

# *In vivo* efficacy of garlic extract and yeast for the control of post harvest diseases of mango and papaya

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## ABSTRACT

The present investigations were carried out with collection of diseased samples, isolation of the organisms responsible for post harvest spoilage, their pathogenicity, symptomatology and morphological characters in order to suggest suitable control measures in respect of yeast as a bioagent and garlic extract as a botanical in controlling post harvest fungal diseases of mango and papaya. The causal organisms was isolated from infected fruits and recorded association of four fungal pathogens viz., *Aspergillus niger*, *Colletotrichum gloeosporioides*, *Alternaria alternata*, and *Rhizopus stolonifer*. The pathogenicity of all pathogens was proved by artificial inoculation method. The conidial size of *A. niger*, *A. alternata*, *C. gloeosporioides*, and *R. stolonifer* measured as 4.4 µm, 42.47 x 16.37 µm, 9.50 – 18.56 x 2.68 -6.72 µm and 125 x 294.1 µm in size (average), respectively. Use of 5 per cent yeast, (*Eremothecium cymbalariae*) was found effective against *Aspergillus niger* and *Colletotrichum gloeosporioides*. 1 per cent garlic extract was found effective against *Colletotrichum gloeosporioides* and *Alternaria alternata*, but not much effective against *Alternaria alternata* on papaya fruits. Both yeast and garlic extract increases shelf-life and market quality of fruits, with increase in glossiness of fruits.

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## INTRODUCTION

Mango (*Mangifera indica* L.) belongs to family 'Anacardiaceae' and of drupe type fruit. It is native to India and known as the 'King' of Indian fruits. Papaya (*Carica papaya* L.) belongs to family 'Caricaceae' and of a berry type fruit, commercially important tropical crop. Chemical control is risky due to possibility of residual effect and awareness of people about health,

and also results in considerable financial loss to the sellers as well as the consumers. Fungi are the important cause of storage rots, the fungal pathogens affecting the mango and papaya after harvest includes *Aspergillus niger*, *Colletotrichum gloeosporioides*, *Alternaria alternata* and *Rhizopus stolonifer*. Among the fruit rots, rots caused by *Alternaria alternata* and *Aspergillus niger* are most common. Taking in the consideration necessity

of controlling post harvest diseases development of alternative strategies, which are ecologically safe and risk free to human being is important. Biological control is one of the safest approach for controlling post harvest diseases. In view of post harvest diseases fruit crops, it was thought to undertake use of garlic extract and yeast for study. Garlic (*Allium sativum*) when crushed, yields allicin, an antibiotic and antifungal compound (Phytocide). The main antimicrobial effect of allicin is due to its chemical reaction with *thiol* group of various groups of an assortment of enzymes. Yeast (single celled fungi) abundantly found in soil as well as plant phyllosphere also have antagonistic properties against some post harvest fungal plant pathogens (Droby *et al.*, 1993).

## MATERIAL AND METHODS

The micro-organisms responsible for spoilage of fruits were isolated on PDA medium by employing tissue isolation method from diseased fruit collected from different markets at Rahuri and Ahmednagar. Pathogens isolated from diseased samples of mango and papaya were identified on the basis of morphological characters observed under microscope and on the basis of pathogenicity (Barnett and Bary, 1972). Garlic extract Prepared from fresh cloves were collected and washed. 100 g of fresh sample was crushed in grinder in 100 ml sterile distilled water (1:1w/v), extract was filtered through double layers of Muslim cloth. Extracted solution was filtered through GG bacterial filter and used as stock solution (Kota *et al.*, 2006).

Antagonistic effect garlic extract against post harvest pathogens, experiments were laid out in *in vivo* conditions by wound inoculation methods. In this method

small wounds (3mm wide x 5 mm deep) were made by pinching sterile paper pins on to health fruits, washed in 1:1000 sodium hypo chloride for one minute followed by rinsing twice in sterile distilled water. The spore suspension of pathogens was prepared from 7 days old culture on PDA media by flooding with sterile distilled water on the slants. Inoculation was made by dipping the wounded fruits in spore suspension of pathogenic fungi. After drying for 1 hour, fruits were sprayed with 1 per cent garlic extract solution and kept in moist chamber. Checks were also maintained by inoculating spore suspension of post harvest pathogens on mango and papaya fruits.

