A Survey: Benefits of Mango Leaves and Techniques Used For Evaluvation of Diseases Affecting Mango Leaves

M.Prabu[1], Dr.Balika J Chelliah[2]

[1] Research Scholar, Department of Computer Science and Engineering, SRM Institute of Science and Technology, Ramapuram, Chennai, India
[2] Associate Professor, Department of Computer Science and Engineering, SRM Institute of Science and Technology, Ramapuram, Chennai, India
E-mail: [1]prabum@srmist.edu.in, [2]ballikaj@srmist.edu.in

Abstract: Agriculture plays a vital role in day to day life for the living organisms in all over the world. There are many plants are identified as medicinal plants in India. This survey aims to give a clear picture of the benefits of mango leaves, how it can be considered to be herbal medicine or home remedy for various diseases. But in spite of its numerous benefits these leaves are subjected to various types of diseases that are caused due to fungal infections. Along with the fungal infection there are climatic factors that affect the growth of these leaves resulting in less production, growth and quality. The factors such as light, temperature, nutrients, rainfall directly or indirectly influence the growth of the tree. Hence the mango leaves has been survived with detailed explanation of techniques in order to detect the diseases based on the factors and techniques that addresses all the existing issues and help in predicting the diseases well in advance.

Keywords: Fungal Infection, Machine Learning, Prediction

1. Introduction

Mango is the classic fruit available during summer which is liked by everyone irrespective of the age [25]. Along with the taste mangoes are considered to be very healthy which many of them are not aware. The fruit contains magnesium, copper and potassium also it's rich in Vitamin in A and C. May be some of them probably know this, but along with this healthy fruit there are much more benefits with its leaves. They act as an herbal medicine for a variety of diseases as it has immense mechanism in healing and curing infections in our body. Due to his medical value it has importance in eastern medicines too. Initially they look reddish, tender during younger stage of growth thereby keeps moving to dark green color under which the color seems to be pale. Their looks seem to be fresh and shiny always and it is rich in various amounts of proteins. [8] These leaves have high content of phenols and flavonoids due to which it has a high antioxidant nature. Due to these properties, the mango leaves are allowed to be boiled in water and made as a decoction which acts as a cure for certain diseases. In southern parts of Asia these leaves are powdered and taken, along with this in some parts they are cooked and taken as a part of normal food. There is some amazing cure done by these mango leaves. Along with the proteins it has antimicrobial and oxidant properties which help to treat various infections.

[18] The lists of benefits that are supported by mango leaves are listed below:

Blood Pressure - The leaves have antihypertensive properties which maintain the blood level at a stable rate. It is possible to make tea from the leaves which help to strengthen the blood vessels thereby lowers the blood pressure and helps in treating varicose veins.

Diabetes - Young and fresh tender mango leaves are rich in anthocyanins and tannis. This property helps in treating and managing diabetes. The leaves are taken, dried, powdered and used as infusion to maintain the same. The leaves are soaked in water at night, then morning it is taken in an empty stomach so that it controls the sugar level in blood. The other benefits including this are that they help in treating hyperglycemia, diabetic angiopathy and diabetic retinopathy. This all happens because ethyl acetate and 3beta-taraxerol is present in the leaves which react with insulin present in the blood and glycogen is stimulated.

Oral Problems - Oral hygiene or loosen gums often leads to bad smell by breathing. Take matured leaves and put them in water and boil for some time until it becomes yellow color, then add salt and let it settle down for some time. Once after it is settled down rinse the mouth with this water. When it is done the germs present in gums are been removed and helps to control bad smell from mouth.

Restlessness - Adding the leaves to the bath tub while bathing helps to removes the restless feel in our body, anxiety and refreshes our body. It is good home remedy to relax ourselves.

Fig 1.1 Tender mango leaves

Kidney & Gall bladder Stones - The leaves and dried and powdered. This powder is mixed with water in a tumbler and kept full night. Next day morning intake of this water helps in flushing out the stones present by breaking them.

Ear Aches - No one would be expected that these leaves can heal ear aches. [26] Juice extracted from the leaves, slightly heated and one or two drop inside the ear relieves all sorts of ear pains.

