CHAPTER 5

DISCUSSION

It is clear from the results of the present experiment that climatic factors like temperature relative humidity, rainfall and leaf age as well as season and the study area play a significant role on the disease development in Som (*Persea bombycina* Kost.). The climatic factors also influences the soil, air and phylloplane microfungal quality and quantity as well with seasonal variation. During the study period four major diseases were encountered in all the 5 study sites, i.e. Dorapara Agia, Budlung pahar, Lengopara, Buraburi and Kalyanpur Bhalukdubi were identified as grey blight, leaf blight, leaf spot and leaf rust. The average percentage disease index (PDI) of two years showed that the disease intensity of grey blight (12.531%) were highest followed by leaf blight (9.61%), leaf spot (9.351%) and leaf rust (9.268%) during the study period. Das and Benchamin (2000) reported grey blight as one of the major foliar disease of Som plant that occurred during March to September with 48-59% of the plant infection and 13.8-21.6% leaf area destruction. Leaf loss in grey blight disease was estimated at 1273 kg/hectare/annum. In present study the occurrence of grey blight were maximum during the Aheruwa generation of muga silk worm i.e. in the month of June-July. Other foliar diseases leaf rust were also maximum during Aheruwa generations of muga silkworm and leaf blight and leaf spot were maximum during Bhodia(August-September) generations muga silkworm. For all the generations of muga silk worm grey blight was found to be the dominant foliar disease of som than the other three diseases.

Huq (2011) studied epidemiology of leaf rot and leaf spot diseases of Betel Vine. Where he observed the peak incidence of leaf spot in the second week of August when the average temperature, relative humidity and rainfall were 29.60°C, 94.6 % and 13.4 mm respectively. Incidence of leaf spot reached maximum when average temperature, relative humidity and rainfall parameters were 26.7°C, 88.3% and 19.4 mm respectively. The meteorological factor which had greatly influenced initiation of leaf spot was less favorable for leaf rot diseases. On the other hand in present studies showed that average temperature maximum 34°C and minimum 20. 75°C, humidity maximum 92% and minimum 63% with a rainfall of 4286.25 ml and total rainy days of 17.75 days favoured the maximum occurrence of grey blight and leaf rust disease during the June-July. During August and September an average temperature maximum of 36.5°C and minimum 21.5°C, maximum humidity of 92% and minimum 62%,average rainfall of 2645.75 ml and total rainy days 15 days favoured the maximum occurrence of leaf spot and leaf blight of som leaves during Bhodia generations of muga silkworm. Whereas during December and Janury i.e. Jaruwa generations of muga silkworm an average temperature maximum of 25 °C and minimum 8.75 °C, average humidity maximum of 81.75% and minimum 61.5%, average rainfall of 112.5 ml and total rainy days of 1.25 favoured the minimum occurrence of foliar diseases of som in the Goalpara district of Assam. Kadam *et* al., (2014) studied epidemiology of leaf blight disease of Turmeric caused by *Colletotrichum gloeosporioides* (Penz. and Sacc.) They found that there is a crucial relationship between various parameters like minimum temperature, mean temperature, relative humidity, wind velocity, rainfall and rainy days and disease severity. Weather parameters minimum temperature and rainy days and wind velocity plays decisive role in disease development every year. Correlation coefficients between Percentage Disease Index (PDI) and minimum temperature and rainy days were statistically significant where as it was highly significant with wind velocity. Gadre *et* al. (1990), Potphode and Furgo (2012) also confirmed similar trends of prevailing weather parameters responsible for higher conidial population in atmosphere and subsequent anthracnose development in mango and bitter gourd respectively. Sidhan and Bose (1980) reported that atmospheric temperature and relative humidity are important meterological factors for development of different diseases and increase in relative humidity due to rainfall enhances initiation of diseases.

