Indian J.Sci.Res. 7(2): 219-221, 2017 ISSN: 0976-2876 (Print)
ISSN: 2250-0138(Online)

EFFICACY OF OILS AGAINST POST-HARVEST ALTERNARIA ROT OF TOMATO

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ABSTRACT

The efficacy of oils in control of Alternaria rot of Tomato caused by *A. alternata* was observed. Each fruit sample of tomato prior to fumigation by Anethum and Cuminum oils on their respective MIC (*i.e.* 500 ppm) and above to MIC (*i.e.* 1000 ppm) were inoculated by *Alternaria alternata*. The control sets comprised the uninouulated and inoculated fruits. After 10 days of storage the decay of fruits was recorded. It was found that *Anethum* and *Cuminum* oils, respectively could control Alternaria rot up to 66.01 and 56.66 per cent at 500 ppm while it was 81.02 and 73.65 per cent at 1000 ppm. Thus oils exhibited potency in management of Alternaria rot of tomato.

KEYWORDS: Alternaria Rot of Tomato, MIC

Plant diseases, by their presence, prevent the cultivation and growth of food plants in some areas; or food plants may be cultivated and grown but plant diseases may attack them, destroy parts or all of the plants, and reduce much of their produce, *i.e.*, food, before they can be harvested or consumed. According to Bunting (1972) "The storage pests; principally insects, fungi and small rodents require special mention because they cause extensive, discouraging and unnecessary losses of plant and animal products. Their control is perhaps the most immediately rewarding aspect of pest regulation in developing countries".

Worldwide estimates of post-harvest losses of fresh fruits and vegetables amount to 10 to 30% of the total yield of crops, which peaks up to 50% and over in several less developed countries (Jeffries & Jeger, 1990). Fungi represent one of the main causes of post-harvest losses. Eckert and Ratnayake (1983) estimated that out of 1,00,000 species of fungi, less than 10% are plant pathogens and more than 100 species of fungi are responsible for the majority of post-harvest diseases. In addition to causing rot, they can also contaminate food with highly toxic chemicals known as mycotoxins. It is estimated that each year 30-40% of the world wide food production is contaminated by mycotoxins (Richard *et al.,* 1989) and mycotoxins are well known for their carcinogenic, mutagenic and teratogenic effects on man and domestic animals (Lancaster *et al.,* 1961; Moss, 2002).

Attempts to control post-harvest diseases have been carried out by different physical and chemical treatments. Physical treatment includes heat therapy, mechanical etc. These techniques are much expensive and the requisite man power is lacking or inadequate in most developing tropical countries. Moreover, physical treatment has been widely used with limitations. Firstly, some non-parasitic troubles such as red blotches, pitting, membranous stain, sprouting, injuries etc. develop on the commodity (Desrosier & Desrosier, 1977; Banwart, 1981). Secondly some fruit rotting fungi develop well even at low temperatures (Eckert & Somner, 1967). The irradiated food can lead to adverse metabolic reactions in human and animal systems (Ray Chaudhari & Dharamavir, 1977).Therefore it is necessary to discover plant product to control post-harvest diseases.

MATERIALS AND METHODS

To find out the practical applicability of *A. graveolens* and *C. cyminum* oils as fumigants for protection of Tomato (*Lycopersicon esculentum*) from Alternaria rot, experiments were designed to fumigate the fruit samples separately with the oils by the method adopted by Chandra (1984) and Mishra (1992). Mature medium sized and healthy fruits were used for the experiment. The fresh fruits of Tomato of control as well as treated sets were washed in running water and were surface sterilized with 0.1 per cent sodium hypochloride solution and were then washed with distilled water. The pathogenicity of *Alternaria alternata* was tested on tomato fruits (Fig.1) following Garcha & Singh (1980). An injury (about 3mm diameter) was made on the outer surface of fruits with the help of syringe. The fruits of tomato were inoculted by 5ml of the standard spore suspension of *A. alternata* with the help of atomizer on the scratched peel at the stem end of each lot of fruit samples.

The normal spore suspensions of *A. alternata* was prepared according to method of Mishra (1992). The fungal spores were harvested from a seven day old culture of Alternaria and suspended in 100ml of distilled water containing a wetting agent (0.05% Tween-80) by stirring at high speed in a warning blender. The suspension was diluted to obtain approximately 30 to 40 spores per low power field of microscope. Five fruits of each set were

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then placed separately in plastic containers. Requisite amounts of oils of Anethum and Cuminum were introduced in these containers by soaking in cotton pieces so as to get required concentrations (v/v).

