Available online at www.ijpab.com

DOI: http://dx.doi.org/10.18782/2320-7051.2412

ISSN: 2320 – 7051

Int. J. Pure App. Biosci. **4 (6):** 180-185 (2016)

International Journal of Pure & Applied Bioscience

Research Article

OPEN ACCESS

Control of Fungal Pathogen *Pestalotiopsis disseminata* Causing Grey Blight Disease in Som (*Persea bombycina* Kost.): An *In Vitro* Study

Manjit Kumar Ray[1], Piyush Kumar Mishra[2] and Pradip Kumar Baruah[3]

[1]SRF, DBT-Biotech Hub, BN College, Dhubri, Assam & PhD scholar, University of Sc. & Tech., Meghalaya-01

[2]Assistant Professor, Dept. of Botany, BN College, Dhubri, Assam-783324

[3]HOD & Assoc. Prof., Dept. Of Botany, University of Science & Technology, Meghalaya-793101

*Corresponding Author E-mail: manjit_ray2002@yahoo.com

Received: 29.11.2016 | Revised: 15.12.2016 | Accepted: 18.12.2016

ABSTRACT

Som (Persea bombycina Kost. Family-Lauraceae) is the primary host plant of golden silk producing muga silkworm (Antheraea assamensis Helfer), which is effected by one of the major foliar diseases grey blight caused by the fungus Pestalotiopsis disseminata (Thum) Stey. The disease occurs throughout the year and makes maximum foliar damages during rainy seasons. It was recorded that the disease incidence were peak during the month of july in Goalpara district of Assam, India. Four systemic fungicides namely Bavistin, Copper oxychloride, Mancozeb, Topsin-M and five plant extracts of Azadirachta indica, Lantana camara, Eupatorium odoratum, Lucas aspera, Bougainvillea spectabilis were tested at five different concentrations i.e. 1:100(0.01), 5:100(0.05), 10:100(0.10), 15:100(0.15) and 20:100(0.20) for both the control measures in vitro. It showed that in case of systemic fungicides Bavistin and Topsin-M showed complete inhibition of the fungal growth at 10:100 while Mancozeb showed complete inhibition of fungal growth at 20:100 concentration level. Copper oxychloride was found effective at higher concentration. Again among the plant extracts Azadirachta indica showed greater inhibitory effect against the test fungus i.e 95.56% at 20:100 concentration level. While the other plant extracts showed an effective results at higher concentration.

Key words: *Som, muga silkworm, grey blight, systemic fungicides, plant extracts, Goalpara district*

INTRODUCTION

Muga silkworm (*A. assamensis* Helfer), the golden silk producing silkworm primarily feed on two host plants Som (*Persea bombycina* Kost.) and Sualu (*Litsea polyantha* Juzz.). The plant som is highly susceptible to various foliar diseases caused by bacteria, fungi, insect pest as well which ultimately effect the muga silkworms and production. One of the major foliar diseases of Som is grey blight which is caused by fungus *Pestalotiopsis disseminata* (Thum) Stey[2]. The disease causes maximum foliar damages during rainy seasons and occurs throughout the year.

Cite this article: Ray, M.K., Mishra, P.K. and Baruah, P.K., Control of Fungal Pathogen *Pestalotiopsis disseminata* Causing Grey Blight Disease in Som (*Persea bombycina* Kost.): An *In Vitro* Study, *Int. J. Pure App. Biosci.* **4(6):** 180-185 (2016). doi: http://dx.doi.org/10.18782/2320-7051.2412

Due to pollution in the environment, soil residues, waste material, the use of chemical fungicides for disease management in the present day crop husbandry has been discouraged. For controlling of various plant diseases a large number of chemicals have been developed. Due a numbers of reason, Roy[12] put forward that the use of chemical fungicides is not economical and has some limitations in muga food plant cultivation. Although fungicides derived from plant products contain alkaloids, terpenoids, polyacetylenes, unsaturated isobutylanides and phenolics which are the richest source of bioactive phytochemicals and they are the safer alternatives for fungi control[18]. Therefore due to overgrowing awareness of the hazardous side effects of these chemicals more and more emphasis is being given to the use of biological control agents. Fungitoxicity of botanical products were considered to be safe means in sericulture[15]. Keeping the above in mind and bound on the socioeconomic condition of poor muga growers, present study was conducted to evaluate locally available few plants extracts against the fungus *Pestalotiosis disseminata*, which causes grey blight in Som leaves alongwith few chemical fungicides under laboratory conditions. For a wide acceptance and for conservation of environment and sustainable agriculture, the biological control measures of the diseases, the plant extracts need to be exploited commercially and incorporated in the integrated management of crop diseases, which is of prime importance[6].

