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Guava Pest App to Assist Farmers

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Author's contribution

The sole author designed, analyzed, interpreted and prepared the manuscript.

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Review Article

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ABSTRACT

In this paper, Guava Pest App is designed to identify the several diseases in Guava at early stage. Guava Pest App is an innovative application that is useful for farmers.
The farmers can capture the images from Guava farm and upload the images. Guava API is created and placed in cloud services. Images taken from farmers field matches with Guava API and gets the TNAU recommendation for the Guava fruit diseases.
Guava Pest App for pest management in Guava will analyze and provide an accurate recommendation to farmers about the type of pesticide for the symptoms given through the images This paper expresses the idea about the creation of Guava Pest App, an android application that helps to make management decision for cotton leaf symptoms. The study would provide a better understanding of the management practice required for the Guava fruit disease.

Keywords: Bacterial blight; anthracnose; wilt; guava pest app; TNAU recommendation.

1. INTRODUCTION

Guava is an important fruit due to its exquisite advantages, it's far a spherical yellow tropical fruit with light green or mild yellow skin, and the coloration of its flesh varies from white or red to dark purple, and has purple or white flesh and tough fit to be eaten seeds. Guava belongs to the myrtle own family (Myrtaceae), native to Mexico which contains about 150 species of bushes and shrubs [1]. The guava has been cultivated and distributed with the aid of man, by

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means of birds, and varied four-footed animals for goodbye that its place of foundation is uncertain, however it's far believed to be a place extending from southern Mexico into or via imperative the us [2].

The guava is simple to apprehend due to it's easy, thin, copper- colored bark that flakes off, showing the greenish layer beneath; and additionally due to the appealing, "bony" factor of its trunk which might also in time reap a diameter of 10 in (25 cm). Young twigs are quadrangular and downy. The leaves, fragrant while beaten, are evergreen, opposite, quick-petiole, oval or rectangular-elliptic, truly abnormal in define; 2 three/four to 6 in (7-15 cm) long [2].

The guava fruit is replete with antioxidants and different nutrients like vitamin C and lycopene. it's far a powerhouse of fiber too. just one guava incorporates 126 mg of diet C, which meets a whopping 209% percentage of every day encouraged values. The fruit also carries 229 mg of potassium, 343 IU of diet A, and 27 mcg of folate [3]. Guava certainly is a powerhouse of vitamins. "This humble fruit is fantastically rich in antioxidants that are beneficial for pores and skin. Guavas also are rich in manganese that enables the body to soak up other key vitamins from the meals. Guavas advantages are credited because of the presence of folate, a mineral that allows sell fertility. However, 100 gm of guava carries just sixty-eight calories and 8.92 gm sugar, consistent with the records of USDA. Guavas are also rich in calcium, as they comprise 18 gm of the mineral in line with 100 gm of the fruit. It additionally carries 22 gm of magnesium according to one hundred gm of the fruit, as well as huge amounts of phosphorus and potassium- forty and 417 per 100 gm [4].

Guava, also referred to as "the apples of the tropics," is a common fruit with significant economic and nutritional value. It has a lot of vitamin C in it. For their medicinal benefits, guava leaf supplements in the form of capsules and leaf teas are widely used. These plants' illnesses can result in decreased production and losses in the variety and quality of the fruits. An important area of study is how to identify and categorise plant diseases [5,6]. The production of guava has, however, decreased recently because of fungi diseases. When diseases develop on plants, they are invisible to the naked eye. For the agro economy and, indirectly, human health, accurate and prompt disease diagnoses, followed by corrective actions, are essential. Agricultural experts typically observe disease through visual observation [7], and this ongoing need for expert oversight may be prohibitively expensive in developing nations.

