Bangladesh J. Sci. Res. **30**(1&2): 91-95, 2017 (December) **- Short communication**

IN VITRO EVALUATION OF SELECTED FUNGICIDES AND SOME PLANT EXTRACTS AGAINST SEED-BORNE FUNGI OF SESAME (*SESAMUM INDICUM* L.)

Md. Delwar Hosen and Shamim Shamsi*

Department of Botany, University of Dhaka, Dhaka-1000, Bangladesh

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Two pathogenic fungi *Aspergillus niger* van Tiegh, and *Fusarium merismoides* Corda were isolated from sesame seeds. Five fungicides *viz*., Bavistin DF, Capvit 50 WP, Dithane M-45, Ridomil Gold MZ 68 WG and Tilt 250 EC were selected to evaluate their *in vitro* efficacy at 100, 200, 300, 400 and 500 ppm concentrations against *A. niger* and *F. merismoides*. Out of five fungicides Bavistin DF showed the complete growth inhibition of *A. niger* and *F. merismoides* at 100 ppm concentration. Tilt 250 EC also showed the complete growth inhibition of *F. merismoides* at 100 ppm concentration. Ethanol extracts of five plant parts were selected to evaluate their *in vitro* fungitoxicity at 5, 10, 15 and 20% concentrations against the test pathogens. In the present study, out of the five plants extract, *A. sativum* showed complete growth inhibition of both the test pathogens. Bavistin DF and Tilt 250 EC found to be the best inhibiting fungicide while *A. sativum* as the best plant extract for further testing against seed borne fungi of sesame.

In Bangladesh, sesame is the important summer oilseed crop occupying 9.4% of the total oilseed area (BBS 2012). Sesame is highly beneficial as it contains 42 - 50% oil and the oil contains 42% essential linoleic acid, 25% protein and 16 - 18% carbohydrate. The seed on an average, consists of 47% oil and 20% protein (Rahman 1976). The oil is consumed largely as a cooking and salad oil. Stem rot and Cercospora leaf spot of sesame has been reported from Bangladesh. Pre-sowing seed dressing with fungicides like Vitavax-200 was found effective in reducing the seed borne pathogen and also enhance the germination percentage of the seeds. Cercospora leaf spot was reduced with Bavistin (0.1%) or Dithane M-45 (0.2%). Chemical pesticides could control diseases and result in improved yield. However, indiscriminate use of pesticides could produce environmental and health hazards. Appropriate technology might result in more effective use of natural resources in agriculture. Plant extracts could be useful in modern agriculture for disease management. The control of plant pathogens by their use is becoming important day by day over chemical methods of controlling plant diseases, based on fungicides. Plant parts and their constituents of some higher plants have already been reported to be successful fungitoxicants (Ahmed *et al.* 2013). Present investigation was undertaken to evaluate efficacy of some selected fungicides and plant extracts against two pathogens of sesame.

Two varieties of sesame (*Sesamum indicum* L.) seeds, namely BARI Til-3, BARI Til-4, were collected from the Bangladesh Agricultural Research Institute (BARI), Joydebpur, Gazipur, Bangladesh. The experiment was conducted in the Laboratory of Mycology and Plant Pathology,

*Author for correspondence: <prof.shamsi@gmail.com>.

Department of Botany, University of Dhaka, Bangladesh from May, 2015 to July, 2016. Quality status of two varieties of sesame seeds were determined by seed quality analysis ISTA (Anon. 1976 and 2014).

Five fungicides i.e., Bavistin DF, Capvit 50 WP, Dithane M-45, Ridomil MZ Gold and Tilt 250 EC at 100, 200, 300, 400 and 500 ppm were used to evaluate their *in vitro* efficacy against test pathogens. Five higher plants were selected to evaluate their *in vitro* efficacy against test pathogens. Ethanol extract of *Allium sativum* L. (bulb), *Azadirachta indica* A. Juss. (leaf), *Citrus limon* (L.) Burm. f. (leaf), *Mangifera indica* L. (leaf) and *Psidium guajava* L. (leaf) at 5, 10, 15 and 20% were used to evaluate their *in vitro* efficacy against test pathogens, *A. niger* and *F. merismoides*. *In vitro* evaluation of fungicides and plant extracts against test pathogens were carried out by 'poison food technique' following Shamim. and Chowdhury (2016).

