

PREDICTION OF PLANT DISEASE EPIDEMIC BY EXPONENTIAL MODELING FOR LARGE-SCALE YIELD FOR USE OF BIOPESTICIDE USING BIOCHEMICAL FORMULATION

***Wavhal Lahu Dattatray, **Dr. Satyveer Singh**

**Research Scholar, **Research Supervisor*

Faculty of Chemistry

OPJS University, Churu, Rajasthan

ABSTRACT

India is known as agricultural land. The global economy of the country majorly depends on agricultural export. However, in the past decade, many researchers are coming up with high-ended research in the area of the agrochemical, biochemical, biotechnology, and allied domains of science. The major problem in agricultural development is organic farm product demands and crop management. Traditionally, many chemical pesticides were in use, which led to numerous health issues like neurological disorders, intestinal problems, and even cancer. Subsequently, Govt. of India has taken a step to promote healthy and secure food production by means of subsidies for organic farming. Organic farming is facing issues relating to yield ratio improvement because of the bacterial/microbial and pest epidemics. To cope with this issue, worldwide integrated pest management research is in progress. This paper focused on plant disease prediction by exponential methodology.

KEYWORDS: *Biochemistry, Biotechnology, Plant disease management, biopesticide*

1. INTRODUCTION

The objective of plant disease management is to decrease the financial as well as visible harm triggered by means of plant diseases. Typically, this is known as plant disease control; however, recent social and environmental ideals consider “influence” as becoming complete and the term as well rigid [1,2]. Since the origin of agriculture, from the decade’s farmers used various growing methods for dealing with the numerous troubles experienced by the crops. Pursuing such findings of the triggers of plant diseases in the early nineteenth century, the developing comprehension of the relationships of viruses as well as host features allowed us to develop a large mixture of steps for the regulation of particular plant diseases [3]. Organic agriculture is improved in importance globally over the previous 20 years and years, with development costs of an additional 10% each year in most countries. By 2015, around 3 million certified organic suppliers farmed extra than 47 million hectares of certified organic agricultural land. Organic plant production is partly indicated by means of the

lack of artificial pesticides and so fertilizers, but procedures that encourage ecosystem health will be actually even more essential [4]. The results of essentially diverse management techniques of organic as well as standard plant creation on agroecosystem working and the event of diseases and pests have got been lately examined; nevertheless, many extra publications on diseases include made an appearance after that, and an extensive publication on plant diseases and so their management was first lately released [5]. Most root diseases are triggered by soil-borne pathogens. The connection between these pathogens and saprophytic microorganisms in soil and so on the root, the area features a big impact on the advancement of root diseases. As a result, reviews of root diseases in organic and standard harvesting systems will be highly influenced by soil top quality and health. Many relative types of research of root diseases in OFSs versus CFSs have got been quite released. These kinds of side-by-side comparisons of root diseases will be somewhat simple and happen to be much less confounded by the motion of virus propagules amongst border OFSs and CFSs than are foliar diseases [6].

2. LITERATURE REVIEW

Soil wellness features and measurable indicators had been explained, and management methods for the promotion and repair of soil well-being as well as root disease suppression had been talked about in a considerable latest assessment on soil overall health and root disease management, incorporating the value of soil wellbeing for the environment working and agricultural durability. So, our conversation about this topic is definitely qualified for particular factors that may require extra interest. Features of healthy and balanced soil will be a substantial organic question, great soil framework, excessive water-holding and drainage capability, well-balanced nutrient cycling, adequate rooting range, and varied populations of ecologically helpful microorganisms, producing resilience to undesirable events as well as stress and low pathogen and pest populations [7]. Similar to ecosystem health and wellbeing, soil health is definitely indicated by biological variety, practical connectedness, balance, and strength. Soil health can be advertised by means of cautious management of organic situations targeted at minimizing very easily available carbon and nitrogen resources, i.e., the designing of even more oligotrophic circumstances to strengthen biological areas. To preserve a steady soil network, soil tillage requires to become reduced. No-till farming is hard without herbicides, but substantial improvement possesses have been produced to decrease tillage [8].

