J. Mycopathol. Res. ***53(2)*** *: 253-257, 2015;* (ISSN 0971-3719)

A study on control of Fruit Rot of tomato caused by pathogens by using certain oils

JAMSHED ALI
Department of Botany, Haflong Government College, Haflong 788819, Dima Hasao, Assam

Received : 23.05.2014 RMS Accepted : 18.05.2015 Published : 27.10.2015

Regular market survey during 2011 and 2012 revealed that the following fungi were responsible for causing the Fruit Rot of tomato namely *Alternaria tenuis*; *Fusarium solani*; *Cladosporium fulvum; Curvularia lunata; Aspergillus niger; Phytophthora nicotiance; Phoma destructiva; Septoria lycopersici* and *Oospora lactis parasitica.* Out of nine diseases recorded on tomato fruits, *Alternaria tenuis* was most destructive and caused losses up to 16.0%. It was prevalent during the months of January to April and October in Hatsingmari market (Mankacher), district of Dhubri, Assam when the mean temperature ranged between14-27°C. The use of oils for control of tomato fruit rot caused by *Alternaria tenuis* was investigated and it is found that the inhibition of spore germination increased with increasing duration of different oils. In case of liquid paraffin oil, the maximum spore germination was recorded in 9 hrs (57.5%) at 15% concentration. It was revealed that paraffin oil, and ground nut oil may check the tomato fruit rot by pathogens. The tomato fruit rot caused by *Alternaria tenuis* was controlled at all temperatures and are controlled at 25% concentration of paraffin oil, at 50% coconut oil and at 75% ground nut oil. It was also found that at 100% oil concentration the fruit rot of tomato was effective showing 100% control. From t values paired analysis, it was found that significant difference in control is observed between liquid paraffin and coconut oils.

Key words: Oils, pathogens, tomato

INTRODUCTION

Fresh fruit, vegetables and root crops are subject to deterioration by a variety of microorganisms after harvest because of high moisture and nutrients. The fruits and vegetables are attacked by specific and unique groups of pathogenic fungi, that have nutritional requirements and enzymatic capabilities which allow them to parasitize extensively. Fruit and vegetables are produced in remote areas and sometime they mature at a time of the year when demand is not great resulting into *glut*. Under this situation, the harvested produce has to be store before it reaches the consumers. It is well known that various types of fruits such as apples, pear, mango, peaches, oranges, banana, grapes and vegetables like potato and tomato are carried over long distance in our country by various mode of transport. Such commodities are under a fairly long period of transit and storage before reaching the consumer (Jamaluddin *et al.* 1975); Adisa,1980). Some of these diseases encountered in transit and storage may be traced to the infection of the host

E-mail: jamshedali69@gmail.com

in field. The inoculums of some fungal pathogens are associated with the surface fruits from the field. Certain pathogen, like species of *Collectotrichum,* remains dormant from flowering to maturity of fruits. In such cases the fruit carries the incipient infection from field, which under proper conditions of suitable environment in transit and storage results in fruit decay.

Most of the dreaded post harvest diseases are initiated from the infections due to mechanical and physiological injuries on fruit surfaces which further develop during harvesting, processing and packaging. Mechanical harvesting result is far greater injury than hand harvesting. Physiological injuries due to heat, cold and other environmental conditions predispose fruits and vegetables. Moderately high temperature and poor ventilation are also responsible for enhancement of fruit diseases. Knowledge about the source of infection is of great importance for developing a viable control programme. In field infection where the pathogen comes in contact with the host before harvests becomes active only during transit or storage. The information about the infection of tomato fruit caused by pathogen of the area is not available. Therefore the incidence and occurrence of Fruit Rot disease of tomato caused by pathogens has been investigated in vegetable market and severity of Fruit Rot of tomato diseases and also the experiments was therefore, carried out to study on the control of tomato fruit rots caused by the pathogens using oils.

METERIALS AND METHODS

The disease samples were collected every month from the infected tomato fruits field of Mankachar area and market. A survey of the incidence and severity of the rots was carried out during the season of 2011 and 2012. The isolation was made in potato dextrose agar (PDA) medium. Rotted fruits were collected from market in clear, labelled polyethylene bags for further investigations in the laboratory. The incidence of tomato fruit rot so far was observed in different lots at different months in the market and the average percentage of the infected tomato fruits was calculated.

Alternaria rot of tomato fruit caused by *Altenaria tenuis* was isolated and brought into pure culture after single spore isolations. These cultures were maintained on 2% malt extract agar for 5 days. The certain oils used (miscible with water) were liquid paraffin oil, coconut oil and ground nut oil. All oils were obtained from local market. Experiments on spore germination were carried out by using the following methods. Dry spores obtained from 10 to 12 days old cultures were put in different oil drops on microscope slides and smeared uniformly. Each inoculated slide was placed in a Petridish (containing 2 layers of 9 mm diameter no.1 whatman distilled wet filter paper) and incubated at 27°C and spore germination counts were recorded after 3, 6 and 9 hrs. Suitable control in distilled water was also maintained. There were five replicates in each treatment.

