CHAPTER 4

RESULTS

- During the study period four major diseases were encountered in all the 5 study sites, i.e. Dorapara Agia (26°5'31.525"N, 90°33'57.109"E), Budlung pahar (25°59'48.254"N,90°57'15.076"E), Lengopara (26°6'7.699"N, 90°47'9.044"E), Buraburi (25°58' 47.057"N, 90°47'32.217"E) and Kalyanpur Bhalukdubi (26°5'38.357"N, 90°33'43.882"E) were identified as Grey blight, Leaf blight, Leaf spot and Leaf rust. The images of all the foliar disease are shown in Plate.**2**.

- 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. The values are tabulated in **Table.1**. **Fig.1**. represents the graphical representation of average PDI values during the study period respectively.

- It was observed that the grey blight disease were highest in occurrence during the *Aheruwa* generation and lowest during the *Jaruwa* generation of muga silkworms. Similarly the leaf spot and leaf blight disease were highest during the *Bhodia* generation & lowest during the *Jaruwa* generation and leaf rust were maximum during *Aheruwa* and lowest during the *Jaruwa* generation of the muga silkworms.

Table 1. Percentage of disease index of different foliar disease of Som (Average value of two years): 2014-2016

Generations of muga silkworm	Seasons	Leaf spot	Grey blight	Leaf blight	Leaf rust	Mean
Chatuwa	February	5.32	7.89	6.53	4.96	6.175
	March	6.39	9.28	7.07	7.82	7.64
	Mean	5.855	8.585	6.8	6.39	6.9075
Jethuwa	April	6.92	12.05	9.64	9.02	9.4075
	May	10.05	13.49	9.98	9.59	10.7775
	Mean	8.485	12.77	9.81	9.305	10.095
Aheruwa	June	13.70	17.56	12.87	14.95	14.77
	July	15.59	18.45	14.63	15.08	15.9375
	Mean	14.645	18.005	13.75	15.015	15.3537
Bhodia	August	15.08	18.02	14.59	13.75	15.36
	September	14.23	17.28	14.06	10.23	13.95
	Mean	14.655	17.65	14.325	11.99	14.655
Kotia	October	7.50	15.04	9.70	9.57	10.4525
	November	7.05	10.93	6.93	7.03	7.985
	Mean	7.275	12.985	8.315	8.3	9.21875
Jaruwa	December	5.37	5.30	4.50	5.95	5.28
	January	5.02	5.09	4.92	3.27	4.575
	Mean	5.195	5.195	4.71	4.61	4.9275
Total Mean		9.351	12.531	9.61	9.268	

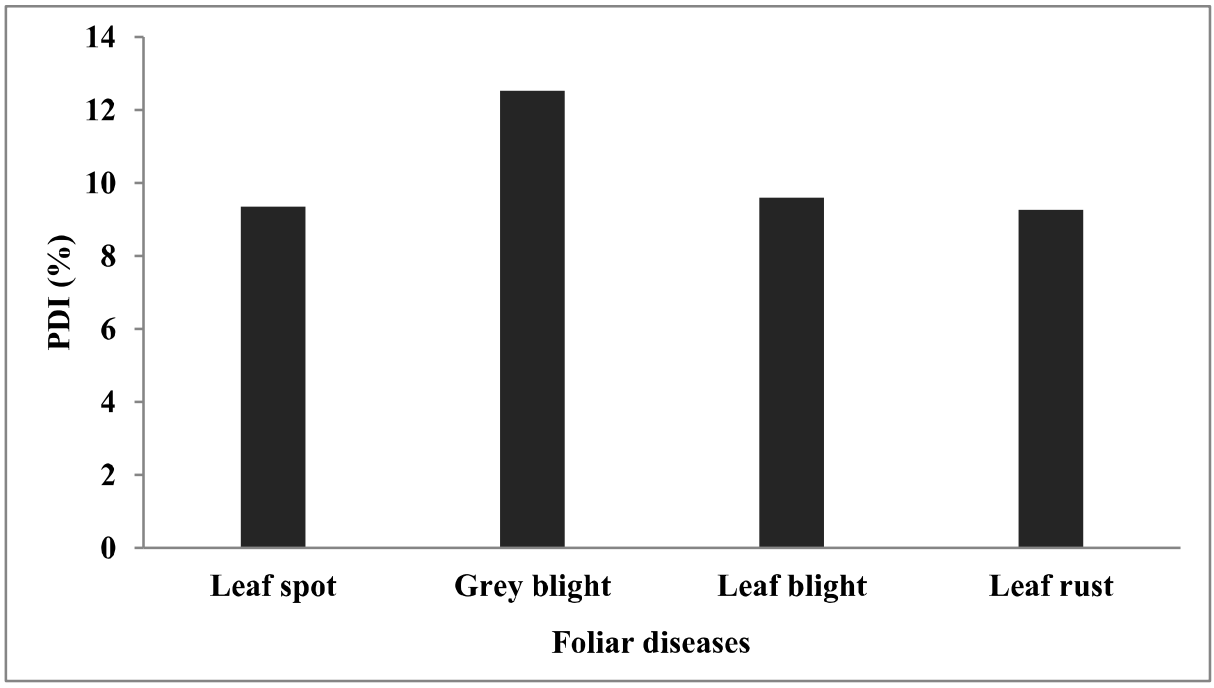


Fig.1. Graphical representation of mean PDI values of two years (2014-2016)

Fig.A. Grey blight disease of Som

Fig.B. Leaf blight disease of Som

Fig.C. Leaf spot disease of Som

Fig.D. Leaf rust disease of Som

Plate.2. Images of major foliar diseases of som from Goalpara district of Assam

The epidemiological study shows that during the *Aheruwa* crop of muga silkworm the *Som* leaves are highly effected with all the four foliar diseases. During high temperature, humidity and rainfall the disease incidence were the highest. Among all leave types taken tender, semimature and mature, it was observed that the disease incidence were encountered only on the mature leaves while there were absence of disease on the tender and semimature leaves. Among the five study areas , it was seen that the Lengopara site is highly effected with grey blight disease during the *Aheruwa* crop of muga silkworm while maximum temperature were 34°C and minimum temperature 20.75° C, humidity 92% and minimum 63% and rainfall were 4286.25 ml. During *Chatuwa* crop among the 5 study sites the occurrence of grey blight disease were maximum in Kalyanpur Bhalukdubi, Lengopara and Buraburi, while in Budlung pahar occurrence of leaf blight were maximum and in Dorapara Agia occurrence of leaf rust were maximum. During *Jethuwa* crop among the 5 study sites occurrence of grey blight were maximum in Lengopara and Buraburi. Leaf spot were maximum in Kalyanpur Bhalukdubi, leaf blight were maximum in Budlung pahar and Dorapara Agia. For *Aheruwa* crop , occurrence of grey blight were maximum for all the study sites. Among them Lengopara is highly effected with grey blight. During *Bhodia* crop also occurrence of grey blight disease were maximum in all the sites, among them Buraburi were highly effected with grey blight. Again for *Kotia* crop grey blight,leaf spot and leaf rust were maximum in Lengopara and leaf blight were maximum in Dorapara Agia. During *Jaruwa* generation of muga silkworm occurrence of grey blight were maximum in Lengopara, leaf spot were maximum in Dorapara Agia while Buraburi were highly effected with leaf blight and Kalyanpur Bhalukdubi were effected by leaf rust. **Table.2.** represents epidemiology of major foliar diseases of Som from Goalpara district of Assam in brief. Whereas detailed study on disease epidemiology at Budlung Pahar, Dorapara Agia, Buraburi ,Kalyanpur Bhalukdubi and Lengopara,Goalpara during different muga crop growing seasons were tabulated in **Table.3., Table.4., Table.5., Table.6.,** and **Table.7.** It was seen that the high temperature, humidity, rainfall and topography of the area effects the growth of the pathogens and disease as well. It was also observed that during low temperature, low humidity and low rainfall conditions the disease intensity were less. The *Som* plant leaves were highly effected by grey blight, leaf blight, leaf spot and leaf rust during the *Aheruwa* and *Bhodia* generation of muga silkworm. Graphical representation of epidemiology of major foliar diseases of Som from 5 different places of Goalpara district of Assam during 2014-2016 is showed in **Fig.2.**

Fig.3. (a, b, c, d, e) showed graphical representation of epidemiology of grey blight diseases; **Fig.4.(a, b, c, d, e)** represented epidemiology graph of leaf spot diseases ; **Fig.5.(a, b, c, d, e)** showed graphical representation of epidemiology of leaf blight diseases and **Fig.6.(a, b, c, d, e)** represented leaf rust diseases of Som leaves during 2014-2016 at (a) Bhalukdubi Kalyanpur (b) Budlung pahar (c) Buraburi (d) Dorapara Agia (e) Lengopara respectively.

Table.2. Epidemiology of major foliar diseases of Som from five different sites of Goalpara district of Assam during 2014-2016

Study site	Coordinates Latitude Longitude		Area (bigha)	Total no. of plants	Age of plants	Type of leaves	No. of leaves	PDI			
								Grey blight	Leaf spot	Leaf blight	Leaf rust
Budlung pahar	25°59'48.254"N	90°57'15.076"E	7.25	775	12-15 yrs	Tender	25	0	0	0	0
						Semi mature	25	0	0	0	0
						Mature	25	10.321	8.23	10.931	9.25
Dorapara Agia	26°5'31.525"N	90°33'57.109"E	12.65	1325	8-10yrs	Tender	25	0	0	0	0
						Semi mature	25	0	0	0	0
						Mature	25	12.56	10.59	11.825	10.532
Buraburi	26°4'10.140"N	90°36'0.612"E	6.1	685	9-11yrs	Tender	25	0	0	0	0
						Semi mature	25	0	0	0	0
						Mature	25	15.063	7.87	9.393	6.958
Kalyanpur Bhalukdubi	26°7'12.126"N	90°34'53.627"E	6.65	575	10-12yrs	Tender	25	0	0	0	0
						Semi mature	25	0	0	0	0
						Mature	25	8.09	8.322	7.824	7.78
Lengopara	26°06'7.699"N	90°47'09.044"E	11.95	1370	8-10yrs	Tender	25	0	0	0	0
						Semi mature	25	0	0	0	0
						Mature	25	16.621	11.743	8.077	11.82

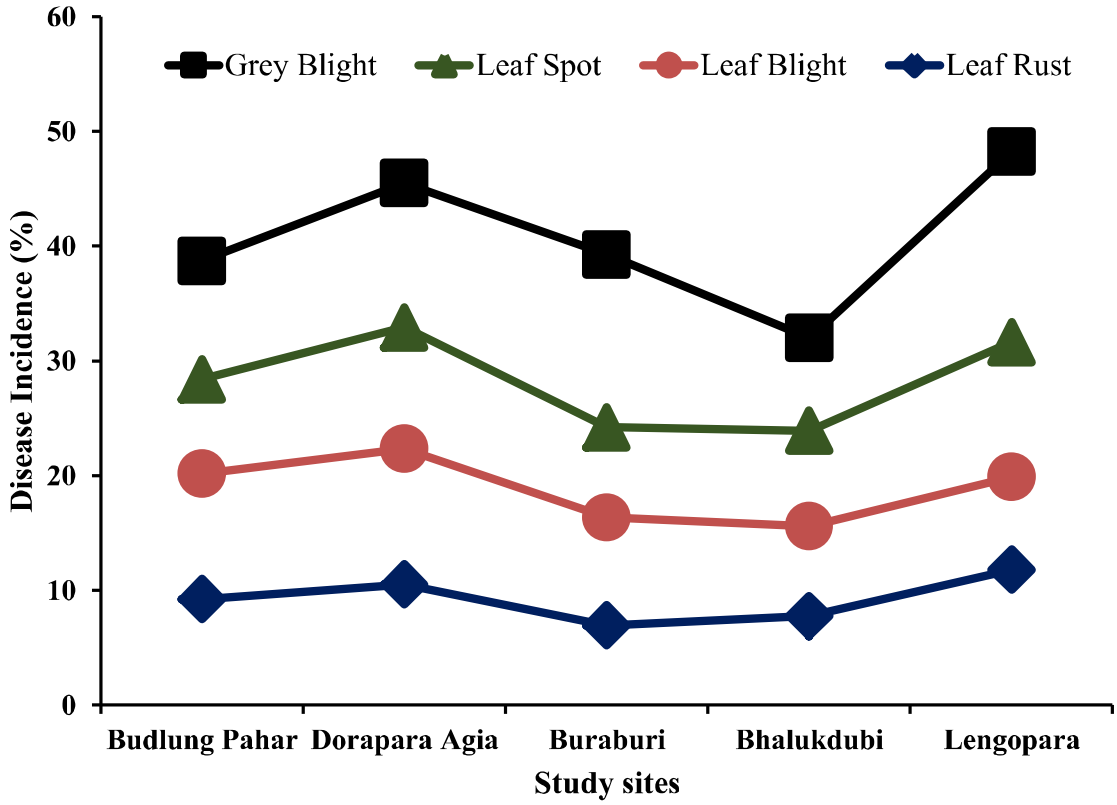


Fig.2. Graphical representation of epidemiology of major foliar diseases of Som from 5 different places of Goalpara district of Assam during 2014-2016

Table. 3. Disease epidemiology at Budlung Pahar, Goalpara in different seasons during 2014-2016

Study site	Climatic factor	Season	Grey blight	Leaf spot	Leaf blight	Leaf rust
Budlung pahar	Temperature: Max 31°C Min 9.75°C Humidity: Max 84.75% Min 50.5% Rainfall: 208.25 ml Total rainy days: 2.5	Chatua (Feb-Mar)	5.95	2.541	8.111	4.18
	Temperature: Max 34.25°C Min 15.5°C Humidity: Max 88% Min 57% Rainfall: 1351ml Total rainy days: 12.5	Jethuwa (Apr-May)	8.56	6.82	9.493	8.43
	Temperature: Max 34°C Min 20.75°C Humidity: Max 92% Min 63 % Rainfall: 4286.25 ml Total rainy days: 17.75	Aheruwa (Jun-Jul)	20.492	15.43	18.925	15.59
	Temperature: Max 36.5°C Min 21.5°C Humidity: Max 92% Min 62 % Rainfall: 2645.75ml Total rainy days: 15	Bhodia (Aug-Sep)	12.239	9.597	10.749	11.32
	Temperature: Max 32°C Min 18.25°C Humidity: Max 88.75% Min 62.25% Rainfall: 112.5 ml Total rainy days:1.75	Kotia (Oct-Nov)	10.32	9.742	12.23	10.03
	Temperature: Max 25°C Min 8.75 °C Humidity: Max 81.75% Min 61.5% Rainfall: 112.5 ml Total rainy days: 1.25	Jaruwa (Dec-Jan)	4.365	5.25	6.08	5.95

Table. 4. Disease epidemiology at Dorapara Agia, Goalpara in different seasons during 2014-2016

Study site	Climatic factor	Season	Grey blight	Leaf spot	Leaf blight	Leaf rust
Dorapara Agia	Temperature: Max 31°C Min 9.75°C Humidity: Max 84.75% Min 50.5% Rainfall: 208.25 ml Total rainy days: 2.5	Chatua (Feb-Mar)	7.538	6.5	5.83	8.666
	Temperature: Max 34.25°C Min 15.5°C Humidity: Max 88% Min 57% Rainfall: 1351ml Total rainy days: 12.5	Jethua (Apr-May)	10.83	10.33	12.02	10.23
	Temperature: Max 34°C Min 20.75°C Humidity: Max 92% Min 63 % Rainfall: 4286.25 ml Total rainy days: 17.75	Aheruwa (Jun-Jul)	20.75	17.23	18.59	16.93
	Temperature: Max 36.5°C Min 21.5°C Humidity: Max 92% Min 62 % Rainfall: 2645.75ml Total rainy days: 15	Bhodia (Aug-Sep)	16.953	12.08	15.85	12.49
	Temperature: Max 32°C Min 18.25°C Humidity: Max 88.75% Min 62.25% Rainfall: 112.5 ml Total rainy days:1.75	Kotia (Oct-Nov)	12.329	10.56	13.43	9.856
	Temperature: Max 25°C Min 8.75 °C Humidity: Max 81.75% Min 61.5% Rainfall: 112.5 ml Total rainy days: 1.25	Jaruwa (Dec-Jan)	6.96	6.84	5.23	5.02

Table.5. Disease epidemiology at Buraburi, Goalpara during different seasons in 2014-2016

Study site	Climatic factor	Season	Grey blight	Leaf spot	Leaf blight	Leaf rust
Buraburi	Temperature: Max 31°C Min 9.75°C Humidity: Max 84.75% Min 50.5% Rainfall: 208.25 ml Total rainy days: 2.5	Chatua (Feb-Mar)	10.87	4.44	6.428	5.638
	Temperature: Max 34.25°C Min 15.5°C Humidity: Max 88% Min 57% Rainfall: 1351ml Total rainy days: 12.5	Jethua (Apr-May)	12.32	8.295	8.78	7.406
	Temperature: Max 34°C Min 20.75°C Humidity: Max 92% Min 63 % Rainfall: 4286.25 ml Total rainy days: 17.75	Aheruwa (Jun-Jul)	28.935	13.52	14.08	10.628
	Temperature: Max 36.5°C Min 21.5°C Humidity: Max 92% Min 62 % Rainfall: 2645.75ml Total rainy days: 15	Bhodia (Aug-Sep)	22.782	10.635	12.75	8.934
	Temperature: Max 32°C Min 18.25°C Humidity: Max 88.75% Min 62.25% Rainfall: 112.5 ml Total rainy days:1.75	Kotia (Oct-Nov)	10.08	7.39	8.63	5.322
	Temperature: Max 25°C Min 8.75 °C Humidity: Max 81.75% Min 61.5% Rainfall: 112.5 ml Total rainy days: 1.25	Jaruwa (Dec-Jan)	5.391	2.94	5.69	3.82

Table.6. Disease epidemiology at Bhalukdubi, Goalpara in different seasons during 2014-2016

Study site	Climatic factor	Season	Grey blight	Leaf spot	Leaf blight	Leaf rust
Kalyanpur Bhalukdubi	Temperature: Max 31°C Min 9.75°C Humidity: Max 84.75% Min 50.5% Rainfall: 208.25 ml Total rainy days: 2.5	Chatua (Feb-Mar)	6.65	6.23	5.96	5.08
	Temperature: Max 34.25°C Min 15.5°C Humidity: Max 88% Min 57% Rainfall: 1351ml Total rainy days: 12.5	Jethua (Apr-May)	8.938	9.09	8.072	7.111
	Temperature: Max 34°C Min 20.75°C Humidity: Max 92% Min 63 % Rainfall: 4286.25 ml Total rainy days: 17.75	Aheruwa (Jun-Jul)	12.25	13.89	12.75	13.25
	Temperature: Max 36.5°C Min 21.5°C Humidity: Max 92% Min 62 % Rainfall: 2645.75ml Total rainy days: 15	Bhodia (Aug-Sep)	10.082	9.32	9.153	9.954
	Temperature: Max 32°C Min 18.25°C Humidity: Max 88.75% Min 62.25% Rainfall: 112.5 ml Total rainy days:1.75	Kotia (Oct-Nov)	6.78	8.23	7.13	6.96
	Temperature: Max 25°C Min 8.75 °C Humidity: Max 81.75% Min 61.5% Rainfall: 112.5 ml Total rainy days: 1.25	Jaruwa (Dec-Jan)	3.84	3.172	3.879	4.325

Table.7. Disease epidemiology at Lengopara, Goalpara in different seasons during 2014-2016

Study site	Climatic factor	Season	Grey blight	Leaf spot	Leaf blight	Leaf rust
Lengopara	Temperature: Max 31°C Min 9.75°C Humidity: Max 84.75% Min 50.5% Rainfall: 208.25 ml Total rainy days: 2.5	Chatua (Feb-Mar)	8.96	6.595	6.39	7.56
	Temperature: Max 34.25°C Min 15.5°C Humidity: Max 88% Min 57% Rainfall: 1351ml Total rainy days: 12.5	Jethua (Apr-May)	15.852	8.54	6.88	8.923
	Temperature: Max 34°C Min 20.75°C Humidity: Max 92% Min 63 % Rainfall: 4286.25 ml Total rainy days: 17.75	Aheruwa (Jun-Jul)	32.96	20.426	15.82	25.49
	Temperature: Max 36.5°C Min 21.5°C Humidity: Max 92% Min 62 % Rainfall: 2645.75ml Total rainy days: 15	Bhodia (Aug-Sep)	22.558	15.894	8.23	13.024
	Temperature: Max 32°C Min 18.25°C Humidity: Max 88.75% Min 62.25% Rainfall: 112.5 ml Total rainy days:1.75	Kotia (Oct-Nov)	12.35	13.805	5.68	10.596
	Temperature: Max 25°C Min 8.75 °C Humidity: Max 81.75% Min 61.5% Rainfall: 112.5 ml Total rainy days: 1.25	Jaruwa (Dec-Jan)	7.046	5.198	5.29	5.327

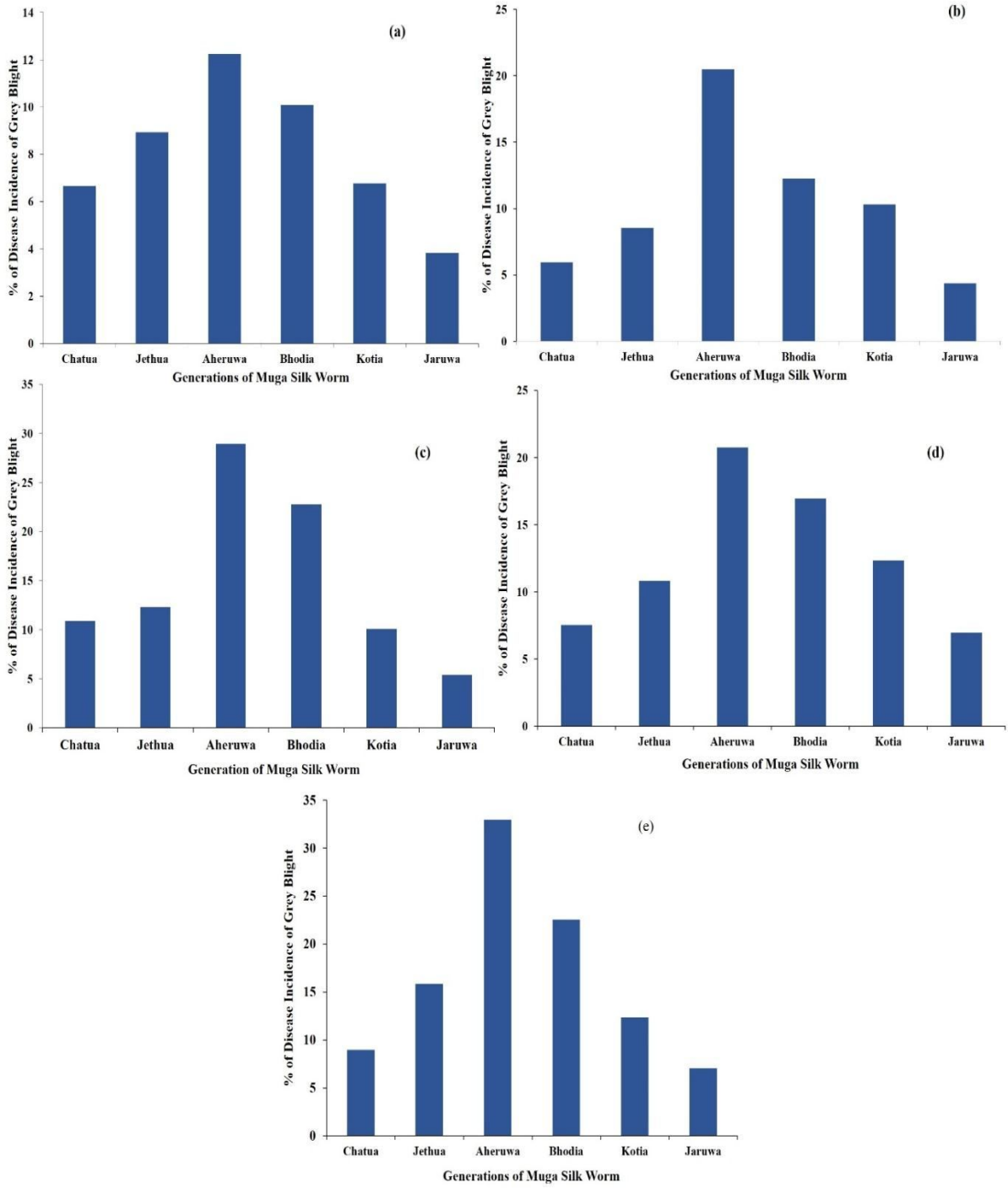


Fig.3: Disease Epidemiology of Grey Blight of Som Plant in different areas of Goalpara districts. (a) Bhalukdubi Kalyanpur (b) Budlung pahar (c) Buraburi (d) Dorapara Agia (e) Lengopara.