Skin Burns - Painful or sun burns can be healed by applying the ashes of mango leaves on the affected area. It heals the burn thereby makes the skin to look soft and shiny.

Respiratory Problems - These leaves are used to treat all sort of respiratory problems especially like cold, asthma and bronchitis. Mango leaves can be put inside water and allowed to boil until decoction is made. Honey added to this decoction helps in reducing the cough and ultimately recovers loss of voice.

Fig 1.2 Matured Mango leaves

Hiccups - Inhaling the smoke of mango leaves burnt, it helps to address the throat problems. People who are having throat issues and used for frequent hiccups can inhale this smoke which cures them in short span of time.

2. 2. Disease Affecting Mango Leaves:

Normally agriculture production reduces due to the diseases that affect the plants. When considering different types of diseases fungal diseases are most high which the leaves of the plants [18].Irrespective of particular part it affects the stem, fruits, vegetables, fruits and all products. The factors considered to be the key for these diseases can be categorized into two: Disorder and Disease. Diseases are caused due to the factors such as bacteria, fungi or algae but disorders are caused due to factors such as deficiency of nutrient, moisture level in soil, rainfall, temperature etc. Many diseases are common in mango leaves. [24] These diseases are identified if the cultivation is done in smaller rate. In case of larger area of cultivation farmers are not able to identify the diseases and hence it affects the crop and loss is at greater rate. To stop this effect farmer's use a large amount of pesticide which in turn makes causes threat for life. [26]Certain main fungal diseases are elaborated in detail:

Powdery Mildew Diseases – Oidium Mangiferae: This type of disease is caused by the fungi Oidium Mangiferae, a plant pathogen. The mango tree is set to be the host of this. This can be identified when the leaves are found to develop a white powdered growth on the leaves. It can be seen on inflorescence, leaves and in young growing fruit. Due to this disease flowers keep falling immediately, fresh young fruits present in tree for long time and drop before maturing. This affects the crop loss in a range of 20%-80%.

Anthracnose/Blossom Blight - This disease is mainly caused by Glomerella Cingulata. In leaves, it is seen as brown or black irregular shape or oval spots on both upside and down and large form is formed near the leaf margins [3]. Leaves when affected very severe starts to curl. The young, tender and fresh leaves are more affected when compared to the matured, old leaves. This cause's heavy damage to crop loss as it takes around 10% - 90% of loss.

Fig 1.3 Powdery Mildew

Fig 1.4 Anthracnose

Alternaria Leaf Spot – Alternaria Alternata -On the surface of the leaves a small, circular brown color spots are identified. More than the upper sides of the leaf a large amount

508

are founder at the bottom of the leaves. This is found over the leaf lamina and fresh leaves gets affected more when compared to old leaves.

Bacterial Canker – Xanthomonas mangiferae - This infection is caused by xanthomonas mangiferae. In apex, lesions are crowded which are seen to be water soaked irregular shapes. [18] In young fresh leaves they are more whereas at old leaves they are visible only in light. When this condition is sever the leaves turn into yellow color and fall from tree.

Die Back – Lasiodiplodia Theobromae - This type of diseases is seen throughout the year but found to be very severe during the month of October and November. They can be identified by symptoms such as; the leaves at upper end keep losing the color gradually, finally dry and fall from the trees. When drying is done at last extent the full leaf is rolled upward the leaf margin.

Fig 1.5 Alternaria Leaf Spot

Fig 1.6 Bacterial Cankers

Fig 1.7 Die Back

3. Factor Influencing Fungal Diseases

The key factors that cause these types of diseases can be broadly categorized into two ways. They are Disease and Disorder.
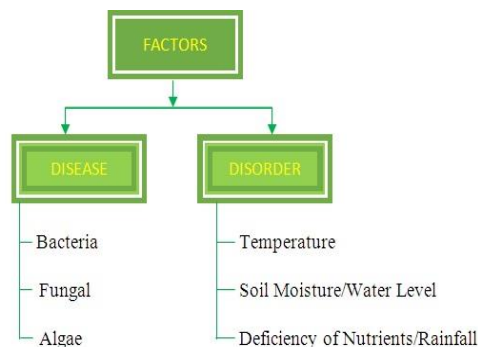

