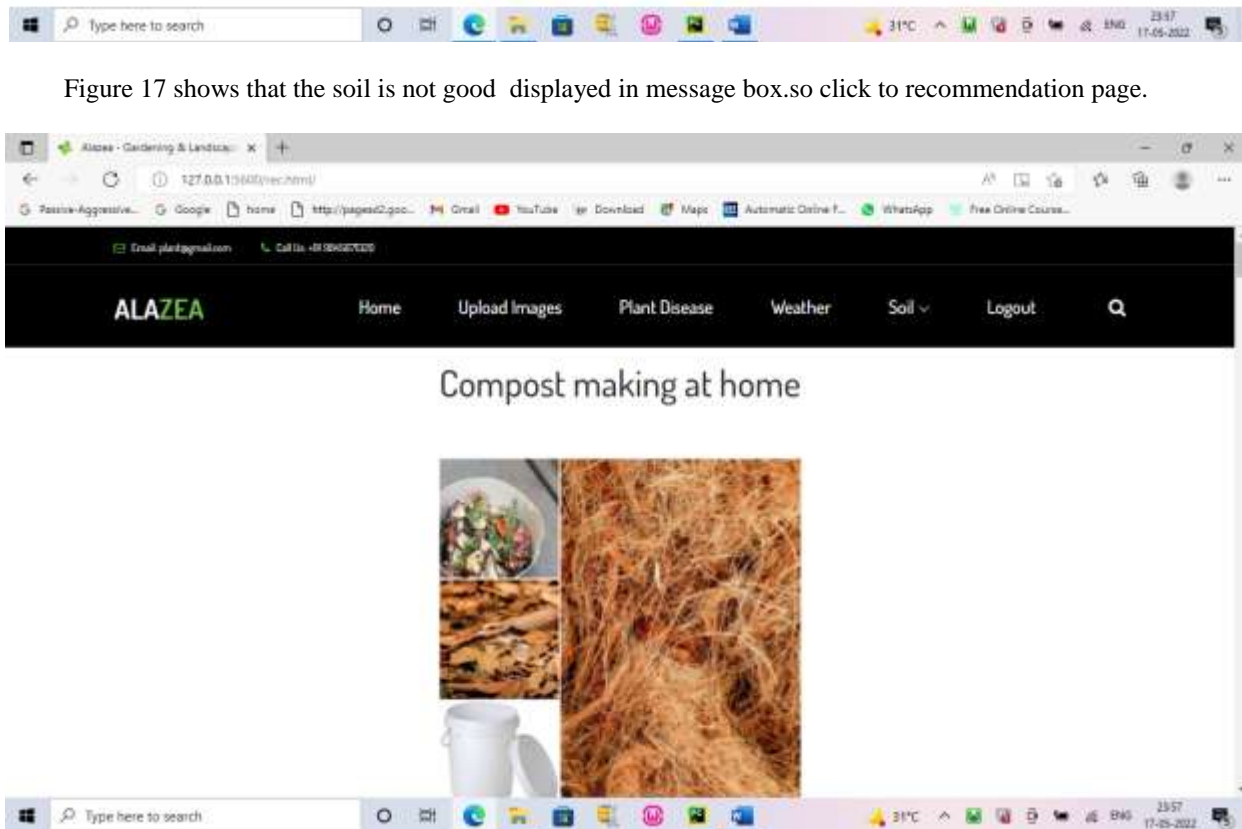
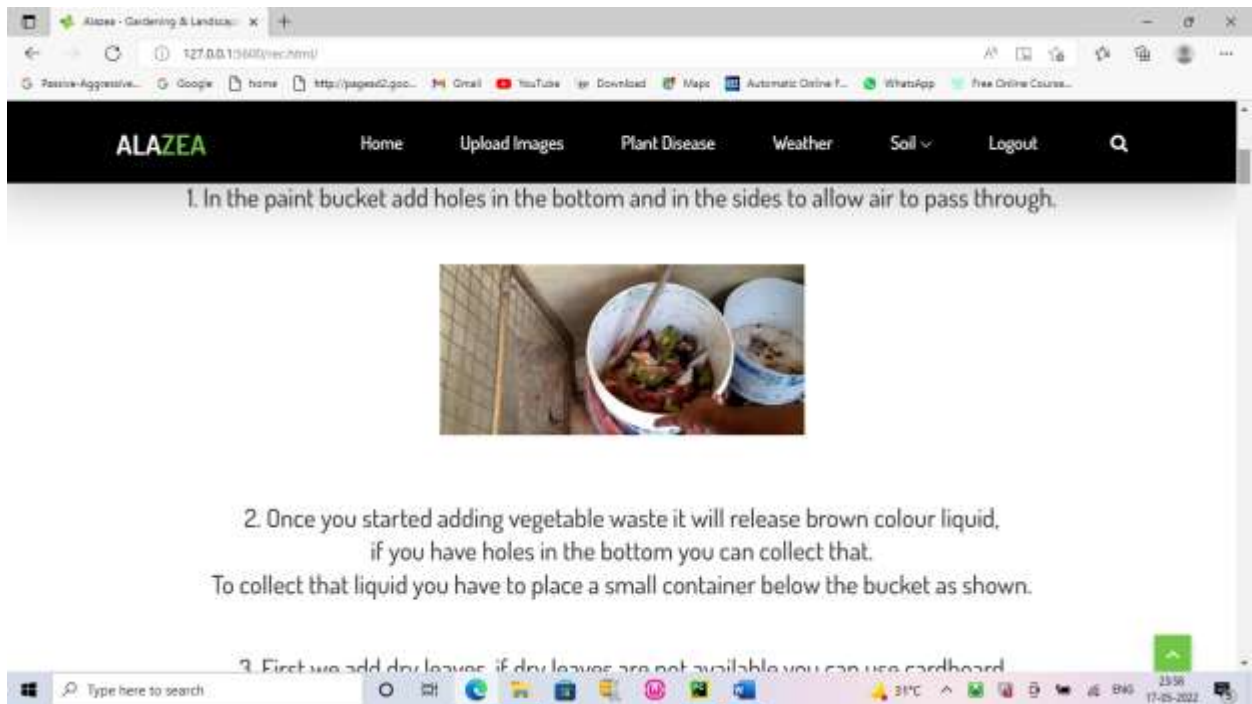