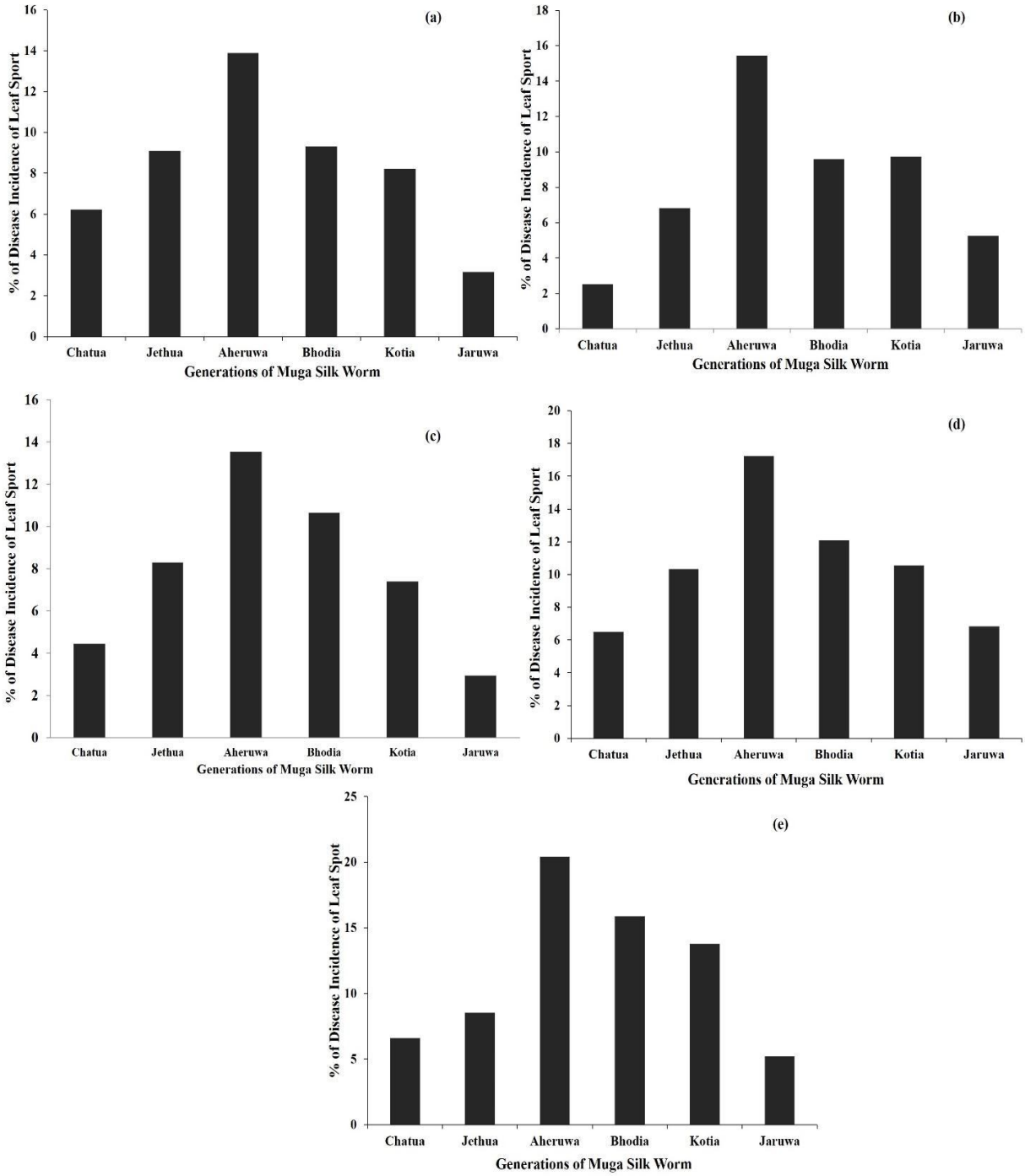


Fig.4 : Disease Epidemiology of Leaf Spot of Som Plant in different areas of Goalpara districts. (a) Bhalukdubi Kalyanpur (b) Budlungpahar (c) Buraburi (d) Dorapara Agia (e) Lengopara.

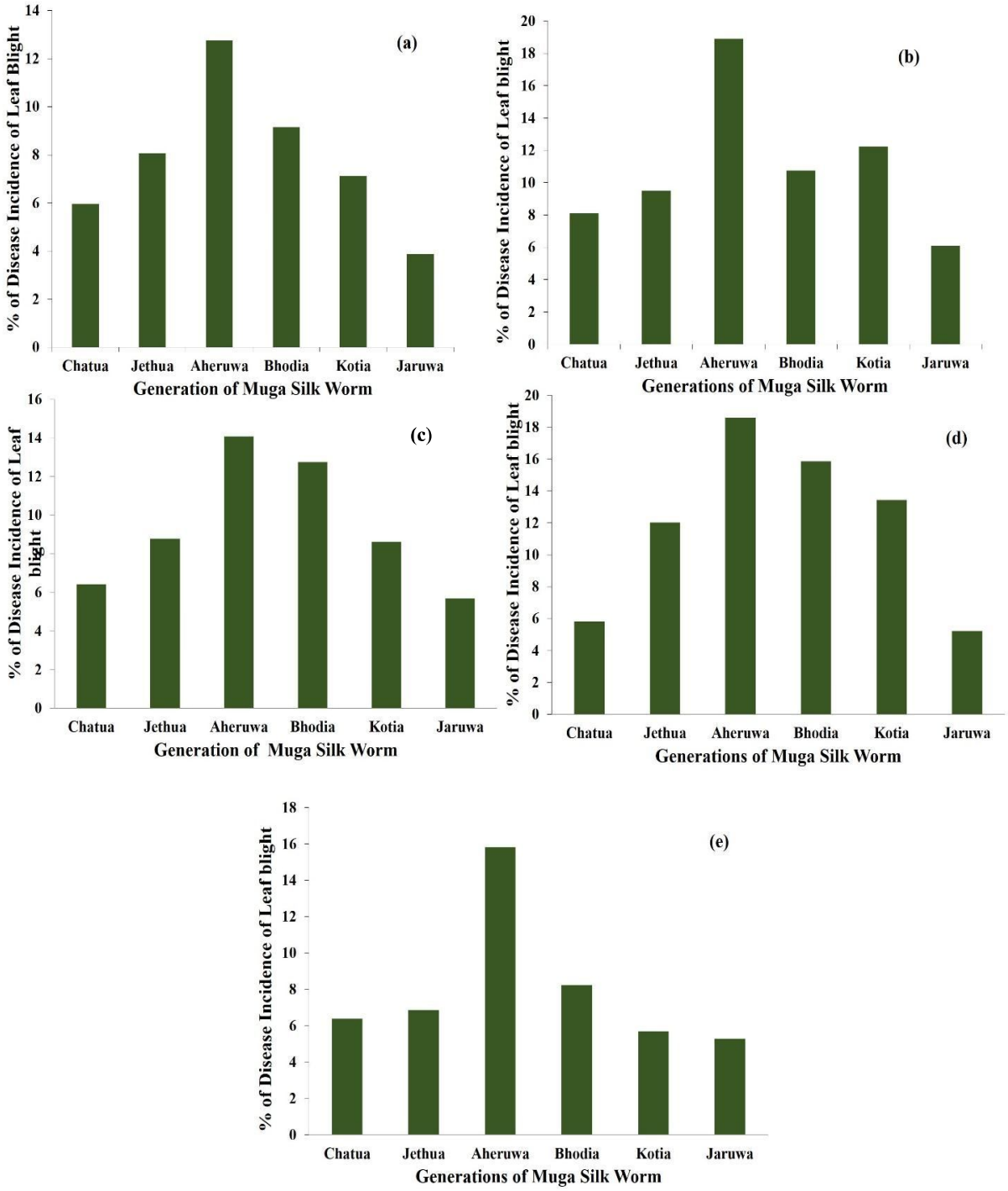


Fig.5: Disease Epidemiology of Leaf blight of Som Plant in different areas of Goalpara districts. (a) Bhalukdubi Kalyanpur (b) Budlung pahar (c) Buraburi (d) Dorapara Agia (e) Lengopara.

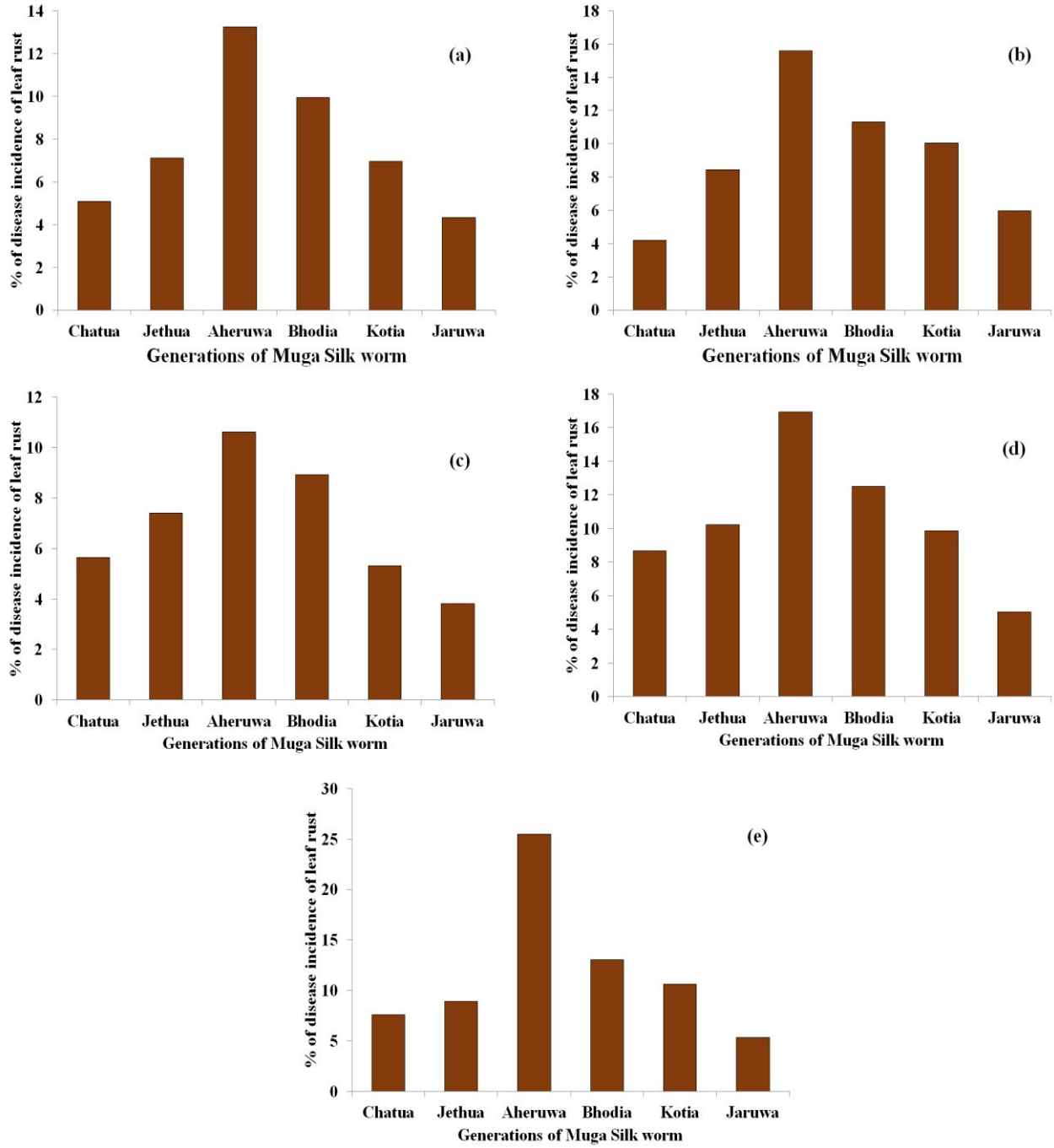


Fig.6: Disease Epidemiology of Leaf rust of Som Plant in different areas of Goalpara districts. (a) Bhalukdubi Kalyanpur (b) Budlung pahar (c) Buraburi (d) Dorapara Agia (e) Lengopara.

For non-rhizosphere soil, in 3 month age old plantlet a total of 12 fungal species, for 6 months age group of plants a total of 16 fungal species, for 9 month old plantlet a total of 12 no. of fungi and for 12 month old planted a total of 11 no. s of fungal species were isolated and identified. Similarly for rhizosphere soil, a total of 18 fungi from 3 months old plantlet, 20 no. s of fungi from 6 month old plantlet, 14 no. s of fungi from 9 months old plantlet and a total of 17 fungi from 12 month old plantlet were isolated and identified. The dominant non-rhizosphere fungal flora in 3 months age group of plants were *Rhizopus stolonifer, Aspergillus niger, Penicillium chrysogenum, Mucor hiemalis, Trichodema viridae* and *Saccharomyces cereviseae,* in 6 months age group of plantlets the dominant mycoflora were *R. stolonifer, A. niger, A. fumigatus, T. viridae and P. chrysogenum*, in 9 months age group of plants *A. fumigatus, R. stolonifer, P. chrysogenum, S. cereviseae, T. viridae, A. niger, M. hiemalis, P. disseminata, Mycelia sterile (white), C. cladosporioides and A. flavus while in 12 months age group of plants A. fumigatus, R. stolonifer, P. chrysogenum, C. cladosporioides, A. flavus, A. niger* were the dominat mycoflora in non-rhizosphere soil. In rhizosphere the dominant mycoflora for 3 months age group of plants were *P. chrysogenum, R. stolonifer, A. niger, T. viridae, S. cerevisae, M. hiemalis, F. oxysporum and M. sterila* (white), in 6 months age group of plants the dominant mycoflora were *R. stolonifer, P. chrysogenum, A. niger, T. viridae, S. cerevisae and A. fumigatu*s, in 9 months old plantlet the dominant mycoflora were *R. stolonifer, A. flavus, A. niger, C. lunata, P. chrysogenum, A. fumigatus, A. alternata, M. sterila* (white) and *T. viridae*. In 12 months age group of plants *R. stolonifer, A. flavus, A. niger, C. lunata, M. hiemalis, P. chrysogenum, A. fumigatus, C. cladosporioides, M. sterila* (white), *T. viridae* and *Trichothecium sp.* were the dominant rhizosphere mycoflora. Frequency of occurence (%) of fungal isolates in the Non-rhizosphere and rhizosphere soil of Som is tabulated in **Table.8.** and **Table.9.** Graphical representation of Frequency of occurence (%) of fungal isolates in the non-rhizosphere and rhizosphere soil of Som were showed in **Fig.7.** and **Fig.8.** respectively.

The major aeromycoflora were *Aspergillus niger*, *Cladosporium cladosporioides*, *Rhizopus stolonifer* and *Fusarium oxysporum* during *Chatua* generation; *Rhizopus stolonifer* , *Alternaria alternata*, *Fusarium oxysporum* and *Curvularia lunata* during *Jethuwa*; *Aspergillus flavus*, *R. stolonifer* and *C. lunata* during *Aheruwa*; *A. flavus*, *A. fumigatus*, *A. niger*, *Pestalotiopsis disseminata*, *Colletotrichum gloeosporioides* and *R. Stolonifer* during *Bhodia*; *A. niger*, *C. cladosporioides*, *A. flavus*, *A. fumigatus*, *R. stolonifer*, *Penicillium*

chrysogenum and *P. disseminata* during Kotia while *P. chrysogenum*, *C. cladosporioides*, *F. oxysporum*, *R. stolonifer*, *A. niger*, *P. disseminata* and *A. flavus* were the dominat aeromycoflora during the *Jaruwa* generation of muga silkworm. During *Chatuwa* generation a total of 9, during *Jethuwa* a total of 12, during *Aheruwa* a total of 12, during *Bhodia* a total of 8, during *Kotia* a total of 11 and during *Jaruwa* a total of 9 fungal species were isolated and identified from air. Percentage of occurrence of aeromycoflora from Som growing areas of Goalpara district, Assam during various muga crop seasons were tabulated in **Table.10.** and graphical representation were showed in **Fig.9.** Images of collection of air sample from Som plantation area and their growth after 7 days of incubation period were documented in **Plate.3.**

During *Chatuwa* generation, from the dorsal surface of tender leaves a total of 11 fungal species and from ventral surface a total of 9 fungal species were isolated and identified. Among them *R. Stolonifer* were the dominant fungal species which were found in both the dorsal and ventral surface of the *Som* tender leaves. In semimature leaves, on the dorsal surface a total of 11 and on ventral surface a total of 8 fungi were isolated among which *R. stolonifer* were the dominant fungal species. On mature leaf dorsal surface a total of 9 fungi and from ventral surface 6 fungi were isolated and identified, among which *R. stolonifer* were the dominant fungal species encountered. In *Jethuwa* generation of muga silkworm, on dorsal surface of tender leaves a total of 10 and in ventral surface a total of 8 fungal species were isolated & identified among which, *Alternaria alternata* were the dominant fungal species in the dorsal surface while *Aspergillus flavus* were the dominant fungi on ventral surface of tender leaves of *Som*. In semimature leaves on both dorsal and ventral surface a total of 10 no. s of fungi were isolated and identified among which *R. stolonifer* were the dominant fungal species on both the dorsal and ventral surface of the leaves. In mature leaves on dorsal surface a total of 8 fungi and on ventral surface a total of 10 fungi were isolated and identified, among them *R. stolonifer* were the dominant fungi in both the dorsal and ventral surface of the mature *Som* leaves. In Aheruwa generation of muga silk worm, on the dorsal surface of tender leaves a total of 8 and on ventral surface a total of 7 fungal species were isolated and identified among which on dorsal surface the dominant fungal species were *A. niger* and on ventral surface *R. stolonifer* were the dominant fungi. In semimature leaves, on the dorsal surface a total of 7 fungi and on ventral surface a total of 7 fungi were isolated and identified among which on both the dorsal and ventral surfaces the

dominant fungal species were *R. stolonifer*. In mature leaves, on the dorsal surface a total of 8 and on ventral surface a total of 9 fungal species were isolated and identified among which *R. stolonifer* were dominant fungal species for both dorsal and ventral surface. In *Bhodia* generation, on tender leaves dorsal surface a total of 7 and on ventral surface a total of 7 fungi were isolated and identified, among which *A .flavus* were dominant on both dorsal and ventral surface. In semimature leaves dorsal surface a total of 6 fungi and on ventral surface a total of 8 fungi were isolated and identified among which on dorsal surface *A. flavus* were the dominant and on ventral surface *A. niger* were the dominant fungal species.In mature leaves dorsal surface a total of 10 fungi and on ventral surface a total of 11 fungi were isolated and identified, among which *Pestalotiopsis disseminata* were dominant on the dorsal surface and *A. niger* were dominant on the ventral surface of leaves. In *Kotia* generation, on tender leaves dorsal surface a total of 8 fungi and on ventral surface a total of 7 fungi were isolated and identified. Among which the *A. niger* were dominant fungal species for both the surfaces. In semimature leaves dorsal surface a total of 7 fungi and on ventral surface a total of 6 fungi were isolated and identified, among which *A. niger* were the dominant fungal species on both the dorsal and ventral surfaces of the leaves. In mature leaves dorsal surface a total of 7 fungi and on ventral surface a total of 8 fungi were isolated and identified, among which *A. niger* were dominant fungal species for both the dorsal and ventral surfaces. In *Jaruwa* generation in tender leaves dorsal surfaces a total of 9 fungi and in ventral surface a total of 7 fungi were isolated and identified , among which *R. stolonifer* were dominant fungi for both the dorsal and ventral surfaces. In semimature leaves dorsal surfaces a total of 5 fungi and on ventral surface a total of 6 fungi were isolated and identified among which *R. stolonifer* were the dominant fungi for both the surfaces . In mature leaves dorsal surface a total of 11 fungi and on ventral surface a total of 9 fungi were isolated and identified. Among which *R. stolonifer* were the dominant fungal species for both the dorsal and ventral surfaces of the leaves. **Table.11. - Table.22.**, shows the percentage of occurrence of various fungal species on the phylloplane of Som during all the muga growing seasons i.e. Chatuwa (Feb-Mar), Jethuwa (Apr-May), Aheruwa (Jun-Jul), Bhodia (Aug-Sep), Kotia (Oct-Nov) and Jaruwa (Dec-Jan) generations respectively for two consecutive year 2014 to 2016 in Goalpara district of Assam. Graphical representation of Occurence of Phylloplane mycoflora on dorsal and ventral surface of tender leaves of som during 2014-2015 were showed in **Fig.10.** and **Fig.11.** Similarly occurence of Phylloplane mycoflora on dorsal and ventral surface of tender leaves of som during 2015-2016 were showed in **Fig.12.** and **Fig.13.** Graphical representation of

occurence of Phylloplane mycoflora on both the dorsal and ventral surface of semi-mature leaves of som during 2014-2016 were showed in **Fig.14., Fig.15., Fig.16.** and **Fig.17.** and graphical representation of phylloplane mycoflora on both the dorsal and ventral surface of mature leaves of som during 2014-2016 were showed in **Fig.18., Fig.19., Fig.20.** and **Fig.21.** respectively.

