

Original Article

Ecofriendly Management of Mycoflora Associated With Fresh Fruits of Two Varieties of *Momordica Charantia* L . In StorageShamim Shamsi* and Md. Dulal Miya¹*Department of Botany, University of Dhaka, Dhaka-1000, Bangladesh*

ABSTRACT: Fresh fruits of two varieties of *Momordica Charantia* (L.) were collected from five local markets of Dhaka city near the campus of Dhaka University during the tenure of May to December, 2015. After harvesting the vegetables are mostly contaminated with fungi within 3-4 days of short storage. Two chemicals namely, Sodium bicarbonate and Sodium chloride and three edible oils namely mustard oil, palm oil and soybean oil were selected for evaluating their efficacy on the vegetative growth of fungi associated with fresh fruit surface of both the varieties of *M. Charantia*. The chemical Sodium bicarbonate and edible Mustard oil completely inhibited the vegetative growth of fungi and checked the fungal growth up to nine days of storage.

Keywords: Ecofriendly Management, Mycoflora, Fresh, Fruits, *Momordica Charantia*, Storage

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INTRODUCTION

Momordica charantia L. is a tropical and subtropical vine of the family Cucurbitaceae, widely grown in Asia, Africa, and the Caribbean for its edible fruit. Its varieties differ substantially in the shape and bitterness of the fruit.

Bitter melon has been used in various Asian and African herbal medicine systems for a long time. In Turkey, it has been used as a folk remedy for a variety of ailments, particularly stomach complaints. In traditional medicine of India, different parts of the plant are used as claimed treatments for diabetes (particularly Polypeptide-p, an insulin analogue), and as a stomachic, laxative, antibilious, emetic, anthelmintic agent, for the treatment of cough, respiratory diseases, skin diseases, wounds, ulcer, and gout (Ross 2003 and Anonymou 2020)¹⁻².

Momordica charantia is native to the Old World tropics, but now pantropical. It was possibly domesticated in India and southern China and is now found naturalized in almost all tropical and subtropical regions. It is an important market vegetable in southern and eastern Asia, e.g. India, Sri Lanka, Vietnam, Thailand, Malaysia, the Philippines and southern China. Local cultivars originally from Asia are cultivated on a small scale in tropical America, and bitter gourd is also cultivated in the southern part of the United States for the Asiatic kitchen. It is a common cucurbit in the wild flora of Africa, occurring almost throughout tropical Africa. It is only occasionally collected from the wild as a vegetable or medicinal plant. It is occasionally cultivated in East Africa mostly by people of Asian origin using Asian cultivar.

Immature fruits of *Momordica charantia* are used in stews and curries, or pickled. They are also stuffed with minced meat. Bitterness may be reduced by parboiling or soaking, squeezing or mashing in salted water, or by scoring the skin of the fruit and sprinkling it with salt. Young fruits of wild small-fruited types are locally eaten in West Africa as supplementary or emergency food. In Zimbabwe young non-bitter fruits are eaten in salads, in the same way as cucumbers. Mature fruits of wild plants are said to be poisonous to people and domestic animals. In Asia shoot tips are a popular leafy vegetable that is considered very healthy. Some farmers even grow bushy bitter gourd types with small fruits especially for this purpose (Ananya and Sarmistha 2010 and Tindall 1983)³⁻⁴. Bitter melon is commonly eaten throughout India. In North Indian cuisine, it is often served with yogurt on the side to offset the bitterness, used in curry such as sabzi or stuffed with spices and then cooked in oil. Bitter melon tea, also known as gohyah tea, is an herbal tea made from an infusion of dried slices of the bitter melon. It is sold as a medicinal tea, and a culinary vegetable (Anonymous 2020 and Lim 2013)⁵⁻⁶. *Momordica charantia* (Korolla) consists lot of nutrients including many alkaloids. Its decoction is applied to boils, ulcers, septic swellings and infected feet. Plaster made from pulverized plants is used to treat malignant ulcers, breast cancer and skin parasites such as filaria and guinea worms. They also play a key role in neutralizing the acids that are formed during digestion. Bitter gourd can be eaten as cooked and play an important role in human nutrition, being mostly low in fat and carbohydrates, but high in vitamins, minerals and fiber. The main constituents of bitter melon (Korolla) are triterpene, protein, steroid, alkaloid, inorganic, lipid, and phenolic compounds (Grover and Yadav 2004)⁷. *Momordica charantia* (Korolla) consists the following chemical constituents those are alkaloids, most common alkaloids are momordicin and charantin, charine, cryptoxanthin, cucurbitins, cucurbitacins, cucurbitanes, cycloartenols, flavochrome, lutein, lycopene and pipercolic acid (Braca et al. 2008)⁸.

Many people in rural and urban areas fully depend on vegetable cultivation and selling it in the markets. But it is the matter of deep concern that a remarkable portion of harvested vegetables are being lost due to mismanagement of the vegetables during transit and storage, as a result fungal infection occurs consequently and vegetables are spoiled. For preventing loss of the vegetable it needs proper management of disease.

