J. Bangladesh Acad. Sci., Vol. 41, No. 1, 11-16, 2017

IN VITRO EVALUATION OF SELECTED PLANT EXTRACTS AND CHEMICALS AGAINST PATHOGENIC FUNGI ISOLATED FROM *MOMORDICA CHARANTIA* L.

MD. DULAL MIYA AND SHAMIM SHAMSI*

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

ABSTRACT

Five plant extracts and two chemicals were evaluated against radial growth of five pathogenic fungi isolated from fresh vegetables of two varieties of *Momordica charantia* L. The isolated fungi were *Aspergillus niger* Van Tiegh, *Curvularia brachyspora* Boedijn, *Fusarium* Link, *Rhizopus stolonifer* (Ehrenb.:Fr.) Vuill and *Trichoderma viride* Pers.. Five plant extracts namely *Allium sativum* L., *Azadirachta indicia* A. Juss., *Citrus limon* (L.) Burm. f, *Mangifera indica* L. and *Psidium guajava* L. were evaluated for inhibiting growth of above mentioned fungi associated with the vegetable. Out of the five plant extracts, *A. sativum* showed complete radial growth inhibition of *A. niger*, *C. brachyspora*, *Fusarium* sp. and *R. stolonifer* at 15 and 20% concentrations. *Azadirachta indica* showed complete radial growth inhibition of *C. brachyspora* and *Fusarium* sp. *Rhizopus stolonifer* was completely inhibited by 15 and 20% concentration owing to leaf extract of A. *indica* and *P. guajava*. The same fungus was completely inhibited by *M. indica* at 20% concentration. *Fusarium* sp. was completely inhibited by *C. limon* at 20% concentration. Two chemicals, sodium bicarbonate and sodium chloride were used against the test pathogens and sodium bicarbonate showed complete inhibition of radial growth of *A. niger*, *C. brachyspora*, *Fusarium* sp. and *R. stolonifer* at 20% concentration. The last one also inhibited by the chemical at 15% concentration. Sodium chloride showed highest 95% inhibition of radial growth of *T. viride* at 20% concentration.

Key words: *In vitro*, Evaluation, Pathogenic fungi, *Momordica charantia*, Plant extracts, Chemicals

INTRODUCTION

Momordica charantia L**.** (Bitter gourd) is widely distributed throughout tropical and subtropical regions of all continents. The fruit is used as vegetable. The fruits are considered as tonic and carminative and are also used in gout and diseases of liver and spleen. Juice from various plant parts is used externally for skin diseases and is ingested to cure arthritis, rheumatism and asthma.

* Corresponding author: <prof.shamsi@gmail.com>.

In the Philippines, young shoots, flowers and fruits are used as a flavouring while the leaves are used as vegetable. In India, the root decoction is administrated orally for peptic ulcers by the *Khya* and *Valmiki* ethnic people. Leaf juice mixed with cereals is given for poultry diseases by *Konda* and *Savaras* ethnic people in India (Ahmed *et al.* 2008).

The vegetable is also excellent substrate for many pathogenic and non-pathogenic fungi because of their nutrient contents. A lot of researches have been done on the nutritive values of the vegetable but works on fungal association of this vegetable was inadequate (Haque and Shamsi 2011 and Mukarji and Bhasin 1986).

In recent years, fungitoxicity of extracts of various parts of higher plants has detected which indicates the possibility of their exploitation as natural fungitoxicants for controlling plant diseases (Islam and Shamsi 2015). Plant extracts are cheaper. Can be easily prepared whenever required. In fact, some workers have already demonstrated the successful use of extracts of plant parts of various plants against some important disease of crop plants. Antifungal activity of different plant extracts have been reported earlier by several investigators against a number of plant pathogens (Shamsi *et al*. 2014 and Shamsi *et al.* 2016).

The present investigation has been undertaken to evaluate the fungitoxicity of plant parts extract and some chemicals against test pathogens.

MATERIALS AND METHODS

Two varieties of *Momordica charantia* L. (Korolla) *viz.* local variety and hybrid variety were collected from five different markets namely, Ananda bazar, Hatirpul bazar, Karwan bazar, Palashi bazar and Siddique bazar of Dhaka city. Five markets were visited for three times to collect the samples. From each market sufficient amount of fresh vegetables were collected randomly. Most of the specimens were collected during May to December 2015. The fungi were isolated from collected samples following the “Tissue Planting Method (Islam and Shamsi, 2016).

Nine species of fungi namely, *Aspergillus flavus, A. fumigatus, A. niger, Curvularia brachyspora, Fusarium* sp., *Mucor* Fresenius, *Penicillium* sp., *Rhizopus stolonifer* and *Trichoderma viride* were found to be associated with the selected vegetables.

Among the fungi *Aspergillus niger*, *Curvularia brachyspora*, *Fusarium* sp., *Rhizopus stolonifer* and *Trichoderma viride* were found to be pathogenic to both the varieties of *M. charantia* (Miya 2016).

Five plant extracts and two chemicals were evaluated against test fungi. Five plant extracts namely *Allium sativum, Azadirachta indica, Citrus limon, Mangifera indica* and *Psidium guajava* and two chemicals, sodium bicarbonate and sodium chloride were evaluated in controlling pathogenic mycoflora associated with the vegetables.