Table.8. Frequency of occurence (%) of fungal isolates in the Non-rhizosphere soil of Som from Goalpara district of Assam during 2014-2016

Serial No.	Fungal isolates	% of occurrence of fungal isolates			
		3 months old plantlet (Feb-Mar-Apr)	6 months old plantlet (May-Jun-Jul)	9 months old plantlet (Aug-Sep-Oct)	12 months old plantlet (Nov-Dec-Jan)
1	*Aspergillus fumigatus*	0.0	20.0	12.50	12.0
2	*Trichoderma viridae*	8.50	10.0	6.5	0.0
3	*Rhizopus stolonifer*	25.50	15.0	16.0	32.0
4	*Penicillium chrysogenum*	10.50	8.0	10.0	15.0
5	*Saccharomyces cereviseae*	5.50	0.0	4.0	0.0
6	*Aspergillus clavatus*	0.0	5.50	0.0	0.0
7	*Aspergillus niger*	24.0	15.0	15.0	10.5
8	*Mucor hiemalis*	10.50	0.0	0.0	3.5
9	*Mycelia sterile (white)*	15.50	0.0	5.5	0.0
10	*Rhodotorula glutinis*	0.0	5.50	3.5	0.0
11	*Aspergillus flavus*	0.0	20.50	15.5	12.5
12	*Pestalotiopsis disseminata*	0.0	0.0	3.0	0.0
13	*Cladosporium cladosporioides*	0.0	0.0	8.5	15.0

Table.9. Frequency of occurence (%) of fungal isolates in the rhizosphere soil of Som from Goalpara district of Assam during 2014-2016

Serial No.	Fungal isolates	% of occurrence of fungal isolates			
		3 months old plantlet (Feb-Mar-Apr)	6 months old plantlet (May-Jun-Jul)	9 months old plantlet (Aug-Sep-Oct)	12 months old plantlet (Nov-Dec-Jan)
1	*Rhizopus stolonifer*	22.5	8.0	5.5	8.5
2	*Mycelia sterile (white)*	7.0	5.0	0.0	2.0
3	*Aspergillus flavus*	0.0	16.5	13.0	7.5
4	*Aspergillus niger*	13.5	15.0	10.0	12.0
5	*Curvularia lunata*	3.5	5.0	9.5	2.0
6	*Fusarium oxysporum*	9.5	3.0	0.0	0.0
7	*Mucor hiemalis*	18.0	0.0	0.0	3.5
8	*Trichoderma viridae*	5.0	10.5	7.0	4.5
9	*Verticillium sp.*	2.0	0.0	0.0	0.0
10	*Penicillium chrysogenum*	5.0	8.0	12.0	13.0
11	*Aspergillus fumigatus*	0.0	8.0	11.5	6.0
12	*Aspergillus clavatus*	0.0	4.0	0.0	5.0
13	*Saccharomyces cereviseae*	4.0	3.0	3.5	0.0
14	*Geotrichum candidum*	2.0	0.0	0.0	0.0
15	*Rhodotorula glutinis*	3.5	7.0	0.0	2.5
16	*Alternaria lternate*	4.5	10.0	12.5	0.0
17	*Cladosporium cladosporioides*	0.0	0.0	8.0	12.5
18	*Rhizoctonia solani*	0.0	0.0	4.5	10.5
19	*Pestalotiopsis disseminata*	0.0	0.0	0.0	5.0
20	*Trichothecium sp.*	0.0	0.0	0.0	5.5
21	*Mycelia sterila (grey)*	0.0	0.0	3.0	0.0

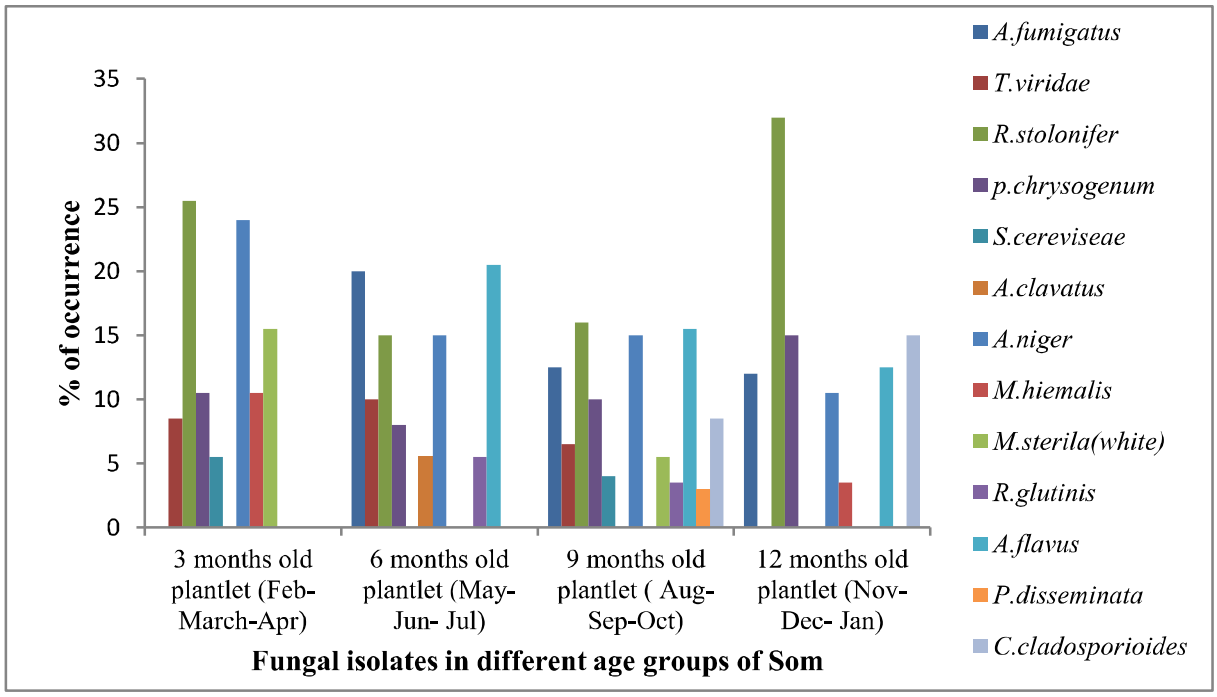


Fig.7. Graphical representation of frequency of occurence (%) of fungal isolates in the non-rhizosphere soil of Som from Goalpara district of Assam during 2014-2016

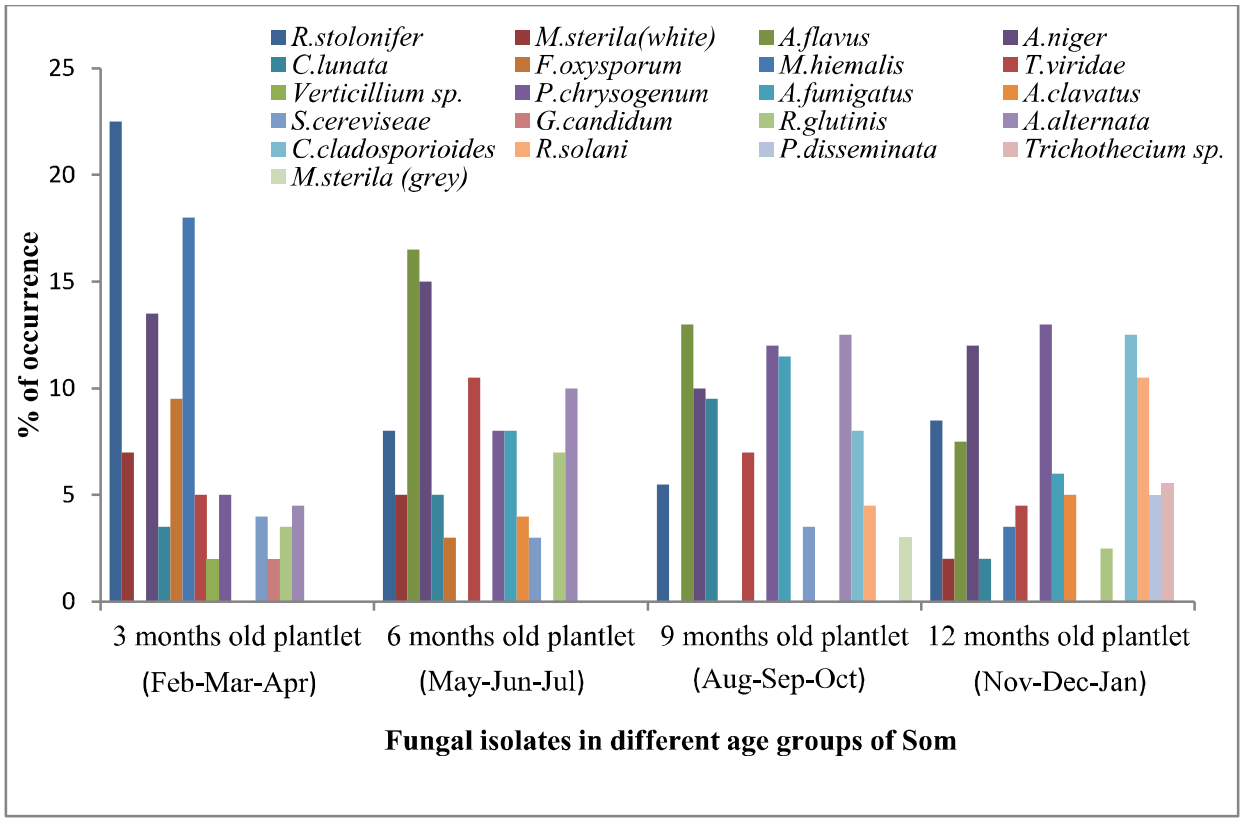


Fig.8. Graphical representation of frequency of occurence (%) of fungal isolates in the rhizosphere soil of Som from Goalpara district of Assam during 2014-2016

Table.10. Percentage of occurrence of aeromycoflora from Som growing areas of Goalpara district, Assam during various Muga crop seasons (2014-2016)

Fungal isolates	Feb-Mar (Chatuwa)	Apr-May (Jethuwa)	Jun-Jul (Aheruwa)	Aug-Sep (Bhodia)	Oct-Nov (Kotia)	Dec-Jan (Jaruwa)
Aspergillus niger	15.25	9.25	13.75	18	14.25	10
Aspergillus flavus	0	11.25	25.5	22	15.5	6.25
Alternaria alternata	11	17.25	5.25	0.0	0.0	0.0
Cladosporium cladosporioides	25.25	6.25	4.25	1.0	14.25	17.25
Curvularia lunata	4.75	8.5	6.5	0.0	0.0	0.0
Fusarium oxysporum	9	7.75	0	0	2.25	18
Rhizopus stolonifer	17.5	17	18	9.5	12	16.5
Aspergillus fumigatus	0.0	0.0	0.0	19.5	14.75	2.75
Aspergillus candidus	0	0	0	0	2.75	0
Penicillium chrysogenum	4.25	3	2	2	11.75	21.5
Pestalotiopsis disseminata	0.0	6.5	12.5	15.75	8.5	5.75
Colletotrichum gloiosporioides	0.0	0.0	0.0	12.5	2.0	0.0
Aerobasidium pullulans	5.25	3.75	0	0	0	0
Chrysosporium sp.	7.75	0	0	0	0	0
Verticillium sp.	0	7.5	4	0	0	0
Beauveria bassiana	0	4.5	0	0	0	0
Mycelia sterila (grey)	0	0	3.5	0	0	0
Mycelia sterile (white)	0	0	4.75	0	3	3.75

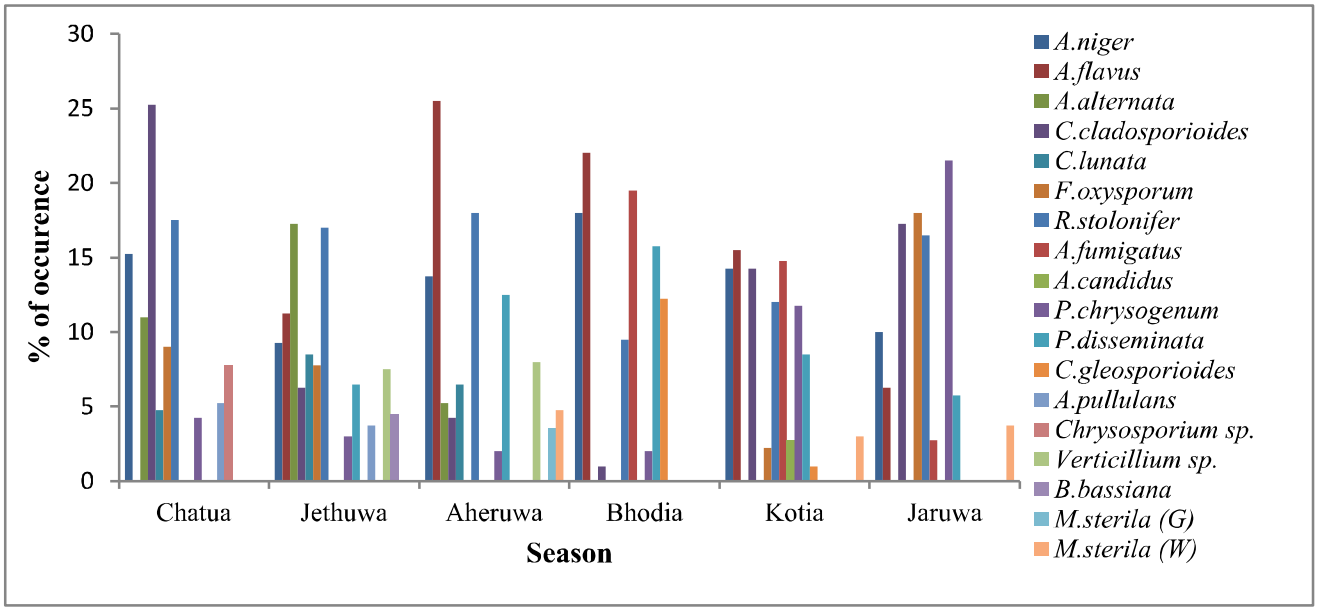


Fig.9. Graphical representation of occurrence of aeromycflora at Som plantation areas of Goalpara district of Assam during muga crop seasons (2014-2016)

Plate.3. Images of collection of air sample from Som plantation area and their growth after 7 days of incubation period.

Table.11. Fungal isolates from phylloplane of Som during Chatuwa (Feb-March, 2014) generation of *A. assamensis* :

Climatic factors	Status of leaves	Types of surface	No. of leaves	Fungi isolated	% of Occurence
<u>February</u> Max Min Temp 32ºC 8 ºC RH 89% 41% Rainfall - 220 ml. Total rainy days- 2	Tender	Dorsal	10	*Rhizopus stolonifer* *Alternaria alternata* *Curvularia lunata* *Mucor hiemalis* *Penicilliumchrysogenum* *Fusarium oxysporum*	27.50% 23.50% 17.50% 12.50% 10.50% 8.50%
		Ventral	10	*Rhizopus stolonifer* *Alternaria alternata* *Curvularia lunata* *Mucor hiemalis* *Penicillium chrysogenum*	38.50% 25.50% 22.50% 10.00% 3.50%
<u>March</u> Max Min Temp 36ºC 12 ºC RH 83% 31% Rainfall – 155 ml. Total rainy days- 3	Semi - mature	Dorsal	10	*Rhizopus stolonifer* *Curvularia lunata* *Alternaria alternata* *Fusarium oxysporum* *Geotrichum sp.*	40.50% 26.50% 20.00% 10.50% 2.50%
		Ventral	10	*Rhizopus stolonifer* *Alternaria alternata* *Aspergillus niger*	55.50% 30.50% 14.00%
	Mature	Dorsal	10	*Rhizopus stolonifer* *Aspergillus niger* *Mucor hiemalis* *Penicillium chrysogenum*	40.00% 25.00% 23.50% 11.50%
		Ventral	10	*Rhizopus stolonifer* *Aspergillus niger* *Penicillium chrysogenum*	45.50% 40.00% 14.50%

Table.12. Fungal isolates from phylloplane of Som during Jethuwa (April-May, 2014) generation of *A. assamensis*:

Climatic factors	Status of leaves	Types of surface	No. of leaves	Fungi isolated	% of Occurence
<u>April</u> Max Min Temp 36°C 19°C RH 84% 32% Rainfall - 220 ml. Total rainy days- 5 <u>May</u> Max Min Temp 38°C 20° C RH 92% 55% Rainfall - 2720 ml. Total rainy days- 14	Tender	Dorsal	10	*Aspergillus niger* *Curvularia lunata* *Alternaria alternata* *Rhizopus stolonifer* *Penicillium chrysogenum* *Microsporum sp.*	12.5% 15.5% 35.5% 20.5% 14.5% 1.5%
		Ventral	10	*Aspergillus flavus* *Aspergillus niger* *Alternaria alternata* *Penicillium chrysogenum* *Trichoderma viridae*	30.5% 20.5% 35.5% 10.5% 3.0%
	Semi - mature	Dorsal	10	*Aspergillus fumigatus* *Aspergillus niger* *Alternaria alternata* *Curvularia lunata* *Penicillium chrysogenum* *Rhizopus stolonifer*	12.5% 20.5% 30.0% 5.5% 10.5% 20.5%
		Ventral	10	*Aspergillus fumigatus* *Penicillium chrysogenum* *Rhizopus stolonifer* *Alternaria alternata* *Aspergillus flavus*	40.5% 10.5% 20.5% 18.5% 10.0%
	Mature	Dorsal	10	*Rhizopus stolonifer* *Alternaria alternata* *Aspergillus flavus* *Penicillium chrysogenum* *Aspergillus niger*	20.5% 35.5% 30.5% 2.0% 10.5%
		Ventral	10	*Rhizopus stolonifer* *Alternaria alternata.* *Trichoderma viridae* *Penicillium chrysogenum* *Curvularia lunata* *Aspergillus niger*	20.5% 30.5% 18.5% 2.5% 12.5% 15.5%

Table.13. Observation of fungal isolates from phylloplane of Som during Aheruwa (June-July, 2014) generation of *A. assamensis*:

Climatic factors	Status of leaves	Types of surface	No. of leaves	Fungi isolated	% of Occurence
<u>June</u> Max Min Temp 30°C 22°C RH 92% 58% Rainfall – 3710ml Total rainy days- 17 <u>July</u> Max Min Temp 38°C 28°C RH 92% 58% Rainfall - 2510 ml Total rainy days- 15	Tender	Dorsal	10	*Rhizopus stolonifer* *Aspergillus niger* *Aspergllus flavus* *Curvularia lunata* *Aspergillus fumigatus*	45.0 % 30.0 % 5.5 % 4.5 % 15.0 %
		Ventral	10	*Rhizopus stolonifer.* *Aspergillus niger* *Aspergillus flavus* *Aspergillus fumigatus*	50.0 % 15.0 % 10.0 % 25.0 %
	Semi - mature	Dorsal	10	*Rhizopus stolonifer* *Aspergillus fumigatus* *Aspergillus niger* *Aspergillus flavus*	39.5 % 20.0 % 10.0 % 25.0 %
		Ventral	10	*Rhizopus stolonifer* *Aspergillus niger* *Curvularia lunata* *Aspergillus flavus* *Aspergillus fumigatus*	55.0 % 25.0 % 10.0 % 5.5 % 4.5 %
	Mature	Dorsal	10	*Rhizopus stolonifer* *Aspergillus niger* *Aspergillus flavus* *Aspergillus fumigatus*	50.0 % 35.0 % 5.0 % 10.0%
		Ventral	10	*Rhizopus stolonifer* *Aspergillus niger* *Curvularia lunata* *Penicillium Chrysogenum* *Aspergillus fumigatus*	45.0 % 25.0 % 15.0 % 10.0 % 5.0 %

Table.14. Observation of fungal isolates from phylloplane of Som during Bhodia (Aug-Sept,2014) generation of *A. assamensis*:

Climatic factors	Status of leaves	Types of surface	No. of leaves	Fungi isolated	% of Occurrence
<u>Aug</u> Max Min Temp 38° C 23°C RH 92% 63% Rainfall – 2680ml Total rainy days- 17 <u>Sep</u> Max Min Temp 37°C 22°C RH 92% 63% Rainfall - 2690ml Total rainy days- 12	Tender	Dorsal	10	*Rhizopus stolonifer* *Aspergillus niger* *Aspergillus flavus* *Curvularia lunata* *Aspergillus fumigatus* *Pestalotiopsis disseminata*	*22.5* *20.0* *18.5* *6.5* *15.0* *17.5*
		Ventral	10	*Rhizopus stolonifer* *Aspergillus niger* *Aspergillus flavus* *Aspergillus fumigatus* *Pestalotiopsis disseminata*	*30.5* *14.5* *25.5* *17.5* *12.0*
	Semi - mature	Dorsal	10	*Rhizopus stolonifer* *Mycelia sterila (white)* *Aspergillus fumigatus* *Aspergillus niger* *Aspergillus flavus* *Pestalotiosis disseminata*	*12.5* *10.5* *15.5* *22.5* *20.5* *18.5*
		Ventral	10	*Rhizopus stolonifer* *Aspergillus niger* *Curvularia lunata* *Mycelia sterila (white)* *Aspergillus flavus* *Pestalotiosis disseminata* *Aspergillus fumigates*	*15.5* *21.0* *10.0* *16.0* *5.5* *27.5* *4.5*
	Mature	Dorsal	10	*Rhizopus stolonifer* *Mycelia sterila (white)* *Aspergillus niger* *Aspergillus flavus* *Aspergillus fumigatus* *Pestalotiopsis disseminata* *Verticilium sp.*	*13.5* *9.5* *18.5* *13.5* *10.5* *23.5* *10.0*
		Ventral	10	*Rhizopus stolonifer* *Aspergillus niger* *Pestalotiopsis disseminata* *Curvularia lunata* *Penicillium chrysogenum* *Aspergillus fumigatus* *Verticilium sp.* *Mycelia sterila (white)*	*15.0* *20.5* *17.5* *15.5* *10.5* *8.5* *6.5* *6.0*

Table.15. Observation of fungal isolates from phylloplane of Som during Kotia (Oct-Nov,2014) generation of *A. assamensis*:

Climatic factors	Status of leaves	Types of surface	No. of leaves	Fungi isolated	% of Occurrence
<u>Oct</u> Max Min Temp 36°C 21°C RH 92% 62% Rainfall – 150ml Total rainy days- 2	Tender	Dorsal	10	*Aspergillus niger* *Aspergillus fumigatus* *Rhizopus stolonifer* *Penicillium chrysogenum* *Aspergillus flavus* *Mycelia sterila (white)* *Pestalotiopsis disseminata* *Cladosporium cladosporides*	*30.5* *6.5* *10.0* *15.0* *14.5* *9.5* *8.0* *5.5*
		Ventral	10	*Aspergillus niger* *Aspergillus fumigatus* *Rhizopus stolonifer* *Penicillium chrysogenum* *Cladosporium cladosporides* *Pestalotiopsis disseminata*	*40.5* *9.5* *20.5* *11.5* *10.5* *7.5*
<u>Nov</u> Max Min Temp 30°C 15°C RH 85% 62% Rainfall - NIL Total rainy days- NIL	Semi - mature	Dorsal	10	*Aspergillus niger* *Rhizopus stolonifer* *Aspergillus flavus* *Penicillium chrysogenum* *Aspergillus fumigatus* *Mucor hiemalis* *Pestalotiopsis disseminata*	*25.0* *20.0* *15.0* *14.0* *12.5* *5.0* *8.5*
		Ventral	10	*Aspergillus niger* *Rhizopus stolonifer* *Penicillium chrysogenum* *Aspergillus fumigatus* *Mucor hiemalis* *Mycelia sterila (white)*	*30.5* *17.5* *20.5* *12.5* *8.5* *10.5*
	Mature	Dorsal	10	*Aspergillus niger* *Rhizopus stolonifer* *Penicillium chrysogenum* *Mycelia sterila (white)* *Pestalotiopsis disseminata* *Cladosprium cladosporioides*	*32.5* *25.0* *20.5* *9.5* *7.0* *5.5*
		Ventral	10	*Rhizopus stolonifer* *Pestalotiopsis disseminata* *Aspergillus niger* *Penicillium chrysogenum* *Cladosporium cladosporioides*	*30.5* *15.0* *35.5* *6.5* *12.5*

Table.16. Observation of fungal isolates from phylloplane of Som during Jaruwa (Dec,2014-Jan,2015) generations of muga silkworm:

Climatic factors	Status of leaves	Types of surface	No. of leaves	Fungi isolated	% of Occurence
December,14 Max Min Temp 30°C 9°C RH 82% 61% Rainfall - Nil Total rainy days- Nil January,15 Max Min Temp 22°C 8°C RH 82% 64% Rainfall – 300ml Total rainy days- 3	Tender	Dorsal	10	*Rhizopus stolonifer* *Mucor hiemalis* *Cladosporium cladosporioides* *Fusarium oxysporum* *Aerobasidium pullulans* *Alternaria alternata* *Pestalotiopsis disseminata* *Mycelia sterila (white)* *Verticillium sp.*	*24.5* *13.5* *14.5* *10.5* *8.5* *12.5* *5.0* *6.5* *4.5*
		Ventral	10	*Rhizopus stolonifer* *Mucor hiemalis* *Cladosporium cladosporioides* *Aerobasidium pullulans* *Fusarium oxysporum* *Pestalotiopsis disseminata*	*30.5* *20.5* *15.0* *13.5* *11* *9.5*
	Semi - mature	Dorsal	10	*Rhizopus stolonifer* *Mycelia sterila(White)* *Penicillium chrysogenum* *Mucor hiemalis* *Verticillium sp.*	*40* *22.5* *12.5* *15* *10*
		Ventral	10	*Rhizopus stolonifer* *Penicillium chrysogenum* *Mucor hiemalis* *Verticillium sp.* *Mycelia sterila (grey)*	*35.5* *30.5* *14.5* *9.5* *10.0*
	Mature	Dorsal	10	*Rhizopus stolonifer* *Mucor hiemalis* *Aspergillus niger* *Penicillium chrysogenum* *Alternaria alternata* *Cladosporium cladosporioides* *Mycelia sterila (grey)*	*20.5* *18.5* *18.0* *15.5* *9.0* *10.5* *8.0*
		Ventral	10	*Rhizopus stolonifer* *Mucor hiemalis* *Aspergillus niger* *Penicillium chrysogenum* *Cladosporium cladosporioides*	*25.5* *22.5* *20.5* *18.0* *13.5*