MATERIALS AND METHODS

The experiment was carried out in Biotech hub, BN college of Dhubri district of Assam, India during 2014 to 2015

Source of pathogen:

The pathogen, *Pestalotiopsis disseminata* was isolated from freshly infected som leaves collected randomly from various places of Goalpara district of Assam, India which is the area of study. Pure culture of the fungus were maintained by subculturing periodically on fresh potato dextrose agar (PDA) medium.

Systemic and Nonsystemic fungicides:

Four systemic fungicides i.e chemicals namely Bavistin, Copper oxychloride, Mancozeb and Topsin M and leaf extracts from five locally available plant species i.e. *Azadirachta indica*, *Lantana camara*, *Eupatorium odoratum*, *Lucas aspera* and *Bouganvillea spectabilis* were selected as nonsystemic fungicides. Both the treatments were made 1:100(0.01), 5:100(0.05), 10:100(0.10), 15:100(0.15) and 20:100(0.20) concentration and tested against *P. disseminata* by the poisoned food method[10]. Equal volume of PDA are mixed with the fungicides in a conical flask. Then the medium was poured in sterilised petridishes and kept for solidification. A mycelial disc of 4 mm in diameter of the test fungus was taken from 7 days old culture with the help of sterilised cork borer and placed at the centre of the petridishes containg the media and the fungicide. A mycelia disc of pathogen on PDA without adding fungicides served as control. Plant extracts were made by using method of Singha *et* al.[14]. Fresh leaves of each plant species were washed in distilled water and separately homogenised with sterile water in 1:1 (W/V) in a sterilised mortar and pestle. The homogenate was filtered through muslin cloth and was considered a stock solution. Five dilutions as mentioned earlier i.e. 1:100(0.01), 5:100(0.05), 10:100(0.10), 15:100(0.15) and 20:100(0.20) were prepared from the stock solution using distilled water. 20 ml of PDA along with 2 ml of plant extracts from each dilutions was poured separately with the medium. Actively growing 7 days old culture of *P.disseminata* was cut into 4 mm in diameter and treatment were made using the same procedures used in case of chemical fungicides. A mycelia disc of pathogen on PDA without adding plant extracts served as control. Each treatment were made triplicate and inear mycelial growth were recorded after 5-7 days. The percentage growth inhibition was calculated using the formula suggested by Vincent[17]. In table .1. & table .2., measurement of mycelial growth of the fungus and inhibitory effect of the chemicals and plant extracts on grey blight disease causing fungal pathogen *P. disseminata* was recorded respectively. While, fig.1. and fig.2. gives graphical representation of the effect of chemical fungicides and plant extracts on the test fungus.

Table 1. Control of Grey blight disease of Som by systemic fungicides

Systemic fungicides	Measurement of mycelial growth of the fungus (in mm) Concentration (%)											
	0.00 (control)		0.01		0.05		0.10		0.15		0.20	
	Growh	Inhibiton	Growth	Inhibition	Growth	Inhibition	Growth	Inhibition	Growth	Inhibition	Growth	Inhibition
Bavistin	90	00	15	83.33	04	95.56	00	100	00	100	00	100
Copper oxychloride	90	00	78	13.33	66	36.67	37.5	58.33	28.3	68.56	10.4	88.44
Mancozeb	90	00	85.4	5.11	66.7	25.89	35	61.11	25.5	71.67	00	100
Topsin M	90	00	20	77.78	12.5	86.11	00	100	00	100	00	100

Table 2. Control of Grey blight disease of Som by non systemic fungicides (Plant extracts)

