



## Polyploids of *Phytophthora* on Solanaceae to Araceae in Nepal & India

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### ABSTRACT

Solanaceae and Araceae are the important hosts of *Phytophthora*. *Phytophthora infestans* is a common facultative saprophytes as well as facultative parasites, one of the most common species of *Phytophthora* is *P. infestans*, causing the disease called late blight of Potato or Potato blight. Cool- temperature between 22-23°C and excess of water favours the growth of this fungus, In Nepal as well as in India, *P. infestans* is found in the plain and the hilly area. Erwin (1983,1996), Trout et.al. (1997) Gupta (2000) & Gopalan et.al. (2019) studied well *P.infestans*, while Sharma et.al.(2019) mentioned inter-relationship of Polyploids of *P.infestans* with temperature.

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### 1. Introduction

Several numbers of solanaceae as well as Araceae are infected by the pathogen belonging to *Phytophthora*. Erwin (1983,1996)<sup>4,5</sup> mentioned biology, taxonomy, ecology and pathology of *phytophthora* firstly, and again emphasised worldwide disease caused by *Phytophthora*. Nutritive value of *colocasia* was described by Gopalan et.al.(2007)<sup>6</sup>. Studies on late blight of Potato and Tomatoes caused by *Phytophthora infestans* was reported by Gupta (2000)<sup>7</sup>. Hussain et.al (2013)<sup>8</sup> detected the latent infection of *Phytophthora infestans* in Potato seed tubers. Muthuswamy et.al (2018)<sup>9</sup> mentioned pathogenic variability in *Phytophthora Capsici* from *piper nigrum* (Black Paper) adopting the methodology of transcriptome analysis. Sharma et.al (2019)<sup>11</sup> described the relationship of temperature with the different polyploids of *Phytophthora infestans*, having well elaborated the phenomenon inter-related Polyploids.

Sundaresha et.al (2018)<sup>12</sup> mentioned the CBD technology in the detection of *Phytophthora infestans* using Carbohydrate binding module 1 protein. Trout et.al.(1997)<sup>13</sup> mentioned rapid detection of *Phytophthora infestans* in late blight infected Potato & Tomato, using Polymerase chain reaction (PCR) and Reverse transcriptase (RT).

### 2. Survey

*Solanaceae* well cultivated in Nepal and India to fulfill the demand of vegetables, while members of *Araceae* are not so e.g. *Colocasia spp.* It grows aside in the plain area of Nepal and India, also wild product having the different places moist, damp, even in polluted area is covered by its population. It attracts the people because some take especially tender leaves as subsidiary of vegetables using mixed with rice flour as gram flour and dried in Sunlight, so that ring like shaped is prepared and after some days, they are fried in edible oil and mixed with common spices to make tasty, onion, garlic, lemon, ginger and turmeric is used. People never take the petiole or tubes as leaves.

### 3. Morphological Study –

Date: 21-05-2019, Time: 11-2.30p.m

1.Place- DEPT. OF BOTANY, M.M.A.M.CAMPUS, BIRATNAGAR, TRIBHUVAN UNIVERSITY, NEPAL.

2. LEAF - Collection on Date : 19/05/2019

3. Calculation &amp; morphological study on Date 19/05/2019

I) Dorsal surface - Constricted with petiole or like triangle shaped with elevation of patches i.e. presence of pathogens along with greenish, yellowish and dried constricted area towards &amp; periphery of the petiole.

II) Ventral surface shows 24 smaller brown rounded in yellow portion, while 1 larger in the constricted, dries area of origin of petiole.

III) Length of leaf 17.1 cm, width-13 cm, area= 222.3 sq.cm.

IV) Total area of Pathogen- 27.4 sq.cm

V) Percentage of pathogen - 12.33% or statistical presentation scale in between 4&amp;5. According to British Mycological society, 1947.

VI) The disease intensity is dependent to infection index and disease intensity of a field.