Table.17. Ocurrence of Phylloplane mycoflora of Som during Chatuwa (February-March, 2015) generation of muga silkworms:

Climatic factor	Status of leaves	Types of surface	No. of leaves	Fungi isolated	% of occurrence
February,15 Max Min Temp 25°C 10°C RH 83% 73% Rainfall- 250ml Tot. rainy days-2 days March, 15 Max Min Temp 31°C 10°C RH 84% 57% Rainfall- 208 ml Tot. rainy days-3 days	Tender	Dorsal	10	*Rhizopus stolonifer* *Colletotrichum gloeosporioides* *Cladosporium cladosporioides* *Penicillium chrysogenum* *Aspergillus niger* *Aerobasidium pullulans* *Fusarium oxysporum* *Mucor hiemalis* *Mycelia sterila (grey)*	20.5 14.5 12.0 4.5 5.5 9.5 11.0 5.0 17.5
		Ventral	10	*R. stolonifer* *C.gloeosporioides* *C.cladosporioides* *M. hiemalis* *F.oxysporum* *A.niger*	25.5 15.5 10.0 20.5 13.5 15.0
	Semi-mature	Dorsal	10	*R.stolonifer* *P.chrysogenum* *A.pullulans* *C.gloiosporioides* *F.oxysporum* *Verticillium sp.* *P.disseminata* *Mycelia sterila(white)*	10.0 18.5 20.0 10.5 12.0 7.0 15.0 7.0
		Ventral	10	*R.stolonifer* *P.chrysogenum* *A.pullulans* *F.oxysporum* *P.disseminata* *M.sterila(white)*	17.5 16.0 18.0 20.5 14.5 13.5
	Mature	Dorsal	10	*R.stolonifer* *F.oxysporum* *M.sterila(grey)* *C.gloeosporioides* *A.niger* *Verticillium sp* *T.viridae*	25.0 15.5 5.5 16.5 20.5 6.5 10.5
		Ventral	10	*R.stolonifer* *C.gloeosporioides* *A.niger* *M.sterila(grey)* *A.pullulans*	23.5 18.5 30.5 8.0 19.5

Table.18. Ocurrence of Phylloplane mycoflora of Som during Jethuwa (April-May, 2015) generations of muga silkworm :

Climatic factor	Status of leaves	Types of surface	No. of leaves	Fungi isolated	% of occurrence
April,15 Max Min Temp 31°C 11°C RH 84% 65% Rainfall- 2244 ml Total rainy days-10 days May,15 Max Min Temp 32°C 12°C RH 92% 76% Rainfall- 7405 ml Total rainy days-21 days	Tender	Dorsal	10	*R.stolonifer* *P.disseminata* *A.niger* *A.alternata* *C.cladosporioides* *Verticillium sp.* *A.flavus*	25.5 11.0 20.5 12.0 10.0 8.5 12.5
		Ventral	10	*R.stolonifer* *Verticillium sp.* *A.flavus* *A.niger* *C.lunata*	30.5 12.5 14.5 22.5 20.0
	Semi-mature	Dorsal	10	*A.pullulans* *T.viridae* *R.stolonifer* *A.niger* *P.disseminata* *A.flavus* *P.chrysogenum*	4.5 15.5 33.5 22.5 5.0 10.5 8.5
		Ventral	10	*R.stolonifer* *A.pullulans* *A.niger* *T.viridae* *M.hiemalis* *M.sterila (white)*	25.0 10.5 20.5 17.5 13.0 13.5
	Mature	Dorsal	10	*T.viridae* *P.chrysogenum* *A.niger* *R.stolonifer* *M.hiemalis* *M.sterila (white)*	25.5 12.5 15.0 20.5 18.5 8.0
		Ventral	10	*A.niger* *A.flavus* *T.viridae* *S.cereviseae* *P.disseminata* *F.oxysporum* *R.stolonifer*	16.5 12.5 13.0 5.5 10.5 14.5 27.5

Table.19. Ocurrence of Phylloplane mycoflora of Som during Aheruwa (June-July, 2015) generations of muga silkworm,

Climatic factor	Status of leaves	Types of surface	No. of leaves	Fungi isolated	% of occurrence
<u>June,15</u> Max Min Temp 30°C 17°C RH 92% 76% Rainfall- 8515 ml Total rainy days- 22 days	Tender	Dorsal	10	*P.chrysogenum* *M.hiemalis* *A.niger* *A.flavus* *A.fumigatus* *P.disseminata*	12.5 27.5 25.5 15.5 10.5 8.5
		Ventral	10	*Verticillium sp.* *M.hiemalis* *A.niger* *A.flavus* *A.fumigatus* *R.stolonifer* *P.disseminata*	7.0 25.5 22.5 15.0 12.5 12.0 5.5
<u>July,15</u> Max Min Temp 38°C 21°C RH 92% 55% Rainfall- 3520 ml Total rainy days- 17 days	Semi-mature	Dorsal	10	*M.hiemalis* *R.stolonifer* *S.cereviseae* *P.disseminata* *A.niger*	21.5 15.0 20.5 12.5 30.5
		Ventral	10	*P.disseminata* *R.stolonifer* *A.niger* *A.flavus* *A.fumigatus* *S.cereviseae*	12.0 13.5 22.5 20.0 17.5 14.5
	Mature	Dorsal	10	*R.stolonifer* *A.flavus* *P.disseminata* *F.oxysporum* *S.cerviseae* *M.sterila (white)*	15.5 18.0 25.5 11.5 14.5 15.0
		Ventral	10	*R.stolonifer* *A.niger* *A.flavus* *P.disseminata* *F.oxysporum* *S.cereviseae*	12.5 25.5 15.5 22.5 10.5 13.5

Table.20. Observation of fungal isolates from phylloplane of Som during Bhodia (Aug-Sept,2015) generation of *A. assamensis* :

Climatic factors	Status of leaves	Types of surface	No. of leaves	Fungi isolated	% of Occurrence
<u>Aug,15</u> Max Min Temp 36° C 21°C RH 92% 61% Rainfall – 2593 ml Total rainy days-14 days <u>Sep,15</u> Max Min Temp 35°C 20°C RH 92% 61% Rainfall - 2620ml Total rainy days-17 days	Tender	Dorsal	10	*Rhizopus stolonifer* *Aspergillus niger* *Aspergillus flavus* *Curvularia lunata* *Aspergillus fumigatus* *Mycelia sterila(white)*	*15.0* *20.5* *25.5* *8.5* *22.5* *8.0*
		Ventral	10	*Rhizopus stolonifer* *Aspergillus niger* *Aspergillus flavus* *Aspergillus fumigatus* *Mycelia sterila (white)* *Curvularia lunata*	*18.0* *17.5* *26.0* *23.5* *11.5* *3.5*
	Semi - mature	Dorsal	10	*Rhizopus stolonifer* *Mycelia sterila (white)* *Aspergillus fumigatus* *Aspergillus niger* *Aspergillus flavus*	*17.5* *9.5* *25.5* *20.0* *27.5*
		Ventral	10	*Rhizopus stolonifer* *Aspergillus niger* *Curvularia lunata* *Mycelia sterila (white)* *Aspergillus flavus* *Aspergillus fumigates* *Verticillium sp.*	*16.0* *15.5* *12.5* *8.0* *22.5* *17.0* *8.5*
	Mature	Dorsal	10	*Cephaleuros parasiticus* *Phyllosticta perseae* *Aspergillus niger* *Aspergillus flavus* *Aspergillus fumigatus* *Pestalotiopsis disseminata* *Colletotrichum gloeosporioides*	*10.5* *12.0* *8.0* *18.5* *25.5* *20.5* *14.5*
		Ventral	10	*Cephaleuros parasiticus* *Aspergillus niger* *Pestalotiopsis disseminata* *Curvularia lunata* *Penicillium chrysogenum* *Aspergillus fumigatus* *Phyllosticta perseae* *Colletotrichum gloeosporioides*	*10.0* *17.5* *19.0* *14.5* *8.5* *7.0* *11.0* *12.5*

Table.21. Observation of fungal isolates from phylloplane of Som during Kotia (Oct-Nov,2015) generation of *A. assamensis* :

Climatic factors	Status of leaves	Types of surface	No. of leaves	Fungi isolated	% of Occurrence
<u>Oct,15</u> Max Min Temp 32°C 19°C RH 92% 62% Rainfall – 300 ml Total rainy days- 5 days <u>Nov,15</u> Max Min Temp 30°C 18°C RH 86 % 63% Rainfall - NIL Total rainy days- NIL	Tender	Dorsal	10	*Aspergillus niger* *Aspergillus fumigatus* *Rhizopus stolonifer* *Penicillium chrysogenum* *Aspergillus flavus* *Mycelia sterila (white)* *Cladosporium cladosporides*	*28.5* *10.0* *12.5* *15.5* *20.5* *2.5* *10.5*
		Ventral	10	*Aspergillus niger* *Aspergillus fumigatus* *Rhizopus stolonifer* *Penicillium chrysogenum* *Cladosporium cladosporides* *Aspergillus flavus*	*32.5* *12.5* *15.0* *17.5* *12.0* *10.5*
	Semi - mature	Dorsal	10	*Aspergillus niger* *Rhizopus stolonifer* *Aspergillus flavus* *Penicillium chrysogenum* *Aspergillus fumigatus* *Mucor hiemalis*	*30.5* *14.5* *15.0* *17.0* *13.5* *9.5*
		Ventral	10	*Aspergillus niger* *Rhizopus stolonifer* *Penicillium chrysogenum* *Aspergillus fumigatus* *Mucor hiemalis* *Mycelia sterila (white)*	*29.0* *18.5* *22.5* *12.0* *10.0* *7.5*
	Mature	Dorsal	10	*Phyllosticta perseae* *Aspergillus niger* *Rhizopus stolonifer* *Penicillium chrysogenum* *Cephaleuros parasiticus* *Pestalotiopsis disseminata* *Colletotrichum gloeosporioides* *Cladosporium cladosporioides*	*8.0* *24.5* *16.5* *16.0* *7.5* *12.5* *10.0* *5.0*
		Ventral	10	*Colletotrichum gloeosporioides* *Rhizopus stolonifer* *Pestalotiopsis disseminata* *Aspergillus niger* *Phyllosticta perseae* *Penicillium chrysogenum* *Cladosporium cladosporioides* *Cephaleuros parasiticus*	*8.5* *20.5* *10.5* *25.5* *8.0* *13.0* *7.5* *6.5*

Table.22. Observation of fungal isolates from phylloplane of Som during Jaruwa (Dec, 2015-Jan,2016) generation of muga silkworm:

Climatic factors	Status of leaves	Types of surface	No. of leaves	Fungi isolated	% of Occurence
<u>December,15</u> Max Min Temp 28°C 10°C RH 83% 60% Rainfall - Nil Total rainy days- Nil	Tender	Dorsal	10	*Rhizopus stolonifer* *Mucor hiemalis* *Cladosporium cladosporioides* *Fusarium oxysporum* *Aerobasidium pullulans* *Alternaria alternata* *Mycelia sterila (white)* *Verticillium sp.*	*25.0* *12.5* *17.0* *9.5* *10.0* *11.0* *8.0* *6.5*
		Ventral	10	*Rhizopus stolonifer* *Mucor hiemalis* *Cladosporium cladosporioides* *Aerobasidium pullulans* *Fusarium oxysporum* *Mycelia sterila (white)*	*32.5* *18.0* *16.5* *15.5* *13.0* *4.5*
<u>January,16</u> Max Min Temp 20°C 8°C RH 80% 61% Rainfall – 150 ml Total rainy days-2 days	Semi - mature	Dorsal	10	*Rhizopus stolonifer* *Mycelia sterila(White)* *Penicillium chrysogenum* *Mucor hiemalis* *Verticillium sp.*	*38.5* *10.5* *20.5* *18.0* *12.5*
		Ventral	10	*Rhizopus stolonifer* *Mycelia sterila (white)* *Penicillium chrysogenum* *Mucor hiemalis* *Verticillium sp.* *Mycelia sterila (grey)*	*30.5* *13.0* *22.0* *20.5* *15.5* *10.5*
	Mature	Dorsal	10	*Rhizopus stolonifer* *Pestalotiopsis disseminata* *Mucor hiemalis* *Cephaleuros parasiticus* *Aspergillus niger* *Phyllosticta perseae* *Penicillium chrysogenum* *Alternaria alternata* *Cladosporium cladosporioides* *Colletotrichum gloeosporioides*	*20.0* *7.5* *13.5* *4.0* *11.0* *5.5* *8.5* *8.0* *14.5* *7.5*
		Ventral	10	*Rhizopus stolonifer* *Pestalotiopsis disseminata* *Mucor hiemalis* *Aspergillus niger* *Cephaleuros parasiticus* *Penicillium chrysogenum* *Colletotrichum gloeosporioides* *Cladosporium cladosporioides* *Phyllosticta perseae*	*21.5* *6.0* *18.0* *16.5* *3.0* *14.0* *6.5* *10.0* *4.5*

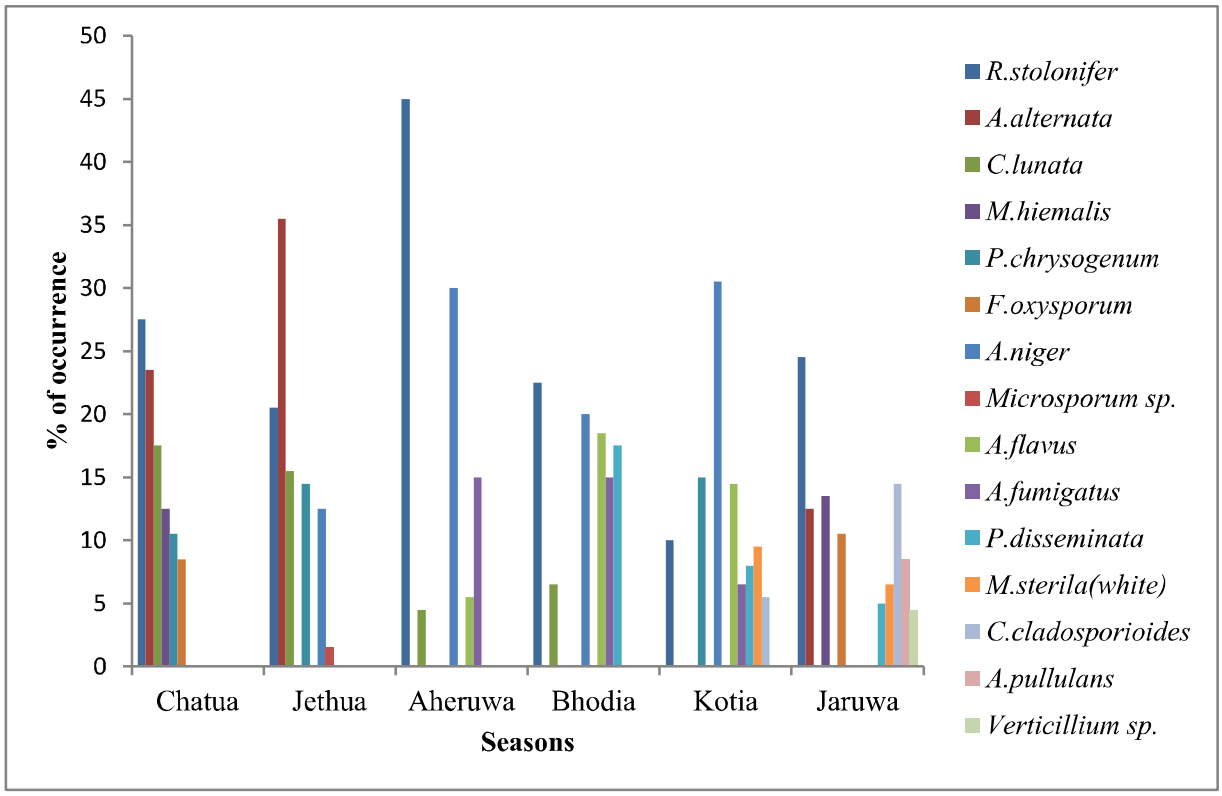


Fig.10. Occurence of Phylloplane mycoflora on dorsal surface of tender leaves (2014-2015)

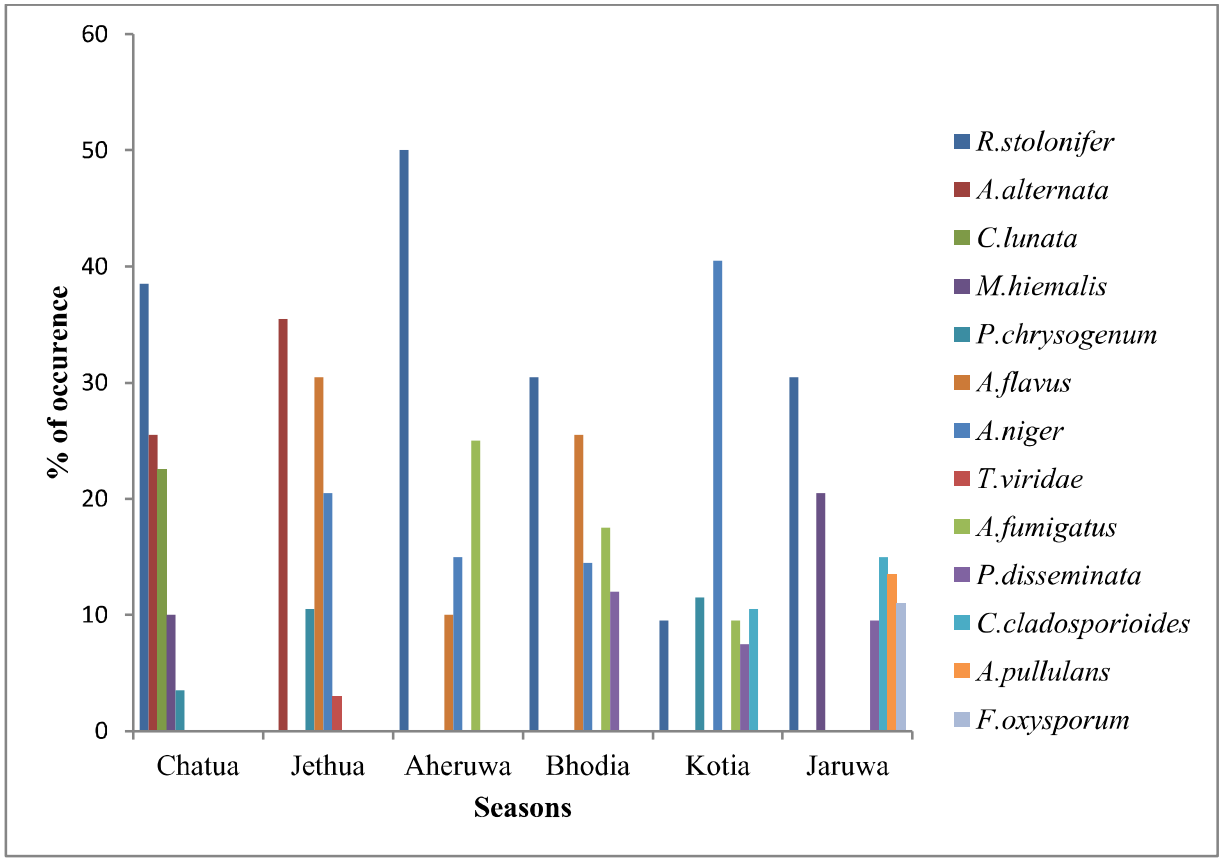


Fig.11. Occurence of Phylloplane mycoflora on ventral surface of tender leaves (2014-2015)

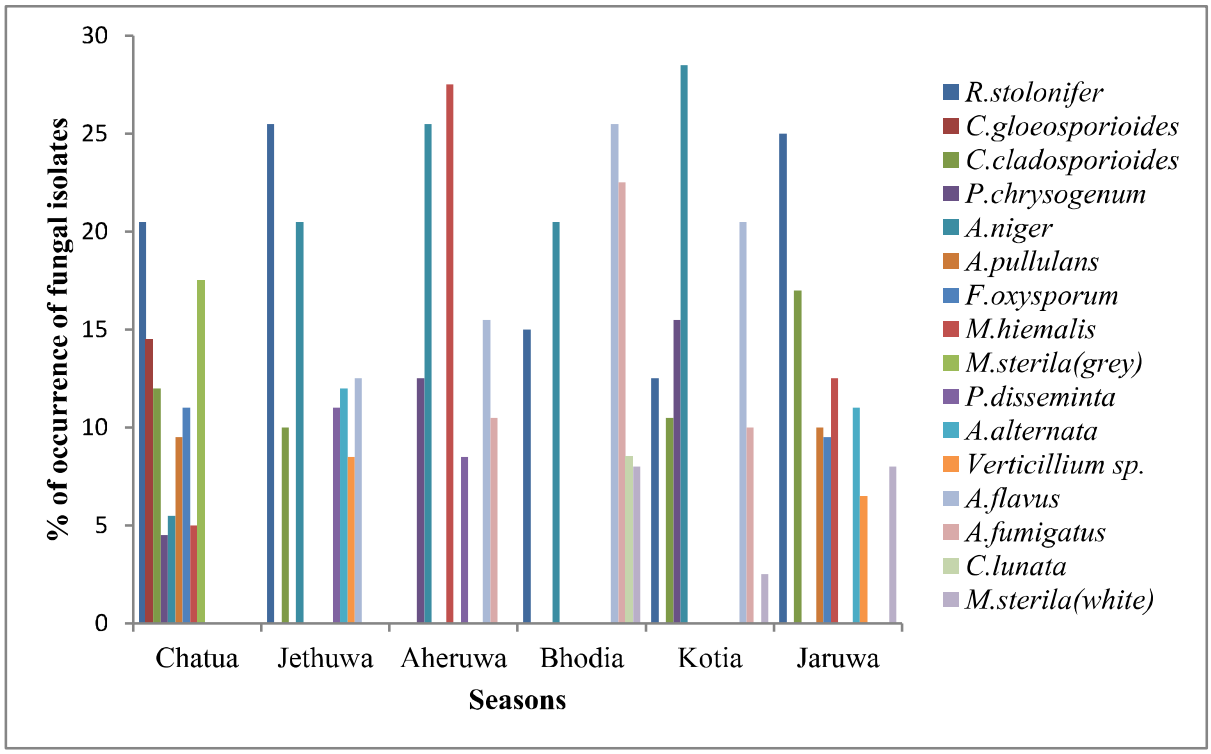


Fig.12. Occurence of Phylloplane mycoflora on dorsal surface of tender leaves during 2015-2016