Along with physiological issues like internal breakdown and fruit firm rot, diseases caused by deficiencies in nutrients such as zinc, magnesium, and other nutrients are also reported. Although the guava is a tough plant, it still has a number of serious diseases, including wilt and fruit rots, which leads to a significant loss in guava output both in India and overseas. A significant fruit of subtropical regions is the guava (Psidium guajava Linn.). It is a resilient crop that may flourish even on neglected soils. In addition to a few bacterial, algal, and a few physiological diseases or deficiencies, there are other infections, mostly fungal, that harm the guava crop. A total of 177 pathogens have been identified on various guava plant sections or in association with guava fruit, of which 167 are fungi, 3 are bacteria, 3 are alga, 3 are nematodes, and 1 is an epiphyte. A total of 91 pathogens have been found on fruits, 42 on foliage, 18 on twigs, 18 on roots, and 17 fungi have been found after fruit surface washing.

Various diseases, including Fruit rots prior to and following harvest (dry rots, wet rots, soft rots, sour rots, anthracnose, brown rots, ripe rots, scab, styler end rots, ring rots, pink rots, waxy fruit rots, etc.), canker, wilt, die back, defoliation, twig drying, leaf spot, leaf blight, anthrac [8]. In India, guava wilt is one of the most harmful diseases, and it causes a significant amount of damage. There are restrictions for the control of this illness because it is a soil-borne condition.

2. REVIEW OF LITERATURE

Systems with good knowledge already inside them are good expert systems. Knowledge is transferred to the computer via expert person or client input, and occasionally knowledge is directly obtained from the environment. There are many knowledge-based systems available today that handle specific problems or manage particular domains, but there are also many expert systems that were developed to identify agricultural illnesses like tomato, plant, and other diseases [9,10]. However, there is not a specific expert system for guava disease diagnosis that is free and uses the CLIPS language coupled with Delphi. Farmers and those who are interested

can use this expert method with ease. Due to the coordinated application interface, this is the case.

Using image-processing methods, Thilagavathi et al. [11] suggested a system for guava plant leaf disease identification. This system includes the use of colour transformation to make it easier to spot diseased spots, followed by classification using SVM and KNN. . From the Sargodha Region Garden, Rauf et al. [12] gathered a set of data on healthy and unhealthy citrus fruits and leaves. Citrus illness was discovered and classified by the author using the data set.

Good Expert Systems are systems with good knowledge existing inside them. The knowledge transfers to computer from expert person or client feedback, and sometimes knowledge can be acquired directly from the environment. Nowadays, there is a lot of knowledge-based system that treats a special problem or manages a certain domain; However, There is a lot of Expert System that were designed to diagnose agricultural diseases such as tomato, plant and others diseases [13].

3. GUAVA DISEASES

3.1 Wilt

The disease's first visible external sign is the terminal branch leaves turning a light shade of yellow and curled somewhat. Later on, plants display stinginess with yellow to crimson leaf browning. The result is an early fall in leaf shedding. Some of the twigs eventually dry up because they lose their leaves or blossoms and become naked. All of the damaged branches' fruits continue to be hard, rocky, and undeveloped. One of the most serious ailments affecting guavas, particularly in India, is guava wilt, which causes significant financial loss.

3.2 Anthracnose

Starting at one of the branch's tops, the plant starts to die backwards. Attacks on sensitive young shoots, leaves, and fruits happen quickly. The growing tip's once-green colour changes to a dark brown, then to black necrotic regions that expand backward, which causes the plant to wither and die. After a time of incubation in the diseased buds and twigs, the disease becomes increasingly apparent. At the intersection of the diseased and healthy portions, the previously produced brown patches eventually turn silvery grey.

3.3 Canker

The disease mostly affects green fruits, with leaves very occasionally being affected. The initial sign of infection on fruit is the emergence of tiny, brown or rust-colored, circular, necrotic patches that are not broken. At an advanced stage of infection, these areas tear up the epidermis in a cyclic fashion. A depressed area can be seen inside the lesion, and its margin is high. On fruits rather than leaves, the crater-like look is more obvious.