Plant extracts	Measurement of mycelial growth of the fungus (in mm) Concentration(%)											
	0.00 (control)		0.01		0.05		0.10		0.15		0.20	
	Growth	inhibition	growth	inhibition	growth	inhibition	growth	inhibition	growth	inhibition	growth	Inhibition
Azadirachta indica	90	00	35.5	60.56	27	70	21	76.67	10	88.89	0 4	95.56
Lantana camara	90	00	90	00	85.5	5	70	22.22	45.5	49.44	35.5	60.56
Eupatorium odoratum	90	00	75	16.67	57	36.67	50	44.44	42.5	52.78	18	80
Lucas aspera	90	00	90	00	90	00	85	5.5	77.5	13.88	60.3	33
Bougainvillea spectabilis	90	00	63.5	29.44	37.5	58.33	20	77.78	15.8	82.44	15	83.33

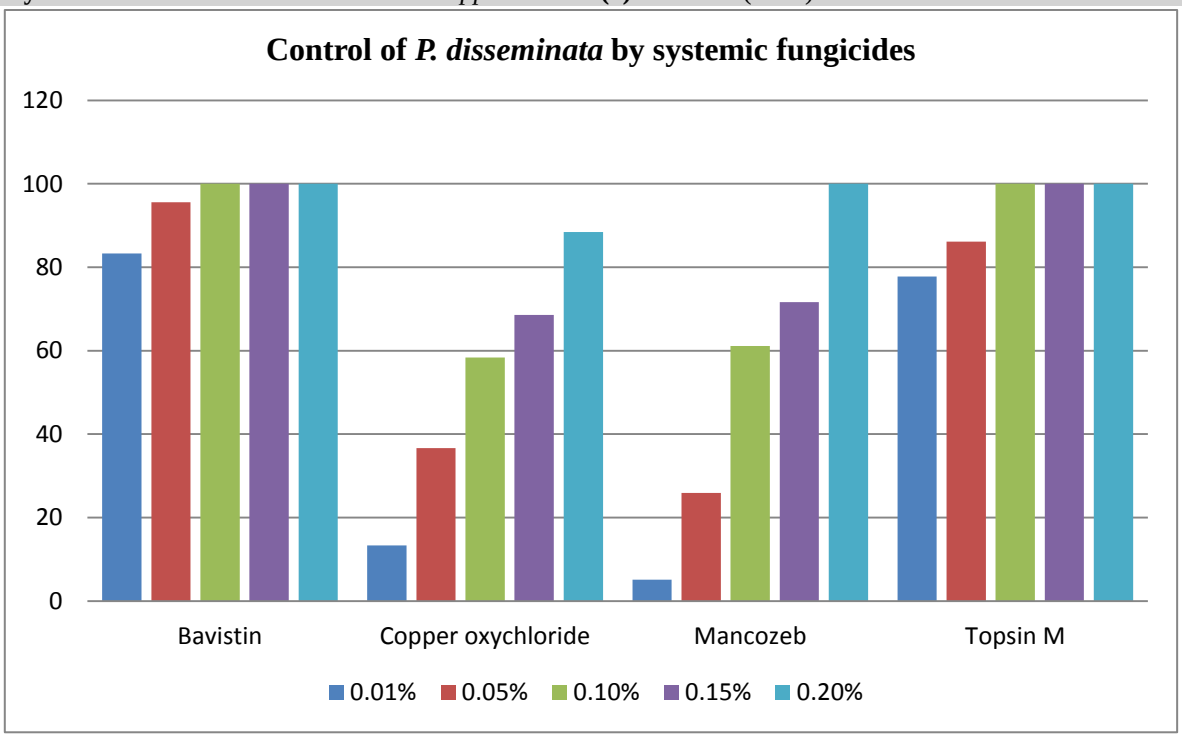

Fig. 1: Graphical representation of the effect of chemical fungicides on the test fungus

