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Studies on Diseases Survey of Medicinal Plants at Different Locations of North Bengal

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ABSTRACT

Incidences of plant diseases are increasing and threaten the food security of vulnerable populations in many parts of the world. A human pandemic is currently threatening the health of millions of people around the globe. People need a stable and nutritious food supply to lift them out of poverty and improve their health. Both plant and emerging diseases are spreading and exacerbated by climate change, transmission through global food trade networks, pathogen spread, and the development of unique new pathogen. Therefore, plant diseases pose a difficult problem for commercial agriculture and pose a real economic threat. West Bengal has various agro-ecological regions with genetic diversity of medicinal plants that can be used commercially in the pharmaceutical industry. Addressing these grand challenges will require sufficient knowledge on the occurrence of disease of medicinal plant and their management. In consequence a survey was conducted in terai region of West Bengal in different medical plant growing areas to find out the occurrences of different disease of medicinal plant for development of a disease calendar.

Key words : Medicinal plants, Survey, Climatic condition, Disease calendar.

Introduction

Since the dawn of civilization the medicinal plants have been used for ameliorating the sufferings of mankind. Next to food, medicines are the second most essential requisite for mankind. Medicinal plants are the important source of the secondary metabolites (glycosides, coumarins, flavonoids, steroids, etc.) and potential source of raw drugs. However, the knowledge regarding the uses of medicinal plants as drugs dates back to 4500 –1600 BC in the form of scattered hymns in Rig-Veda. The updated information confirms that out of 20,000 medicinal plants of the world, India Contributes about 15% of it, i.e., 3000 – 3500 in numbers and 90% of these plants is used as prophylactic, curative and suppressive drugs in the Indian system of medicine (Roy & Pandey, 2005). The world health organization (WHO) estimated that 80% of the population of developing countries rely on traditional medicines, mostly drugs from plants for their primary health care needs (Anonymous 2000). According to a 1994 UNDP report, the annual value of medicinal plants derived from developing countries is approximately 32 billion US dollars. The

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value of global trade of the medicinal plant products has been put over US$ 75 billion per year and is growing @ 12.5% annually. The trade of medicinal plants in India is estimated to the tune of 675 crores per year. The export of medicinal plants from India appears to be growing faster. Conservative estimates put the economic value of medicinal plant species globally indicates a continuous upward trend and World Trade in medicinal plant and related products is expected to rise to US $ 5 billion by 2050 AD (Sharma, 2004). The importance of plants as a major source of therapeutic agents has assumed greater significance in recent years because of the remarkable revival in the use of plants for health care in the last two decades throughout the world. Further the importance of medicinal plants became popular for the past couple of years since the outbreak of a COVID-19 pandemic. All these factors resulted in the large-scale exploitation of some medicinal plants as raw materials for pharmaceuticals. In order to obtain sustainable supply, large scale cultivation of a good number of medicinal plants has necessitated. Therefore, commercial cultivation of a large number of medicinal plants has been taken popularized in recent years in developing countries. The extensive cultivation of these plants has increased the pathological problems. Amongst different abiotic and biotic factors, fungal pathogens are found to damage the plants as a whole or partly. Therefore, it is the demand of the time to study the diseases of medicinal plants of each agro ecological situation and their management. In depth scanning of literatures suggested that little works were done in West Bengal regarding the diseases of medicinal plants, their epidemiology and management. Therefore, in the present study emphasis has been given on the survey surveillance and occurrence of diseases of medicinal plants under North Bengal situation and their etiological establishments.

Materials & Methods

Survey was conducted during 2005-2007 at different location of Terai zone to study the occurrence of diseases of some of the important medicinal plants grown in this region. Specimens from diseased medicinal plants were collected mainly from Central Herbal Garden of Uttar Banga Krishi Viswavidyalaya at Pundibari, Coochbehar. Beside this, some specimens were also collected from other locations during survey as indicated in the Table.1.

Result and Discussion

Central Herbal Garden Uttar Banga Krishi Viswavidyalaya, and Herbal Garden Buxa Coochbehar Range at Rajabhatkhawa and some farmer's field at different locations of Coochbehar and Jalpaiguri, and Darjeeling district were visited periodically during October 2005 to April, 2007 for observing diseases of some of the important medicinal plants and the time of peak occurrence of those diseases under North Bengal situation. Results of the survey have been presented in a tabular form in Table-2. Incidences of ten diseases on nine important medicinal plants were recorded during the period of survey. Occurrence of *Cercopora* leaf spot disease was noticed on *Clerodendron* (*Clerodendron indicum*), *Smilax* (*Smilax indica*) and Soap Berry (Ritha – *Sapindus mukorossi*) plant. In all these cases the incidence of the diseases on the respective hosts were found

Table 1 : Survey on diseases of medicinal plants at different locations of Terai region of West Bengal

