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WSN Monitoring of Weather and Crop Parameters for Possible Disease Risk

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Abstract: Tomato powdery mildew caused by Oidum Neolyco persici is an important weather- related disease that can potentially cause heavy losses in production quality and quantity each year and especially serious in climates with high rain fall and high relative humidity imparting long period of leaf wetness. Disease management generally requires frequent use of fungicides applied sever all times during the growing season. High cost due to frequent applications of fungicide and the desired to reduce pesticide levels in the environment have motivated considerable efforts to develop disease prediction or warning systems. Agro meteorological variables i.e. Air Temperature, Air Humidity and Leaf Wetness Duration(LWD) are known to be the parameters, which strongly influence the disease development. The WSN system deployed consisted of battery- powered nodes equipped with sensors used for continuously monitoring the agricultural and weather parameters, served as input of the models.

Keywords: Powdery Mildew, Tomato, Leaf Wetness Duration, Wireless Sensor Network

I. INTRODUCTION

Disease occurs when a path ogen attacks a susceptible plant under environmental conditions that favor the infection and growth of the path ogen with in the plant. Weather plays a key role in plant disease development. Air temperature, Air relative humidity and leaf wetness are major factors that trigger fungal disease in a plant. Most fungal disease path ogens require specific leaf surface conditions for their spores to germinate i.e. favorable temperature and a film of water on the plant surface. But in particular, leaf- surface wetness produced by dew or precipitation is reported to be one of the most significant meteorological pest-promoting factors (Dalla Martaetal.,2005).

Powdery mildew is one of the most common and important fungal diseases of the tomato world wide. It affects both leaves and fruit berry. Infection can cause reduced size and give off flavor. Disease management generally requires the use off ungicides applied several times during the growing season of crop has typically several parts: a radio transceiver with an internal antenna or connection to an external antenna.

II. BACKGROUND

A. Wireless Sensor Network

A wireless sensor network (WSN) of spatially distributed autonomous sensor to monitor physical or environmental conditions, such as temperature, sound, pressure etc. and to cooperatively pass their data through the network to a main location.

The more modern networks are bi-directional, also enabling control of sensor activity.The development of wireless sensor networks was motivated by military applications such as battlefield surveillance; today such networks are used in many industrial and consumer applications, such as industrial process monitoring and control, machine health monitoring, and so on.The WSN is built of "nodes" – from a few to several hundreds or even thousands, where each node is connected to one (or sometimes several) sensors. Each such sensor network node.

B. Behavioural Analysis

1) With mathematical model one can develop plant disease forecasting systems, which can help growers to make economic decisions about disease management (Couch,1995; Royle2008). Empirical models /multiple regression equations are typically constructed through the statistical relationships of variables with experimental data. The output of an empirical model is a numerical index of disease risk, which predicts disease incidence or severity.

2) To ensure the accurate estimation of disease, their variability, management and evaluationin space-timeover a field,wireless sensor network (WSN) technology involving sensors for ambient temperature, ambient humidity, and leaf wetness will be deployed.

III. EXPERIMENTAL METHODOLOGY

This section describes the agricultural experiments conducted in the field, which concentrated on monitoring different parameters relating to crop, soil and climate by deploying the wireless sensors so as to establish a cor relation between sensors out put and agricultural requirement in term so fpest management.

The real time information of the fields provides information for farmer to adjust strategies at any time which helps enabling early warning for any eventuality, like pests, crop diseases etc which in turn will facilitate early control action.WSN system was focused on

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establishing feasibility of capturing and analyzing data and transmitting the same data. The server also supports a real time updated web-interface giving details about the measure dagri-parameters.

IV. DATA ANALYSIS

Two different models i.e. **Logistic And Bet a models** evaluated for estimation of infection index, as function of environment variables is given below.

Table1: ValuesofInfection Index and Risk of Infection

Infection Index Values	Risk Levels
0 or below	No risk of infection
0.01 to0.50	Low risk of infection
0.50 to1.00	Moderate risk of infection

V. RESULT SET

It describes the effect of temperature and leaf wetness duration on computed value of infection index and also a comparison of infection index obtained using two different models and validation of the same in field situation.

VI. CONCLUSION

Weather data monitoring helped in computing infection index values based on ambient temperature and leaf-wetness duration. This provided solid base for farmers to adjust strategies at any time. When there is absolutely no risk of infection, then also the current practice and schedules in cultivation entail frequent use of pesticides, which not only is a cost burden but also leaves un acceptable levels of chemical residues.

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