### 4. Microscopic - Observation in 10x, 100x and 400x

I. Mycelia- aseptate, small pieces, scattered, while one elongated septate.

II. Sporangium - single larger than several other minute rounded structure apical papilla (-,+).

III. Conidiophore- not clear due to breakage.

IV. Reproductive structures- minute rounded spores liberated after karyogamy. All these characteristics features appeared on the dried largest symptoms selected for microscopic study and lastly, it may be confirmed that the pathogen is *phytophthora spp.* And finally due to the host *colocasia spp.*, the pathogen is *phytophthora colocasiae* Taxonomic guidelines follows as described by Cantino (1966)<sup>1</sup>, De-Barry (1876)<sup>2</sup> & Dube (1985)<sup>3</sup>.

### 5. Chemical constituents

*Colocasia spp.* have been known very familiar to the people of villages than the others. Gopalan et.al (2007) mentioned as below:

(A) *Colocasia stem*- Moisture -94, protein- 0.3, Fat-0.3, Minerals- 1.2, crude fibre - 0.6, carbohydrate- 3.6g/100gm. Energy- 18k.cals, calcium- 60 mg, phosphorus- 20 mg, iron- 0.5 mg, carotene- 104 mg, thiamine- 0.07 mg, Riboflavin - 0.07 µg, Niacin-0.1mg, vitamin c- 3 mg.

(B) *Colocasia* - Roots and Tuber contain - moisture- 73.1, protein-3, fat- 0.1, minerals-1.7, crude fibres- 1.0, carbohydrates- 21.1 g/100gms Energy -97, Calcium-40, phosphorus-140, Iron - 0.42 (All wt.in.mg ), Carotene-24 µg, Thiamine-0.09mg, Riboflavin-0.03mg, Niacin-0.4mg free, Folic Acid-16.0mg, Total Folic Acid -54 µg, mg-28, Sod-9, Pot. -550, Cu-0.18, Mn-0.28, Zn-0.31, Cr-0.005 (all value mg/100gms)

(C) *Colocasia* Leaves - moisture-82.7, Protein-3.9, Fat-1.5, Minerals-2.2, Crude fiber-2.9, Carbohydrate 6.8, all in (gm/100gms) Energy -56c.cals, Calcium-227, Phosphorus-82, Iron -10 ( all wt. in mg), Carotene-10,278 µg, Thiamine-0.22mg, Riboflavin-0.26mg, Niacin-1.1mg, Vitamin-C-12mg. But with Variation in Carotene contents is also reported especially the Green leaves variety contains carotene Total= 15,700 µg, Beta carotene- 5920 mg, oxalic acid - 43 mg, total Dietary fibre (TDF)- 6.6g, Insoluble Dietary fibre (IDF)- 5.1g, soluble Dietary fibre (SDF)- 1.5G.

#### 6. Variations in *Phytophthora* Spp

*Phytophthora infestans* is a global challenging pathogen among the biotic stress, which affect healthy and sustainable potato productions. It is dependent to disease cycle, early detection of the pathogen because cellulose binding domain (CBD-1) Protein. Therefore, it will enable to detect the pathogen in the potato seed before planting as well as in the standing crop in the field. Sundaresha et. al. (2018)<sup>12</sup>, I CAR- Central potato Research Institute, Shimla, India.

Husain et.al (2013)<sup>8</sup> mentioned the detection of latent infection in Potato seed, tubers, Sharma (2018)<sup>11</sup> listed different polyploids related to temperature. Trout et.al(197)<sup>13</sup> mentioned polymerase chain reaction (PCR) techniques in Potato & Tomato. Muthuswamy et.al (2018)<sup>9</sup> mentioned pathogenic Variability in *Phytophthora capsici* from black papper (*Piper nigrum* L) as revealed by transcriptome analysis ICAR-Indian Institute of spices Research, Kozhikode, Kerala, India.

#### 7. Conclusion

Polyploids of *phytophthora* on *Solanaceae* to *Araceae* is a soil borne pathogen, infecting seed or tubers, spreading different parts as soon as the germination of different hosts starts and finally becomes visible, if use of fungicidal sprays or resistant varieties of the hosts is not maintained properly in the field because several wild varieties of hosts exist in nature and may be sometimes changed to polyploids unable to control.

#### 8. Acknowledgment

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