The fertility of the soil, organic matter decomposition, diseases of roots and production of antibiotics are greatly influenced by soil i.e. nonrhizosphere and rhizosphere microflora . The climatic and edaphic factors greatly influence the distribution pattern of microfungi in the soil of perennial plant.(Warcup, 1951, Saxena, 1954). Oyeyiola (2009) studied rhizosphere mycoflora of okro (*Hibiscus esculentus*), where he reported that the rhizosphere soil contained a greater spectrum of fungal species than either the rhizoplane or the non rhizosphere soil , the experimental soil were sandy loam in texture. The rhizosphere microflora of agar plant of Assam was studied by Das and Dubey (2001). They mentioned that total 60 percent microbial population were isolated from rhizosphere soil and rest 40 percent from non rhizosphere soil. The rhizosphere soil has capacity to produce more numbers of microbial population due to physiological affect of root system. Rhizosphere mycoflora of *Aquttaria agllocha* was studied by Borthakur *et* al.(2001). There were 15 numbers of fungal species isolated from rhizosphere soil and 9 numbers from non-rhizosphere soil. These studies support the present study on the non-rhizosphere and rhizosphere mycoflora of som plantation area. Where a total of 13 fungal species were isolated from the non rhizosphere soil and a total of 21 fungal species were isolated from the rhizosphere soil of som in Goalpara district of Assam. Which also supports the findings of Jalander and Mamatha (2015). They have studied rhizosphere and non rhizosphere mycoflora of some leguminous crop plants in relation to age of plant growth. It was reported that the rhizosphere mycoflora were higher than the non rhizosphere in all the three crops used for the experiment Bengal gram, Green gram and Black gram. The most abundant fungal species recorded were *Aspergillus*, *Penicillium*, *Rhizoctonia* and *Cladosporium sp*. Also in the present study it was seen that mycoflora of rhizosphere and non-rhizosphere soil of som are common except few species which supports the study conducted by Manoharachary *et* al. (1977), where they have reported except few species most of the fungi appeared common in both the soils i.e. the rhizosphere and non-rhizosphere soil of four different plants. The study was supported by the work of Sharma *et* al. (2013), where they have studied the frequency and percentage of occurrence of soil mycoflora in different crop fields at HD Kote of Mysore district. The most common among them were *A.niger*, *A.terreus*, *A.fumigatus*, *A.flavus*, *R.stolonifer*, *P.chrysogenum, P.fumiculosum, T.viridae, T.harzinum, F.oxysporum, F.solani, and C.lunata.* The further study showed that with the crop, soil and climate, the domination of certain fungal genera and species might vary. Patil and Chandra (1980) and Gangawane and Kulkani (1985) studied the density of fungal population in rhizosphere soil of cotton and ground nut plants. Where they reported that the climatic factors along with some basic characteristics of the plant play vital role for occurrence of rhizosphere fungal population. The mycoflora in rhizosphere of ground nut grown in sewage and sludge treated soil had difference. In sewage treated soil higher numbers of species were recorded than sludge as against a minimum numbers in untreated soil. Ivarson and Mack (1972) studied rhizosphere mycoflora of Soybean in relation to soil temperature and moisture in a field environment. Where they reported that high soil and incubation temperature encouraged greater root populations of *Rhizoctonia* early in the season , *Trichoderma* and *Aspergillus* throughout the growing season, and *Fusarium* late in the season. Where as low soil temperature favoured the growth of *Pythium*, *Mortierella*, *Mucor*, *Alternaria*, *Cladosporium* throughout the growing season. On the other hand in the present study it was found that in som in relation with age and season the microfungal species varies. In non rhizosphere soil it was found that in 3 months age group of plant, i.e. during February-April the dominant fungal species encountered were *Rhizopus stolonifer*, in 6 months age group of plant, i.e. during May-July the dominant fungal species were *Aspergillus flavus,* during 9 months age group of plant i.e. during August-October the dominant fungal species were *Rhizopus stolonifer*. Similarly for 12 months age group of plant, i.e. during November-January *Rhizopus stolonifer* were the dominant fungal species. Tamini *et al.* (1987), studied seasonal variation in the rhizosphere fungi of potato where they observed that the fungal population started increasing in May, reached in peak during September. They also found a correlation between the dominance of *Aspergillus* and *Penicillium* and the population dynamics of potato was pathogenic fungi. The present study supports the findings of Barua and Bara (1995) .Where they reported seasonal variation and distribution of microfungal population in Sal (*Shorea robusia)* forest soil. All these seasons showed a well marked distinction in variation of fungal population due to physico-chemical properties of the soil. Ramesh *et* al. (2002) reported the fungal diversity of rhizosphere of cotton *(Gossypium* sp.) of Dharwad, Karnataka where a total of 45 species belonging to 24 genera were isolated. More fungal population were found in rainy season and least number were obtained in winter season. On the other hand it was observed in the present study that during the winter season in 12 months age group of som plantlet the occurrence of rhizosphere mycoflora were little higher than the other seasons. A total of 15 fungal species were isolated from the 12 months age group of plants and a total of 12 fungal species were isolated in 9 months age group of plants.