3.4 Algal Leaf and Fruit Spot

The alga stains the fruit and leaves, which lowers the plant's ability to photosynthesize. Small, shallow brown lesions first form on leaves; as the disease advances, the lesions grow to a diameter of 2–3 mm. On leaves, there may be tiny spots or large regions of colour. They could be strewn around or crowded. The most frequently affected sections of a leaf are its tips, margins, or regions close to the mid vein. The growth of fruits causes cracks to appear regularly on older blemishes. Only a few layers of cells beneath the epidermis are susceptible to fruit penetration.

Fig. 1. Guava Wilt

Fig. 2. Guava anthracnose

Fig. 3. Canker on the fruit

Fig. 4. Algal spots on leaves

3.5 Stem Canker / Bark Canker

The disease's initial signs include longitudinal fissures in the bark of stems or branches, which are noticeable after the rain. Typically, the disease starts with damaged bark. The sub-cortical region of scraping bark reveals brown to black lines or streaks. Large vertical fissures form and the damaged bark changes from dark brown to grey. The illness travels up and down the branches, eventually reaching the main stem and upper roots. The leaves on the encircled areas gradually start to turn bronze-purple. In the course of two to three years, completely encircled trees deteriorate and eventually die.

3.6 Leaf Blight

Blight manifests as tiny, round patches with a reddish rim and a dark brown core. These spots gradually become bigger and combine into massive necrotic patches in the advanced stages, which blights the area. On the necrotic areas, the fungus's fruiting bodies (pycnidia), which resemble minute, light brown to black pinheads, proliferate in vast numbers.

Fig. 5. Stem canker

Fig. 6. Leaf blight

4. DESIGN OF GUAVA PEST APP

4.1 Guava Pest App Algorithm

Guava Pest App architecture is shown in Fig. 7.

Step 1: Capture the image from farmer'sfield.
Step 2: Image may be capture by Camera or uploaded from gallery
Step 3: Guava API is created and placed in cloud services
Step 4: Images taken from farmers field matches with Guava API.
Step 5: Final recommendation to the farmers

4.2 Guava API

Python programming and a convolution neural network are used to construct the guava API. 80% of the images are for training, and 20% are for testing. 14,392 pictures were taken to detect leaf diseases. There are 12,062 training photos and 2330 test images. In order to assess the model's correctness, the guava API is assessed using an image taken from the guava field. The model's accuracy is 94.98%.

4.3 Output

Guava Pest App gives the TNAU management practice as recommendation. The Guava Pest App advisory was based on crop production guide 2020.

5. EXPERIMENTAL RESULTS

The Android operating system, with Oreo as the bare minimum requirement, was used to develop the Guava Pest App. An android app called Guava Pest App helps farmers recognize guava diseases such bacterial blight, anthracnose, wilt, canker, and stem canker. Guava Pest App offers an API with a model created in Python that assists in providing text-

based TNAU recommendations to guava farmers on leaf diseases.

Farmers begin communicating with Guava Pest App by sharing photos taken in the guava field using either their mobile device's camera or a computer's gallery (image already captured). On the app's home page, photos of illnesses including bacterial blight and anthracnose are displayed. The photographs are posted with the press of a button, and the farmers are advised to use TNAU. Guava API is used toidentify the leaf diseases from a field captured image. Guava Pest App displays the TNAU suggestion as text based on the leaf disease.

In Guava Pest App, the image of leaf, petiole, stem and fruits are captured through camera and gallery as shown in Fig. 9. Fig. 11 shows sample of 12 types of leaf diseases.