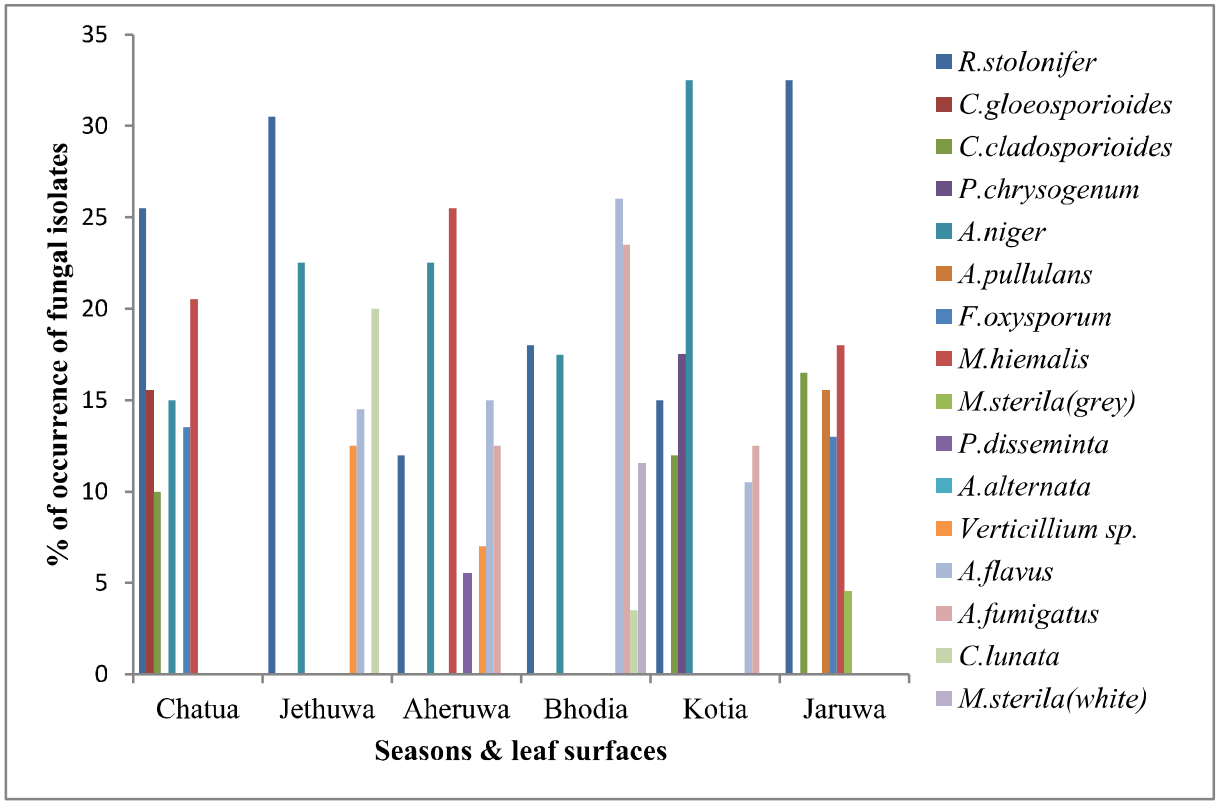


Fig.13. Occurence of Phylloplane mycoflora on ventral surface of tender leaves during 2015-2016

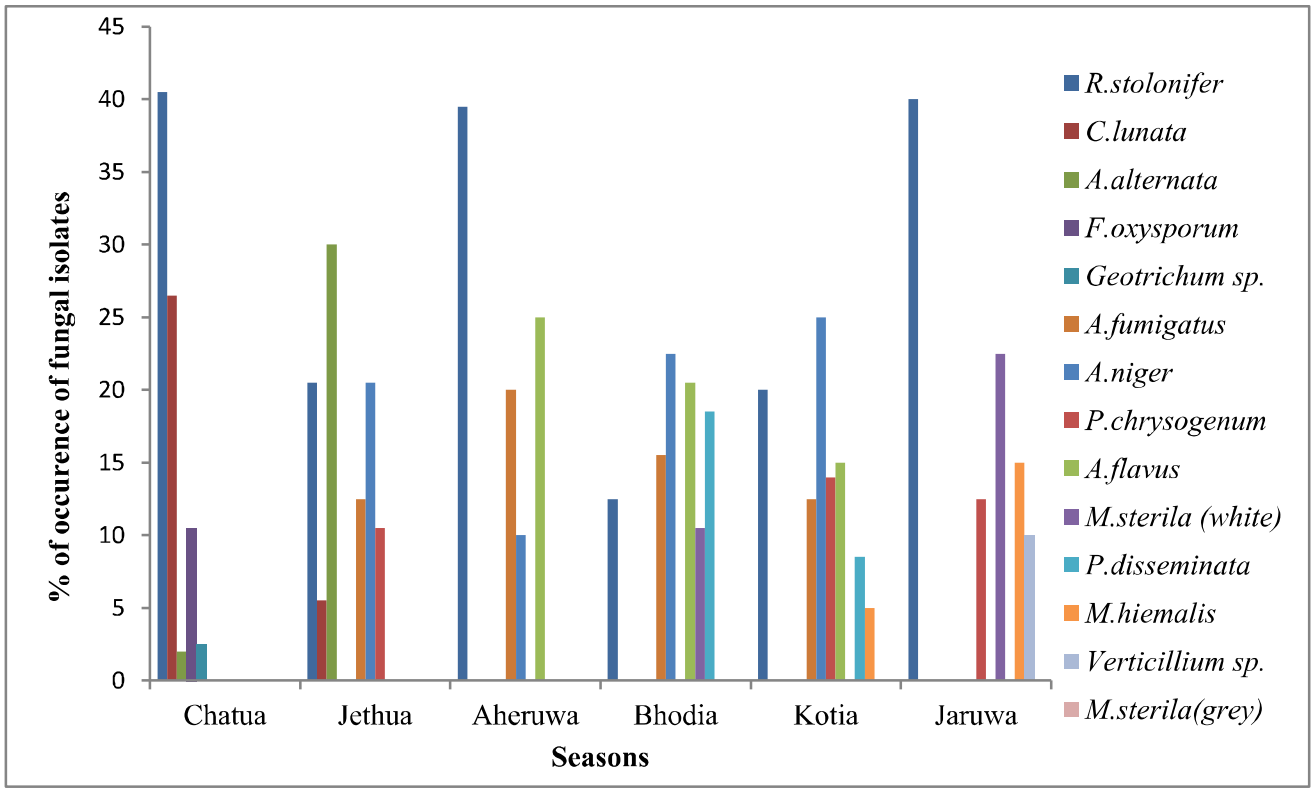


Fig.14. Occurence of Phylloplane mycoflora on dorsal surface of semi-mature leaves of Som during 2014-2015

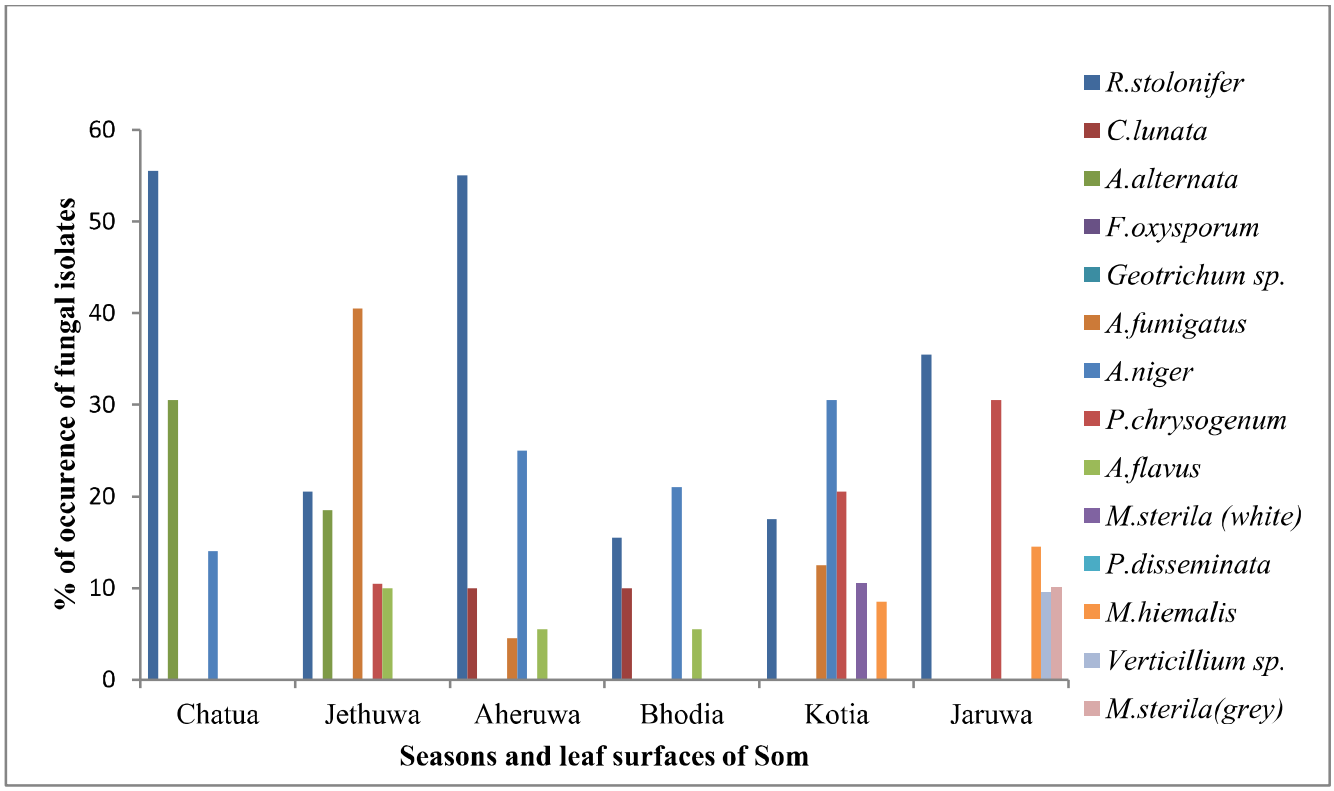


Fig.15. Occurence of Phylloplane mycoflora on ventral surface of semi-mature leaves of Som during 2014-2015

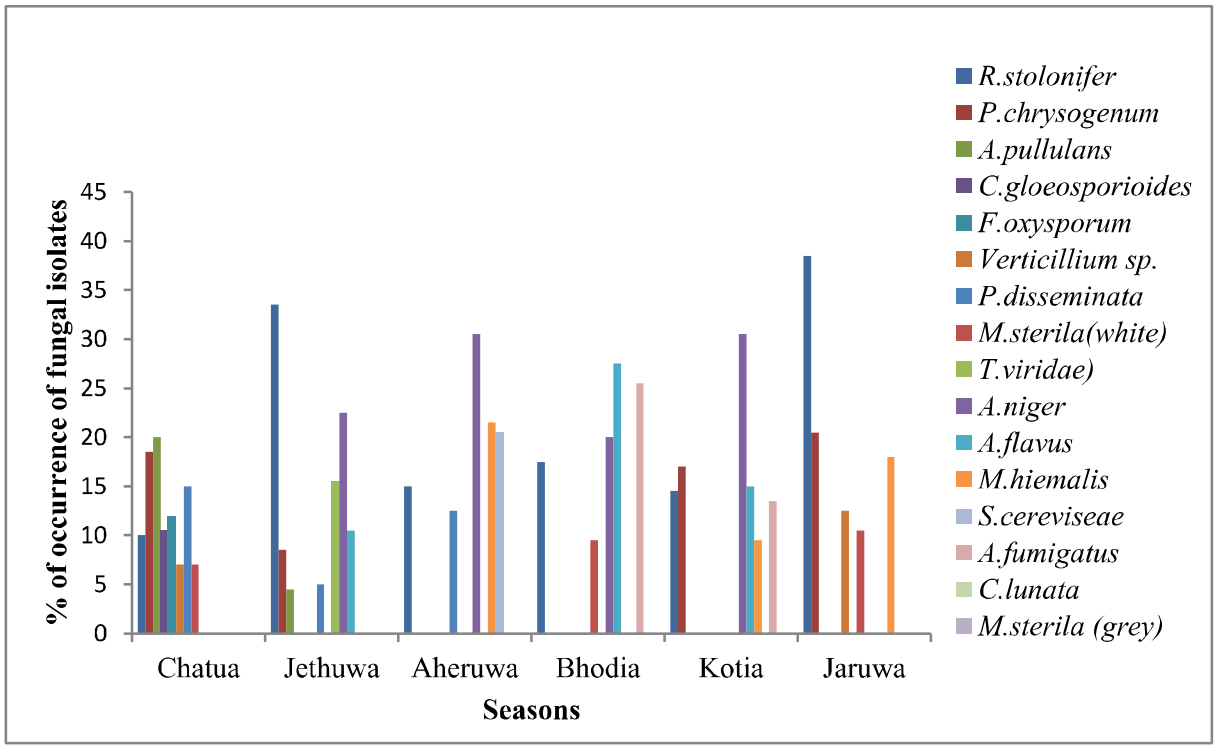


Fig.16. Occurence of Phylloplane mycoflora on dorsal surface of semi-mature leaves of som during 2015-2016

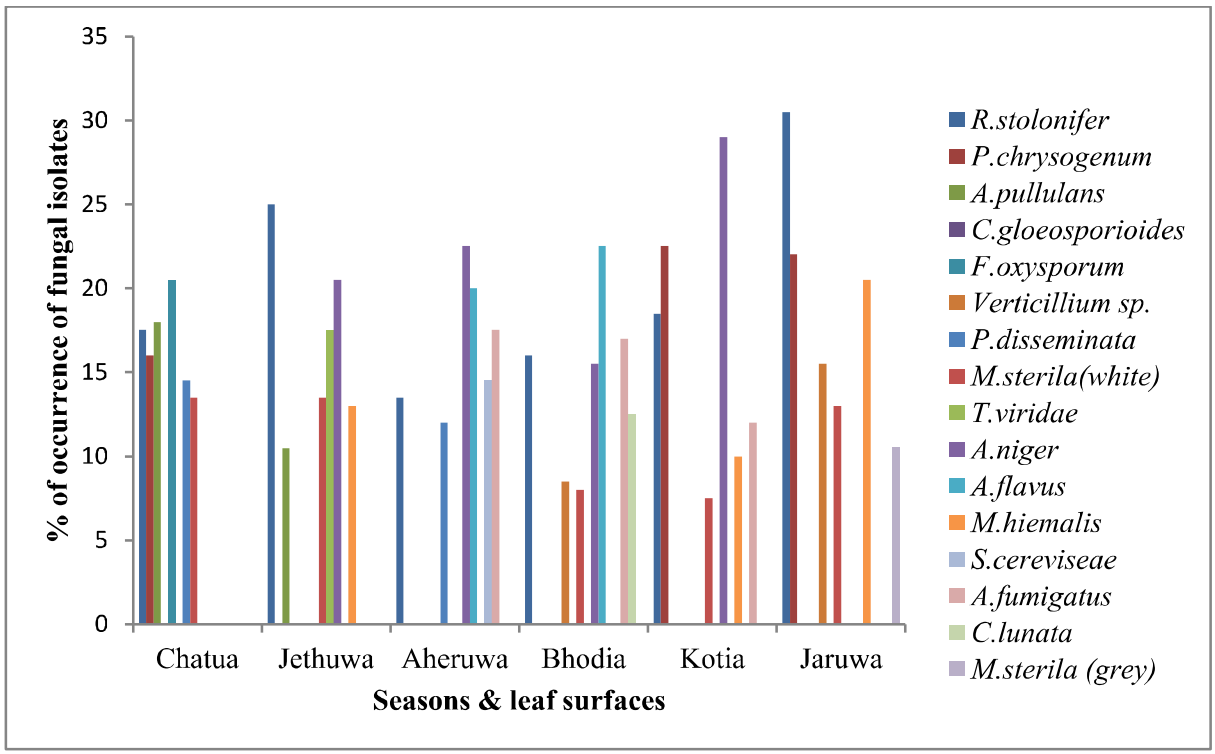


Fig.17. Occurence of Phylloplane mycoflora on ventral surface of semi-mature leaves of som during 2015-2016

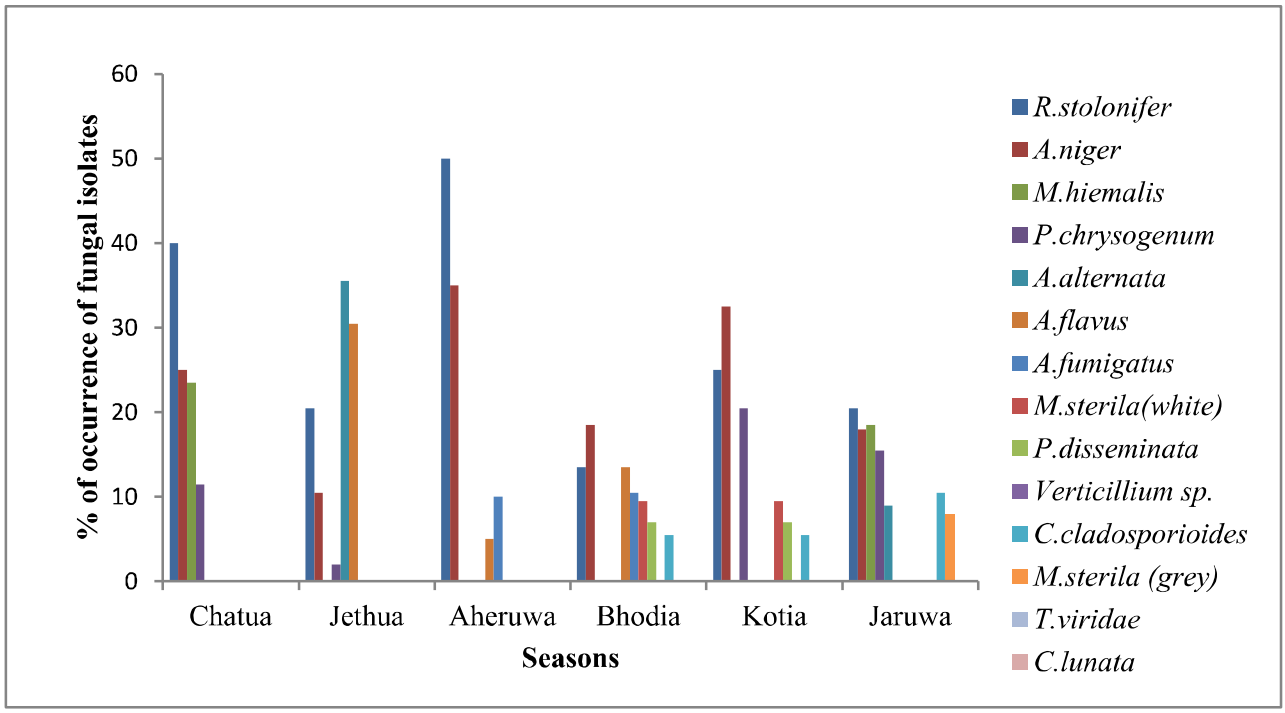


Fig.18. Occurence of Phylloplane mycoflora on dorsal surface of mature leaves of som during 2014-2015

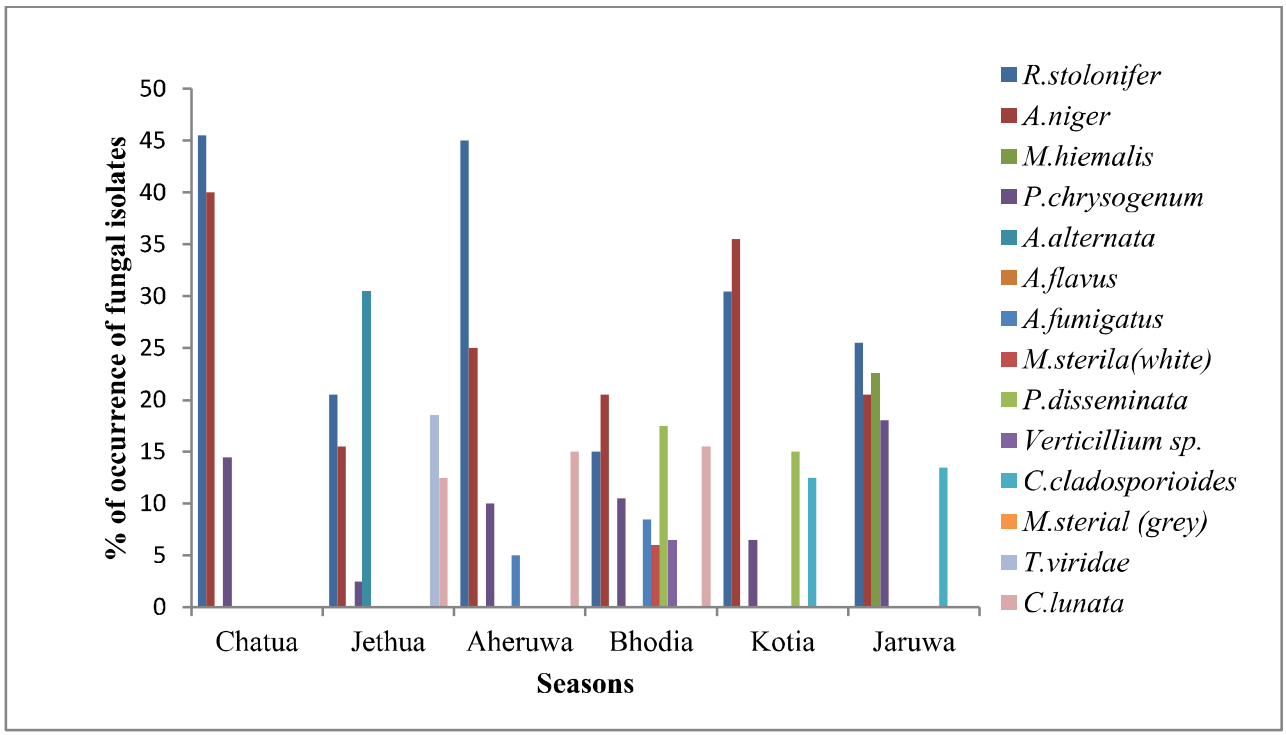


Fig.19. Occurence of Phylloplane mycoflora on ventral surface of mature leaves of som during 2014-2015

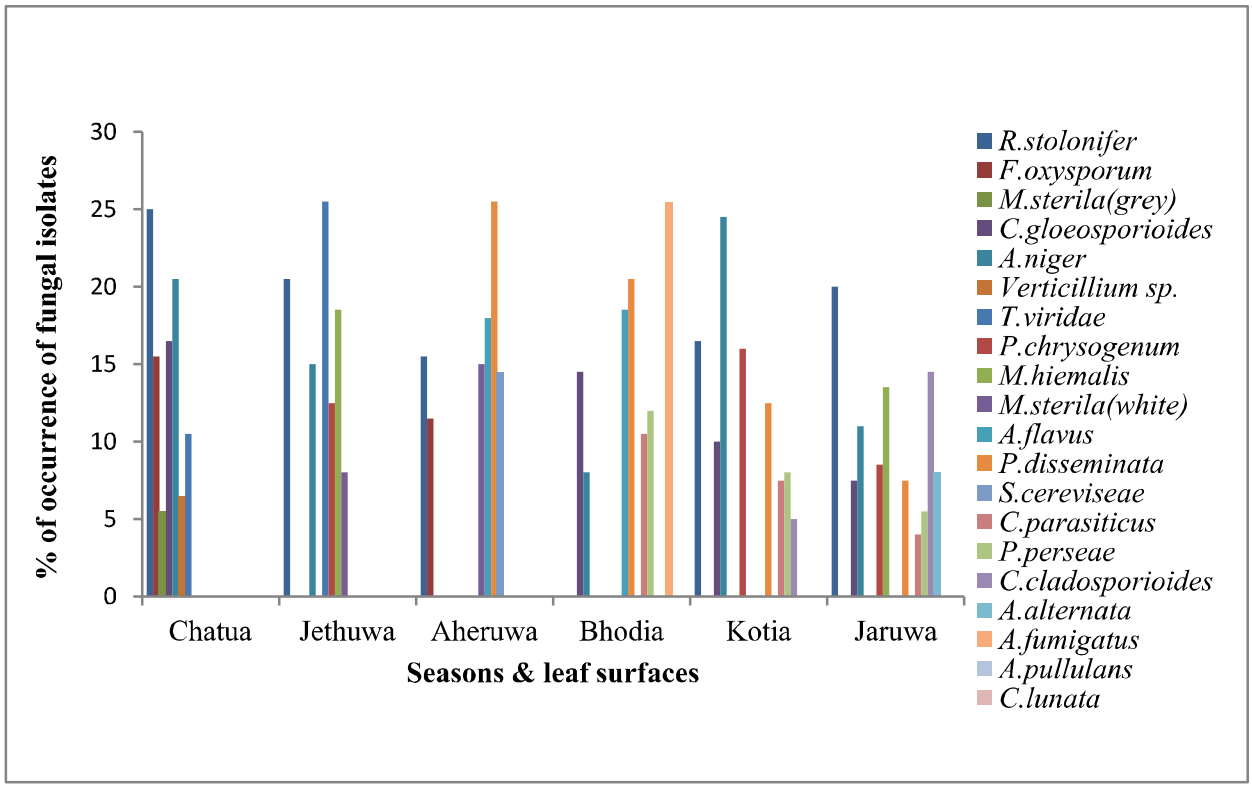


Fig.20. Occurence of Phylloplane mycoflora on dorsal surface of mature leaves of som during 2015-2016