Spore concentration of the atmosphere fluctuates with season, weather, change of time and with the plants height. A total of 18 aeromycoflora were isolated from the som plantation areas of Goalpara district of Assam, all of them showed seasonal variation. Chandwani *et* al. (1963) reported the occurrence of aerobiology of paddy field in different period. They further reported that season affect on occurrence of aerospora, profoundly *Cladosporium* and *Alternaria* shows the seasonal variation which was related with temperature and relative humidity. Similar studies have been done by Bordoloi and Barua (1964) in tea plants for atmospheric air spora in different seasons reported that *Aspergillus, Penicillium, Fusarium, Curvularia, Cladosporium, Phytopthora, Mucor* and *Pestaloptia* were dominant fungal species. Seasons influence on occurrence of these fungi and concentration of spore gradually decreased by increasing of height. In our study *Cladosporium cladosporioides* were found to be dominant fungi during February-March (Chatuwa), *Alternaria alternata* were dominant during April-May (Jethuwa), *Aspergillus flavus* were dominant during June-July (Aheruwa) , August-September (Bhodia) and October-November (Kotia), and *Penicillium chrysogenum* were found to be dominant during December-January (Jaruwa) which supports the report of Hamilton (1968). Where he mentioned that *Penicillium* may show little seasonal changes, it may even been more plentiful in winter than in summer season in coffee plantation field. It has been also reported that the concentration of air spores were significantly influenced by increase of temperature, relative humidity (Konger and Barua,1970). Barua (1991) reported that the occurrence of air microflora in sal tree indifferent seasons and height of the plants in South Kamrup district, Assam. She reported that occurrence of different mycoflora were depend upon the different climatic factors. Sharma and Bhattacharyee (2001) studied the nature of occurrence of aeromycoflora in Banana plants in Kamrup district in separate seasons. They reported *that Alternaria, Aspergillus, Botrytis, Botrydiploidia, Cercospora., Cladosporium, Mucor,Penicillium* were dominant species and occurred throughout the year. But the occurence were recorded highest during August to September, which gradually declined towards the last part of January. Sharma and Dutta (2002) studied the aeromycoflora of Jute plants in Silchar area and reported that a total 22 fungal forms belonging to 15 genera were isolated and identified. Among 15 genera 39 percent belonged to *Aspergillus* sp. and 16.45 percent belonged to *Penicillium* sp. while rest of genera included *Alteraria* sp., *Curvularia* sp., *Cladosporium* sp., *Fusarium* sp., *Geotrichum* sp., *Humicola* sp., *Nigrospora* sp., *Trichoderma* sp. and *Torula* sp. Similar studies have been performed by Das *et* al. (2005). Where they studied the seasonal variation of fungal air spora in muga food plant soalu in different heights of the plants. They reported that maximum fungal spora was recorded in rainy - summer and minimum during winter season. The result is similar to our present study, where it was observed that the occurrences of aeromycoflora were maximum during the rainy-summer season and minimum during winter season i.e. December to March. The results clearly indicates that seasonal as well as monthly variation of climatic factors such as temperature, humidity, rainfall etc of the particular area affect the distribution of airborne fungal flora. A very few works have been carried forward on the field of aeromicrobiology at the Northeast part of India, including Assam. No systematic studies have been made on aeromycoflora under agroclimatic condition of Goalpara district, Assam. However, few works have been done on aeromicrobiology over tea plantation area. Debnath and Baruah(2008), Dutta *et al.*(2010) made a study over aeromicroflora of tea plantation area. Bhattacharjee *et al.* (2012)