Aqueous plant extracts and chemicals were prepared and test pathogens were inoculated on Petri plates following Islam and Shamsi (2016).

The per cent inhibition of radial growth of test pathogens was calculated using the following formula:

$$I = \frac{C - T}{C} \times 100$$

Where, I = Per cent growth inhibition, C = control and T = treatment

RESULTS AND DISCUSSION

Results of plant extracts on the radial growth of isolated fungi are presented in Figs. 1-5. All the plant extracts showed varied degree of growth inhibition of the fungi at different concentrations.

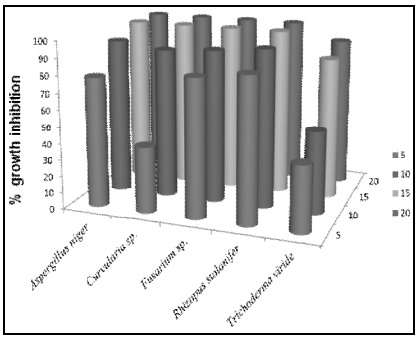


Fig 1: *Allium sativum.*

Among the five plants bulb extract of *Allium sativum* at 15 and 20% showed 100% radial growth inhibition of four test fungi *viz*., *Aspergillus niger*, *C. brachyspora*, *Fusarium* sp. and *R. stolonifer*. *Trichoderma viride* showed 90% radial growth inhibition owing to *A. sativum* at 20% concentration (Fig. 1).

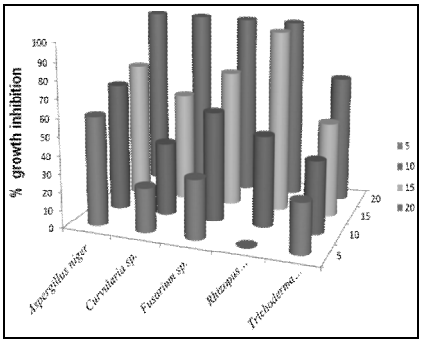


Fig 2: *Azadirachta indica.*

Leaf extract of *Azadiractha indica* showed 100% radial growth inhibition of *C. brachyspora*, *Fusarium* sp. and *R. stolonifer* at 20% concentration except *A. niger* (82.50%) and *T. viride* (64%). *R. stolonifer* was also 100% controlled by the same plant extract at15% concentration (Fig. 2).

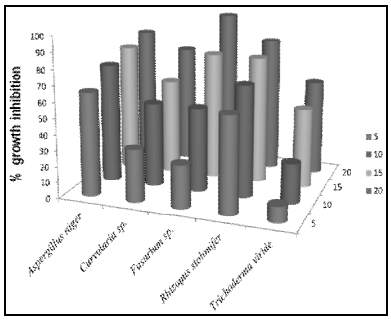


Fig 3: *Citrus limon.*

Fusarium sp. was completely inhibited with the leaf extract of *Citrus limon* at 20%. At the same concentration *A. niger* and *R. stolonifer* showed highest (85.11%) growth inhibition followed by *C. brachyspora* (75%) and *T. viride* (58.32%) (Fig. 3).

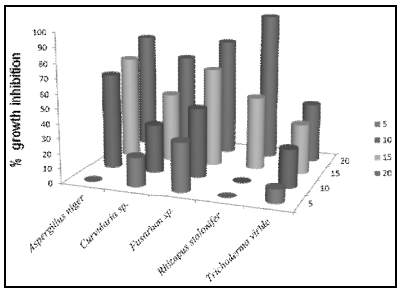


Fig 4: *Mangifera indica.*

Leaf extract of *Mangifera indica* at 20% concentration showed 100% radial growth inhibition of *R. stolonifer* followed by *Fusarium* sp. (80%), *A. niger* (79.33%), *C. brachyspora* (66.67%) and *T. viride* (40%*)* (Fig. 4).

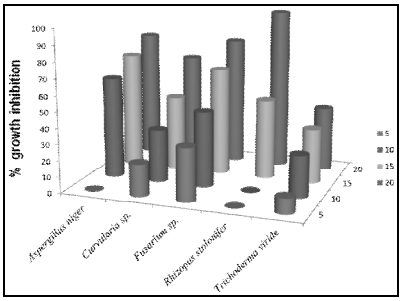
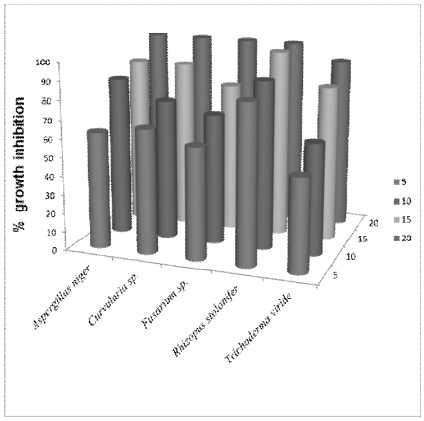


