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SENSITIVITY OF *ASPERGILLUS NIGER* AGAINST CARBENDAZIM CAUSING FRUIT ROT OF *ZIZYPHUS MAURITIANA* LAM.

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Altogether ten isolates of *Aspergillus niger,* causing soft rot of *Zizyphus mauritiana* were tested against carbendazim for their sensitivity. It was found that sensitive isolate An - 1 showed MIC 5.00 µg/ml, however, it increased in An - 9 and An - 10 (10 µg/ml). The ED_{50} was 3.11 to 4.54 µg/ml on agar plates. Similar results were observed on fruits and the MIC increased with ED_{50}. It was 3.31 to 4.70 µg/ml. This suggests that the pathogen has a tendency to develop resistance against carbendazim. The development of emerging resistance in pathogen due to spontaneous mutation under selection pressure of carbendazim.

Keywords: Carbendazim; Fungicide resistance; Sensitivity.

Ber *(Zizyphus mauritiana* Lam.) is an ancient and indigenous fruit of Indian subcontinent[1]. The fruits are very nutritious and are rich in vitamin C, A and B complex. The Ber is one of the most common fruit trees of India and is cultivated practically all over the country and can be within the reach of the poor people and hence known as poor man's fruit. Eighteen different fungal species reported to cause post-harvest decay of fruits. However, only *Aspergillus* species infection was of significance which results in maximum loss of ascorbic acid and also induces aflatoxin production during pathogenesis[2]. Fruit rot is severe in store houses if proper management strategies are not undertaken. Lal *et al.*[3] applied a number of fungicides to control soft rot of jujube and found that carbendazim and difolatan were quite promising in controlling it. However, excessive application of carbendazim may lead to development of resistance in the pathogen[4]. The present paper reports the sensitivity of *A. niger* and tendency to develop resistance against carbendazim from certain areas of Maharashtra.

The infected Ber fruits were collected from different fruit market of Maharashtra and brought into laboratory. The soft rot portion was removed by sterile needle and incubated on potato dextrose agar plates at 25±2°C for seven days. The *A. niger* colonies were separated, purified and maintained. Sensitivity of *A. niger* was determined by food poisoning technique[5]. Potato dextrose agar plates were prepared containing various concentrations (1-10 µg/ml) of carbendazim. Discs (4mm) of *A. niger* isolate taken from margin of 7 day old colony were placed on agar surface. The plates were then incubated at 25±2°C and linear growth was measured at different intervals. In order to see the sensitivity of carbendazim against pathogen on Ber fruits, the conidial culture (10^3) of *A. niger* was treated with carbendazim solution (1-10 µg/ml) and fruits were wrapped by sterile tissue paper and incubated in BOD for seven days. The percent control efficacy (PCE) was calculated by following formula.

$$PCE = 100\ [1-X/Y]$$

Where, X= diameter of the infection on the fruit, Y= diameter of the absolute carbendazim.

The minimum inhibitory concentration (MIC) and ED_{50} dosage curves of carbendazim were calculated by following equation[6].

$$Y = \frac{H}{1 + Exp\ (a + bx)}$$

Where, Y= radial growth as percentage of control, H= upper limit of curvr, Exp= logarithmic exponent, a= regression constant, b=regression coefficient and x= measured points.

Altogether ten different isolates of *A. niger* were tested for their sensitivity against carbendazim from different Ber growing areas of Maharashtra. It was found that the sensitivity against carbendazim is varied both in laboratory and on fruits. The MIC (data from Table 1) was found to be 5 to 10 µg/ml, however, ED_{50} 3.11 µg/ml

Table 1. Sensitivity of *Aspergillums niger* against carbendazim on agar plates.

Isolate	Locality	Regression coefficient	Correlation Coefficient	ED_{50} µg/ml	MIC µg/ml
An-1	Rahuri	1.667	0.8888	3.11	5.00
An-2	Kopargaon	1.663	0.8891	3.12	5.00
An-3	Shrirampur	1.672	0.8948	31.3	5.00
An-4	Jalna	1.671	0.8994	3.17	5.00
An-5	Sinnar	1.647	0.8969	3.21	5.00
An-6	Rahata	1.619	0.8933	3.27	5.00
An-7	Aurangabad	1.635	0.9007	3.27	5.00
An-8	Nashik	1.636	0.9033	3.27	5.00
An-9	Akole	0.729	0.7371	4.27	10.0
An-10	Sangamner	0.730	0.7561	4.54	10.0

Table 2. Sensitivity of *Aspergillums niger* against carbendazim on Ber fruits.

Isolate	Locality	Regression coefficient	Correlation Coefficient	ED_{50} µg/ml	MIC µg/ml
An-7	Aurangabad	1.631	0.9063	3.31	5.00
An-5	Sinner	1.661	0.9239	3.37	5.00
An-6	Rahata	1.643	0.9161	3.33	5.00
An-4	Jalna	1.646	0.9164	3.33	5.00
An-2	Kopargaon	0.794	0.8019	4.47	10.0
An-10	Sangamner	0.753	0.8753	4.97	10.0
An-8	Nashik	0.811	0.8207	4.59	10.0
An-1	Rahuri	0.810	0.8214	4.60	10.0
An-3	Shrirampur	0.787	0.8065	4.63	10.0
An-9	Akole	0.769	0.8966	4.70	10.0

to 4.54 µg/ml on agar plates. The MIC was double when compared with sensitive isolate An - 1. This suggests that the development of resistance is ongoing in Akole and Sangamner area. Similar result was also observed when fruits were treated with carbendazim. Table 2 suggests that *A. niger* from Kopargaon, Sangamner, Nashik, Rahuri, Shrirampur and Akole area showed increasing dose against carbendazim. This suggests that the pathogen has a tendency to develop resistance against carbendazim. Variation in the sensitivity of different pathogen against various fungicides noted by many workers[4,7-9]. There are earlier reports also supporting the development of carbendazim resistance in various pathogens[10]. All of them agreed that the resistant mutants are emerged due to spontaneous mutation under selection pressure of a fungicide.

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