conducted a study on aeromycology at a bus terminus in Guwahti, Assam. Similarly Ray and Mishra (2012) conducted a study on aeromicroflora both at indoor and outdoor environment of a B.N College campus of Dhubri district of Assam. In all the studies there is a little difference on the occurrence and distribution of mycoflora. Sharma (2011) on her study on aromycoflora in relation to soil mycoflora of Darjeeling tea garden recorded 16 fungal species. During her study she observed *Aspergillus fumigatus* showed maximum percentage followed by *Aspergillus flavus*. While in the present study *Aspergillus flavus* showed the maximum occurrence followed by *Cladosporium cladosporioides*. On the other hand Kulkarni (2011) on her study over public park recorded *Alternaria alternata* as a dominant fungus followed by *Aspergillus niger*. She also mentioned that however *Aspergillus* was found most predominanted genus in the various studies conducted by different reasearcher at Raipur. Dutta *et* al., (2010) made a comparative study on the air, phyllosphere and soil mycoflora of tea plantation area of Cachar district, Assam where they reported *Aspergillus niger* showed highest occurrence in the month of June, July and September where as in the present investigation *Aspergillus niger*, *Penicillium chrysogenum* , *Rhizopus stolonifer* , *Cladosporium cladosporioides* were prevailed throughout the season with variation in occurrence. Hence from the above discussions it is seen that the seasonal variation as well as geographical location affects the fungal flora of the environment both in quantitatively and qualitatively.

From the results it is clear that the phylloplane mycoflora of Som leaves are effected by various seasonal and climatic factors such as temperature, humidity and rainfall. Similar works have been performed by Bora *et* al. (2004). Where they reported the occurrence of Phylloplane mycoflora of three mung bean in different growing seasons. They observed that fungal population were increased with the increased of age of the plant. Maximun occurrence of fungal species was observed during November to December *i.e.* at the time of harvesting. Das *et* al. (2005) studied on occurrence of leaf surface mycoflora in soalu plant during different muga silkworm rearing period in three different leaves such as tender, semi-tender and mature leaves. They reported that maximum fungal population harvested in mature leaves in all the seasons but among the season spring crop trap highest number of fungi. *Aspergillus fumigatus* was found as dominant species and occurred throughout the year. Similar work has been done by Deb *et* al (1999).They studied phyllosphere mycoflora of tea and the soil mycoflora of an experimental tea plantation area of cachar. It was reported that

Aspergillus , *Fusarium spp.* and *Penicillium* were the dominant mycoflora on the tea phyllosphere and in soil *Aspergillus*, *Cephalosporium, Fusarium* and *Penicillium* were the most dominant genera. In the present study fungal population showed an increasing pattern in winter and summer season but the population has decreased during the rainy season. Comparative study of the air, phyllosphere and soil mycoflora of the tea plantation area of Cachar district, Assam were studied by Dutta *et* al. (2010), where they reported a total of 34 fungal species from air, phylloplane and soil of the tea plantation area. Among them *Penicillium sp.*, *Aspergillus sp.*, *Fusarium sp.* and *Curvularia sp.* dominated in all the conditions i.e air, phyllosphere and soil. It was observed that air, soil and phylloplane mycofloral community remains almost similar for all the plants. Bhuyan *et* al. (2013) studied the phyllosphere microflora of muga silkworm host plant som leaves in jorhat district of Assam, India. Where they have reported positive correlation between temperature and microbial population, where as negative correlation was observed against relative humidity. During their study they reported Penicillium species as the dominant fungal species. In present study *Aspergillus niger*, *Aspergillus flavus*, *Alternaria alternata, Rhizopus stolonifer* and *Pestalotiopsis disseminata* were the dominant fungus during the study period in Goalpara district of Assam. Fungal diversity in phylloplane of castor plant during summer as well as winter season alongwith meterological parameters were studied by Borgohain *et* al. (2014). Where they reported a total of 11 fungi, among which *Alternaria alternata* and *Cercospora ricinela* were found to be most abundant fungi during all the seasons where as few fungal species were restricted to summer or winter season only. In summer in present study *Alternaria alternata* and *R.stolonifer* were dominant fungal species on the som phylloplane and in winter season *R.stolonifer* was found to be dominant in som phylloplane.