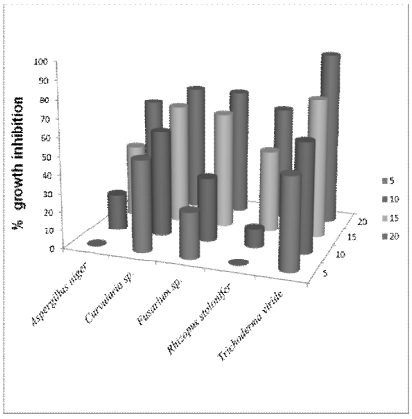
Fig 5: *Psidium guajava.*

Leaf extract of *P. guajava* at 20% concentration showed 100% radial growth inhibition of *R. stolonifer* followed by *A. niger* (75%), *Fusarium* sp. (66.67%), *C. brachyspora* (60%) and *T. viride* (52%) (Fig. 5).

Results of chemicals on the radial growth of isolated fungi are presented in Figs. 6-7. All the chemicals showed various degree of growth inhibition of the test fungi at different concentration. Sodium bicarbonate showed 100 % radial growth inhibition of fungi *Aspergillus niger, Curvularia brachyspora, Fusarium* sp. and *Rhizopus stolonifer* at 20% concentrations. Sodium chloride showed highest 95 % radial growth inhibition of *T. viride* at same concentration.



Sodium bicarbonate



Sodium chloride

Figs. 6 and 7 Effects of sodium bicarbonate and sodium chloride on five fungi isolated from fresh vegetables.

Chowdhury *et al*. (2015) reported that the plant extracts of *Allium sativum, Azadiractha indica, Citrus limon* and *Mangifera indica* showed complete growth inhibition of *Aspergillus niger*, *Curvularia lunata* and *Fusarium* sp. at 20% concentration. The same plant extracts also showed different effects on different pathogens in the present investigation. This variation might be due to selection of different test pathogens.

Plat parts and their constituents of some higher plants have already reported having fungitoxicity (Lakshmanan 1990). Fawcett and Spencer (1970) and Pandey *et al.* (1983) also reported that some plat extract are fungitoxicants, have lesser phytotoxicity, systemicity, easily biodegradability and favourable effects on host.

Islam and Shamsi (2016) reported association of seven species of fungi namely *Aspergillus flavus, A. fumigatus, A. niger, Fusarium* sp., *Penicillium* sp., *Rhizopus stolonifer* and *Trichoderma viride* with *Trichosanthes anguina* L. and *T. dioica* Roxb.

They also reported that bulb extract of *Allium sativum* and both the chemicals sodium bicarbonate and sodium chloride showed 100% radial growth inhibition of the isolated fungi at 20% concentrations.

ACKNOWLEDGEMENTS

The first author (MDM) gratefully acknowledges the "Ministry of Science and Technology", People's Republic of Bangladesh for providing financial support in his research through NST fellowship.

REFFERENCES

Ahmed, Z. U., M.A. Hossain, Z.N.T. Begum, M. Khondoker, S.M.H. Kabir, M. Ahmad, A.T.A. Ahmad, A.K.M. Rahman and E.U. Hague, (eds.) 2008. Encyclopeda of Flora and Fauna of Bangladesh. Vol. 7. *Angiosperms: Dicotyledons (Balsaminaceae-Euphorbiaceae) Asiatic Society of Bangladesh*, Dhaka. 546 pp.

Fawcett, C.H, and D. M. Spencer. 1970. Plant chemotherapy with natural products. *Ann. Rev. Phytopathology***. 8**: 403-418.

Haque, J. and S. Shamsi. 2011. Study of fungi associated with some selected vegetable of Dhaka city. *Bangladesh J. Sci. Res.* **24**(2): 181-189.

Islam, A. A. and S. Shamsi. 2016. Eco Friendly Management of Mycoflora Associated with *Trichosanthes Anguina* L. and *Trichosanthes Dioica* Roxb. *International Journal of Research Studies in Biosciences (IJRSB)* **4** (1): 52-56.

Lakshmanan, P. 1990. Effect of certain plant extracts against *Corynespora cassicola*. *Ind. J. Mycol. and Plant Path.* **20**(3): 267-269.

Miya, M. D. 2016. Management of mycoflora associated with *Momordica charantia* L. (Korolla) in storage with botanicals. pp. x +125.

Mukerji, K.G. and J. Bhasin. 1986. *Plant diseases of India.* A source Book. Tatta Mc.Grew-Hill Publishing Company Ltd. New Delhi. 467 pp.

Panday, D.K., H. Chandra, N. N. Tripathi and S.N. Dixit. 1983. Fungitoxicity of some higher plants with reference to the synergistic activity among some fungitoxicants. *Journal of Phytopathol.* **106**: 226-232.

Shamsi, S. and P. Chowdhury. 2014. Microflora associated with rubber sheets and its management by common salt (Sodium chloride). *J. Asiat. Soc. Bangladesh. Sci.* **40**(1): 79-87.

Shamsi, S., Saha and Naher. 2016. Efficacy of plant extracts and fungicides against fungi consociated with Lemon in storage. *Bioresearch Communications*. **2**(1): 249-253.

(*Received revised manuscript on 2 May, 2017*)