Fig 1.8 Factors affecting the crop

From the above diagram it is very clear that disease and disorder are two different regions which affect the overall growth of mango production. [3] Various means or sources that bring in diseases are due to bacteria's, fungal activity or algae production. Previous sections we briefly saw what are the different fungal attacks on trees and their outcome diseases in detail. In this section the remaining factors that cause the disorder are dealt in detail. Major four things considered here which will be influenced by the climatic factors are;

Temperature - Fruit maturity and quality is the main two features that are influenced by this factor. When the temperature stands <12ºC and >44ºC the ovules of mango fruit gets aborted. The temperature decides the stability of entire tree, withstanding nature of leaves without withering. This varies from region to region and cannot be fixed to certain degree stating that in this temperature the mango trees, leaves and fruits are not affected.

Light -The major development of fruit and leaves lies in this factor. This is sole responsible for photosynthesis, which determines the carbohydrates to be accumulated. When there is enough amount of light there is increase amount of leaf which is directly proportional to cultivation of fruits. It is stated that enough amount not excess amount of light.

Rainfall - This factor influences the stability nature of the entire tree including its leaves and fruits. The leaves and fruits to be matured depend on this factor majorly. When the range of rainfall is from 75cm to range of 350cm the growing is said to be successful. But the rainfall should not be in time of blooming season and setting of fruit. In case of water logging the leaves start to spoil thereby directly affects the entire set of production. The weather is set to be dry atleast for a period of four moths during which flowering and harvest can be focused more.

Nutrients -Young growing trees need enough nutrients so that they can go rapidly thereby produce flowers and fruits. But incase of excess nutrients such as nitrogen, it affect the leaf: fruit ratio that makes the fruit color to be affected. When the ratio increases the severity of diseases increase and all parts of the tree are prone to be diseased.

4. Analysis Of Existing Techniques:

In tool learning (ML), deep studying (DL) profits a good deal hobby inside the last few years and finished promising consequences on big datasets. This deep learning is used out to examine various tool learning with health benefits, monitoring of surveillance and in need of agriculture. In crop based cultivation, this display advanced standard overall evaluation by means of correctness, overall performance on large datasets. Learning in deep is just like neural networks that consider the facts of theory of convolution based on dependencies flow. In this, the capabilities are retrieved from the given facts and research more green as compared to hand-crafted features. Similarly, it solves complicated problems more successfully and decreases the mistake fee.This version holds a several techniques which include various techniques that manipulate and find the exact situation present [21]. In this, authors delivered connectivity in accordance with neural networks that totally technique it truly is relies on these methods which include alexnet, VGG, AlexNetOWTBn, overfeat, and googlenet. The brought models are assessed which makes on a cutting-edge storage container that includes different illnesses of leaves that is considered for wholesome and perilous. The AlexNetOWTBn approach carries out nicely in properly as examine to extraordinary strategies in phrases of sophistication accuracy. Further image processing, Segmentation of a image manner to section the picture into several components. The most commonplace meaning of dividing is to find out the location of hobby (ROI) in the photograph. The identical pixels are mixed as part, the section occur is within the input image. In cultivation of crops, numerous sicknesses are holding inside the leaves and end result.

K-mean clustering approach is used for dividing the parts. This is carried out into different parts [1]. The group is a fixed of pixels which can be near to each other and stands different with exclusive cluster values. Further other techniques are done by researchers to find optimal values. This technique consist of an Otsu method for picture firmness, cutting and grouping based on k-means algorithm to category and asses the images holding out lesions[12]. The NN classifiers inclusive of different methods are applied to categorize different illnesses. The opposite sicknesses which include different types of tree illness that can be applied and detected using various classifier techniques.