Present investigation was undertaken to control the fungi associated with fruit surface of *M. charantia* with selected chemicals and edible oils.

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. Each market was 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' following Islam and Shamsi (2016)⁹.

Identification of the isolates were determined following the standard literature (Barnett and Hunter 2000, Booth 1971, Ellis 1971, 1976, Ellis and Ellis 1997, Thom and Raper 1945 and Raper et al. 1949)¹⁰⁻¹⁶.

Nine species of fungi namely, *Aspergillus flavus*, *A. fumigatus*, *A. niger*, *Curvularia brachyspora*, *Fusarium* sp., *Mucor* sp., *Penicillium* sp., *Rhizopus stolonifer* and *Trichoderma viride* were found to be associated with the selected vegetable. Among the fungi *A. niger*, *C. brachyspora*, *Fusarium* sp., *R. stolonifer* and *T. viride* were found to be pathogenic to both varieties of *M. charantia* (Miya and Shamsi 2016)¹⁷.

Two chemicals namely, Sodium bicarbonate and Sodium chloride and three edible oils namely mustard oil, palm oil and soybean oil were selected for evaluating their efficacy on the vegetative growth of fungi associated with the vegetable. The chemicals and oils were collected from Ananda Bazar, Dhaka.

Application of chemicals on the surface of fresh vegetables

One Kg of each vegetable was taken for treatment and control set. Three replications were made for each treatment. Solutions of Sodium bicarbonate and Sodium chloride prepared for in vitro control of fungi were used on the surface of the fresh vegetable namely *M. charantia* at 20% concentration. The surface of the fresh vegetable was coated by Sodium bicarbonate and Sodium chloride separately with sterilized cotton sheet. After the treatment it was dried for an hour and it was placed inside A-4 sized brown envelop carefully and stored at room temperature $28 \pm 2^{\circ}$ C in the laboratory.

Application of oils on the surface of fresh vegetables

The oils are triglyceride. Oils extracted from plants have been used since ancient time in various purposes. Plants as well as plant products such as oils have an inhibitory effect against fungi. Three cooking oil viz., Mustard oil, palm oil and soybean oil were chosen for the management of the isolated fungi. One Kg of each vegetable was taken for treatment and control set. Three replications were made for each treatment. Vegetables were collected from Ananda bazar near University of Dhaka. Two hundred fifty ml of oils were taken in clean bowl and sterile cotton sheet was

soaked with oil. The fresh vegetable surface was coated with oil. Treated vegetables were stored for observation following same procedure as mentioned above. The experiment was conducted in the laboratory of Mycology and plant Pathology, Department of Botany, University of Dhaka for further observations.

RESULTS AND DISCUSSION

Two chemicals viz., sodium bicarbonate and sodium chloride were applied on the surface of the fresh fruits of local and improved varieties of *M. charantia*. Between two chemicals Sodium bicarbonate at 20% concentration completely inhibited the vegetative growth of the fungi on fruit surface up to 09 days of storage. Sodium chloride also showed complete inhibition of vegetative growth of fungi for one week at 20% concentration. Whereas untreated control vegetables were infected by fungi within 3 days. Three edible oils namely mustard oil, palm oil and soybean oil were coated on the surface of the fresh vegetables separately. Palm oil and soybean oil checked the vegetative growth of fungi more than one week conversely untreated vegetables were infected by fungi

within 3 days. Mustard oil checked the vegetative growth of fungi up to 09 days. Out of two chemicals sodium bicarbonate showed best result and out of three edible oils mustard oil showed excellent result to control the fungi associated with *M. charantia* (Table 1- 4 and Figure 1).

From Bangladesh, Haque and Shamsi (2011)¹⁷ reported association of fungi with fresh fruits of *Capsicum fruticans* L. (Chilli), *Cucurbita maxima* Duch. (Pumkin), *Lablab purpureus* (L.), Sweet bean, *Trichosanthes anguina* L. (Snake gourd) and *Trichogenthes dioica* Roxb. (Pointed gourd). A total of 16 species of fungi representing 7 genera were of Deuteromycetes and one genera of conidial Phycomycetes were isolated from five selected vegetables.

Islam and Shamsi (2016)⁹ reported association of fungi with fresh fruits of *Trichosanthes anguina* L. and *T. dioica* Roxb. Miya and Shamsi (2016)¹⁸ first reported association of fungi with fresh fruits of *M. indica* in Bangladesh. This is the first report of management of fungi associated with aforesaid vegetable. Subsequently this is new addition in the field of Mycology and Plant Pathology.

Table 1. Effect of edible chemicals on vegetative growth of fungi associated with the surface of local variety of *M. charantia*.

Name of the Chemicals	Control Observation			Treatment Observation		
	03 days	06 days	09 day	03 days	06 days	09 days
Sodium Bicarbonate	-	+	+	-	-	-
Sodium chloride	+	+	+	-	-	-

+ = Presence of fungal growth

- = Fungal growth inhibited

Table 2. Effects of edible oils on vegetative growth of fungi associated with fresh fruits of local variety of *M. chorantia*.