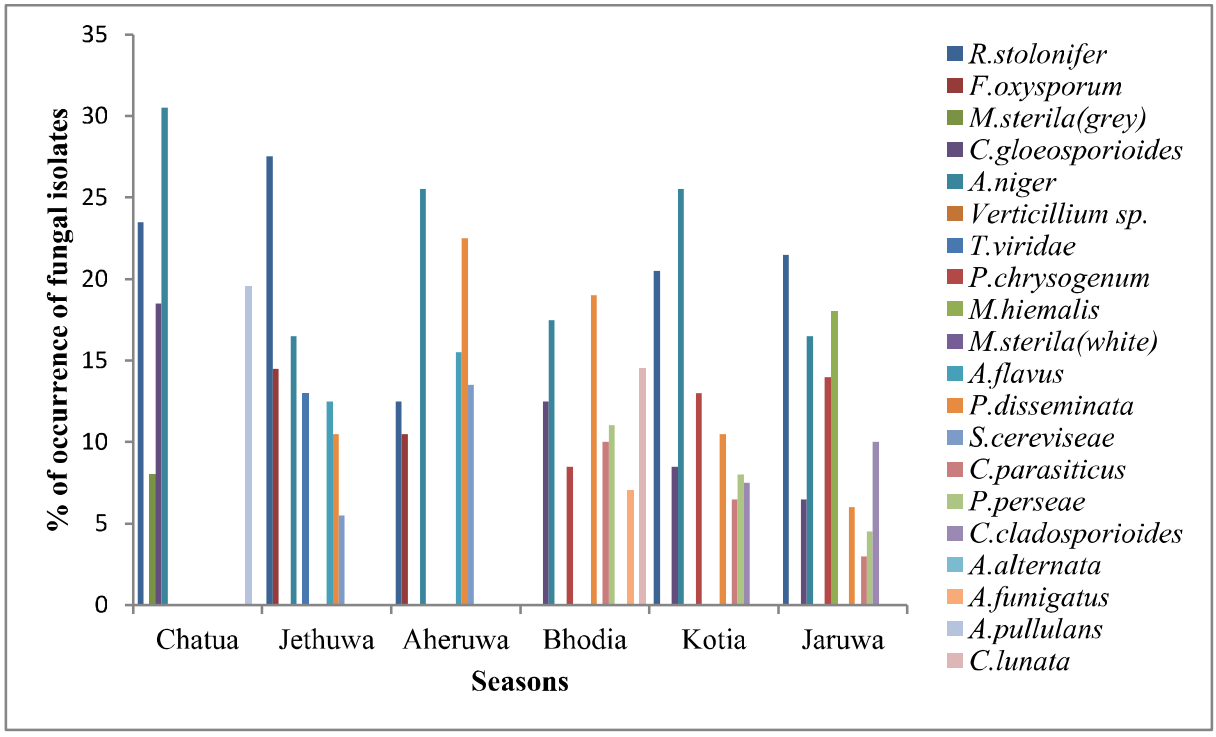
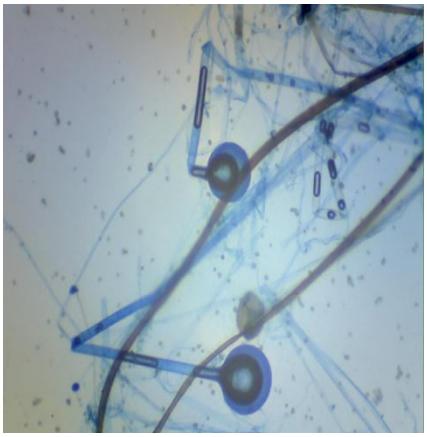
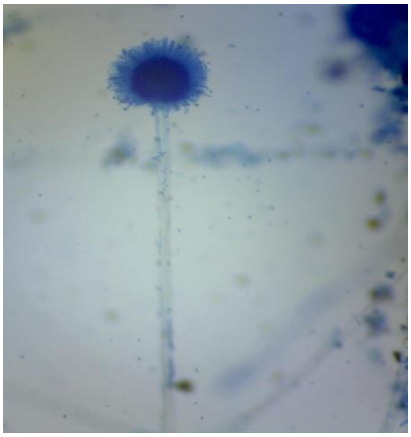


Fig.21. Occurence of Phylloplane mycoflora on ventral surface of mature leaves of som during 2015-2016

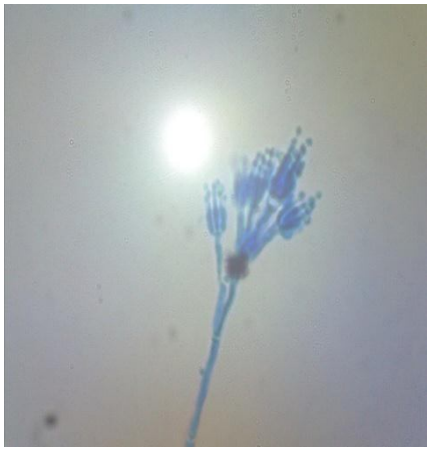
Plate.4. Microscopic images of Some major fungal species



A. *Mucor hiemalis*

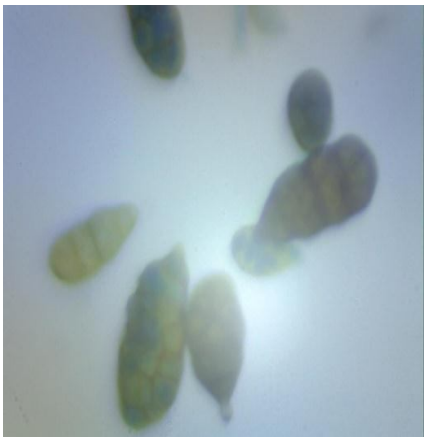


D. *Aspergillus fumigatus*



B. *Penicillium chrysogenum*

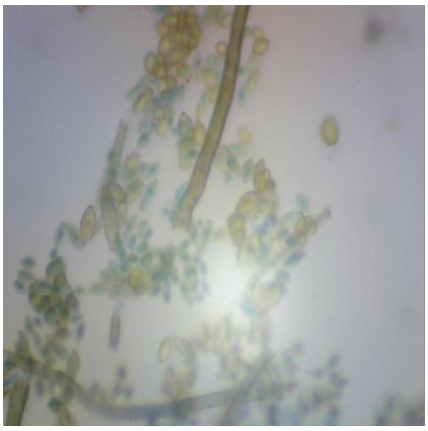
E. *Fusarium oxysporum*



C. *Alternaria alternata*

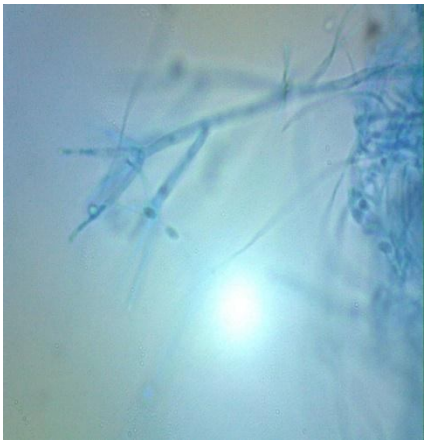
F. *Curvularia lunata*

Plate.5. Microscopic images of Some major fungal species

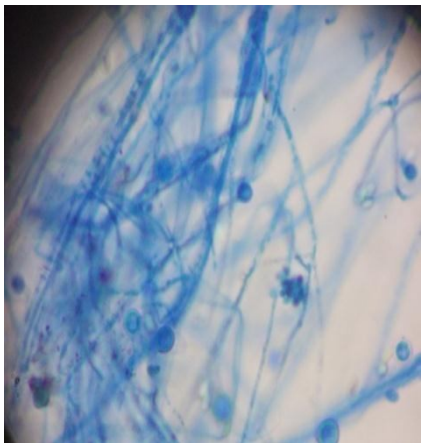


G. *Cladosporium cladosporioides*

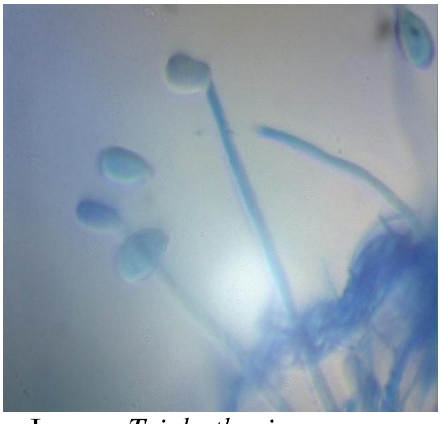
J. *Trichoderma viridae*



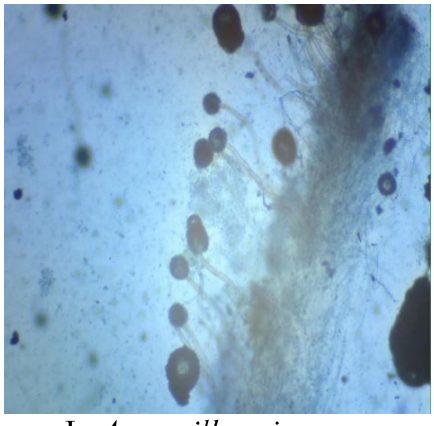
H. *Verticillium sp.*



K. *Rhizopus stolonifer*

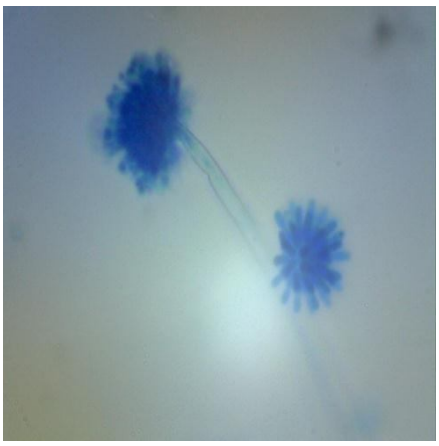


I. *Trichothecium sp.*

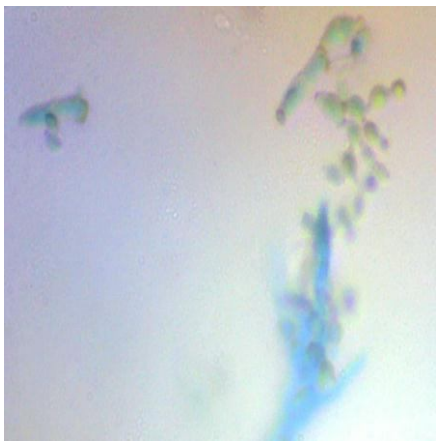


L. *Aspergillus niger*

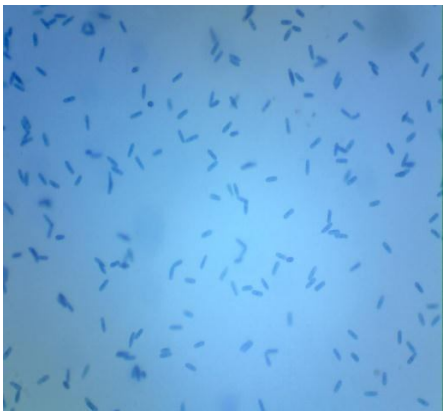
Plate.6. Microscopic images of Some major fungal species



M. *Aspergillus flavus*



N. *Beauveria bassiana*



O. *Colletotrichum gloeosporioides*

The physicochemical properties of soil were analysed using standard procedures in summer as well as in winter seasons. Which shows that all the 5 soil samples of the study area were acidic. During summer season, the soil of Dorapara Agia were highly acidic (P^H 5.65) while during winter season also the soil of Dorapara Agia were highly acidic (P^H 4.52). The organic carbon content during summer season were highest on the soil of Lengopara (3.11 %) and less at Kalyanpur (1.16%). Again during winter, the organic carbon content were highest on the soil of Kalyanpur (3.03 %) and less at Dorapara Agia (1.5%). During summer season the available nitrogen content were highest on the soil of Lengopara (1035.53 Kg/ ha) and less on the soil of Kalyanpur (385 Kg/ha) and in winter season maximum at Kalyanpur (1008.18 Kg/ha) and less at Dorapara Agia (502.43 Kg/ha). Again during summer the available phosphorus was maximum at Lengopara, Dorapara Agia and Kalyanpur (44.88 Kg/ha each) and less at Budlung pahar (33.34 Kg/ha) while during winter maximum at Budlung pahar (34.62 Kg/ha) and less at Buraburi and Kalyanpur (11.54 Kg/ha for each). Available Potassium were maximum at Lengopara (399.84 Kg/ha) and less at Dorapara Agia (181.44 Kg/ha) during summer season, while during winter maximum at Buraburi (524.16 Kg/ha) and less at Dorapara Agia (423.32 Kg/ha). In summer the water holding capacity were maximum for the soil of Lengopara (42.20 %) and less for the soil of Kalyanpur (33.15 %) while during winter season maximum at Kalyanpur (50.74%) and less at Budlung pahar (44.30%). The soil texture were also analyzed. Physico chemical properties of Soil of Goalpara district of Assam during summer and winter seasons are tabulated in **Table.23.** and soil texture were recorded in **Table.24.**

The biochemical estimation of foliar constituents were done with standard methods in three seasons for three leave types namely tender, semimature and mature leaves. Results showed that during summer season i.e the *Jethuwa* and *Aheruwa* generation of muga silkworm, the total nitrogen, crude protein, total carbohydrate, crude fibre and moisture content were more than the winter i.e the *Jaruwa-Chatuwa* and autumn season *Bhodiya-Kotia* generations of muga silkworm. The annual mean of all the three types of leaves shows a total nitrogen content of 4.1332%, crude protein of 25.833%, total carbohydrate 12.429%, crude fibre 15.009 % and moisture 68.27 %. The Biochemical estimation of foliar constituents of Som during different seasons were recorded in **Table.25.** Graphical representation of foliar constituents of Som during different seasons and for different leaf types i.e. tender, semi-mature and mature are represented in **Fig.22.** and **Fig.23.** respectively.

Table.23. Physico chemical properties of Soil of Goalpara district of Assam during summer and winter seasons (2014-2016)

Site	Season	pH	O.C. (%)	Av. N_2 (Kg/ha)	Av.P_2O_5 (Kg/ha)	Av.K_2O (Kg/ha)	Water Holding Capacity (%)	Moisture (%)
Budlung pahar	Summer	6.23	2.79	929.32	33.34	379.68	38.55	2.52
	Winter	4.60	2.39	795.23	34.62	493.92	44.30	8.70
Lengopara	Summer	6.11	3.11	1035.53	44.88	399.84	42.20	3.16
	Winter	4.56	2.51	835.16	28.21	504.009	46.39	12.36
Dorapara agia	Summer	5.65	1.64	544.32	44.88	181.44	37.57	2.16
	Winter	4.52	1.51	502.43	23.08	423.31	45.80	5.26
Buraburi	Summer	6.35	2.27	756.73	28.21	299.04	40.23	2.62
	Winter	5.19	2.75	915.01	11.54	524.169	44.88	6.38
Kalyanpur (Bhalukdubi)	Summer	6.34	1.16	385.00	44.88	369.6	33.15	1.85
	Winter	4.79	3.03	1008.18	11.54	470.40	50.74	8.70

Table.24. Soil texture of the district during summer and winter seasons (2014-2016)

Site	Season	Sand %	Silt %	Clay %	Texture
Budlung pahar	Summer	7.82	56.34	35.84	Silty clay loam
	Winter	7.65	63.83	28.52	Silty clay loam
Lengopara	Summer	4.25	58.19	37.56	Silty clay loam
	Winter	6.45	50.91	42.64	Silty clay
Dorapara agia	Summer	13.16	55.17	31.67	Silty clay loam
	Winter	13.84	54.51	31.65	Silty clay loam
Buraburi	Summer	19.64	51.88	28.48	Silty loam
	Winter	19.88	50.97	29.15	Silty loam
Kalyanpur (Bhalukdubi)	Summer	2.68	49.50	47.82	Silty clay
	Winter	5.20	63.54	31.26	Silty clay loam

Table.25. Biochemical estimation of foliar constituents of Som during different seasons of 2014-2016

Season	Leaf type	Total Nitrogen (%)	Crude protein (%)	Total carbohydrate (%)	Crude fibre (%)	Moisture (%)
Winter	Tender	3.22	20.125	12.07	8.31	82.77
	Semimature	3.18	19.875	12.18	11.15	71.20
	Mature	3.15	19.6875	12.42	20.03	45.47
Mean		3.1833	19.895	12.2233	13.1633	66.48
Summer	Tender	5.08	31.75	12.15	10.19	83.84
	Semimature	4.82	30.125	12.95	15.76	73.92
	Mature	4.69	29.3125	13.17	25.89	50.56
Mean		4.8633	30.3956	12.7566	17.28	69.44
Autumn	Tender	4.55	28.4375	12.20	8.75	82.48
	Semimature	4.34	27.125	12.32	12.66	73.57
	Mature	4.17	26.0625	12.41	22.35	50.63
Mean		4.3533	27.208	12.31	14.5866	68.8933
Leaf type mean	Tender	4.2833	26.7708	12.14	9.083	83.03
	Semimature	4.1133	25.7083	12.483	13.19	72.896
	Mature	4.003	25.020	12.666	22.756	48.886
Annual mean		4.1332	25.833	12.429	15.009	68.27

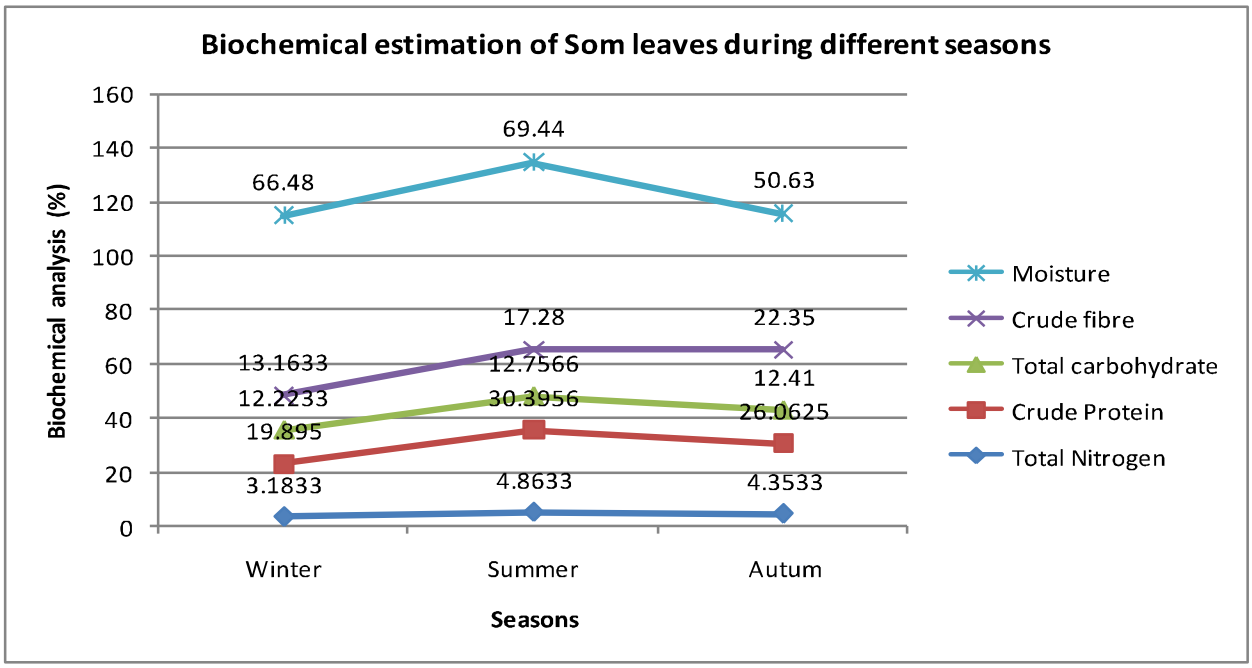


Fig.22. Biochemical estimation of foliar constituents of Som during different seasons of 2014-2016

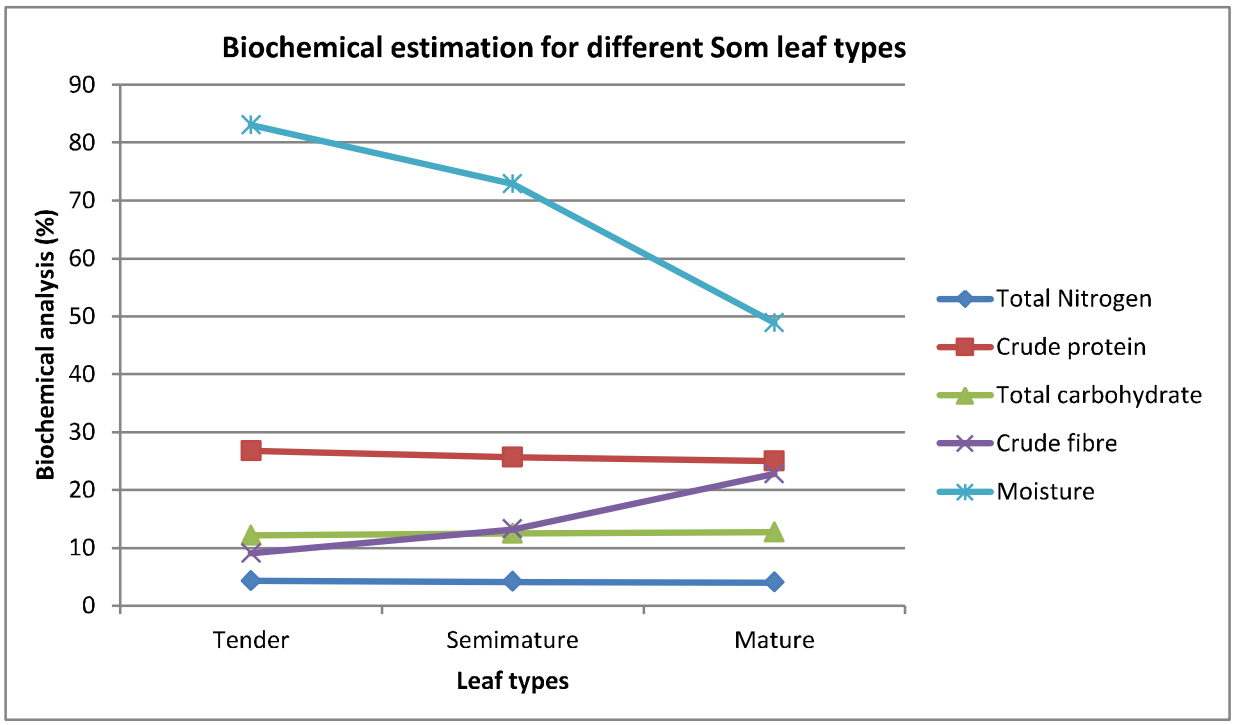


Fig.23. Graphical representation of foliar constituents of Som for different leaf types during 2014-2016

Among the systemic fungicides used it was seen that at 0.1% concentration of Bavistin and Topsin M showed 100% growth inhibition of *Pestalotiopsis disseminata*. While Mancozeb at 0.2% concentration showed 100 % growth inhibition against the test fungus. Again the copper oxychloride showed less inhibitory effect against *Pestalotiopsis disseminata*. Among the non-systemic fungicides i.e the plant extracts it was seen that at concentration 0.20% , *Azadirachta indica* showed 95.56% of inhibition against *Pestalotiopsis disseminata* while *Bougainvillea spectabilis* and *Eupatorium odoratum* showed 83.33% and 80% of growth inhibition against the test fungus. The *Lantana camara* and the *Lucas aspera* showed comparatively less inhibitory effect against *Pestalotiopsis disseminata.* Effect of Systemic fungicides on *Pestalotiopsis disseminata* were tabulated in **Table.26.**, **Table.27.**, **Table.28.** and **Table.29.** Effect of non systemic fungicides i.e. the plant extracts on *Pestalotiopsis disseminata* were tabulated in **Table.30**., **Table.31**., **Table.32**., **Table.33**. and **Table.34**. The graphical representations of systemic fungicides were made on **Fig. 24**., **Fig.25**., **Fig.26**. and **Fig.27**. while for non systemic fungicides i.e. plant extracts it were shown in **Fig.28., Fig.29., Fig.30**., **Fig.31**. and **Fig.32**.