Location	District	Medicinal plant observed		
		Local name	**English**	**Botanical name**
Herbal Garden Buxa Cooch-behar Range at Rajabhatkhawa.	Jalpaiguri	Bamunhati Chandra Boch	*Clerodendron* *Rauwolfia* Sweet flag	*Clerodendron indicum* *Rauwolfia serpentina* *Acorus calamus*
Central Herbal Garden Uttar Banga Krishi Viswavidyalaya	CoochBehar	Udal Neem Bamunhati Boch Chandra Kumarika Totala Ritha MistiTulsi	*Sterculia* Margosa tree *Clerodendron* Sweet flag *Rauwolfia* *Smilax* *Oroxylum* Soap berry Sweet basil	*Sterculia velosa* *Azadirachta indica* *Clerodendron indicum* *Acorus calamus* *Rauwolfia serpentina* *Smilax indica* *Oroxylum indicum* *Sapindus mukorossi* *Ocium basilicum.*
Abutara, Farmer's fields	CoochBehar	Boch	Sweet flag	*Acorus calamus*
Gairibas Ipecac Plantation Subdivision Kalimpong Naxal farm	Darjeeling	Boch Chandra	*Sweet flag* *Rauwolfia*	*Acorus calamus* *Rauwolfia serpentina*

to be at their peak during the month of September to October. In *Oroxylum* (*Oroxylum indicum*), Neem (*Azadirachta indica*) and *Sterculia* (*Sterculia velosa*), occurrence of leaf blight disease by *Corynespora* sp. was observed.incidence of the disease on respective hosts was found to be at its peak during the months of September to October, August to September and August to October respectively in *Oroxylum,* Neem and *Sterculia*. During survey the incidence of leaf blight on Sweet Basil (*Ocium basilicum*) incited by *Macrophomina Phaseolina* was also observed and its peak time of occurrence was observed in the month of September to October.

In *Rauwolfia*, incidence of two diseases viz. leaf blight and bud rot disease and the target spot disease were noticed. The pathogen identified was *Alternaria* sp. in the former case while in the later case it

was *Corynespora* sp. Peak period of incidence of leaf blight and bud rot disease was experienced during May to June whereas the target spot was at its peak during August to September in areas surveyed.

Rust disease on sweet flag (Boch-*Acorus calamus*) plants was also noticed during the survey. It's peak time of occurrence was observed during the month of June to September in the area surveyed.

Table 2 : Survey of diseases on medicinal plants at different locations of North Bengal

Sl. No.	Disease observed	Causal oragism	Location	Peak time of occurrence
1.	Leaf spot of *Clerodendron*	*Cercospora clerodendri* Sawada.	Central Herbal Garden, Uttar Banga Krishi Viswavidyalaya & Herbal garden Buxa Cooch behar Range at Rajabhatkhawa.	Sept-Oct.
2.	Leaf spot of *Smilax*	*Cercospora smilacina* Sacc	Central Herbal Garden, Uttar Banga Krishi Viswavidyalaya	Sept-Oct.
3.	Leaf spot of Ritha	*Cercospora* sp.	Central Herbal Garden, Uttar Banga Krishi Viswavidyalaya	Sept-Oct.
4.	Leaf blight of *Oroxylum*	*Corynespora* sp.	Central Herbal Garden, Uttar Banga Krishi Viswavidyalaya	Sept-Oct
5.	Leaf blight of Neem.	*Corynespora* sp.	Central Herbal Garden, Uttar Banga Krishi Viswavidyalaya	Agust-Sept
6.	Leaf blight of *Sterculia*	*Corynespora* sp.	Central Herbal Garden, Uttar Banga Krishi Viswavidyalaya	Aug-Oct.
7.	Leaf blight of Sweet Basil	*Macrophomina pheoslina*	Central Herbal Garden, Uttar Banga Krishi Viswavidyalaya	Sept-Oct.
8.	Leaf blight & Bud rot of *Rauwolfia*	*Alternaria* sp.	Central Herbal Garden, Uttar Banga Krishi Viswavidyalaya	May-June
9.	Target spot of *Rauwolfia*	*Corynespora* sp.	Central Herbal Garden, Uttar Banga Krishi Viswavidyalaya & Gairibas Ipecac Plantation	Aug -Sept
10.	Rust of Sweet flag	*Uromyces* sp.	Subdivision Kalimpong Naxal farm Central Herbal Garden, Uttar Banga Krishi Viswavidyalaya & Abutara, fermer's field	June-Sept.

The reason for predominance of diseases in particular months namely, August, September, October might be due to the effect of monsoon. This rainy weather condition favours the establishment of the pathogen in host and thereby aid in the development of disease. Cercospora (causing leaf spot of *Clerodendron indicum, Smilax indica* and *Sapindus mukorossi*) can survive as a dormant mycelium in plant debris in maize after disease onset. The pathogen produces conidia in lesions of plant debris (Payne and Waldron, 1983). These conidia serve as the primary inoculum in disease development. Rain spray also plays an important role in conidial dispersal (William, 1987). Cercospora leaf spot is considered an important pathogen not only because of its widespread distribution but also because many crops are susceptible to the disease (Wang et al., 1998; Windels et al., 1998). Warm and humid conditions favour the leaf disease of Cercospora (Barbetti, 1985). Epidemiological conditions for conidial production require a relative humidity of 90-100 percent and a temperature of 20-26 °C which is prevailing in the months specified earlier. The ideal measurement temperature for germination and development of infection is 25-30°C. Conidia will not form if the temperature is below 10 °C.