It was also noticed in the present investigation that the leaf types viz. tender, semi-mature and mature also influences growth of various phylloplane mycoflora. Seasonal incidence of phylloplane mycoflora of guava (*Psidium guajava*) was studied by Pandey and Dwivedi (2000). They observed a remarkable change in the phylloplane mycoflora with the maturity of leaves in different seasons. The maximum fungal population was recorded by them in rainy and minimum in summer season. The overall seasonal patterns of isolation from infected and non-infected materials were similar. However, *Aspergillus, Penicillium* and *Paecilomyces* sp. were most dominant in summer. On the other hand, *Aureobasidoum pullalans, Ascocyta, Fusarium* sp., *Curvularia* sp., *Colletotrichum gloeosporioides* were extensively present in rainyseason. During winter, *Cladosporium, Pestolatia, Cephalosporium* were dominant and *Phoma* were dominant in rainy season. Thakur *et* al. (1987) studied the leaf surface mycoflora of *Azadirachta indica.* They isolated maximum fungal population on leaf washing method. *Cunninghamella echinulata* was present only on dorsal side of leaflet during October. Species of *Fusarium* were present up to November and they totally disappeared in other months. In December and January dark colour sterile forms were dominant. The same method has been used in the present study with leaf sectioning method. Leaf surface microflora of healthy and diseased plant of *Solarium khasianum* was studied by Sharma and Tiwari (1988) and the investigators reported that maximum filamentous fungi were found on diseased leaves, where as maximum yeast and bacteria were observed on healthy leaves. On the other hand, some fungal species were found common in both healthy and diseased leaves. Sharma *et* al. (1992) made a quantitative and qualitative analysis of phylloplane microflora of yellow sarson and tamarind in relation to microclimatic factors. They found that the population of microplane microbes of both the host i.e. yellow sarson and tamarind decreased from November onwards up to January (very cold humid season) with a simultaneous fall of temperature and increase in relative humidity but later a reverse trend was observed during February with the peak population and an increase of temperature as well as relative humidity. The fungi were the dominant followed by bacteria and Actinomycetes.

The study on physicochemical properties of soil as well as its texture and study on biochemical properties of host plant leaves are very important phenomenon for sericulture industry. For undertaking any crop protection process, primary knowledge on the nutrient status of the soil status of the soil system is the first step for planning an effective crop production management system (Sharma *et* al., 2013).The nutrition of silkworm is entirely depend upon the quality of leaves. The health and growth o f the silkworm larvae as well as cocoon production and raw silkquality are influence by the condition of the leaves. A high nutritive value in leaf increases the resistance of the silkworm against the diseases and produces the good numbers of cocoons. Jolly *et al.* (1975) analyzed the food plants of tasar silkworm and reported that minimum crude fibre occurred in *Terminalia arjuna* (7.71%) and maximum in *Lagerstoemia parviflora (20%).*Yadava and Goswami (1992) analyzed the foliar constituents of som, and soalu and also recorded significantly highest total minerals, crude, fat and starch contents. Similarly, soalu recorded significantly high values for total nitrogen and crude proteinas against som. Variation between som and soalu for moisture, organic carbon, crudefibre and sugars were not significant. Similar studies have been performed by Hazarika *et* al. (1995). They determined the quality of som leaves for rearing of muga silk worm and found that there was significant variationin soluble protein, soluble sugar and total phenol. Better rearing performance wasrecorded in ecotypes having highest amount of soluble protein and phenol. Kakati and Hazarika (1997) reported in significant variation in dry lipid contents in the host plant of muga silkworm. Som leaf contains highest amount of lipids (10-20%) followed by soalu (8.2%) and lowest amount (7.5%) was recorded in mejankari. Dutta *et al.* (1999) reported variation in nutritional constituents in four different food plants of muga silkworm, *A. assama.* Bio-chemically the diseased leaves are poor in proteins, sugars and moisture. Feeding such leaves to silkworms has been found to adverse affect the health of the larvae and resulting in poor yield in production. From the present study it was seen that seasonal variation with different leaf types viz. Tender, Semi-mature and Mature, effect the biochemical properties of the leaves. Seasonal variation on physicochemical properties of soil were also observed in the different soil samples of the som plantation areas of Goalpara district of Assam.