Name of the oils	Control Observation			Treatment Observation		
	03 days	06 days	09 day	03 days	06 days	09 days
Mustard	-	+	+	-	-	-
Palm	+	+	+	-	-	+
Palm	+	+	+	-	-	+

+ = Presence of fungal growth

- =Fungal growth inhibited

Table 3. Effect of edible chemicals on vegetative growth of fungi associated with the surface of improved variety of *M. charantia*.

Name of the Chemicals	Control Observation			Treatment Observation		
	03 days	06 days	09 day	03 days	06 days	09 days
Sodium Bicarbonate	-	+	+	-	-	-
Sodium chloride	+	+	+	-	-	+

+ = Presence of fungal growth
 - = Fungal growth inhibited

Table 4. Effect of edible oils on vegetative growth of fungi associated with on the surface of improved variety *M. charantia*.

Name of the oils	Control Observation			Treatment Observation		
	03 days	06 days	09 day	03 days	06 days	09 days
Mustard	-	+	+	-	-	-
Palm	+	+	+	-	-	+
Palm	+	+	+	-	-	+

+ = Presence of fungal growth
 - = Fungal growth inhibited

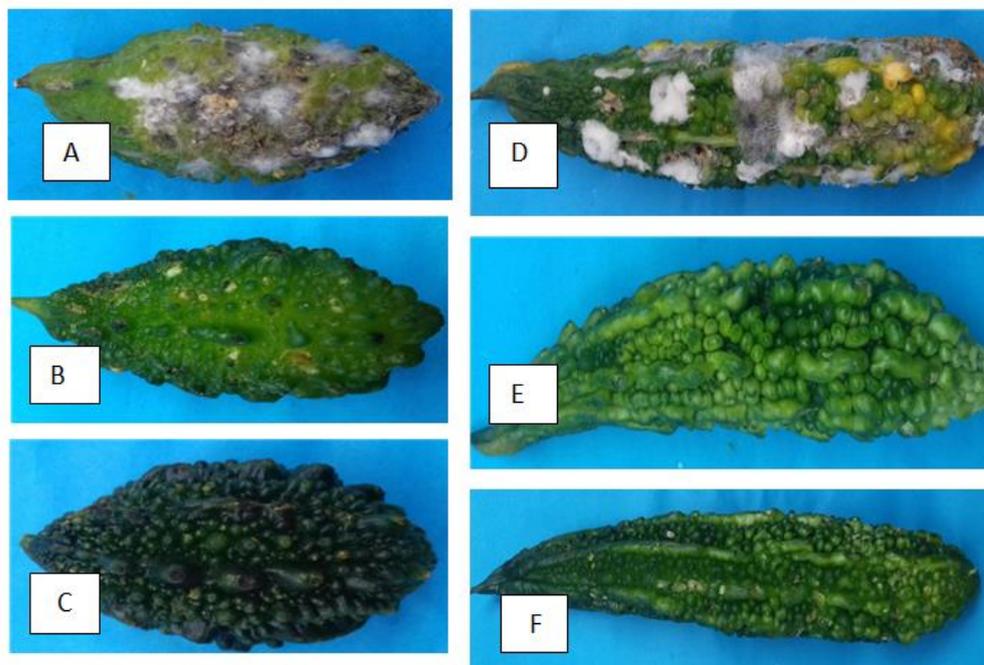


Figure 1. Treatments that were showed best result in controlling the surface mycoflora of *M. charantia* (Local variety): (A) Untreated control vegetable, B. Treated with Sodium bicarbonate at 20% concentration and (C) Treated with mustard oil. (Improved variety): (D) Untreated control vegetable, Treated with (E) Sodium bicarbonate at 20% concentration and (F) Treated with mustard oil.

CONCLUSION

Fruits of *Momordica charantia* is one of the important vegetable throughout the world. It is a potent hypoglycemic agent due to alkaloids and insulin like peptides and a mixture of steroidal sapogenins known as charantin. Diabetes mellitus is the one of the five important causes of death in the world. It is a major global health problem with a probable rise in prevalence from 171 million in 2000 AD to 366 million in 2030 AD with majority still remaining undiagnosed. *Momordica charantia* have provided many remedies for various diseases from ancient days to now a day. It has been used in various Asian traditional medicines for the treatment of cholera, anemia, diarrhea blood diseases, bronchitis, gout, dysentery, gonorrhea rheumatism, ulcer, colic, worms, disease of liver and spleen, cancer and diabetes etc. Bangladesh is one of the least developed countries in the world and facing numerous economic problems. Spoilage of vegetables become a serious threat to production in the country. Results of present investigation indicates that spoilage of the vegetables can be reduced with application of selective and safe chemicals and oils and subsequently grower will be get proper profit and consumers will be get fresh vegetables.

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