K-Nearest Neighbor is used to process the negligible separation the different genuine situations to the next job. The position is to figure the hole of question picture to all tutoring pics and chooses the near factor for example having insignificant separation. Further, appraisal paper of various kind plans utilized for leaves of plant infections personality comprehensive of KNN, ANN, SVM, PCA, PNN, fluffy rationale and hereditary calculations. The class is a plan while leaves are distinguished dependent on remarkable genetically capacities. The infections characterization to have an immense utility specifically zones which incorporate agribusiness and natural examinations, and so on [13]. The creator present another plan principally based at the mechanized white dependability in pictures. For division, the influenced area used the Euclidean Distance approach and afterward did the K-Nearest mates classifier for the classification thought process. In this the creator [18] depicts another procedure for leaves illness to analyze dependent on the shading space change structure. Inside the division, the influenced region applied the alright methodology grouping after which actualized the GLCM and Gabor Wavelet adjust highlights, which moreover the use of this classifier for the characterization design [14]. Other researchers present a fresh out of the box new methodology utilizing subjective covering capacities and the excited region of pics used the utilization of K- Nearest companions and Adaptive Bayes classifiers.

Support Vector Machine is utilized for working with non-directed values. Further can be said for two instructions elements; but, unfortunately growth of this method represents to stand as for variant-class aspect via competition of every kind [14]. It's likewise used for the selecting the choice. SVM worked about levels. The first is a disconnected area, where training framework is introduced the utilization of the association of cells needing to be showered or now not splashed and furthermore the decision activity is done. Next as second most is the segment, where determination making process is introduced for all most recent approaching cells, relies upon the choice activity finished in disconnected segment. Some other MSVM classifier is made use of on par with SVM for categorization and education technique.Yuan along with set of researchers [15] came up with ID for device that helps of wheat leaf afflictions the utilization of SVM based absolutely different classifier machine. Major four sicknesses are accumulated which incorporates leaf rust, Puccinia striiformis, leaf scourge and fine buildup on this examination artworks. The tinge, surface and shape trademark is registered which further used in instruction set for the three classifiers. This system is isolated into three first segments which incorporate enter realities, trademark extraction, and classifier. MC-SVM machine incorporates the assortment of the classifier which may also convey effective class exactness.

Segmentation and Classification of images using classifiers - Pictures of different leaves are gained utilizing an advanced camera. At that point picture preparing methods are applied to the gained pictures to separate helpful highlights that are vital for additional examination [17]. From that point onward, a few expository strategies are utilized to arrange the pictures as indicated by the particular issue within reach. To

start with, initially pixels holding the values of RGB moved or converted to the portrayal such that it can take up values of HIS shades. By doing so, the region of influenced area makes in determining the hues based on standard term, by and large acknowledged ways. HSI (shade, immersion, force) is a best described model that makes it as fit since it considers the discernment values as on par with human [18]. Shade is shading ascribe that alludes to the predominant shading as seen by a spectator. The region of spaces that are shaded keeps moving over when compared to other in given space. Then considering change steps, the H part is taken as assumption as or for additional examination.

5. Challenges To Be Addressed

The essential detriment in the front line works of art is the history relied photo handling. for example for the term of the picture securing, leaf legacy should composed in this kind of way that it presents adequate appraisal to the leaf and the ailing piece of the leaf with the goal that a legitimate division might be performed. The predetermination work interests at continuous picture procurement immediately in the agrarian control and the execution must be competent to recognize the legacy and the leaf zone. Execution of the automated arm is intentional as fate advancement to this exploration topic. This execution gives an independent robot which may be fit for overview the rural field and recognize the sickness of the verdure. The recognized sicknesses can be consequently refreshed to the turmoil database which would be imparted to the rancher. The vehicle conveying the mechanical arm will be a tractor if there should be an occurrence of the fields with roomy vegetation like mango. If there should arise an occurrence of the elective yields where the tractor can't move in the order, a line following robot is completed [mini undertaking of the course] to hold the robot arm. There is no uncommon course of action expected to make the strains in the field for mechanical movement, trickle water system pipes utilized inside the order will give the course to the automated movement inside the control.

6. Conclusion

In existing, various machine learning algorithms are used to predict the type of diseases occurred in the plants. A set of data is taken as training data and system is trained with various classification algorithms. Once after training it is applied and tested with test data which predicts the type of diseases occurred. Other way the image processing methods are utilized where the system is preloaded with various set of images in which both affected and non affected leaves are present. When an image is given as input it extracts the features of input image matches with the image in database and predicts the disease occurred. Hence all these approaches

help out in predicting the type of disease rather than prior prediction.