Another experiment was carried out to study the effect of different oils and temperatures on the control of tomato fruit rots, artificially inoculated by *Alternaria tenuis*. Twenty five ascetically washed, mature half ripe freshly harvested healthy tomato fruit were dipped in different concentration per litre of distilled water (5, 10, 25, 50, 75 and 100%) of liquid paraffin oil, coconut oil and ground nut oil for one hr. The treated fruits were then inoculated with *Alternaria tenuis*. Surface sterilized, uninjured non inoculated fruits were treated and served as controls. The fruits were then placed in incubators set at 15, 20, 25, and 28°C for 10 days. Regular observations were made for rot development.

RESULTS AND DISCUSSION

Regular market survey during 2011 and 2012(Table 1) revealed that the fungi recorded which were responsible for causing the fruit rot of tomato were *Alternaria tenuis*; *Fusarium solani*; *Cladosporium fulvum; Curvularia lunata; Aspergillus niger; Phytophthora nicotiance; Phoma destructiva; Septoria lycopersic* and *Oospora lactis parasitica.* Out of nine diseases recorded on tomato fruits, *Alternaria tenuis* was most destructive and caused losses up to 16.0%. It was prevalent during the months of January to April and October in Hatsingmari market (Mankacher), district of Dhubri, Assam when the mean temperature ranged between14-27°C. It may be due to high temperature and humidity during the hot weather. *Alternaria tenuis* occurred in severe form and the infection takes place in the field and subsequently, the fungus multiplies during storage conditions. Tomato fruits may be subjected to the attack of various fungal diseases facilitated by certain inevitable injuries during harvesting, transport and mar-

Table 1 : Some important diseases of tomato fruit rots in vegetable market

Causal organisms	Maximum incidence (month) 2011 and 2012	Average loss in %	Mean value of atmospheric data			
			Temperature (°C)		R.H.%	Rainfall (mm)
			MAX.	Min.		
Alternaria tenuis	January to April October	16.0	27	14	88.0	87.0
Fusarium solani	February to April	10.2	23.7	11.4	88.5	72.0
Cladosporium fulvum	February to March	9.7	22.2	10.0	76.2	65.0
Curvularia lunata	May to June	8.35	33.2	22.5	72.5	215.4
Phytophthora nicotianae	August to September	7.4	30.4	23.2	80.2	623.5
Aspergillus niger	August to September	3.0	30.4	23.2	80.2	623.5
Oospora lactis parasitica	April to May	3.0	30.2	20.6	78.5	172.7
Phoma destructiva	June to July	5.0	33.5	24.7	88.3	744.5
Septoria lycopersici	July to August	4.0	32.5	24.5	81.2	975.1

Table 2: Showing spore germination inhibition (%) of *A tenuis* by different oils

Types of oils	Different concentration oils	3 hrs	6 hrs	9 hrs
Liquid Paraffin	5	17.3	21.2	34.5
	10	25.2	31.5	38.7
	15	37.5	45.3	57.5
Groundnut oil	5	14.4	18.3	21.5
	10	16.0	20.5	31.5
	15	22.5	7.4	37.5
Coconut oil	5	5.5	9.3	12.7
	10	7.2	11.5	17.5
	15	9.5	16.2	22.4
Control	–	–	–	–

keting which results into storage heavy losses and low market value of the commodity.

During the survey of different vegetable markets of Haryana for determining the nature and extent of fungi associated with the decay of ripe tomato fruits in 1967-68, large number of fruits were found to be rotted due to *Fusarium nivale* (Fr) Ces. Thakur and Yadav (1971) and Narain and Rout (1976) reported that during February 1979 a severe rot of tomato (*Lycopersicon esculentum*) fruit was observed, caused by *Cladosporium tenuissimum* Cooke. Jamaluddin and Tandon (1976) also reported a pink rot of tomato (*Lycopersicon esculentum* Mill) caused by *Trichothecium roseum* (Pers.) Link ex. S. F. Gray was observed in February March, 1974 at Allahabad market and storage place of fruits and vegetables. *Aspergillus niger* and *Rhizopus arrhizus* were considered to be responsible to cause major disease in various fruit and vegetable in Delhi market (Chenulu and Thakur, 1968).