A total of 9 species of fungi *viz. Aspergillus flavus, A. fumigatus, A. niger, Curvularia lunata, Fusarium merismoides, Mucor* sp., *Penicillium* sp., *Rhizopus stolonifer* and *Trichoderma viride* were isolated and identified from sesame seeds. All the isolated fungi were tested for their pathogenic potentiality following seed inoculation technique (Chowdhury *et al*. 2015). Among the isolated fungi *A. niger*, was found to be pathogenic to both the sesame varieties studied and *F. merismoides* was found to be pathogenic to seeds of BARI Til-3.

All the fungicides inhibited the radial growth of the two test pathogens *A. niger* and *F. merismoides.* The extent of growth inhibition, however, varied amongst the fungal isolates. *A. niger* and *F. merismoides* were completely inhibited by Bavistin DF at the concentrations of 100, 200, 300, 400 and 500 ppm. Tilt 250 EC also completely inhibited radial growth of *F. merismoides* at the same concentrations. Chakraborty *et al*. (2009) reported that, at 5% conc., Bavistin happened to be the most efficient on *Fusarium solani* causing wilt of brinjal. Bashar (1992) reported the results of laboratory evaluation of some fungicides on *F. oxysporum* f. sp. *ciceri* causing wilt of chickpea found that Bavistin could control the pathogen completely at 100 ppm concentration. Results of the experiments are presented in Tables 1 and 2.

Table 1. Per cent inhibition of radial growth of *Aspergillus niger* at different conc. of fungicides.

Name of fungicides	% inhibition of radial growth at different concentrations (ppm)				
	100	200	300	400	500
Bavistin DF	100^{a}	100^{a}	100^{a}	100^{a}	100^{a}
Capvit 50 WP	0.0^{NS}	0.0^{NS}	0.0^{NS}	0.0^{NS}	0.0^{NS}
Dithane M-45	43.82^{a}	52.62^{a}	56.18^{a}	57.30^{a}	60.67^{a}
Ridomil MZ Gold	47.75^{a}	53.37^{a}	70.00^{a}	100^{a}	100^{a}
Tilt 250 EC	87.08^{a}	88.76^{a}	92.70^{a}	97.75^{a}	98.88^{a}

Remarks efficiency gradient: Bavistin DF > Ridomil MZ Gold > Tilt > Dithane M-45 > Capvit 50 WP.
a, b and c indicate significance at 0.1, 1 and 5% level, respectively. In a row, figures with same letter do not differ significantly whereas figures with dissimilar letter differ significantly (as per DMRT), NS = Not significant.

Capvit 50 WP showed maximum (70.09%) growth inhibition of *F. merismoides* at 400 ppm concentration. Complete inhibition of *F. merismoides* occurred at 500 ppm concentration. Capvit 50 WP had no effect on *A. niger.*

Dithane M-45 showed the highest (60.61%) growth inhibition of *A. niger* at 500 ppm. The same fungicides showed 43.48% growth inhibition of *F. merismoides* at 500 ppm conc..

Ridomil MZ Gold showed maximum (70.00%) growth inhibition of *A. niger* at 300 ppm, *Aspergillus niger* was completely controlled by the same fungicide at 400 and 500 ppm concentrations.

Table 2. Per cent inhibition of radial growth of *Fusarium merismoides* at different conc. of fungicides.

Name of fungicides	% inhibition of radial growth at different concentrations (ppm)				
	100	200	300	400	500
Bavistin DF	100^{a}	100^{a}	100^{a}	100^{a}	100^{a}
Capvit 50 WP	42.31^{b}	47.44^{b}	51.28^{a}	70.09^{a}	100^{a}
Dithane M-45	20.51^{c}	26.92^{b}	32.05^{b}	35.90^{b}	45.30^{b}
Ridomil MZ Gold	28.57^{b}	34.28^{b}	37.14^{b}	42.86^{b}	45.71^{b}
Tilt 250 EC	100^{a}	100^{a}	100^{a}	100^{a}	100^{a}

Remarks efficiency gradient: Bavistin = Tilt > Capvit > Ridomil > Dithane.
a, b and c indicate significance at 0.1, 1 and 5% level, respectively. In a row, figures with same letter do not differ significantly whereas figures with dissimilar lettet differ significantly (as per DMRT), NS = Not significant.

Table 3. Effects of plant extracts on the radial growth of *Aspergillus niger* at different concentrations.