From the results it was clear that all the five study sites viz. Dorapara Agia, Budlung pahar Lengopara, Buraburi and Kalyanpur Bhalukdubi som leaves were highly infected by Grey blight disease. It was also observed that in all the study sites the occurrence of Grey blight was dominant through out the season. Depending on crop varieties, presence of pathogens and environmental conditions the occurrence and prevalence of diseases varies with season to season. Regular monitoring and harvesting of infected leaves and twigs at the initial stage are an effective practice in som cultivation to minimize the diseases. Several fungicides have been identified and evaluated to control different diseases on different crops caused by *Pestalotiopsis disseminata* at different places (Govindaiah *et* al., 1990; Pandey *et* al., 2006) but information related to Grey blight of som are very less. *Pestalotiopsis disseminata* has been recorded from a wide range of host, mostly from their leaves, fruits and rhizosphere (Bilgrami *et* al., 1979).In an in*vitro* test Harsh *et* al. (1987) reported that 0.1% of Bavistin, 0.3% of Dithane M 45 were effective in controlling of the foliar disease of *Diospyros melanoxylan* caused by *Pestalotiopsis varsicolor* among the all fungicides used. The present data clearly indicates that there was significant reduction in linear growth of the test fungus due to application of chemical fungicides. Among the fungicides used during the present investigation Bavistin and Topsin M showed 100% of inhibition at concentration 0.10 % where as Mancozeb found effective at 0.20 % concentration. Copper oxychloride was found less effective among the four fungicides used for the study. Similar reports have been made by Das and Jha(2008), where they tested five fungicides against *Pestaloptiopsis disseminta* causing grey blight of som, among which carbendazim was found most inhibitory followed by Topsin M. Out of five fungicides carbendazim, thiophanate methyl and phenyl pyrrole had completely inhibited the growth of pathogen at all concentration. Mancozeb was found effective at higher concentration. Copper oxychloride was found least effective. They also suggested that Carbendazin at 0.20 % can be effectively used for minimizing the severity of Grey blight disease of Som. Das and Benchamin (2000) reported that Leaf spot, Leaf blight, Leaf rust and Leaf curl are the main foliar diseases of muga food plant som, *Persea bombycina* Kost. which occurred throughout the year. On the other hand, leaf spot, *Alternaria* blight, seedling blight and leaf rust of eri silkworm food plant castor can be controlled by spraying of 0.1 percent Bavistin 3 times at 15 days interval. Similar studies have been performed by Das and Das (2003), where they reported the Grey blight diseases of som plant can be controlled by spraying of 0.1 percent Bavistin 3 times at 15days interval before peak infection of the disease. Saju *et* al., (2011) reported Carbendazin 50 WP significantly effective at all concentration tested against *Pestalotiopsis sp.* infecting large cardamom (*Amomum sublatum* Roxb.) upto 80.6%. Where he suggested potential of using biocontrol agents and botanicals for ecofriendly management of *Pestalotiopsis sp.* infecting large cardamom & fungicides incase the incidence is severe. Devanath *et* al. (1994) screened the different fungicides for controlling of Leaf blight disease of guava plant. All five fungicides were found to be superior to control in preventing the disease incidence and among the fungicides, Dithane M-45 recorded the lowest disease incidence and highest yield.Various workers have reported that Bavistin, Cupravit, Dithane M 45, EC and Tilt 250 and performed best against *Pestalotia palmarum* (Kundalkar *et* al., 1991; Khaleqizaman *et* al., 2001). The complete inhibition of *Pestalotiopsis mangiferae* in vitro by 0.1% concentration of carbendazim was reported by Pandey *et* al. (2006). Mulberry foliar blight disease can be controlled by spraying 0.05% Blitox or Bavistain (Philip and Govindaiah, 1995). They have reported that these fungicides can completely suppressed the growth of fungal mycelium at 0.05, 0.1 and 0.2% concentration of the fungicides. Use of chemicals as combined mixture can be more effective in controlling of various foliar diseases as suggested by several