The results show (Table 2) that the inhibition percentage of spore germination increased with increasing duration of different oils. The analysis of

Table 3: Effect of storage temperature –different oils concentration on the Control of tomato fruit rots artificially inoculated by *A tenuis*

Oil concentration	Temperature (^{0}C)	Healthy Control fruits	% rot development		
			Liquid Paraffin oil	Coconut oil	Groundnut oil
5	15	.....	25	45	36
	20	75	35	45	64
	25	80	40	50	64
	28	72	45	55	100
10	15	....	....	....	36
	20	....	15	40	56
	25	....	15	55	56
	28	....	16	55	52
25	15	....	....	....	32
	20	....	....	24	44
	25	....	....	24	44
	28	....	....	28	45
50	15	....	....	....	....
	20	....	....	....	....
	25	....	....	....	30
	28	....	....	....	32
75	15	....	....	....	....
	20	....	....	....	....
	25	....	....	....	....
	28	....	....	....	....
100	15	....	....	....	....
	20	....	....	....	....
	25	....	....	....	....
	28	....	....	....	....

the results of the experiment on the evaluation of the various oils on spore germination showed that effective of the three oils. In case of liquid paraffin oil, the maximum spore germination inhibition was recorded in 9 hrs (57.5%) at 15% concentration. Generally, all the oils were inhibitory to fungal spore germination. It was also found that germ tubes were distorted and malformed in liquid paraffin oils. From the results, coconut oil and groundnut oil were the least effective (Table 2). It is revealed that paraffin oil, coconut oil, and groundnut oil may check the fruit rot by pathogens. The results of investigation on the effective of storage temperature paraffin oil, coconut oil and groundnut oil concentration on rot development are shown in Table 3. The tomato fruit rot caused by the fungal pathogens were controlled at all temperature and were controlled at 25% paraffin oil, at 50% coconut oil and 75% groundnut oil. It was found that at 100% concentration the fruit rots of tomato were effectively controlled (100%). Liquid paraffin oil was not only effective in control of tomato fruit rot by pathogen but also preserved the fruit keeping quality. Coconut oil and groundnut oil were next effective in control the fruit rot of tomato caused by *A tenuis*.

The T value of paired analysis between liquid paraffin oil and coconut oil = 4.37*; between coconut oil and groundnut oil = 9.08*; and between liquid paraffin oil and groundnut oil = 9.31* which are significant at 5% level of probability and at 1% level of probability. From paired analysis, it was found that significant difference in control were observed between liquid paraffin and coconut oils, but control did not differ significantly between liquid paraffin and groundnut oil which clearly shows that the liquid paraffin oil is maximum effective in control of tomato fruit rots.

Grover and Aulakh (1968) reported that spraying of harvested tomato with oil-soap emulsion of castor oil or mobil oil (30w) effectively protected tomato fruits from Oospora rot and enhanced keeping quality by 8 to 10 days. The Alternaria rot was the most destructive in cultivated and market areas. In this connection to control the tomato rots caused by *A. tenuis, F. roseum* and *C. fulvum* by spraying five different oil-soap emulsions which in spore germination tests, all oil inhibited germination of *Cladosporium fulvum and Fusarium roseum* spores, whereas for *A tenuis* conidia only castor oil and mobil oil were toxic; this indicates differential toxicity of oils to these fungi. The oil-soap emulsion spraying fruits remain firm and healthy for 5 to10 days longer than untreated healthy fruits (Aulakh and Grover,1968; Adisa,1985; Madhukar and Reddy,1989). Most of the oil tested in our studies inhibited germination of conidia of *Alternaria tenuis* but was greatest in liquid paraffin oil only.

REFERENCES

Adisa, V, A. 1980. *Post harvest rots of some fruits with particular reference to citrus species in south western Nigeria.* Ph. D. Thesis. Univ. of Ibadan.

Adisa, V. A. 1985. Control of four post harvest tomato fruit rots in Nigeria by oils. *Indian Phytopathology* **38** : 270 – 277.

Aulakh, K. S. and Grover, R. K. 1968. Ripe fruit rots in tomato and their control by oils. *Plant Disease Reptr.* **52** : 555 – 558.

Chenulu, V. V. And Thakur, D.P. 1968. Tomato fruits infected by *Fusarium nivale* (fr). Ces. *Indian Phytopathology, Bull.* **4**: 63 – 70.

Grover, R. K. And Aulakh, K. S. 1968. Oospora rot of tomato fruit and its control by oil. *Indian Phytopathology* **21**: 139 – 140.

Jamaluddin, M. P. and Tandon, M. P. 1976. Some new market diseases of vegetables and fruits. *Indian Phytopathology* **29** : 74 – 75.

Jamaluddin, M. P. and Tandon, R. N. And Tandon, I. R. 1975. Post harvest decay of fruit of tomato caused by *Cylindrocladium scoparium. Indian Phytopathology* **27**: 487 – 492.

Madhukar, J. And Reddy, S. M. 1989. Efficacy of certain oils in the control of fruit rot of Guava. *Indian J. Mycol. Pathol.* **19** : 131 – 132.

Narain, A. And Rout, G. B. 1981. A tomato rot caused by *Cldosporium Tenuissimum. Indian Phytopathology* **34** : 237 – 238.

Thakur, D. P. and Yadav, H. C. 1971. A new fruit rot of tomato. *Indian Phytopathology* **24**: 583 – 584.