Sl. No.	Name of plant	% inhibition of radial growth of the pathogen at different conc. (%)			
		5	10	15	20
1.	*Allium sativum*	100^{a}	100^{a}	100^{a}	100^{a}
2.	*Azadirachta indica*	64.04^{a}	66.29^{a}	67.42^{a}	82.02^{a}
3.	*Citrus limon*	74.16^{a}	78.65^{a}	79.78^{a}	80.90^{a}
4.	*Mangifera indica*	0.0^{NS}	67.98^{a}	70.79^{a}	74.16^{a}
5.	*Psidium guajava*	0.0^{NS}	0.0^{NS}	0.0^{NS}	75.84^{a}

Remarks of efficiency gradient of *Aspergillus niger* : *Allium sativum >Citrus limon >Azadirachta indica Mangifera indica > Psidium guajava.*
a, b and c indicate significance at 0.1, 1 and 5% level, respectively. In a row, figures with same letter do not differ significantly whereas figures with dissimilar lettet differ significantly (as per DMRT), NS = Not significant.

Tilt 250 EC showed maximum 98.88% growth inhibition of *A. niger* at 500 ppm. *Fusarium merismoides* was completely inhibited at 100 concentration by the same fungicide. (Tables 1 and 2).

The order of effectiveness of fungicides at 500 ppm concentration against *A. niger* were Bavistin BF > Ridomil MZ Gold > Tilt 250 EC Dithane > M-45 > Capvit 50 WP . The order of

effectiveness of funicides against *F. merismoides* at 500 ppm concentration were Bavistin BF > Capvit 50 WP > Tilt 250 EC >. Ridomil MZ Gold > Dithane > M-45 .

In vitro evaluation of fungicides revealed that except Capvit all the fungicides showed complete/partial inhibition of *A. niger* and *F. merismoides* at 500 ppm.

All the five plant extracts showed fungitoxicity against both the test pathogens (Table 3 and 4). The most promising fungitoxic effect was recorded in case of *A. sativum* against *A. niger* and *F. merismoides.* Efficacy of *A. sativum* extracts in controlling seed-borne fungal infection in different crops has also been reported by Meah *et al.* (2004) and Rashid *et al.* (2007).

Table 4. Effects of plant extracts on the radial growth of *Fusarium merismoides* at different concentrations.

Sl. No.	Name of plant	% inhibition of radial growth of the pathogen at different conc. (%)			
		5	10	15	20
1.	*Allium sativum*	100^{a}	100^{a}	100^{a}	100^{a}
2.	*Azadirachta indica*	60.00^{b}	67.50^{a}	71.25^{b}	80.42^{b}
3.	*Citrus limon*	34.94^{b}	54.22^{b}	77.11^{a}	100^{a}
4.	*Mangifera indica*	25.00^{c}	28.57^{c}	39.29^{b}	50.00^{b}
5.	*Psidium guajava*	28.57^{c}	35.71^{b}	46.43^{b}	53.57^{b}

Remarks of efficiency gradient of *Fusarium merismoides* : *Allium sativum >Citrus limon >Azadirachta indica >Psidium guajava>Mangifera indica.*
a, b and c indicate significance at 0.1, 1 and 5% level, respectively. In a row, figures with same letter do not differ significantly whereas figures with dissimilar lettet differ significantly (as per DMRT), NS = Not signific.

The order of effectiveness of plant parts extracts against *A. niger* at 20% concentration was *Allium sativum* (100%) >*Azadirachta indica* (82.02%) > *Citrus limon* (80.90%) > *Psidium guajava* (75.84%) > *Mangifera indica* (74.16%).

The order of effectiveness of plant parts extracts against *F. merismoides* at 20% concentration was *Allium sativum* and *Citrus limon* (100%) > *Azadirachta indica* (80.42%) > *Psidium guajava* (53.57%) > *Mangifera indica* (50.0%). Mamun *et al.* (2016) reported that the plant extracts of *Allium sativum, Azadirachta indica* and *Citrus limon* showed growth inhibitory role on *F. oxysporum* at the same concentration.

Extracts of *Azadirachta indica* and *Citrus limon* were moderately effective while extracts of *Mangifea indica* and *Psidium guajava* were slightly effective in controlling the test pathogens. Rahman *et al.* (1999) also found moderate effect of neem extract against fungi associated with wheat seeds. The study suggested that fungitoxicity of the plant extracts that have been found to be promising against both the pathogens associated with sesame seeds. Chakraborty *et al.* (2009) reported that the efficacy of various plant extracts against the growth plant of the plant.

Bavistin DF and Tilt 250 EC were found to be the best inhibiting agent against the *in vitro* growth of the sesame pathogens. Considering plant extracts *A. sativum* was found to be effective against *A. niger* and *F. merismoides.*

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