Figure 17 shows that the soil is not good displayed in message box. so click to recommendation page.





ALAZEA Home Upload Images Plant Disease Weather Soil Logout

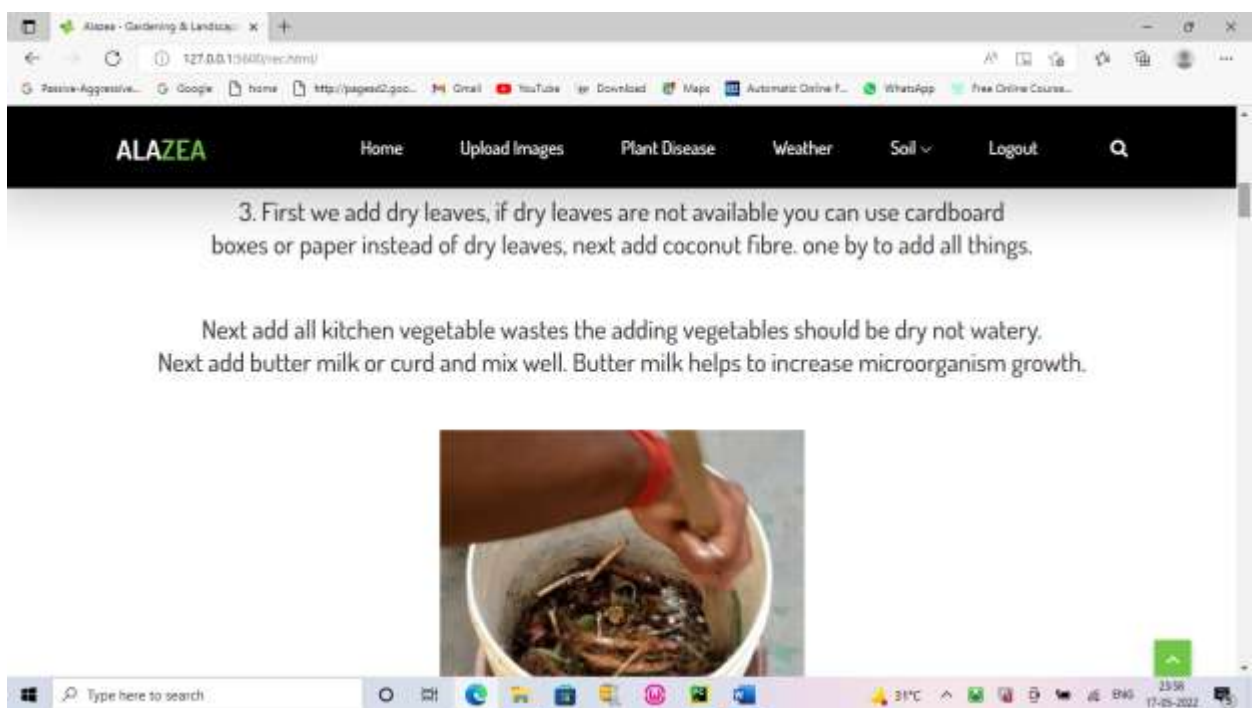
1. In the paint bucket add holes in the bottom and in the sides to allow air to pass through.