Understanding various medical effects of mango tree leaves it has become a challenge for researchers to come up with various solutions that can be used for the early detection of these diseases and to work with the factors at a sustainable environment. But it is well known that the climatic factors cannot be changed as it is not in our hand. Whereas other factors that causes the diseases can be controlled and can be predicted at an early stage.

We propose a system for future work that will be able to address the existing problems. The proposed approach will be able to address the following features; Nutrients level for prediction, monitoring levels, threshold value, prior prediction and prediction accuracy. The system will be able to analyze the nutrient levels for each diseases then fixing up threshold value so that above and below may rise to a set of problems. By doing this process we will be able to predict the type of disease may occur well in advance. The results can be compared to measure the accuracy level.

References

[1] Z. Iqbal et al., ``An automated detection and classification of citrus plant diseases using image processing techniques: A review,'' Comput. Electron. Agriculture.vol. 153, pp. 12_32, Oct. 2018. doi: 10.1016/j.compag.2018.07.032.

[2] S. S. Chouhan, A. Kaul, U. P. Singh, and S. Jain, ``Bacterial foraging optimization based radial basis function neural network (BRBFNN) for identi_cation and classi_cation of plant leaf diseases: An automatic approach towards plant pathology,'' IEEE Access, vol. 6, pp. 8852_8863,2018.doi: 10.1109/ACCESS.2018.2800685.

[3] Jayaprakash Sethupathy , Veni S, "OpenCV Based Disease Identification of Mango Leaves", International Journal of Engineering and Technology (IJET), Vol 8 N0 5, pp.1990-1998, Oct-Nov 2016. doi: 10.21817/ijet/2016/v8i5/160805417

[4] S.S.Chouhan, A.Kaul, and U. P. Singh, ``Soft computing approaches for image segmentation: A survey,'' Multimedia Tools Appl., vol.77, no.21, pp.28483_28537, Nov. 2018. doi: 10.1007/s11042-018-6005-6.

[5] Stephen Gang Wu, Forrest Sheng Bao, Eric You Xu, Yu-Xuan Wang, Yi-Fan Chang and Qiao-Liang Xiang (2007) "A Leaf Recognition Algorithm for Plant Classification Using Probabilistic Neural Network" arXiv:0707.4289v1

[6] J. Ding, B. Chen, H. Liu, and M. Huang, ``Convolutional neural network with data augmentation for SAR target recognition,'' IEEE Geosci. Remote Sens. Lett., vol. 13, no. 3, pp. 364_368, Mar. 2016. doi: 10.1109/LGRS.2015.2513754.

[7] PradnyaRavindra Narvekar, Mahesh Manik Kumbhar, S. N. Patil (2014) "Grape Leaf Diseases Detection &

Analysis using SGDM Matrix Method" International Journal of Innovative Research in Computer and Communication Engineering, Vol. 2, Issue 3, March 2014

[8] Dambreville, Anaelle. (2012). Growth and development of mango tree (Mangifera indica L.) in natura : experimental approach and modeling of the effect of an exogenous factor, the temperature, and architectural endogenous factors.

[9] Ji-Xiang Du, Xiao-Feng Wang, Guo-Jun Zhang, (2006), "Leaf shape based plant species recognition", Applied Mathematics and Computation 185 (2007) 883–893 isra,A.K.(1995).

[10] Control of bacterial canker of mango under suitable weather conditions. Indian J. Mycol.PI. Pathol.25:214-217

[11] Ram, S. (1993). FACTORS AFFECTING MANGO TREE ARCHITECTURE. Acta Hortic. 341, 177-191doi: 10.17660/ActaHortic.1993.341.18

[12] Al Bashish, Dheeb, Braik, Malik, Bani-Ahmad, Sulieman, 2011. Detection and classification of leaf diseases using K-means-based segmentation and Neural Networks. Inform. Technol. J. 10 (2), 267–275.

[13] Prasad, S., Peddoju, S.K. & Ghosh, D. Multi-resolution mobile vision system for plant leaf disease diagnosis. SIViP 10, 379–388 (2016).

[14] Haidar, Abudulhamid, Dong, Haiwei, Mavridis, Nikolaos, 2012. Image-based date fruit classification. In: 2012 4th International Congress on Ultra Modern Telecommunications and Control Systems and Workshops (ICUMT), 3–5 Oct 2012, pp. 357–363.