Qualities common to a healthier soil that gives a range of environmental services will be generally even more prevalent in varied OFSs than in CFSs. The soil in long-lasting OFSs happens to be generally regarded as healthier than comparable soil choices in high-input CFSs. Healthful soil has got frequently been connected with root disease reductions. Two types of disease suppression include been lately recognized: basic and virus particular. Basic suppression is definitely mainly the action of biological reasons, many of these as rivals between microorganisms, and physical-chemical points, like the nutrient and strength source obtainable for development of the pathogen through the soil and

on the root exterior. Pathogen-specific suppression can be credited to a particular discussion between a plant virus and its villain, for a case in point is an antibiotic maker or parasite, as occasionally discovered in mono-cropping circumstances. This particular sort of disease reduction will not really most likely occur in organically handled soil, where a wonderful range of crops can be produced in space and time [9]. Replant diseases on young trees can end up being triggered by a range of pathogens, varying from fungi and oomycetes to nematodes, based on the microorganisms that are connected with the sources of trees that were eliminated. In organic apple orchards, pathogenic *Pythium* species had been much less regularly separated from the root beginnings of young trees than were definitely non-pathogenic *Pythium* species, whereas that is not really the circumstance in regular orchards. Decreased colonization of organic apple roots likened to typical apple origins through *Pythium* as well as *Rhizoctonia* species was even noticed in some other research. On old fruit trees, *Phytophthora* root rot is generally covered up in OFSS. For the case in point, suppressiveness against *Phytophthora cinnamomi* on avocados developed after most years and years of mulching, producing an increased microbial process and lysis of *Phytophthora* hyphae [10].

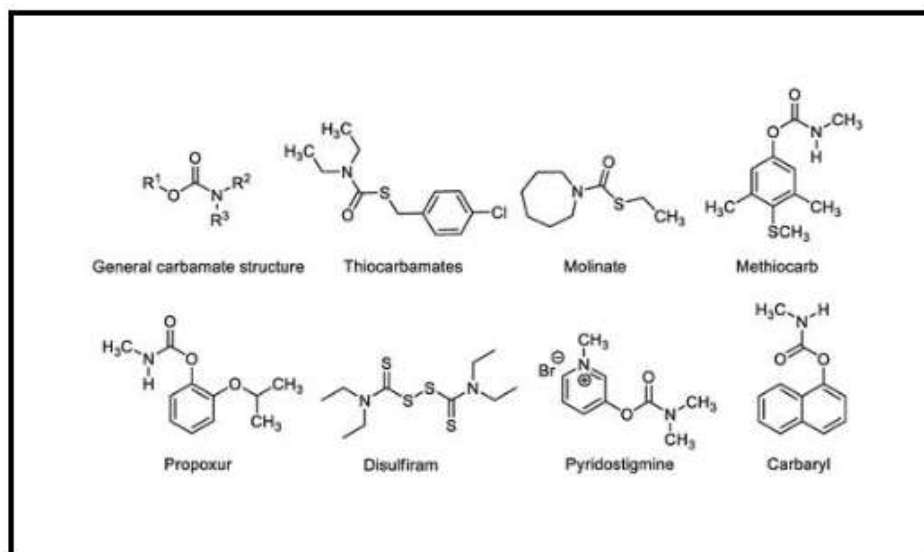


Fig. 1: Structures of carbamate and thiocarbamates chemical pesticides (Source: Mohamed Hassaan et. al, 2020)

Many strategies of soil disinfestation can be utilized in OA, specifically flooding, soil steaming, solarization, anaerobic soil disinfestation, and bio fumigation, and will be talked about in the latest evaluations. Soil flooding can be hardly ever applied due to the absence of water in many aspects. Soil steaming is certainly occasionally employed in the event that plant-parasitic nematodes as well as, root pathogens possess gathered credited to a modest rotation of high-value crops in green properties. Sizzling eliminates all heat-sensitive plant pathogens, nematodes, and weeds to a particular soil depth, although huge parts of the soil microbial community as well as, fauna happen

to be also removed [11]. Consequently, this technique in fact will go against the creation of concepts of many organic farmers. For soil solarization, damp soil is normally protected with clear, UV-resistant clear plastic and uncovered to sunshine for a few weeks. Many plant-pathogenic fungi, bacteria, and so nematodes, except for some heat-tolerant fungi and viruses, are quite delicate to improved temperatures. The solarization impact can get superior by incorporation of isothiocyanate-producing elements from brassica crops into the soil prior to macellg by vinyl. Along with the immediate heat results on pathogens, soil solarization can likewise improve plant development by means of raising the supply of mineral nutrients as well as enhancing soil tilth [12].

