

Studies and Development of Late Blight Disease Prediction model for Climate Change and Co-related Worldwide Weather Information

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Abstract – India is the very highly dense country according to population wise. In the next future, we shall require a good quality food with very huge amount for the large population. Presently, in agriculture we have face lot of problems due to natural disaster like flood and no rain fall. Agriculture is a very vast and active research area without agriculture we can't imagine the life on the earth. In this paper, we shall focus on the diseases of the plants for detection and prevention. Recently Internet of things and Artificial intelligence are very much useful for resolving the research issues in every field. In this work, we shall focus on the “late blight of potato”, it's a worldwide disease in many vegetables such as eggplants, bell peppers, potatoes, tobacco, and tomatoes.

I. INTRODUCTION

Providing a good quality and quantity food for huge population of India is one of the most important problems in the 21st century. The first is that the resources are limited and the second is that they have been accused of causing climate change & global warming due to the pollution, population and many other environmental changes. “**Late blight**” is the most significant disorder of potatoes in worldwide and can completely destroy a crop.

The potato crop was first domesticated within the region of modern-day southern Peru and extreme north-western Bolivia between 8000 and 5000 BC. It's since spread round the world and become a staple crop in many countries. Late blight is a significant fungal disorder of potatoes caused by *Phytophthora* infectants [1, 2]. It is worldwide in its

distribution. It occurs in potato growing areas of the world. Winter is the main potato growing season in India. It is followed by hot summer months in the plains. The drought and high temperature kill the fungus in the soil. The late blight epidemics are thus rare in the plains in India. It is destructive to the crop grown in the rainy season [3]. The disease occurs annually in the cooler Himalayan regions extending from Assam to Kashmir at an altitude of 6,000 ft. or more as the crop is grown in the rainy season. Moreover, the temperature during the day is never above 22°-23°C which is favourable for the appearance of disease. The crops grown in the plains have been usually free from the epidemics of late blight because the chief predisposing factors (temperature and moisture) that render potato plants susceptible to disease are absent during the period of their growth [4]. The temperature is high for the development of the disease. Now it has established itself in the Indo-Gangetic plain and occurs annually in the states of Punjab, Uttar Pradesh, Bihar, and W. Bengal. The disease is also destructive to tomatoes. The disease first appears on the tops of the plants generally after the blossoming period but mostly in the month of January. It may appear as well at any time during the growth period of the plant. The conditioning factor is the favourable environment.

It is one among the major diseases in potato crop production, reason major harms in yield. Employing the environmentally dangerous fungicides is

that the established and traditional method for controlling blight, thus polluting food and water [5]. There's therefore a requirement for inventive research way of dealing with a situation to supply food sustainably. Here, we employed a systems approach to spot sustainable management strategies for disease control in potato production within the worldwide [6]. In the worldwide number of "Late blight of potato" prediction model is available and some other online simulation model is also available. In the existing prediction model have number of drawbacks:

Database is very limited regions for the learning & training.

- Not very efficient prediction due to lack of weather variable information.
- Lack of correlated weather variable, minimum environmental factors and climate change information not created the global prediction model.
- Lack of social-ecological correlation, number of weather information is not collected correctly and properly.
- Mostly simulation models are region wise.

An growing severity of late blight in many potato crop growing areas, a shift in prions population toward increased specific virulence and increasing tolerance to the leading effective blight specific fungicides suggests a requirement to develop an appropriate disease Prediction Model supported information technology [7]. Though different forecasting models are developed across the earth none is universally applicable, hence this is often often the need of the hour to develop a forecasting model that's effective in most regions and seasons. As more and more weather information is being generated and picked up there is a requirement to

develop an appropriate disease prediction model for farmer-friendly information.

II. OBJECTIVES OF THE PROPOSED WORK

This proposed work has been envisaged by keeping in view that an efficient "**Late Blight**" disease prediction model should possess various worldwide weather information variables, climate change information, and compatibility with other components of the environment.

The specific objectives of the proposed work include the followings:

- To study about the environmental factors and the components of the resistance to Late blight disease.
- To study about the previous existing late blight disease prediction models.
- To study about the disease severity data on Late Blight of potato.
- To investigate the correlation of the characteristics of environmental variables, climate change factors, and the weather-related information variables.
- After having done the above investigations, we aim to propose the disease prediction model suitable for the worldwide weather.
- By using well known existing disease prediction model and the huge amount of worldwide weather datasets, a disease prediction model will be developed and tested.
- Publishing good numbers of research articles in peer reviewed international scientific journals, possible patents and participation in international conferences and meeting.

III. PROPOSED WORK

- Literature survey pertaining to research work.
- Preparation of datasets about the weather and climate change.

- Simulation and modelling with newly prepared dataset on existing models.
- Design and Implementation of the Proposed Model for disease Prediction.
- Validation of the proposed Model with the help of previous datasets.

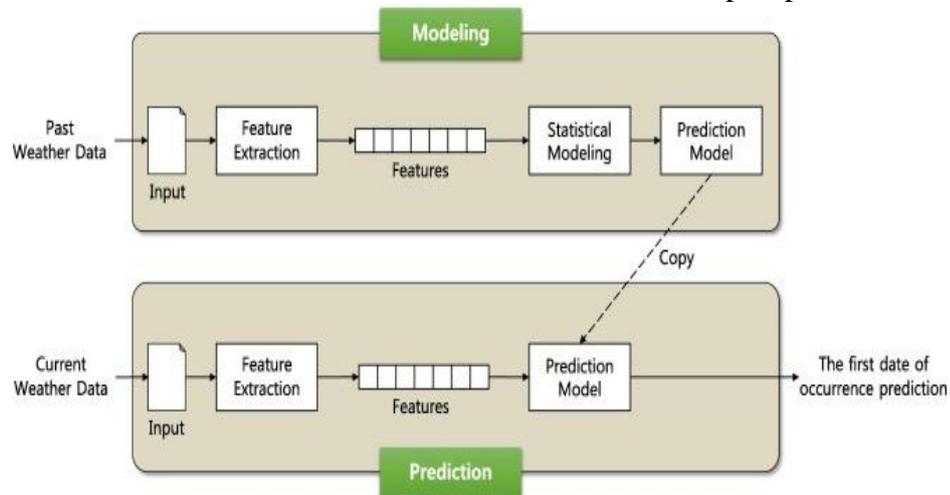


Fig. 1: Proposed Model

The aforementioned diagram depicts that the first of all, input dataset will be given in our proposed model that will extract the feature i.e. qualitative information in accordance to our proposed objective, weather information (temperature, rainfall, air density, moisture etc.) and define the name of diseases. Similarly, statistical model will utilize the techniques (genetic algorithm, data-mining techniques, and deep learning concepts) in this proposed model according to our datasets.

IV. EXPECTED RESULTS AND IMPACTS OF PROPOSED WORK IN THE SPECIFIED AREA

We propose to co-relate information of worldwide weather based better simulation model for the optimize disease prediction about the late blight of potato. This proposed model also employs the prediction of tomato disease correlated the worldwide weather information. Basic impact of that research is, the huge amount production of potato and tomato, maintain the natural property of soil due to limited use of pesticide, cost effective & time

efficient due preplanning of the crop. Based on the research findings, this work may be extended for worldwide acuteness of late blight using with GIS-linked disease forecast models.

Apart from above it is expected that proposed work may contribute some patent and high quality Journal publications.

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