workers. Yokoyama (1996) reported that Powdery mildew can be effectively controlled by using Bordeaux mixture in field condition. On the other hand Iyengar (1995) reported that Dinocap at 0.1 percent and Morestan at 0.025 to 0.050 percent were found to be effective for blight disease. He also mentioned that the residual toxicity of Dinocap lasted for 10 days while Morestan was free from any toxicity to silkworm. Gunashekar and Govindaiah (1999) reported that individual treartment with Carbendazim and Captan at the rate of 0.1- 0.2 or in combination is most effective to control of powdery mildew disease as well as Leaf rust in mulberry plants. Biswas and Sing (2005) worked on management of foliar disease of groundnut at ICAR, Tripura. They considered the combinations of carbendazim and mancozeb, carbendazim and tridemoph, carbndazim and COC mixing in two solutions in 1:1 (v/v) ratio, which minimized the leaf spot disease in the field. The intensity of former two combinations was at par with disease intensity observed with carbendazim alone. Simultaneously, rust intensity was less that with carbendazim for all the treatments of combination solutions. The most effective combination of fungicides for controlling of leaf spot and rust diseases was carbendazim and tridemoph mixture. Chakravorty *et* al., (2007) recommended that after every muga crop rearing destruction of infected leaves of crop/plant debris and twigs should be done by burning immediately which will help in the control of Grey blight disease. Although chemical control measures are also necessary. The chemical methods of plant disease management cover both the aspect the inoculums reduction and eradication of pathogen as well as protection of the host. Production of quality leaves in the silkworm food plants by the modern scientific way is the main goal in sericulture industry.

Control of diseases of silkworm food plants using chemicals is a risky management practice as it causes problem of residual toxicity to silk worm, when the chemical sprayed leaves are fed to them (Gangwar *et* al. 2000). Fungicides derived from plant products are safer alternatives for fungi control because they are richest source of bioactive phytochemicals such as alkaloids, terpenoids, polyacetylenes, unsaturated isobutylamides and phenolics (Verma *et* al. 2008). In the present study antifungal activity of 5 plants extracts reveals that the degree of inhibition of mycelial growth increases with increase in the concentration of the extract. It was seen that the leaf extract of *Azadirachta indica* have showed comparatively highest inhibition rate (95.56%) then the other plant extracts at 0.20 % concentration followed by *Bougainvillea spectabilis* extract (83.33%). Neem *(A. indica)* is abundantly grown in any where, widely known for its antifungal activities in all parts of the plant and it control most of the fungal diseases of leaves, seeds and roots (Achimu and Schloesse,1992; Hossain and Schloesser,1993). Sarvamangala *et* al. (1993) used the extract on neem, parthenium and some other plant extracts against the control of Leaf spot and Leaf rust diseases of mulberry food plant. It was observed that neem and parthenium significantly reduced the percent disease index (PDI) in Leaf spot and Rust diseases. On the other hand, the effect of other plant extracts on controlling of diseases were not under consideration. Ganapaty and Narayanaswamy (1994) reported that the plant species tested in different concentrations of neem oil, young neem leaf, neem seed and neem cake were most effective in inhibition of spore germination of *Phaeoisariopsis personata* and *Puceinia arachidis.* An in-vitro study were done by Singha *et* al. (2004) on antifungal activities of different plant extracts by considering *Azadiracta indica, Datura stromonium, Cassia tora, Parthenium histoporum* and *Ocimum sanctum* against *Colletotrichum capsid.* All the different plant extracts inhibited the radial growth and sporulation into some extent. It was observed that radial growth of *C. capsid* was minimum in *O. sanctum* and it was maximum in *A. indica.* On the other hand, sporulation was maximun in the extract of *C. tora* and minimum in *A. indica.