Table.26. Mycelial growth inhibition of *Pestalotiopsis disseminata* by systemic chemical fungicide Bavistin

Chemical fungicides	Concentration (mg/ml)	Mycelial growth inhibition (%) (Mean ± SD)
Bavistin	0.01	83.3275 ±0.56547
	0.05	95.5525 ±0.23768
	0.1	100 ± 0
	0.15	100 ± 0
	0.2	100 ± 0
	0.0 (Blank)	0

Table.27. Mycelial growth inhibition of *Pestalotiopsis disseminata* by systemic chemical fungicide Topsin M

Chemical fungicides	Concentration (mg/ml)	Mycelial growth inhibition (%) (Mean ± SD)
Topsin M	0.01	77.775 ± 1.37614
	0.05	86.1075 ± 0.59332
	0.1	100 ± 0
	0.15	100 ± 0
	0.2	100 ± 0
	0.0 (Blank)	0

Table.28. Mycelial growth inhibition of *Pestalotiopsis disseminata* by systemic chemical fungicide Mancozeb

Chemical fungicides	Concentration (mg/ml)	Mycelial growth inhibition (%) (Mean ± SD)
Mancozeb	0.01	5.1075 ± 0.47989
	0.05	25.885 ± 1.045
	0.1	61.1075 ± 0.27354
	0.15	71.665 ± 0.72215
	0.2	100 ± 0
	0.0 (Blank)	0

Table.29. Mycelial growth inhibition of *Pestalotiopsis disseminata* by systemic chemical fungicide Copper oxychloride

Chemical fungicides	Concentration (mg/ml)	Mycelial growth inhibition (%) (Mean ± SD)
Copper oxychloride	0.01	13.33 ±0.94513
	0.05	26.6625 ± 0.7752
	0.1	58.33 ± 0.83118
	0.15	68.5525 ± 0.63631
	0.2	88.7725 ± 0.28791
	0.0 (Blank)	0

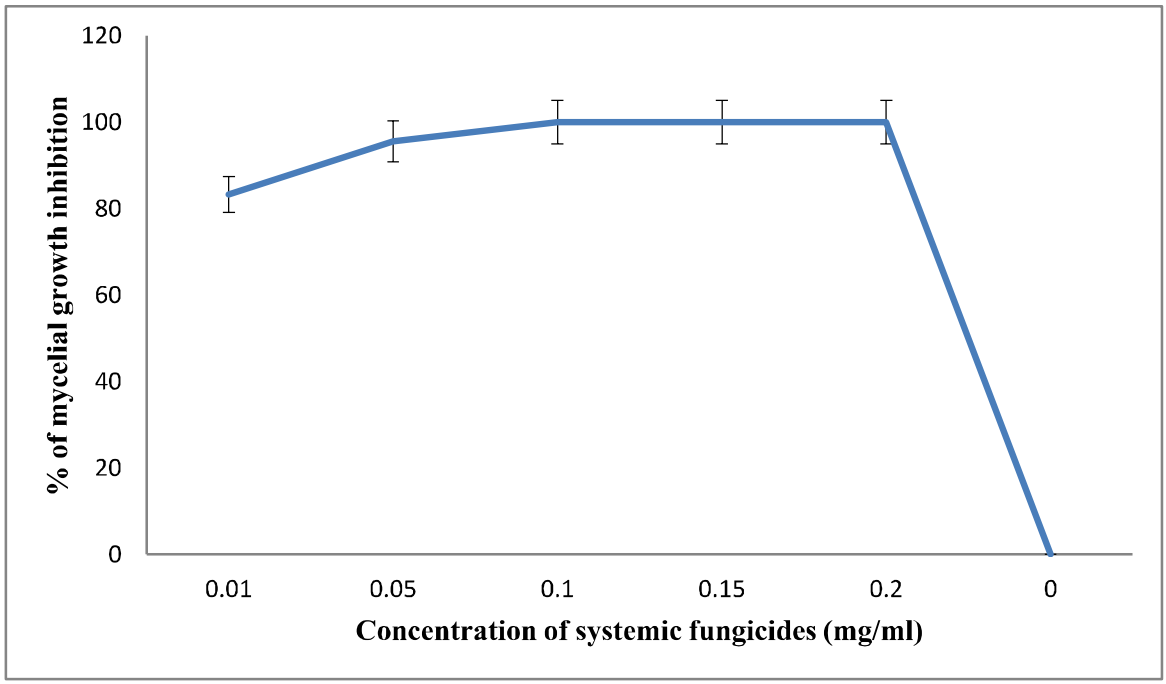


Fig.24. Graphical representation of mycelial growth inhibition of *P.disseminata* by Bavistin

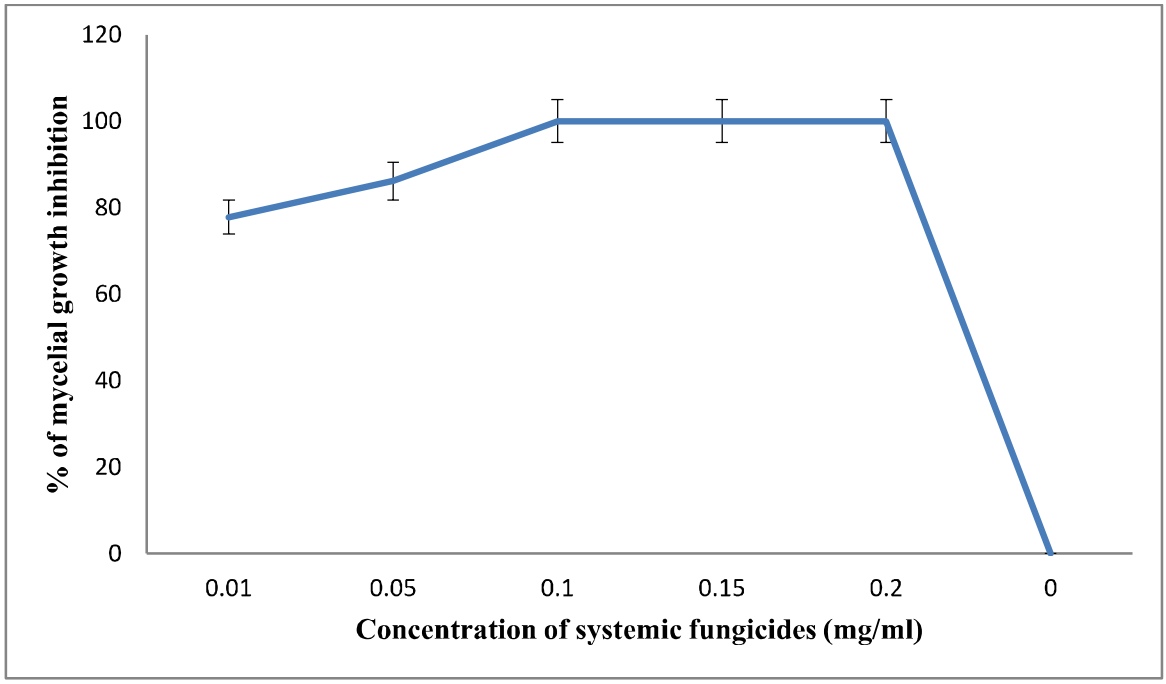


Fig.25. Graphical representation of mycelial growth inhibition of *P.disseminata* by Topsin M

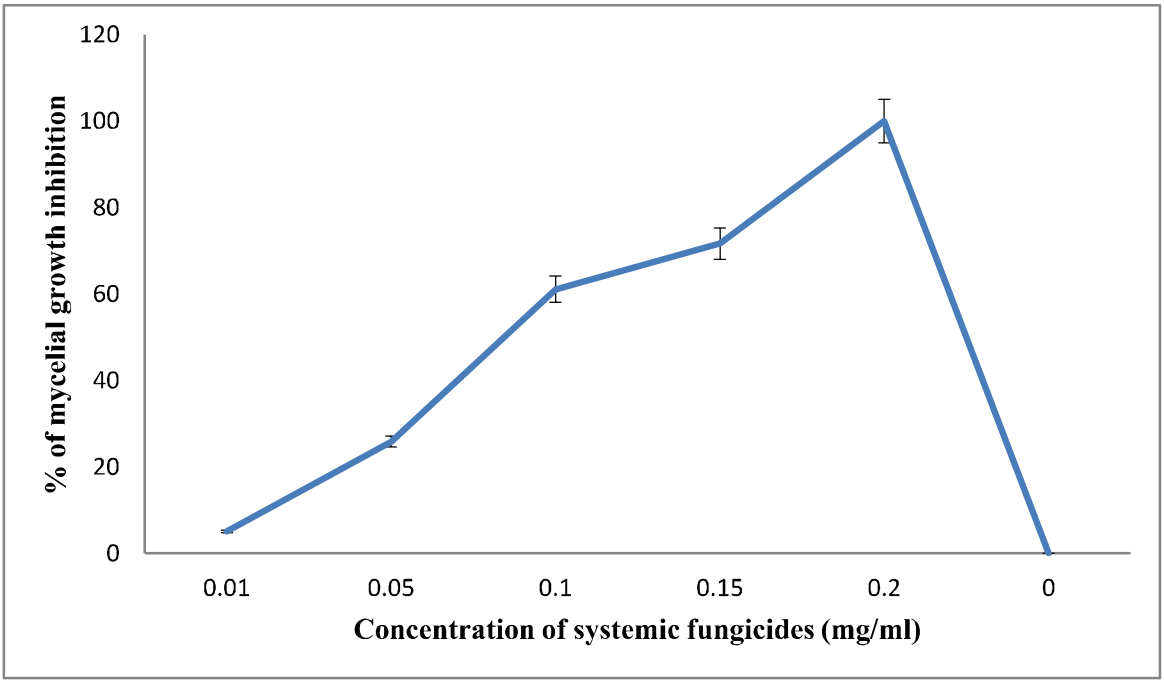


Fig.26. Graphical representation of mycelial growth inhibition of *P.disseminata* by Mancozeb

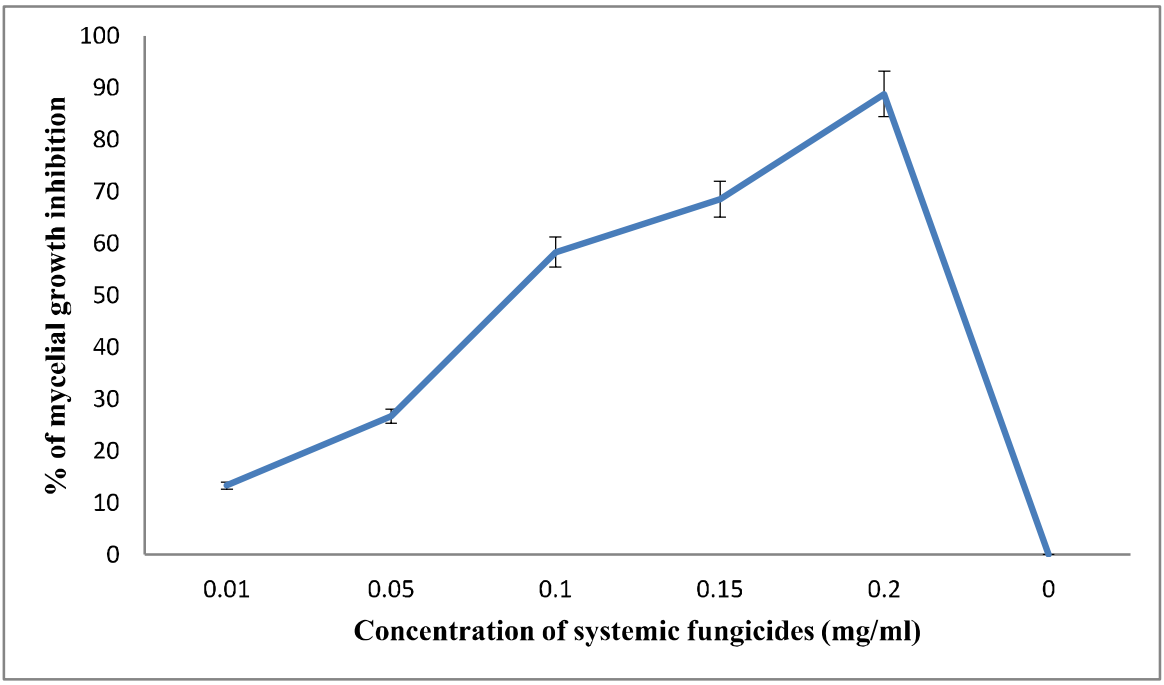


Fig.27. Graphical representation of mycelial growth inhibition of *P.disseminata* by Copper oxychloride

Table.30. Mycelial growth inhibition of *Pestalotiopsis disseminata* by aqueous extract of *Azadirachta indica*

Plant	Concentration (mg/ml)	Mycelial growth inhibition (%) (Mean ± SD)
Azadirachta indica	0.01	60.555 ± 0.94708
	0.05	70 ± 1.83799
	0.1	76.665 ± 2.44111
	0.15	88.885 ± 1.51267
	0.2	95.5525 ± 2.16754
	0.0 (Blank)	0

Table.31. Mycelial growth inhibition of *Pestalotiopsis disseminata* by aqueous extract of *Bougainvillea spectabilis*

Plant	Concentration (mg/ml)	Mycelial growth inhibition (%) (Mean ± SD)
Bougainvillea spectabilis	0.01	29.44 ±1.51633
	0.05	58.33 ±0.56874
	0.1	77.775 ±1.45786
	0.15	82.4375 ±1.13421
	0.2	83.33 ±0.17963
	0.0 (Blank)	0

Table.32. Mycelial growth inhibition of *Pestalotiopsis disseminata* by aqueous extract of *Eupatorium odoratum*

Plant	Concentration (mg/ml)	Mycelial growth inhibition (%) (Mean ± SD)
Eupatorium odoratum	0.01	16.6675 ±0.18373
	0.05	36.6675 ±1.37155
	0.1	44.4425 ±3.5136
	0.15	52.7775 ±0.56547
	0.2	80 ±0.63629
	0.0 (Blank)	0

Table.33. Mycelial growth inhibition of *Pestalotiopsis disseminata* by aqueous extract of *Lantana camara*

Plant	Concentration (mg/ml)	Mycelial growth inhibition (%) (Mean ± SD)
Lantana camara	0.01	0 ±0
	0.05	4.975 ±0.45
	0.1	22.22 ±3.39494
	0.15	49.4425 ±4.03777
	0.2	60.555 ±2.97341
	0.0 (Blank)	0

Table.34. Mycelial growth inhibition of *Pestalotiopsis disseminata* by aqueous extract of *Lucas aspera*

Plant	Concentration (mg/ml)	Mycelial growth inhibition (%) (Mean ± SD)
Lucas aspera	0.01	0
	0.05	0
	0.1	5.5425 ±0.24851
	0.15	13.8825 ±1.76549
	0.2	32.9975 ±1.87647
	0.0 (Blank)	0

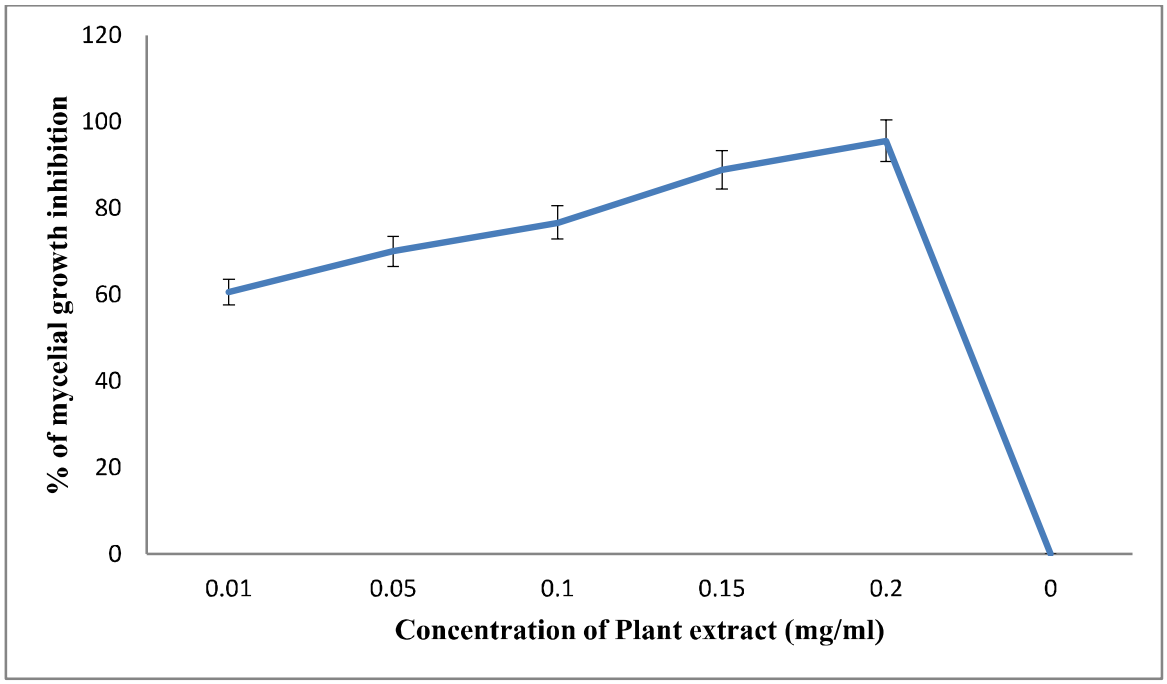


Fig.28. Graphical representation of mycelial growth inhibition of *P.disseminata* by *Azadirachta indica*

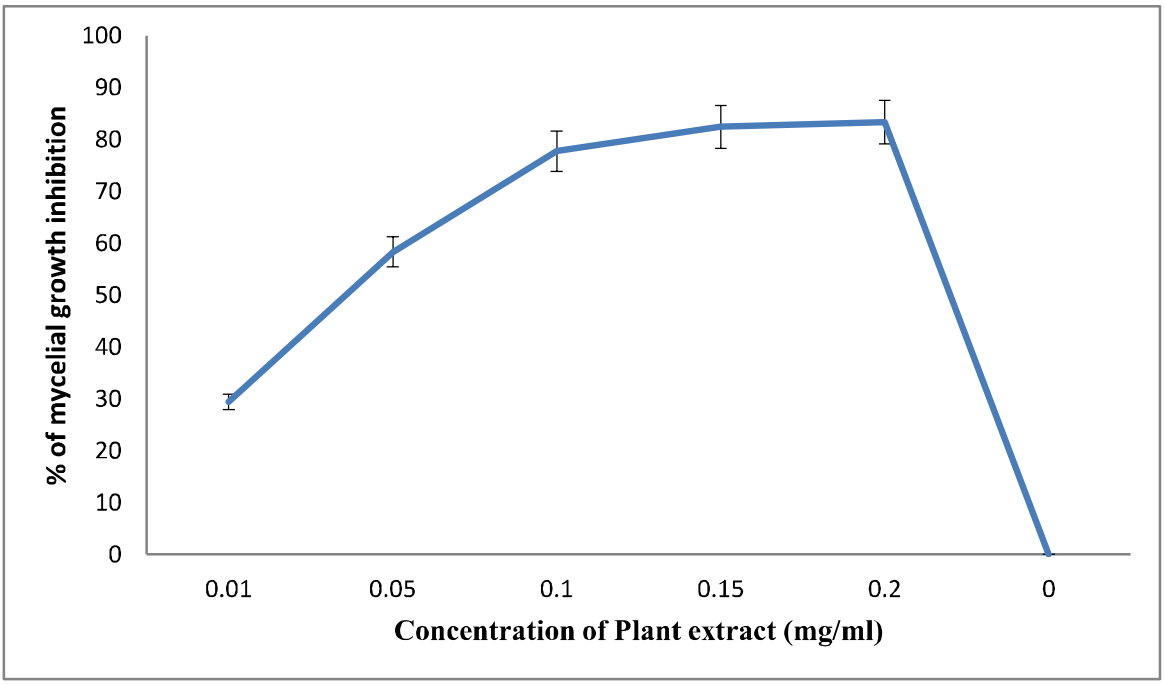


Fig.29. Graphical representation of mycelial growth inhibition of *P.disseminata* by *Bougainvillea spectabilis*

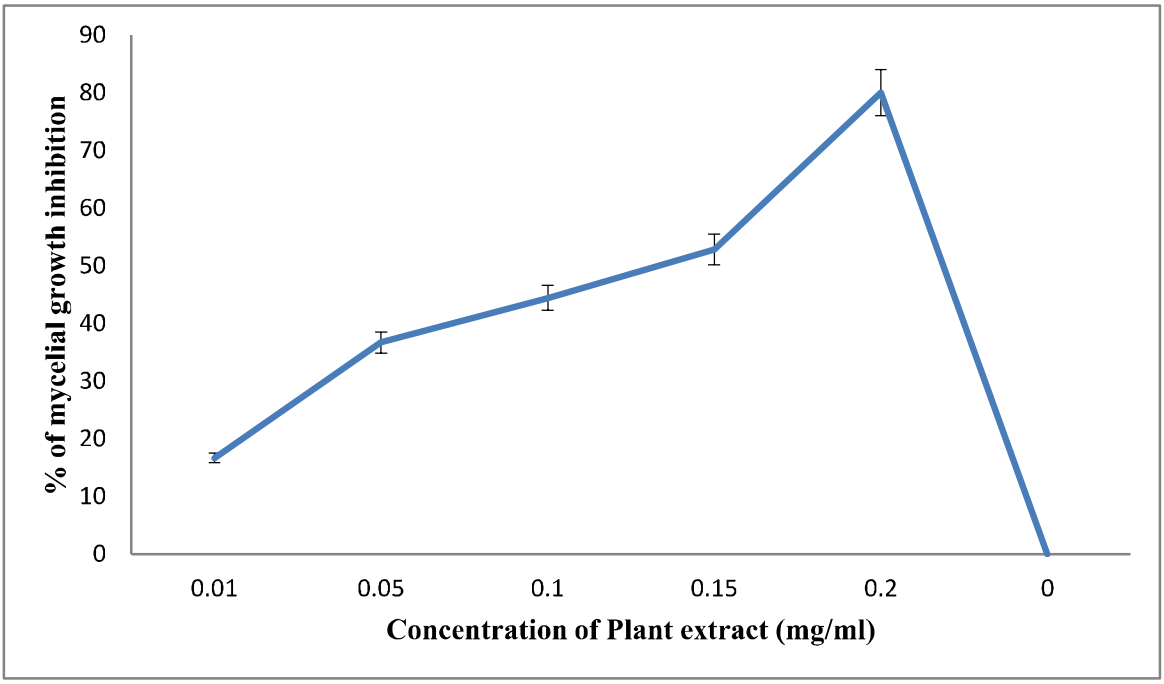


Fig.30. Graphical representation of mycelial growth inhibition of *P.disseminata* by *Eupatorium odoratum*