2. Once you started adding vegetable waste it will release brown colour liquid, if you have holes in the bottom you can collect that. To collect that liquid you have to place a small container below the bucket as shown.

3. First we add dry leaves, if dry leaves are not available you can use cardboard


Windows taskbar: Type here to search, 31°C, 13:58 17-05-2022



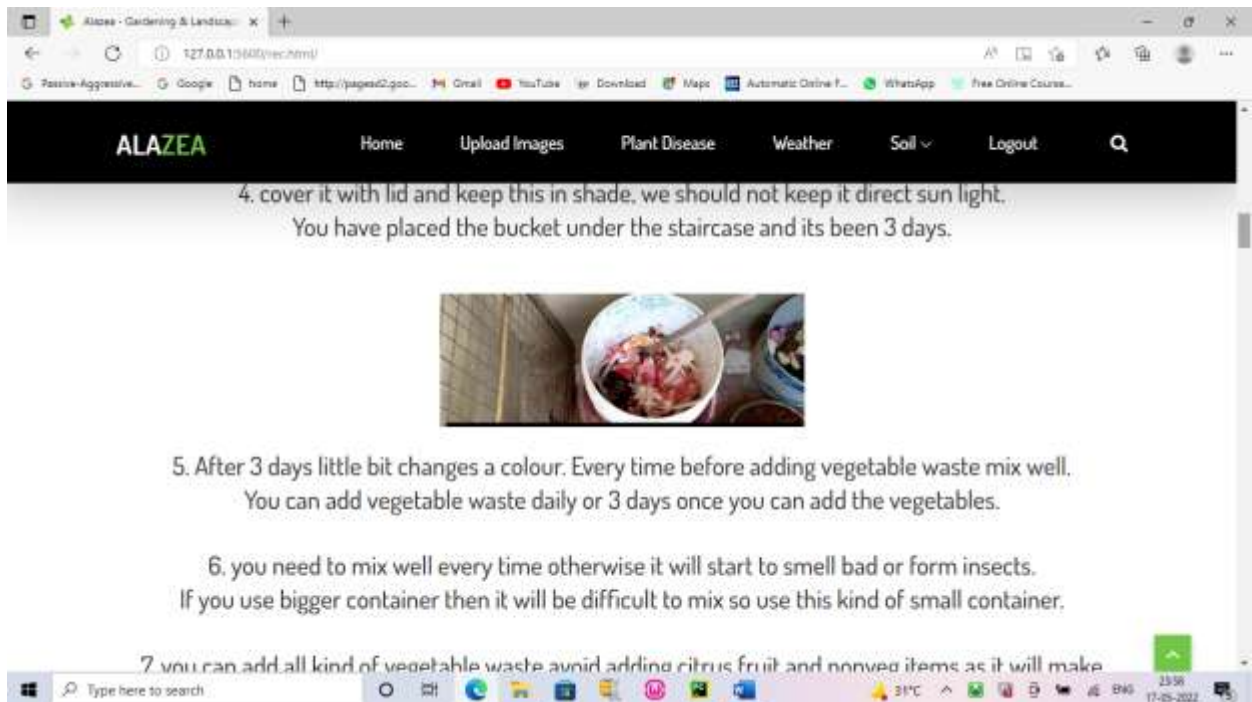
ALAZEA Home Upload Images Plant Disease Weather Soil Logout

3. First we add dry leaves, if dry leaves are not available you can use cardboard boxes or paper instead of dry leaves, next add coconut fibre. one by to add all things.

Next add all kitchen vegetable wastes the adding vegetables should be dry not watery. Next add butter milk or curd and mix well. Butter milk helps to increase microorganism growth.