3. RESEARCH METHODOLOGY

If disease progress in monocyclic epidemics can be linear, the slope of the disease progress curve is certainly regular. Aside from that, if disease progress in a monocyclic epidemic is normally proportional to the quantity of the first inoculum, we can help to make the slope of the disease progress curve the item of primary inoculum and so proportionality frequent. Consequently, we may explain a monocyclic epidemic by linear disease progress by applying the differential equation:

$$\frac{dx}{dt} = QR \dots\dots\dots (Eq.1)$$

We can see a linear line with an intercept of zero and a slope of **QR**

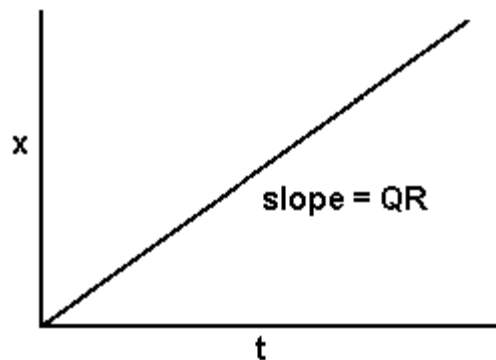


Fig. 2: Monocyclic Disease Progress

Even though measurements of the amount of inoculum offer a great evaluation concerning the progress of the epidemic, the immediate statement of inoculum is not really possible or actually feasible. With many plant diseases, nevertheless, we can observe several sorts of symptoms that enable us to count the number of figures of plants unhygienic and calculate the quantity of tissue contaminated. To end up being convinced, there is a time lag between infections and so the overall look of noticeable manifestations, and the symptoms of symptoms can get influenced by means of external circumstances, however, generally, the progress of manifestations parallels the progress of inoculum production.

4. CONCLUSION

Plant disease epidemics can get categorized right into two standard choices, monocyclic and polycyclic, based on the number of infection cycles per crop cycle. The first levels of a monocyclic epidemic can come to be referred to actually perfectly by means of a linear model, even though the early periods of a polycyclic epidemic may stay defined by a great model. Since we are worried about continuing to keep disease levels good under 100%, there is no want to change the models for nearing the top limit, as well as we can make use of the basic linear and exponential models to program ideas. This can be used to predict the plant disease spread and accordingly preventive steps can be taken.

REFERENCES:

- [1] Wang, Huiyan, Ning Wang, and Yixin Huo. "Multi-tissue transcriptome analysis using hybrid-sequencing reveals potential genes and biological pathways associated with azadirachtin A biosynthesis in neem (*azadirachta indica*)." *BMC genomics* 21.1 (2020): 1-17.
- [2] Zhou, You, et al. "The comparative metabolic response of *Bactrocera dorsalis* larvae to azadirachtin, pyriproxyfen, and tebufenozide." *Ecotoxicology and Environmental Safety* 189 (2020): 110020.
- [3] Pascoli, Mônica, et al. "The potential of nanobiopesticide based on zein nanoparticles and neem oil for enhanced control of agricultural pests." *Journal of Pest Science* 93.2 (2020): 793-806.
- [4] Kumar, Sushil, et al. "Bio-efficacy of some newer insecticides and bio-pesticides against whitefly (*Bemisia tabaci* Gennadius) in Brinjal ecosystem." *IJCS* 8.5 (2020): 1883-1888.
- [5] Meena, A., et al. "Efficacy of biopesticides against major arthropod pests and their natural enemies on okra." *Indian Journal of Entomology* 82.1 (2020): 189-194.
- [6] Xiao, Jinjing, et al. "Application method affects pesticide efficiency and effectiveness in wheat fields." *Pest Management Science* 76.4 (2020): 1256-1264.
- [7] Paudel, Sulav, et al. "Conservation agriculture and integrated pest management practices improve yield and income while reducing labor, pests, diseases and chemical pesticide use in smallholder vegetable farms in Nepal." *Sustainability* 12.16 (2020): 6418.
- [8] Saito-Shida, Shizuka, et al. "Quantitative analysis of pesticide residues in tea by gas chromatography–tandem mass spectrometry with atmospheric pressure chemical ionization." *Journal of Chromatography B* 1143 (2020): 122057.

[9] Liu, Ji, et al. "Nitrogen and phosphorus runoff losses were influenced by chemical fertilization but not by pesticide application in a double rice-cropping system in the subtropical hilly region of China." *Science of the Total Environment* 715 (2020): 136852.

[10] Qu, Xianglong, and Bing Yan. "Zn (ii)/Cd (ii)-based metal–organic frameworks: Crystal structures, Ln (iii)-functionalized luminescence and chemical sensing of dichloroaniline as a pesticide biomarker." *Journal of Materials Chemistry C* 8.27 (2020): 9427-9439.

[11] Liang, Pei, et al. "A balsam pear-shaped CuO SERS substrate with highly chemical enhancement for pesticide residue detection." *Microchimica Acta* 187.6 (2020): 1-8.

[12] Faber, Daniel. "Poisoning the World for Profit: Petro-Chemical Capital and the Global Pesticide Crisis." *Capitalism Nature Socialism* 31.4 (2020): 1-17.