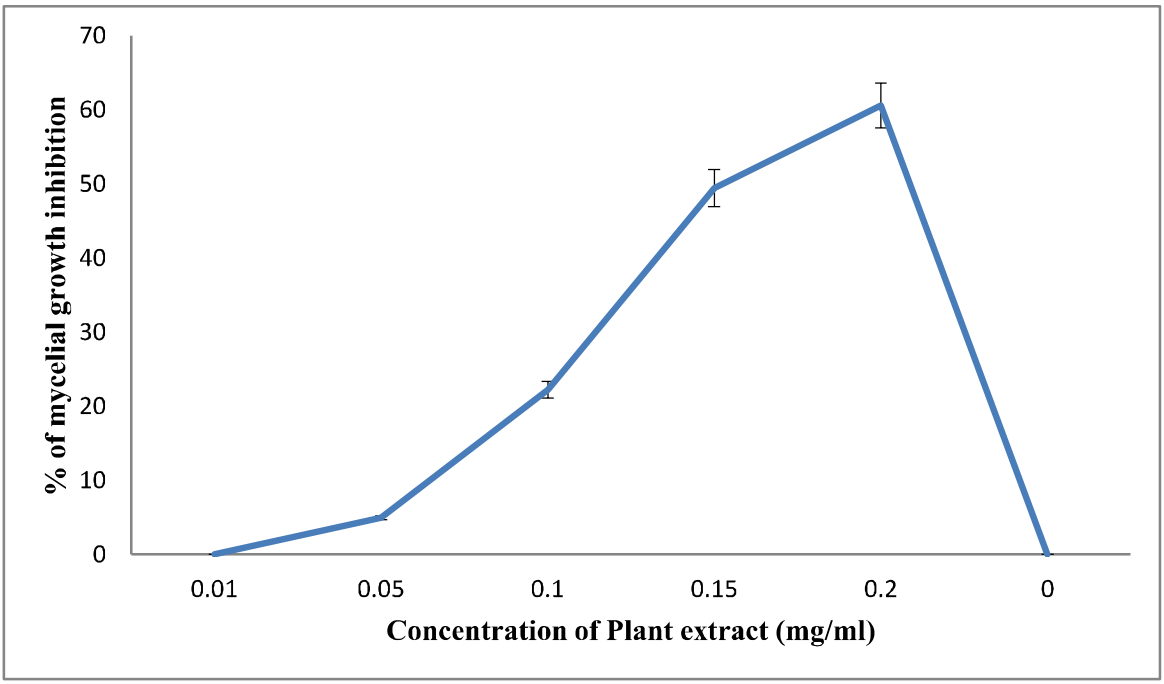


Fig.31. Graphical representation of mycelial growth inhibition of *P.disseminata* by Lantana *camara*

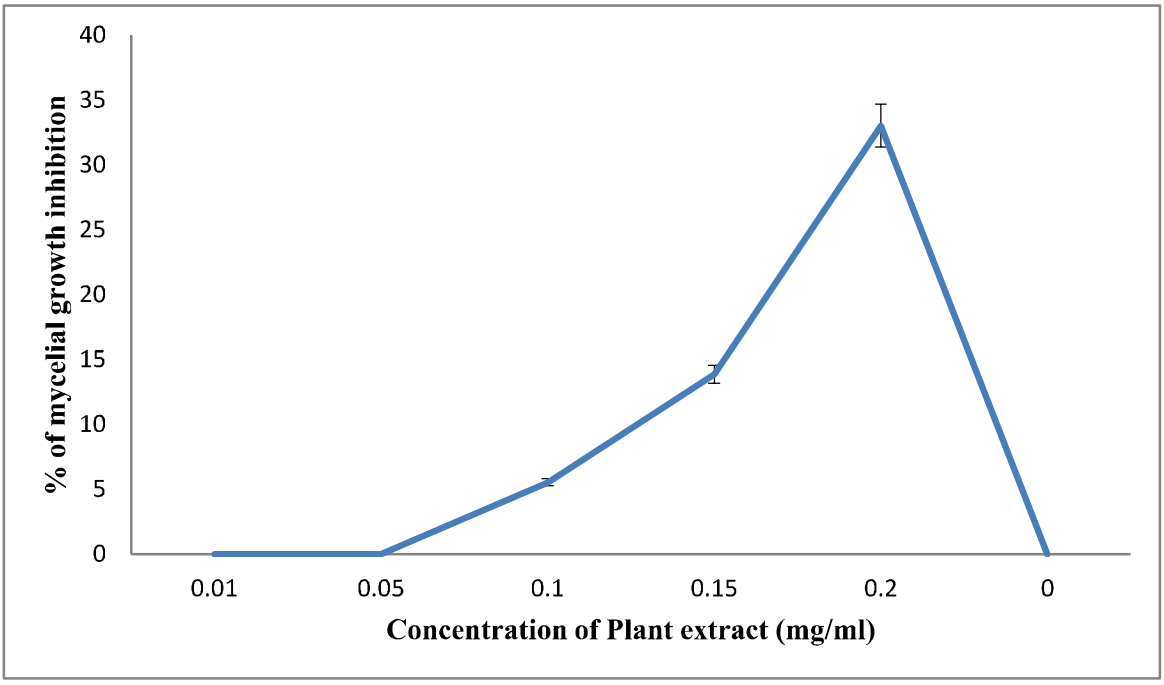


Fig.32. Graphical representation of mycelial growth inhibition of *P.disseminata* by *Lucas aspera*

Statistical analysis using SPSS software showed that there was a significant difference found among the chemical fungicides used ($F_{3,60}$= 33232.794, $p<0.05$) and inhibition at different concentrations ($F_{4,60}$=19703.914, $p<0.05$) .Furthermore, multiple comparison Tukey HSD also showed that there is a significant difference ($p<0.05$). Similarly for plant extract the statistical analysis showed that there was a significant difference found among the botanicals used ($F_{4,75}$= 4675.620, $p<0.05$) and inhibition at different concentrations ($F_{4,75}$=2266.798, $p<0.05$) .Furthermore, multiple comparison Tukey HSD also showed that there is a significant difference ($p<0.05$). Statistical analysis for systemic fungicides was recorded in **Table.35**. – **Table.37**. Similarly, the statistical analysis for non-systemic fungicides i.e. plant extracts was reported in **Table.38**. - **Table.40**. Image of the plants used as non-systemic fungicides were recorded in **Plate.9**. **Fig.33**. and **Fig.34.** shows the overall inhibition of mycelial growth by both non systemic and systemic fungicides respectively. Image of grey blight infected leaf and pure culture of the pathogen are recorded in **Plate.7**. and microscopic view of the test pathogen *Pestalotiopsis disseminata* are recorded in **Plate.8**.

Statistical analysis for Systemic fungicides (Chemical fungicides):

Table.35. Tests of Between-Subjects Effects

Source	Sum of Squares	df	Mean Square	F	Sig.
Chemical	35961.372	3	11987.124	33232.794	.0001
Concentration	28428.939	4	7107.235	19703.914	.0001
Chemical * Concentration	11915.711	12	992.976	2752.901	.0001
Error	21.642	60	.361		
Total	503918.810	80			

Table.36. Multiple Comparisons

Tukey HSD

(I) Chemical	(J) Chemical	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Bavistin	Copper oxychloride	44.6465*	.18992	.0001	44.1446	45.1484
	Mancozeb	43.0230*	.18992	.0001	42.5211	43.5249
	TopsinM	2.9995*	.18992	.0001	2.4976	3.5014
Copper oxychloride	Bavistin	-44.6465*	.18992	.0001	-45.1484	-44.1446
	Mancozeb	-1.6235*	.18992	.0001	-2.1254	-1.1216
	TopsinM	-41.6470*	.18992	.0001	-42.1489	-41.1451
Mancozeb	Bavistin	-43.0230*	.18992	.0001	-43.5249	-42.5211
	Copper oxychloride	1.6235*	.18992	.0001	1.1216	2.1254
	TopsinM	-40.0235*	.18992	.0001	-40.5254	-39.5216
TopsinM	Bavistin	-2.9995*	.18992	.0001	-3.5014	-2.4976
	Copper oxychloride	41.6470*	.18992	.0001	41.1451	42.1489
	Mancozeb	40.0235*	.18992	.0001	39.5216	40.5254

Based on observed means.

The error term is Mean Square (Error) = .361.

*. The mean difference is significant at the .05 level.

Table.37. Multiple Comparisons by Tukey HSD

(I) Concentration	(J) Concentration	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
0.01	0.05	-13.6669*	.21234	.000	-14.2641	-13.0697
	0.10	-34.9744*	.21234	.000	-35.5716	-34.3772
	0.15	-40.1694*	.21234	.000	-40.7666	-39.5722
	0.20	-52.3081*	.21234	.000	-52.9053	-51.7109
0.05	0.01	13.6669*	.21234	.000	13.0697	14.2641
	0.10	-21.3075*	.21234	.000	-21.9047	-20.7103
	0.15	-26.5025*	.21234	.000	-27.0997	-25.9053
	0.20	-38.6412*	.21234	.000	-39.2384	-38.0441
0.10	0.01	34.9744*	.21234	.000	34.3772	35.5716
	0.05	21.3075*	.21234	.000	20.7103	21.9047
	0.15	-5.1950*	.21234	.000	-5.7922	-4.5978
	0.20	-17.3338*	.21234	.000	-17.9309	-16.7366
0.15	0.01	40.1694*	.21234	.000	39.5722	40.7666
	0.05	26.5025*	.21234	.000	25.9053	27.0997
	0.10	5.1950*	.21234	.000	4.5978	5.7922
	0.20	-12.1388*	.21234	.000	-12.7359	-11.5416
0.20	0.01	52.3081*	.21234	.000	51.7109	52.9053
	0.05	38.6412*	.21234	.000	38.0441	39.2384
	0.10	17.3338*	.21234	.000	16.7366	17.9309
	0.15	12.1388*	.21234	.000	11.5416	12.7359

Based on observed means.

The error term is Mean Square (Error) = .361.

*. The mean difference is significant at the .05 level.

There is a significant difference found among the chemical fungicides used ($F_{3,60}$= 33232.794, $p<0.05$) and inhibition at different concentrations ($F_{4,60}$=19703.914, $p<0.05$) .Furthermore, multiple comparison Tukey HSD also showed that there is a significant difference ($p<0.05$).

Statistical analysis for non-systemic fungicides (plant extracts):

Table.38. Tests of Between-Subjects Effects

Source	Sum of Squares	df	Mean Square	F	Sig.
Plant extract	61228.213	4	15307.053	4675.620	.0001
Concentration	29684.195	4	7421.049	2266.798	.0001
Plant extract * Concentration	5037.641	16	314.853	96.173	.0001
Error	245.535	75	3.274		
Total	305278.633	100			

Table.39. Multiple Comparisons by Tukey HSD

		Mean			95% Confidence Interval	
		Difference	Std.		Lower	Upper
(I) Code	(J) Code	(I-J)	Error	Sig.	Bound	Bound
0.01	0.05	-12.6620*	.57217	.0001	-14.2614	-11.0626
	0.1	-23.9965*	.57217	.0001	-25.5959	-22.3971
	0.15	-36.1525*	.57217	.0001	-37.7519	-34.5531
	0.2	-49.1545*	.57217	.0001	-50.7539	-47.5551
0.05	0.01	12.6620*	.57217	.0001	11.0626	14.2614
	0.1	-11.3345*	.57217	.0001	-12.9339	-9.7351
	0.15	-23.4905*	.57217	.0001	-25.0899	-21.8911
	0.2	-36.4925*	.57217	.0001	-38.0919	-34.8931
0.1	0.01	23.9965*	.57217	.0001	22.3971	25.5959
	0.05	11.3345*	.57217	.0001	9.7351	12.9339
	0.15	-12.1560*	.57217	.0001	-13.7554	-10.5566
	2.0	-25.1580*	.57217	.0001	-26.7574	-23.5586
0.15	0.01	36.1525*	.57217	.0001	34.5531	37.7519
	0.05	23.4905*	.57217	.0001	21.8911	25.0899
	0.10	12.1560*	.57217	.0001	10.5566	13.7554
	0.20	-13.0020*	.57217	.0001	-14.6014	-11.4026
0.2	0.01	49.1545*	.57217	.0001	47.5551	50.7539
	0.05	36.4925*	.57217	.0001	34.8931	38.0919
	0.15	25.1580*	.57217	.0001	23.5586	26.7574
	2.0	13.0020*	.57217	.0001	11.4026	14.6014

Based on observed means.

The error term is Mean Square (Error) = 3.274.

*. The mean difference is significant at the .05 level.

Table.40. Multiple Comparisons by Tukey HSD

(I) Plant extract	(J) Plant extract	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
A.indica	*L.camera*	50.8930*	.57217	.0001	49.2936	52.4924
	E.odoratum	32.2205*	.57217	.0001	30.6211	33.8199
	L.aspera	67.8470*	.57217	.0001	66.2476	69.4464
	B.spectabilis	12.0690*	.57217	.0001	10.4696	13.6684
L.camara	*A.indica*	-50.8930*	.57217	.0001	-52.4924	-49.2936
	E.odoratum	-18.6725*	.57217	.0001	-20.2719	-17.0731
	L.aspera	16.9540*	.57217	.0001	15.3546	18.5534
	B.spectabilis	-38.8240*	.57217	.0001	-40.4234	-37.2246
E.odoratum	*E.odoratum*	-32.2205*	.57217	.0001	-33.8199	-30.6211
	L.camara	18.6725*	.57217	.0001	17.0731	20.2719
	L.aspera	35.6265*	.57217	.0001	34.0271	37.2259
	B.spectabilis	-20.1515*	.57217	.0001	-21.7509	-18.5521
L.aspera	*A.indica*	-67.8470*	.57217	.0001	-69.4464	-66.2476
	L.camara	-16.9540*	.57217	.0001	-18.5534	-15.3546
	E.odoratum	-35.6265*	.57217	.0001	-37.2259	-34.0271
	B.spectabilis	-55.7780*	.57217	.0001	-57.3774	-54.1786
B.spectabilis	*A.indica*	-12.0690*	.57217	.0001	-13.6684	-10.4696
	L.camara	38.8240*	.57217	.0001	37.2246	40.4234
	E.odoratum	20.1515*	.57217	.0001	18.5521	21.7509
	B.spectabilis	55.7780*	.57217	.0001	54.1786	57.3774

Based on observed means.

The error term is Mean Square (Error) = 3.274.

*. The mean difference is significant at the .05 level.

There is a significant difference found among the botanicals used ($F_{4,75}$= 4675.620, $p<0.05$) and inbition at different concentrations ($F_{4,75}$=2266.798, $p<0.05$) .Furthermore, multiple comparison Tukey HSD also showed that there is a significant difference ($p<0.05$).

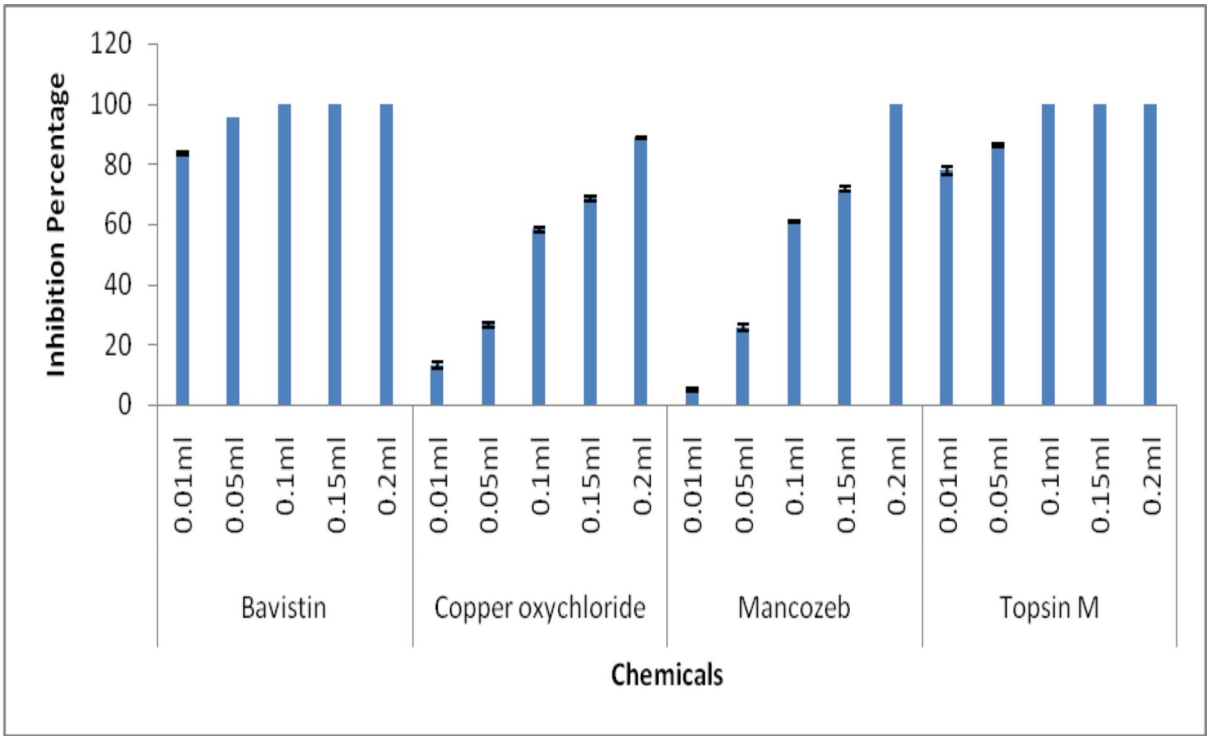


Fig.33. Effect of Systemic fungicides on *Pestalotiopsis disseminata*

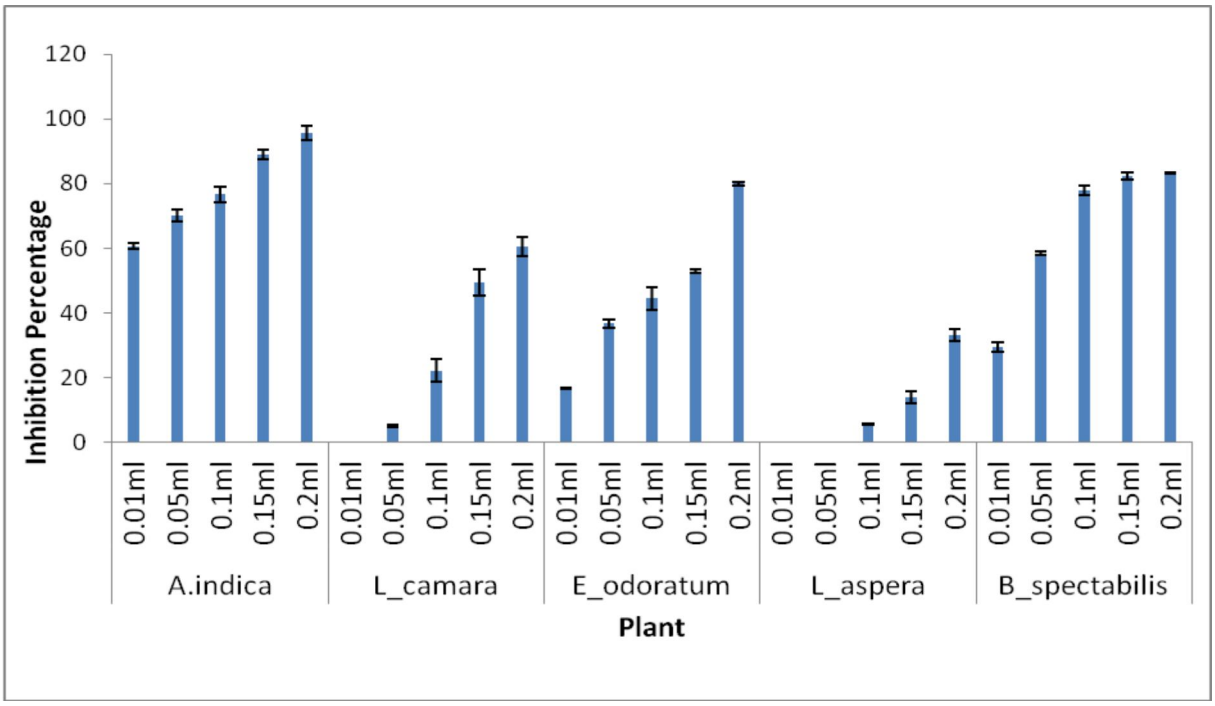


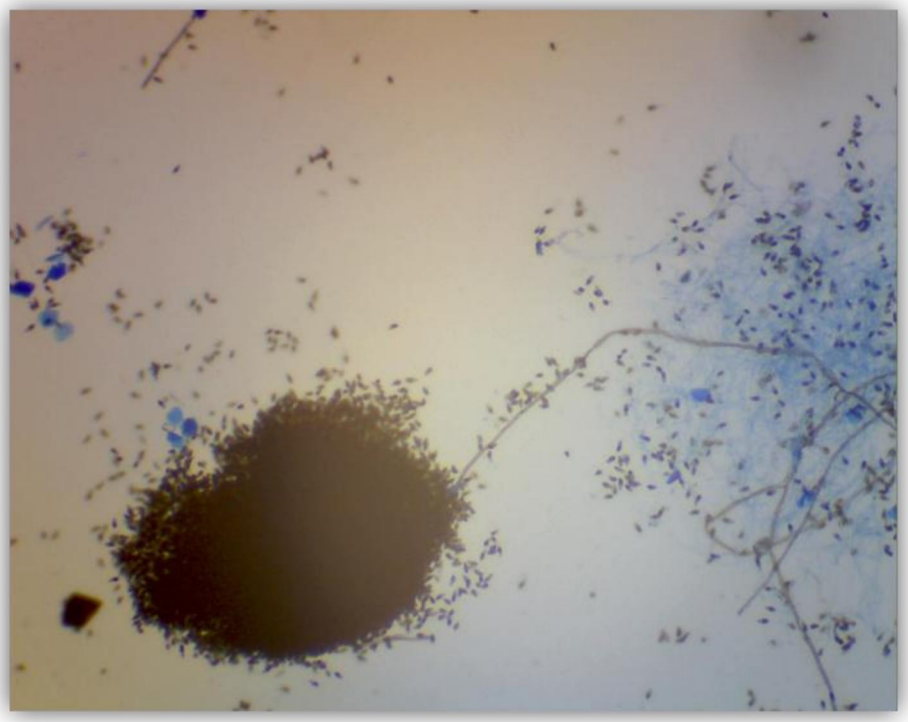
Fig.34. Effect of Non-systemic fungicides (Plant extracts) on *Pestalotiopsis disseminata*

Plate.7. Image of disease infected leaf and pure culture of the pathogen

A. *Pestalotiopsis disseminata* infected leaf

B. Pure culture of *Pestalotiopsis disseminata*

Plate .8. Microscopic view of *Pestalotiopsis disseminata*



A

B

Plate.9. Plant used as non-systemic fungicides

A. *Azadirachta indica*

D. *Bougainvillea spectabilis*

B. *Lantana camara*

E. *Lucas aspera*

C. *Eupatorium odoratum*