The control set contained two sets: uninoculated control and inoculated controls. In the uninoculated controls, the fruit samples were stored as such in plastic containers whereas in inoculated controls each fruit sample was inoculated with normal spore suspension of test fungus as usual to treated sets. The plastic containers were kept for 10 days in a BOD incubator set at 25±2 ^{0}C. Three replicates were kept for treatment and control sets. The percentage loss of fruit tissue was calculated in the form of disease index (0-10) scale which was based on average value following Garcha & Singh (1980). Per cent disease control was calculated by following formula:

Disease control $= \frac{dc-dt}{dc} \times 100$

Where,

dc = % disease index in inoculated control

dt = % disease index in treated sets

RESULTS

It is clear from Table 1 that *A. graveolens* and *C. cyminum* oils have ability to control Alternaria rot of tomato caused by *A. alternata* on their respective MICs (500 ppm) by 66.01 and 56.66 per cent, respectively. While, it was 81.02 and 73.65 per cent above to their respective MICs (1000 ppm). Thus these oils exhibited potency to control post harvest Alternaria rot of tomato (Fig.2). The results are described in Table 1.

Table 1: Efficacy of Oils for the Control of Post-harvest rot of Tomato Caused by *Alternaria alternata*

Groups	Anetum Oil				Cuminum Oil			
	500		1000		500		1000	
	DI	PC	DI	PC	DI	PC	DI	PC
Uninoculated control	0	–	0	–	0	–	0	–
Inoculated control	3.53 ± 0.25	–	3.53 ± 0.25	–	3.53 ± 0.25	–	3.53 ± 0.25	–
Inoculated treatment	1.2 ± 0.16	66.01	0.67 ± 0.25	81.02	1.53 ± 0.09	56.66	0.93 ± 0.19	73.65

Where,

DI = Mean ± SD value of Disease index (0- 10 scale)

PC = Percentage of Disease Control

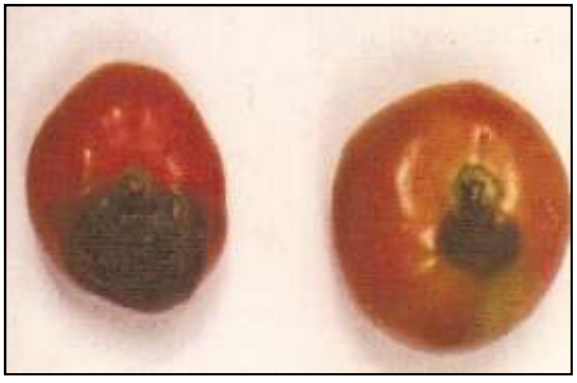

Figure 1: Pathogenicity test of *A.alternata* on Tomato fruit

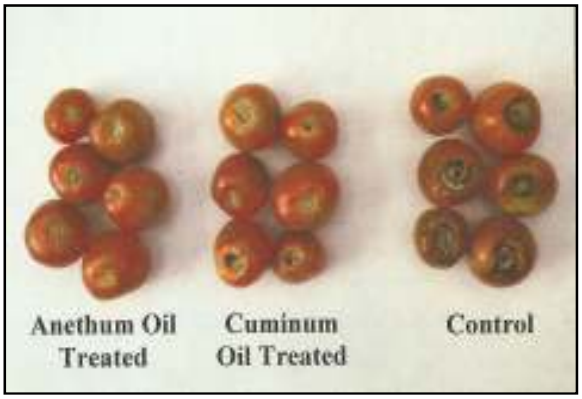

Figure 2: Efficacy of *Anethum* and *Cuminum* Oils against *Alternaria* rot of Tomato during storage.

DISCUSSION

Fruits are an important part of the human diet because they supply essential nutrients such as vitamins and minerals and they are also considered important to human health and well-being because they contain other necessary compounds such as antioxidants. Increased

consumer awareness that diet and health are linked has therefore resulted in a greater consumption of fruits.

Losses due to pests and diseases in the field, during storage, as well as in transit and commercialisation can amount up to 25% of the total production in industrialised countries(Harvey,1978) and in developing countries damage is often higher, exceeding 50%, because of the lack of adequate storage facilities (Eckert and Ogawa, 1985) some higher plant products have proved their fruitfulness as promissing fungitoxicants due to their biodegradable nature .non- phytotoxicity and systemicity (Mishra & Dubey, 1994; Liu *et al.,* 2001a) and non-animal toxicity (Mishra *et al.,* 1992) and thus they can be exploited as natural fungitoxicants in place of the synthetic chemicals.

Therefore in the present study it was thought desirable to find out the potentiality of some higher plant products (essential oils) in control of postharvest Alternaria rot of Tomato during storage and transportation

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