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Survival ability of *Corynespora cassiicola* in rubber (*Hevea brasiliensis* Muell. Arg.) plantations

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ABSTRACT- Corynespora leaf fall (CLF) disease of rubber incited by the fungal pathogen *Corynespora cassiicola*, one of the major threats for natural rubber cultivation in rubber growing regions of India. The CLF disease occurs regularly in rubber plantation during the dry period after re-foliation and intensity rise from March to April and sub-sides during wet months. The study was undertaken to investigate on survival mechanism of the pathogen in rubber plantations over the seasons. The results of the studies revealed that the pathogen survived up to 11 days in infected leaf litter and shown good growth on potato dextrose agar medium. The pathogen was able to survive on intact infected leaves on the plant and also on plant debris as thick dark brown dormant mycelium under the bark of dried infected twigs.

Key-Words: Corynespora leaf fall, *Corynespora cassiicola*, *Hevea brasiliensis*, Survival

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INTRODUCTION

Natural rubber (NR) is one of the cell constituents of several plant species which produce latex. Though there are many alternative species of natural rubber, is available *Hevea brasiliensis* Muell. Arg**.** accounts for 99 percent of the worlds NR production (Thomas and Panicker, 2000). Conversely, the latex production is constrained by availability of suitable land and other abiotic and biotic stress that influence the productivity of rubber plantations (Jacob, 1997). Among the biotic constraints to production of rubber plantations, the most important is the incidence of diseases that cause significant crop loss (Jacob, 2006). Recently the Corynespora leaf fall (CLF) disease has emerged as major leaf disease of rubber in India and regular occurrence of this disease leads to economic yield loss up to 45 percent (Harmid, *et al.,* 1999). Severe outbreak of this disease was first observed in the coastal Karnataka region and was found spreading towards traditional rubber growing regions of Kerala (Manju, *et al.,* 2001). In spite of proper disease management, the spread of disease had been increasing year after year covering large geographical areas. The disease is now prevalent in almost all the rubber growing regions of south India. Therefore, we investigated methods of survival and spread of the pathogen so that an intervention can be made in the infection chain at the appropriate time in order to manage the disease effectively.

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MATERIALS AND METHODS

The present investigation on survival of *C. cassiicola* was undertaken at Hevea Breeding Sub-Station, Nettana, Karnataka to obtain information about the perpetuation of pathogens during the off-season. The survival of pathogen in fallen leaf litters infected dried twigs and infected leaves intact on trees were studied.

The CLF disease infected fallen leaves of rubber were

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collected and stored in the nylon basket under field conditions. The viability of the pathogen was studied by isolating the pathogen on PDA media regularly for every alternate day. The CLF disease infected twigs of rubber plants were collected from the field. The collected twigs were carefully sectioned using microtome as well as teased and observed under the microscope for the presence of dormant or inactive stage of *C. cassiicola*. The viability of the pathogen was studied by isolating the pathogen by plating dormant mycelia on PDA plates.

Study on survival of *C. cassiicola* on infected leaves intact with rubber trees and seasonal variation in disease intensity was undertaken for a period of 12 months. The pathogen from the infected leaves was regularly isolated throughout the year on PDA plates to estimate the survival. Periodic observations on disease progress were also recorded from the marked plants at fortnightly interval. Five leaflets from randomly selected four twigs on each marked plants were scored for the disease symptoms and intensity. Severity of the disease was assessed on a 0-5 scale based on the intensity of spotting, leaf deformation and leaf fall (Manju *et al*., 2001).

RESULTS AND DISCUSSION

The viability of pathogens on infected fallen leaves, dried twigs and infected leaves intact with plants was studied. The viability of the pathogen on infected fallen leaves revealed that pathogen survived up to 11 days in infected leaf litter as it showed growth on PDA medium. On 13th and 15th days after storing the leaf litter in field conditions, the pathogen could not be isolated (Table 1). The survivability of the *C. cassiicola* on infected rubber plant parts and debris was studied by sectioning and direct observation under microscope. The viability was also tested by plating the dormant mycelia on PDA plates. Results indicated that the pathogen was able to survive on infected plant debris from one season to the next as thick dark brown dormant mycelium under the bark of infected twigs. The dormant mycelia showed good growth on PDA medium.

Table 1: Survival of *Corynespora cassiicola* on fallen leaf litters

S. No.	Storage period (days)	Isolation and growth of pathogen on PDA medium
1	1	+
2	3	+
3	5	+
4	7	+
5	9	+
6	11	+
7	13	+
8	15	-
9	17	-

+ = Pathogen grows well, - = No pathogen growth

The results generated on seasonal variation on survival and severity of *C. cassiicola* on infected rubber plants is presented in Table 2. Pathogen *C. cassiicola* was found to survive on infected rubber trees throughout the year at varying intensity. Fresh infection observed after the refoliation during February and higher disease intensity was observed during March and April. The disease remained moderate during rainy season and there was no leaf fall during the rainy as well as wet months. Further, pathogen isolated from detached infected leaves showed good mycelial growth on PDA medium throughout the year. It indicated that the infected leaves intact with the plant serves as a primary source of infection during the favorable condition.

Table 2: Effect of seasonal variation on severity and survival of *Corynespora cassiicola* on infected rubber trees

Months	Growth of pathogen on PDA	Disease Intensity (%)	
		I FN	II FN
January	Positive	1.72	2.32
February	Positive	6.40	14.52
March	Positive	31.00	60.88
April	Positive	74.40	75.60
May	Positive	59.80	34.40
June	Positive	15.12	11.40
July	Positive	4.40	3.48
August	Positive	3.12	2.60
September	Positive	2.56	2.52
October	Positive	1.96	2.00
November	Positive	1.92	1.84
December	Positive	1.88	1.76

FN = Fortnight, PDA= Potato dextrose agar

During the absence of an active host plant, pathogenic fungi must survive itself to maintain continuity of the disease cycle and to provide primary inoculums for infection in the next season. Dormant inoculums in the infected rubber plants itself and dormant mycelia in the infected dried twigs in the rubber plantations mainly serve as primary source of inoculums in the field during favorable conditions (Manju *et al*., 2014). Similarly Pernezny and Simone (1993) reported the several means of survival and spread of *C. cassiicola*, in the field. They noted that *C. cassiicola* survive up to 2 years in crop debris. This pathogen can also over-winter in root debris and stem for survival in fields (Seaman *et al.,* 1965; Boosalis and Hamilton, 1957). The data generated from the study will be useful in formulating effective disease management strategies in rubber plantation.

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