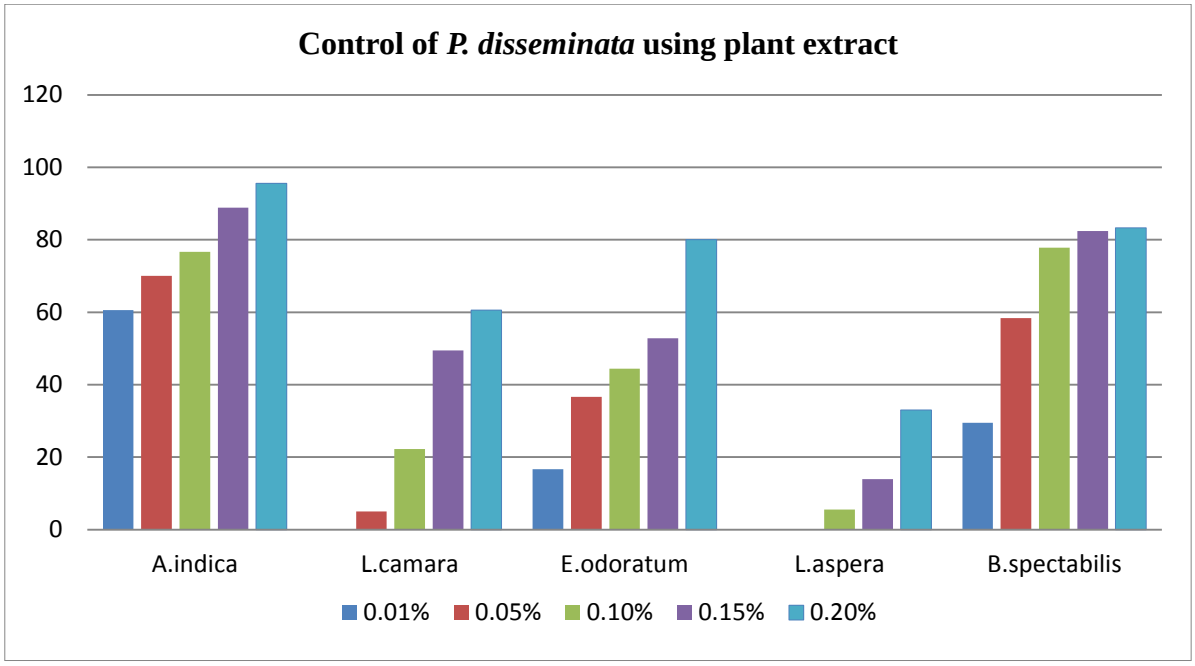

Fig. 2: Graphical representation of the effect of plant extracts on the test fungus

RESULT AND DISCUSSIONS

The 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. The results indicate that Bavistin and Topsin-M were highly effective fungicides for controlling the growth of *P. disseminata*. Use of chemical fungicides in controlling foliar diseases of plants have been reported by various workers[3,5,7.8,11]. Similar reports have been made by Das and Jha[3], where they suggested that Carbendazin at 0.20 % can be effectively used for minimizing the severity of grey blight disease of Som. Saju *et* al.,[13] reported Carbendazin 50 WP significantly effective at all concentration tested against *Pestalotiopsis sp.* infecting large cardamom. Where he suggested potential of using biocontrol agents & botanicals for ecofriendly management of *Pestalotiopsis sp.* infecting large cardamom & fungicides incase the incidence is severe. While 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%). Similar studies by Das *et* al.,[3] showed control of foliar blight of Sualu and reported 100% growth inhibition of the foliar blight causing fungus *Colletotrichum gloeosporioides* at 0.15% concentration level of *B. spectabilis* extract. Also, it was observed that the extract of *Eupatorim 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 & Wagh[1], used *A. indica* & *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* & pronounced activity against *S. aureus*. Mondali N.K. *et* al,[9] studied antifungal activities of neem leaf extracts on *Rhizopus* and *Aspergillus*. Suleiman[16], 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[6], 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. Devi & Chhetry[4], 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*. However further evaluation in the field is required before the biocontrol agents, plant extracts and fungicides are recommended for disease management[13].

CONCLUSION

It showed that in case of systemic fungicides Bavistin and Topsin-M showed complete inhibition of the fungal growth at 10:100 while Mancozeb showed complete inhibition of fungal growth at 20:100 concentration level. Copper oxychloride was found effective at

higher concentration. Again treatments with plant extracts of *Azadirachta indica*, *Bougainvillea spectabilis* and *Eupatorium odoratum* showed promising inhibition of the fungus at concentration level 20:100. While the other plant extract showed an effective results at higher concentration. Hence plant extracts used in the present study can be recommended for control of the grey blight diseases of Som with higher concentration. However further evaluation in field condition is recommended.

Acknowledgement

Financial assistance from Department of Biotechnology, Govt. Of India is gratefully acknowledged.

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