[15] Li, Hui, Ji, Ronghua, Zhang, Jianhua, Yuan, Xue, Hu, Kaiqun, Qi, Lijun, WEB based intelligent diagnosis system for cotton diseases control. In: International Conference on Computer and Computing Technologies in Agriculture. Springer, Berlin Heidelberg, pp. 483–490.

[16] Ayane, Swapnil S., Khan, M.A., Agrawal, S.M., 2013. Identification of nitrogen deficiency in cotton plant by using image processing. Int. J. Pure Appl. Res. Eng. Technology, 112–118 ISSN.

[17] S.Arivazhagan, R.Newlin Shebiah*, S.Ananthi, S.VishnuVarthini," Agricultural Engineering International : The CIGR e-journal · January 2013", Vol 15, No.1, Pg. No.211-217

[18] Singh, Vandita & Musthafa, Mohamed Essa & Waly, Mostafa & Ali, Amanat & Guizani, Nejib & Guillemin, Gilles. (2012). "Mango (MangiferaInfica Linn) and its Health Benefits."

[19] Arivazhagan, S., R. N. Shebiah, S. S. Nidhyanandhan, and L. Ganesan. 2010. Classification of citrus and non-citrus fruits using texture features. Computing Communication and Networking Technologies, ICCCNT-2010.

[20] K. Aurangzeb, F. Akmal, M. Attique Khan, M. Sharif and M. Y. Javed, "Advanced Machine Learning Algorithm Based System for Crops Leaf Diseases Recognition," 2020 6th Conference on Data Science and Machine Learning Applications (CDMA), Riyadh, Saudi Arabia, 2020, pp. 146-151, doi: 10.1109/CDMA47397.2020.00031.

[21] Alex Krizhevsky et al., "ImageNet Classification with Deep Convolutional Neural Networks," in Advances in neural information processing systems, vol. 25(2), 2012, DOI: 10.1145/3065386.

[22] J.Ding, B.Chen, H.Liu and M.Huang,"Convolutional Neural Network with Data Augmentation for SAR Target Recognition," in IEEE Geoscience and Remote Sensing Letters, vol. 13, no. 3, pp. 364-368, March 2016, doi: 10.1109/LGRS.2015.2513754.

[23] M. Volpi and D. Tuia, "Dense Semantic Labeling of Subdecimeter Resolution Images with Convolutional Neural Networks," in IEEE Transactions on Geoscience and Remote Sensing, vol. 55, no. 2, pp. 881-893, Feb. 2017, doi: 10.1109/TGRS.2016.2616585.

[24] Fernández Ponce, María & Casas Cardoso, Lourdes & Mantell, C. & Martinez de la Ossa, Enrique. (2013). Potential Use of Mango Leaves Extracts Obtained by High Pressure Technologies in Cosmetic, Pharmaceutics and Food Industries. Chemical Engineering Transactions. 32. 1147-1152. 10.3303/CET1332192.

[25] Multifaceted Health Benefits of Mangifera indica L. (Mango): The Inestimable Value of Orchards Recently Planted in Sicilian Rural AreasMarianna Lauricella, Sonia Emanuele, Giuseppe Calvaruso, Michela Giuliano, Antonella D'AnneoNutrients. 2017 May; 9(5): 525. Published online 2017 May 20. doi: 10.3390/nu9050525

[26] Om Prakash "Diseases and Disorders of Mango and their Management" S.A.M.H. Naqvi (ed.), Diseases of Fruits and Vegetables, Volume I, 511-619. © 2004 Kluwer Academic Publishers. Printed in the Netherlands.

[27] Yahia, E. M. (2011). Mango (Mangifera indica L.). Postharvest Biology and Technology of Tropical and Subtropical Fruits, 492–567e.

[28] Sujatha, S.; Saravanan, N.; Sona, R. "Disease identification in mango leaf using image processing" in Advances in Natural and Applied Sciences April 2017.

[29] Gowri Shankar V, Arun kumar S, Dr. Balika J Chellial"Multiple Object Detection Using Mask R-CNN in Deep Neural Network" International Journal of Advanced Science and Technology Volume 29 No 5,Pg. no.3677-3683,2020