Leaf Blight of Oroxylum, Neem, Sterculia was caused by Corynespora. Corynespora prefers temperatures between 20 and 24°C with a high relative humidity. Humidity facilitates infection of the pathogen which is spread through the wind from the host plant like papaya . In vitro study revealed that the optimal temperature for mycelial growth is 28°C. With increase in temperature above 32°C significant reduction in radial growth was observed however temperature of 8°C and 40°C results in zero fungal growth (Melendez and Pinero, 1970). The congenial temperature range for these organisms are predominant during the peak months specified earlier.

Leaf Blight of sweet Basil was caused by *Macrophomina* and it's growth may beginbut disease might not express at low temperatures. Symptoms of disease appear at temperatures between 28°C and 35°C. Seedling rot occurs in tropical countries when soil temperature exceeds 30°C at planting. Low soil moisture further increases the severity of the disease as soil moisture keeps latent heat in them.

Leaf Blight and Bud rot of *Rauwolfia* was caused by Alternia. Alternaria prefers a maximum temperature of 27-28°C and a minimum temperature of 14-15°C along with an average relative humidity above 65%. These temperature ranges had been found favorable for the development of Alternaria rot of mustard (Sangeetha *et al.* (2007). Sarkar and Sengupta (1978) reported the optimum temperature for A.brassicola growing at 27°C on mustard. According to the reporting of Humpherson-Jones and Ainsworth (1983), alternating wetting and drying periods (70–80% relative humidity) of 16 and 8 h, respectively can limitthe infection of both species in rice crop. Maud et al. (1986) reported that abundant sporulation of *A. brassicola* required high relative humidity (>90%) and temperatures above 14 °C for at least 12 hours continuously, below which spore formation would be delayed. The findings of Sinha et al.

(1992) from the field studies conducted during 1984 to 1986 observed that at low temperatures (minimum 8–12 °C and maximum 21–26 °C) with high relative humidity (90%) coupled with average rainfall of 0.3 mm causes severe Alternaria blight disease in plants.. Like other disease pathogens discussed earlier Alternaria infestation was also favoured by the weather condition prevailed during August to October except bud rot causing *Alternaria*.

Rust of Sweet flag is caused by Uyromyces. Khare and Agrawal (1978) reported that high humidity, cloudy or drizzling weather with temperature of 20-22C favours disease and those plants are more susceptible at flowering in lentil for Uromyces *viciae fabae*. Upadhyaya *et al.* (2019) Reported similar temperature for rust formation in pea. 2019Hazarika *et al.* (2000) demonstrated the effect of eight sowing dates on leaf spots and rust of groundnut in relation to weather factors during the crop season. They observed that, there was significant and positive correlation between the incidence of disease (leaf spot and rust disease) and weather factors i.e., rainfall, relative humidity and temperature. The optimum germination of aeciospores, urediospores and teliospores was recorded at 20°C. Viability of aeciospores and urediospores of U. viciae fabae (Pers.) de Bary decreased with increase in time, whereas, germination of teliospore gave positive results (Joshi and Tripathi, 2012). All these references suggest in favour of the disease development in sweet flag especially under similar weather condition that prevailed from August to October in North Bengal districts.

Table 3 : Tentative occurrence of different diseases of Medicinal plants in a calendar year under North Bengal condition

Name of the disease	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Cercospora leaf spot Clerodendron												
Cercospora leaf spot of *Smilax*												
Cercospora leaf spot of Ritha												
Leaf blight of *Oroxylum*												
Leaf blight of Neem												
Leaf blight of *Sterculia*												
Leaf blight of Sweet basil												
Leaf blight and bud rot of *Rauwolfia*												
Target spot of *Rauwolfia*												
Rust of Sweet flag												

On the basis of periodical survey, the occurrence of different diseases in a calendar year under North Bengal situation was presented in a tabular form in Table 3. Rust disease on sweet flag was observed from March to November and *Cercospora* leaf spot of *Clerodendron indicum, Smilax indica* and *Sapindus mukorossi* were observed from May to November. Leaf blight and bud rot of *Rauwolfia* was observed during May to July. Leaf blight of sweet basil, Neem, *Sterculia* and *Oroxylum,* were observed during August to November, July - October, June to October and August to November respectively. Target spot of *Rauwolfia* was observed from June to October .

Summary and Conclusion

Except bud rot of *Rauwolfia* all other diseases in medicinal plants studied are favoured to peak in the rainy month especially during August to October. Thus, the knowledge regarding the tentative period of occurrence as well as the peak time of occurrence of different diseases of medicinal plants in a calendar year would necessarily helpful in formulation of management strategy of the diseases under Terai agro-ecological region of West Bengal.

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