* Similar work was investigated by Das *et* al. (2014). Where they studied the effect of leaf extracts of 18 different plant species against foliar Blight of Soalu (*Litsea monopetela*) which is also a primary food plant of muga silkworm caused by *Colletotrichum gloeosporioides* Penz. Out of entire plant species, *Bougainvillea spectabilis* , *Alium sativum* and *Chromolaema odoratum* were found most effective at all concentration. They reported 100% growth inhibition of the foliar blight causing fungus *Colletotrichum gloeosporioides* at 0.15% concentration level of *B. spectabilis* extract. Again, in the present study it was observed that the extract of *Eupatorium odoratum* also showed 80% inhibition of the mycelial growth of the fungus at concentration level 0.20 %. It also reveals that *Lantana camara* was the other promising botanical extract that can be used for controlling the growth of *P. disseminata* at higher concentration while the extract of *Lucas aspera* was less effective. Barsagade and Wagh (2002), used *A. indica* and *L. camara* plant extract for antimicrobial assay against *E. coli*, *S. aureus* and *A. niger*, where they observed that *L. camara* exhibited high activity against *E. coli* and *S. aureus*, where as moderately active against *A. niger*. On the other hand *A. indica* showed higher activity against *A. niger* and pronounced activity against *S. aureus*. Mondali *et* al,. (2009) studied antifungal activities of neem leaf extracts on *Rhizopus* and *Aspergillus*. Suleiman (2011), studied antifungal activity of leaf extract of neem & tobacco on fruit rot of tomato. The inhibitory action of the two extracts on mycelia growth increased with increase in concentration which is also clearly observed in the present study, as the concentration was increased from 0.01 to 0.20 the inhibitory activity of the plant extracts were also increased for all plant extracts. Harde and Suryawanshi (2014), reported *Alternaria* blight of mustard controlled by *A. indica*, *L .camara* and *Bouganvillea spectabilis* which showed 80.46%, 65.65% and 46.03% inhibitory effect against the *Alternaria* blight pathogen, on the other hand in present study it is seen that *A. indica* showed 95.56% inhibitory effect, *Bouganvillea spectabilis* showed 83.33% of inhibitory effect and *L. camara* showed 60.56 % inhibitory effect against grey blight causing fungus *Pestalotiopsis disseminata* in som plants. Antimicrobial activity of crude methanolic and acetone extracts of *Lantana camara* were recorded by Saraf *et* al. (2011) against 13 bacterial and 8 fungal strains. Devi & Chetry(2013), reported effect of *Eupatorium birmanicum* on *Dreschslera oryzae* (brown leaf spot of rice) , which showed 26.7% growth inhition at 15% level of concentration and at 20% concentration showed 31.1% growth inhibition. However in present study *Eupatorium odoratum* showed 80% inhibitory effect against *Pestalotiopsis disseminata*. Shivapuri and Gupta (2002) worked on evaluation of different plant extracts against the leaf spot disease of mustard plant. Out of 15 plant extracts *Azadirachata indica, Datura alba, Vinca rosea, Oscimun sanctum* were found most effective at 20percent concentration for controlling of leaf spot disease. However further evaluation in the field is required before the biocontrol agents, plant extracts and fungicides are recommended for disease management. In*vitro* antifungal activity of different weed extracts of *Capparis deciduas*, *Lantana camara* and *Tridax procumbens* were tested against *Fusarium oxysporum* plant pathogen. (Sharma and Kumar, 2014). Saju *et* al. (2011) evaluated antifungal activity of *Artemissia vulgaris* and *Schima wallichi* against *Pestalotiopsis sp.* infecting large cardamom. Gangwar *et* al. (2002) studied the control measure of powdery mildew disease of mulberry plant by using, different plants extracts. They found that out of 21 plant species considered, 10 were highly effective for control of the disease in in-*vitro* and in-*vivo*.

Nutritionally rich and high yielding variety of food plants are one of the main criteria of Sericulture industry. These food plants are always threatened by climatic factors, various foliar diseases, pests and others (Anonymous, 1962). Also, diseases leaves are poor in biochemical constituents like moisture, protein content and sugars etc. Such diseased leaves can affect the growth and health of larvae of muga silkworm resulting in poor cocoon productivity.