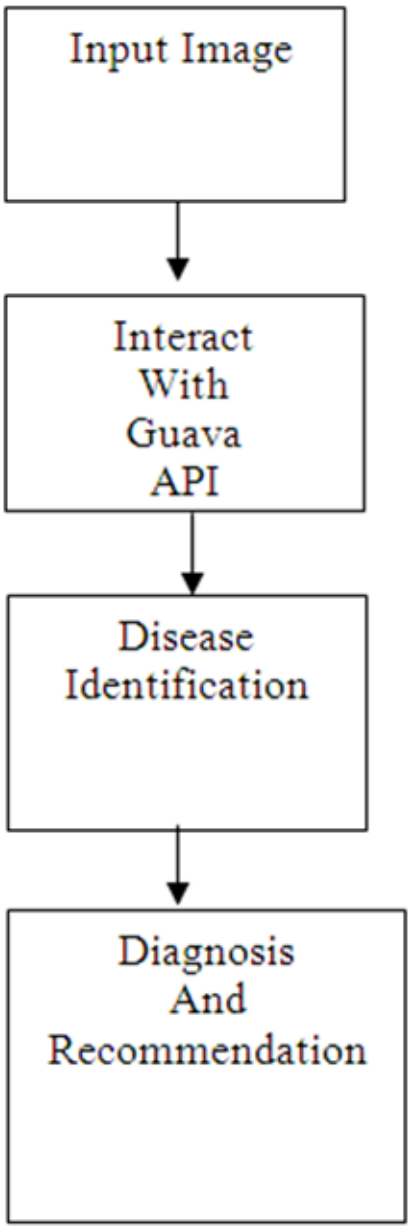

Fig. 7. Proposed architecture

Fig. 8. Home page

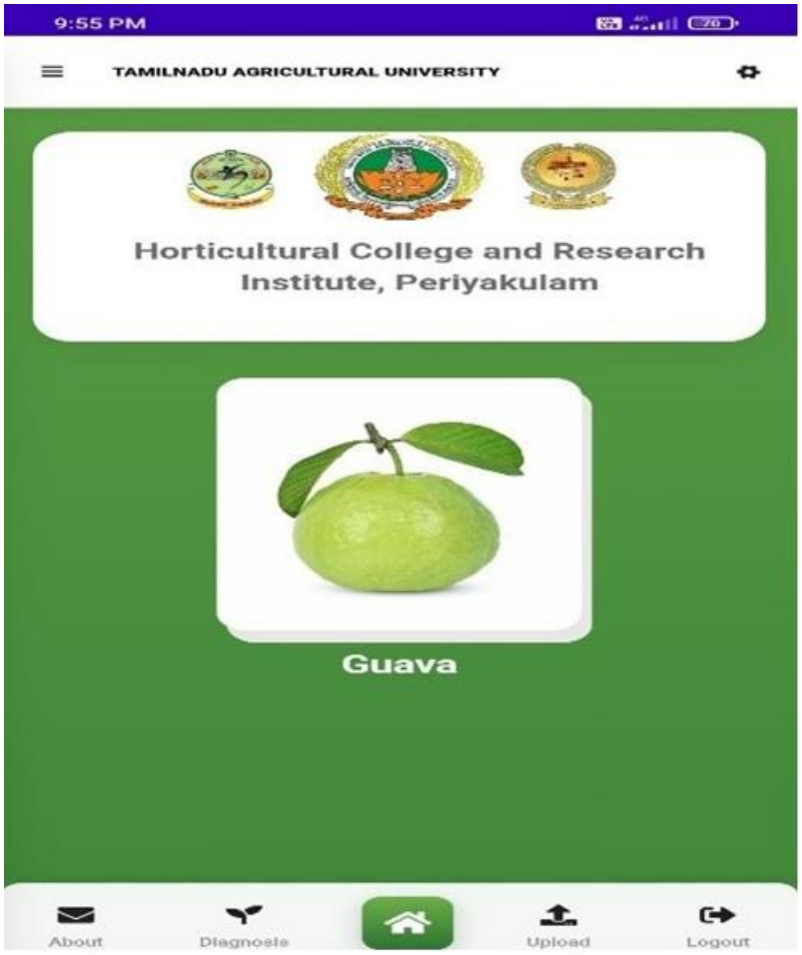

Fig. 9. Diagnosis page

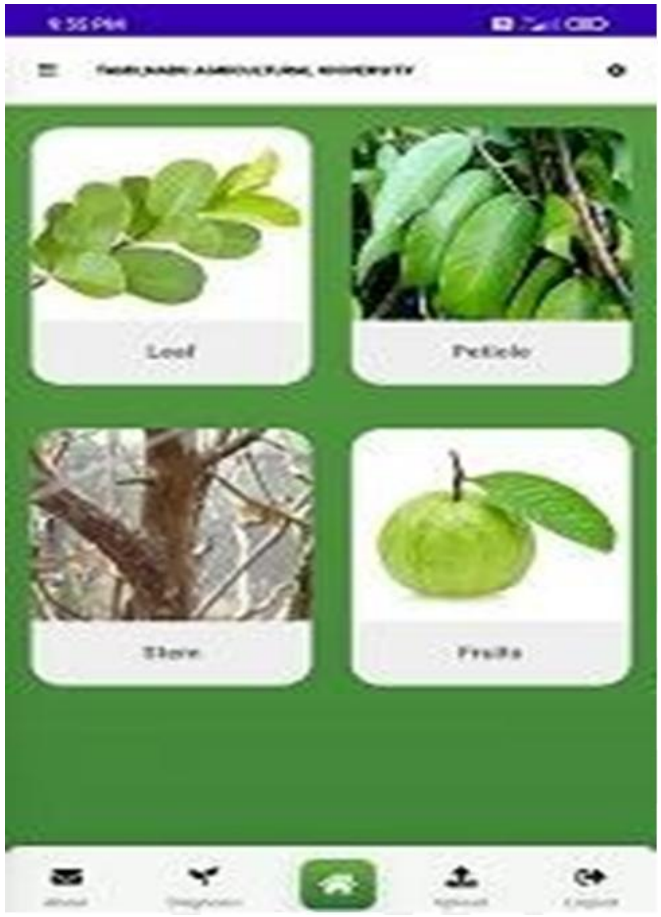

Fig. 10. Four types of diseases

Fig. 11. Sample of leaf disease

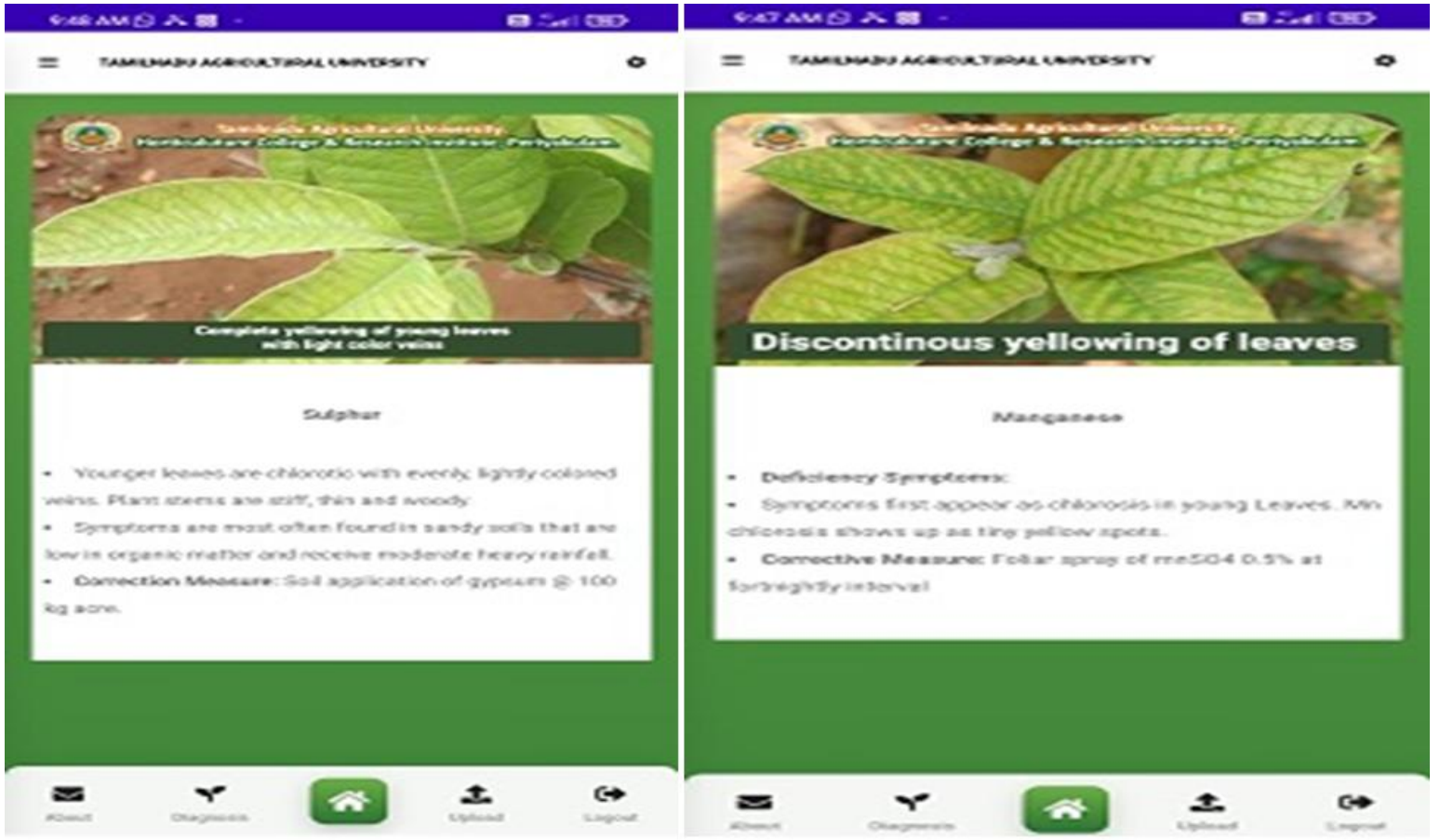

Fig. 12. Sample of leaf diagnosis

Fig. 13. Sample of Stem Disease

Fig. 14. Sample of stem diagnosis

Fig. 13 shows sample of 2 types of stem diseases and Fig. 14 shows sample of its diagnosis

Fig. 15. Sample of Petiole Disease

Fig. 16. Sample of Petiole Diagnosis

Fig. 17. Sample of Fruits Disease

Fig. 18. Sample of Fruits Diagnosis

The image is ready to match with Guava API is shown in samples uploaded. The image captured is compared with the Guava API and identifies the diseases. The disease identified from the API gives the recommendation as text to the farmers through Guava Pest App.

6. CONCLUSION

India is a predominantly agricultural nation. Information services that are mobile-enabled have become increasingly popular in recent years. This knowledge-based system offers a user friendly interface and does not require extensive skills.

The Guava Pest App's future functionality will include the full Guava disease, which will assist the farming community in disease early identification and lower the cost of pesticide application.

To make decisions about their farming operations, farmers require direction. Application of the necessary management practises at the appropriate moment will aid in raising the Guava's overall production. The Guava Pest App, an Android application that aids in management decisions for Guava leaf symptoms, is the subject of this essay. A better understanding of the management strategy needed for the guava illnesses will be provided by the study. The Guava pest control software will examine and accurately advise farmers on the diseases affecting the fruit. Farmers utilize the Guava App as a tool for decision-making. Compared to the conventional diagnosis, farmers can obtain a diagnosis more quickly and accurately.

DISCLAIMER

The products used for this study are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. In addition, the study was not funded by the producing company rather it was funded by personal efforts of the authors.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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