The effect of yeast strain against post harvest pathogen under *in vitro* condition 5 per cent yeast suspension (O.D 0.64) was prepared in a sterile test tube containing 5 ml sterile distilled water 48 hrs old yeast culture grown on yeast extract peptone agar medium with good shaking in order to get clear suspension and the procedure was carried out in laminar air flow. The optical density was adjusted to 0.64 OD with the help of spectrophotometer. The yeast suspension was centrifused at 10,000 rpm for 15 minutes. The wounded fruits were inoculated by dipping in spore suspension of pathogenic fungi. After drying for 1hr fruits were sprayed with yeast suspension having optical density 0.64 and kept in moist chamber *i.e.* desiccators. Check was also maintained by inoculating spore suspension of post harvest pathogens on healthy mango and papaya fruits. Fruits were observed for expression of symptoms.

## RESULTS AND DISCUSSION

Isolation was carried out from the diseased fruits

**Table 1 : *In vivo* efficacy of garlic extract and yeast on post harvest pathogens of mango**

Sr. No.	Treatments	<i>Colletotricum gloesporioides</i>					<i>Aspergillus niger</i>				
		2 DAT	4 DAT	8 DAT	10 DAT	12 DAT	2 DAT	4 DAT	8 DAT	10 DAT	12 DAT
1.	G.E. (1%)	+	+	+	+	-	+	+	+	-	-
2.	Yeast (5%)	+	+	+	+	+	+	+	+	+	+
3.	Control	+	+	-	-	-	+	-	-	-	-

where, += No infection, -= Infection

**Table 2 : *In vivo* efficacy of garlic extract and yeast on post harvest pathogens of papaya**

Sr. No.	Treatments	<i>Alternatia alternata</i>					<i>Rhizopus stolonifer</i>				
		2 DAT	4 DAT	8 DAT	10 DAT	12 DAT	2 DAT	4 DAT	8 DAT	10 DAT	12 DAT
1.	G.E. (1%)	+	+	-	-	-	+	-	-	-	-
2.	Yeast (5%)	+	+	-	-	-	+	-	-	-	-
3.	Control	-	-	-	-	-	-	-	-	-	-

where, += No infection, -= Infection

of mango (*M. indica*) and papaya (*C. papaya*) collected from orchards at Department of Horticulture, MPKV, Rahuri, fruit markets of Rahuri over respective period of maturity of fruits. *Colletotrichum gloeosporioides* and *Aspergillus niger* fungal pathogens were isolated from diseased fruit of mango and *Rhizopus stolonifer* and *Alternaria alternata* from papaya.

The pathogenic fungi identified on the basis of morphology and pathogenicity at Department of Plant Pathology and Agril. Microbiology, M.P.K.V., Rahuri. Several workers have reported the pathogens associated with the post harvest diseases of fruits. Jadeja and Vaishnav (2000); Singh and Sumbali (2000) and Patil (2001), had pointed out association of fungal pathogens like *Aspergillus*, *Colletotrichum* and *Alternaria* are responsible for spoilage of fruits.

*In vivo* efficacy of garlic extract and yeast on the post harvest fungal pathogens of mango (Table 1). *Colletotrichum gloeosporioides* inoculated and 1 per cent garlic extract treated mango fruits were remain uninfected and healthy upto 10 days. Were 5 per cent yeast treated fruits remain uninfected and healthy upto 12 days. Fruits in control get totally rotted within 8 days.

*Aspergillus niger* inoculated and 1 per cent garlic extract treated mango fruits were remain uninfected and healthy upto 8 days. Were 5 per cent yeast treated fruits remain uninfected and healthy upto 12 days. Fruits in control get totally rotted within 8 days.

*In vivo* efficacy of garlic extract and yeast on the post harvest fungal pathogens of papaya (Table 2). *Alternaria alternata* inoculated and with 1 per cent garlic extract as well as fruits treated with 5 per cent yeast remain in healthy condition upto 4 days only. Fruits in control get rotted within 4 days.

*Rhizopus stolonifer* inoculated and 1 per cent garlic extract as well as 5 per cent yeast treatment was not effective against *Rhizopus stolonifer*. All fruits in treatment and control get rotted totally.

The results obtained are in consonance with those reported earlier by workers such as Senthil *et al.* (2011) studied efficacy of biocontrol agents against post harvest pathogens. Zhang *et al.* (2010), efficacy of yeast antagonists individually or in combination with hot water

and also by Chanchaichaovivat (2010) and Zhulong and Shiping (2005).

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