Windows taskbar: Type here to search, 31°C, 13:58 17-05-2022



ALAZEA Home Upload Images Plant Disease Weather Soil Logout

4. cover it with lid and keep this in shade, we should not keep it direct sun light.
You have placed the bucket under the staircase and its been 3 days.

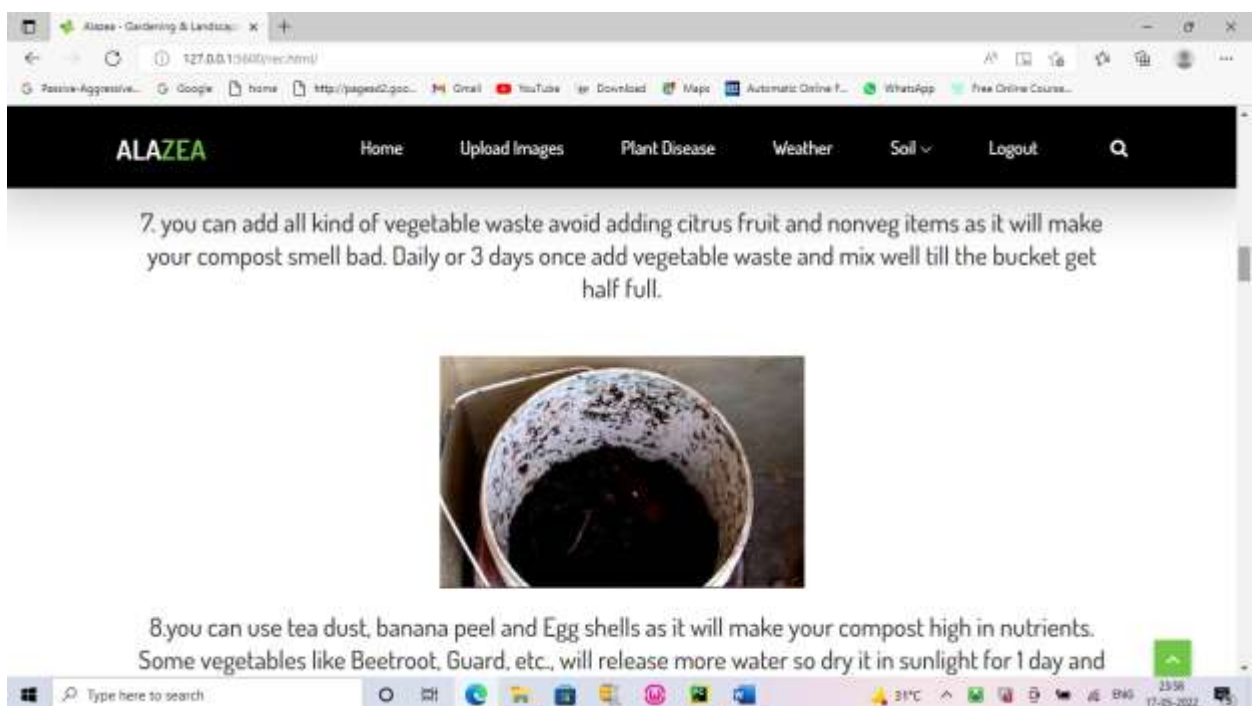


5. After 3 days little bit changes a colour. Every time before adding vegetable waste mix well.
You can add vegetable waste daily or 3 days once you can add the vegetables.

6. you need to mix well every time otherwise it will start to smell bad or form insects.
If you use bigger container then it will be difficult to mix so use this kind of small container.


7. you can add all kind of vegetable waste avoid adding citrus fruit and nonveg items as it will make

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ALAZEA Home Upload Images Plant Disease Weather Soil Logout

7. you can add all kind of vegetable waste avoid adding citrus fruit and nonveg items as it will make
your compost smell bad. Daily or 3 days once add vegetable waste and mix well till the bucket get
half full.




8. you can use tea dust, banana peel and Egg shells as it will make your compost high in nutrients.
Some vegetables like Beetroot, Guard, etc., will release more water so dry it in sunlight for 1 day and

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If the compost become over wet, you need to add dry leaves or wood dust or cardboard box. Before adding crush, the leaves as small and add. You need to maintain the right moisture un the compost then only it will help the microorganism to grow fast. If your compost is dry add very little water or butter milk and mix well




9. After one month you will see a brown colour liquid collects in the bottom container. Collect the

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ALAZEA Home Upload Images Plant Disease Weather Soil Logout

liquid (200 ml) and mix it with 20 litre of water and you add it to all plants.



10. its over 35 days now and the bucket is half full, from now on we don't need to add vegetable waste in it.

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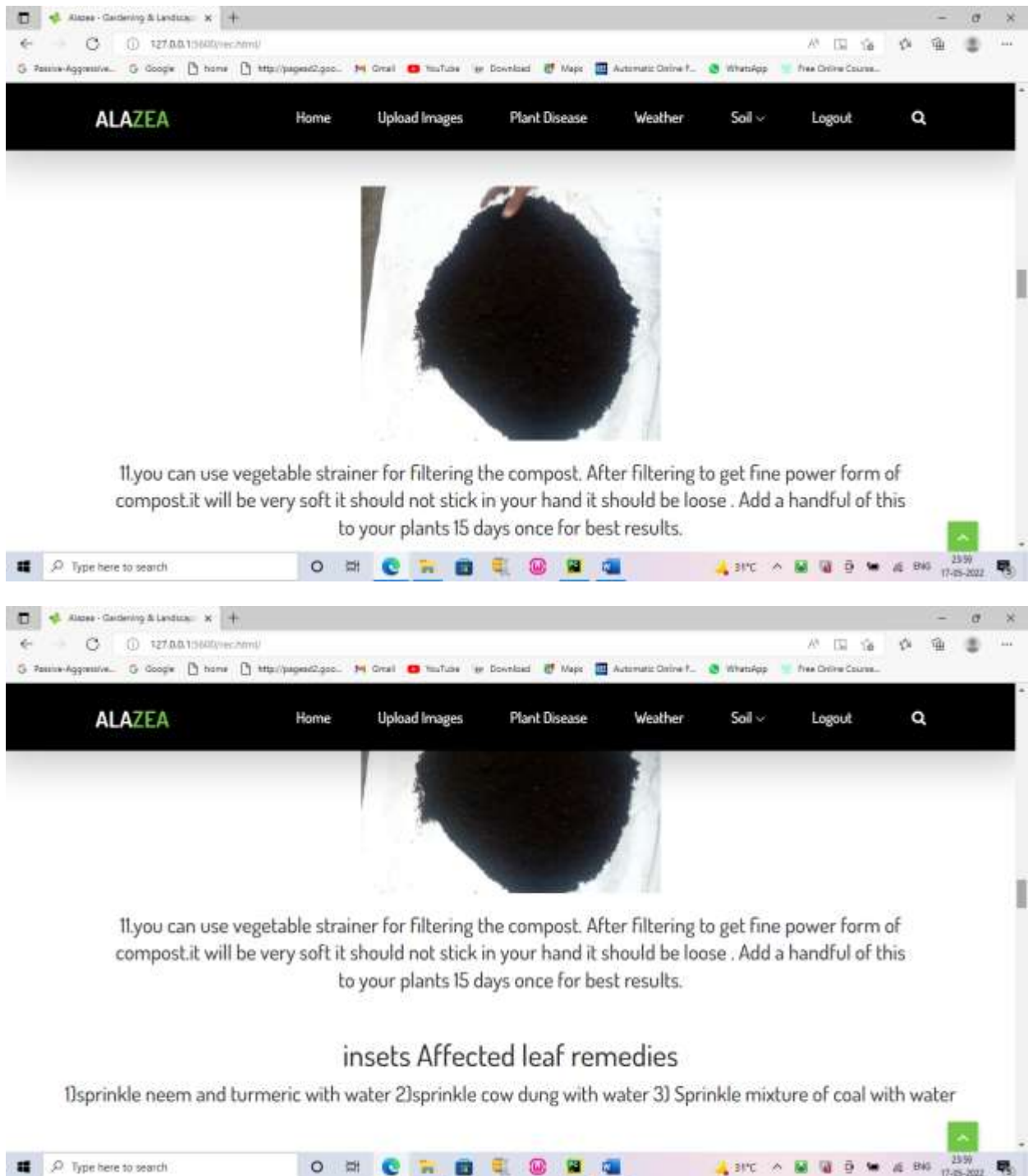


Figure 18 shows that suggest for soil and leaf improvement.

5. Conclusion

Protecting crops in organic farming is not an easy. In our application model convolution neural network is used to detect plant disease through via image of healthy or diseased crops plant leaves. Another part of our study has soil test. If soil is not good, remedies will be suggested. In future this application will be published in website and android apps.