Open Access, Peer Reviewed, Referred Research Journal

Print & Online available on https://jbsd.in
ISSN: 2229-3469 (Print); ISSN: 2231-024X (Online)

Research Article

Effect of Carbon and Nitrogen sources on the growth and sporulation of *Alternaria alternata* causes fruit rot of Grapes

Kadam K. S.

Department of Botany, K.K.M. College, Manwath-431505, Dist. Parbhani (MS), India

Article Info

Received: 12-04-2020
Revised: 17-06-2020
Accepted: 22-06-2020

Keywords: Fruit rot, Aureofungin, *Alternaria alternata*.

Abstract

Nutritional studies of Aureofungin resistant mutant of *Alternaria alternata* (EMS-Aa-3) revealed that its mycelial growth was generally higher than that of the sensitive one on all the sources of carbon and nitrogen except Silver nitrate. Maltose, xylose, glucose, Sucrose, peptone, urea, Sodium nitrate, Potassium nitrate were most favorable for the mycelial growth and fructose, glucose, sucrose, Potassium nitrate, peptone, sodium nitrate were most favorable for sporulation of both the sensitive and resistant mutant of *Alternaria alternata* while Silver nitrate inhibit the growth and sporulation of both the sensitive and resistant mutant of *Alternaria alternata* causes fruit rot of Grapes.

INTRODUCTION

Fruit rot of Grapes (*Vitis vinifera* L.) caused by many fungal pathogens, of these *Alternaria alternata* causing fruit rot is important one in the field as well as during storage and transport (Chahal and Malhi, 1969; Krishnauah *et al.*, 1983; Rao, 1994). Aureogungin is most effective against *Alternaria (*Ghosh and Gemawat, 1976; Krishna *et al.*, 1998). The infection of *Alternaria alternata* causes spoils the quality of fruits for marketing purpose. Effect of different carbon and nitrogen sources used to study the effect on the growth and sporulation of sensitive and resistant mutant of *A. alternata.* The aim of present study was to determine the role of carbon and nitrogen sources in pathogenesis caused by *Alternaria alternata* inciting fruit rot disease to grapes.

MATERIAL AND METHODS

Twenty isolates of *Alternaria alternata* were collected from field and markets of different regions of Maharashtra. Aureofungin was tested against these isolates by using food poisoning technique (Nene & Thaplial, 1993) and minimal inhibitory concentration (MIC) was calculated as described by Molnar *et al* (1985). It was noted that, MIC of highly sensitive isolate (Aa-1) was 324.89µg/ml while that of resistant isolate (Aa-19) was 974.74 µg/ml. During present investigation, disease resistance in the pathogen *Alternaria alternata* was developed by chemical mutagenesis following Dekker (1982) and EMS-Aa-3 mutant was used for experimental purpose.

Effect of various carbon and nitrogen sources on the dry mycelial weight and production of sporulation of both the Aureofungin sensitive and resistant mutant of *Alternaria alternata* was studied by amending them in Czapek Dox liquid medium. Twenty-five ml (25ml) of medium containing various nutritional sources in Ehrlenmeyer conical flask (100 ml) was inoculated with 4mm disc of resistant mutant. Conical flask without carbon/nitrogen source served as control. Dry mycelial weight and sporulation were recorded after seven days, simultaneously sensitive isolate was also studied for comparism.

Table 1. Effect of carbon sources on the Aureofungin sensitive isolate (Aa-1) and resistant mutant (EMS-Aa-3) of *Alternaria alternata.*

Sr. no.	Carbon sources (3.0 %)	Sensitive isolate		Resistant mutant	
		Dry mycelial weight (mg/25ml)	**Sporulation**	**Dry mycelial weight (mg/25ml)**	**Sporulation**
1	D-Fructose	133.4	+ + +	148.5	+ + +
2	D-Galactose	96.2	+ +	118.4	+ +
3	D-Glucose	166.3	+ + +	179.8	+ + +
4	Lactose	112.6	+ +	136.5	+ +
5	Maltose	174.3	+ + +	189.3	+ +
6	D-Manitol	136.4	+	143.5	+
7	D- Mannose	152.7	+ +	166.2	+ +
8	Sucrose	164.6	+ + +	178.3	+ + +
9	D-Xylose	172.4	+ +	185.7	+ +
10	Control	-	-	-	-
	S.E.	15.86		16.79	
	C.D. at 0.05	156.91		172.16	
	0.01	167.68		183.57	

+ + + = Good sporulation, + + = Moderate sporulation, + = Few sporulation, - = Nil

Fig. 1 Effect of carbon sources on the Aureofungin sensitive isolate (Aa-1) and resistant mutant (EMS-Aa-3) of *Alternaria alternata.*

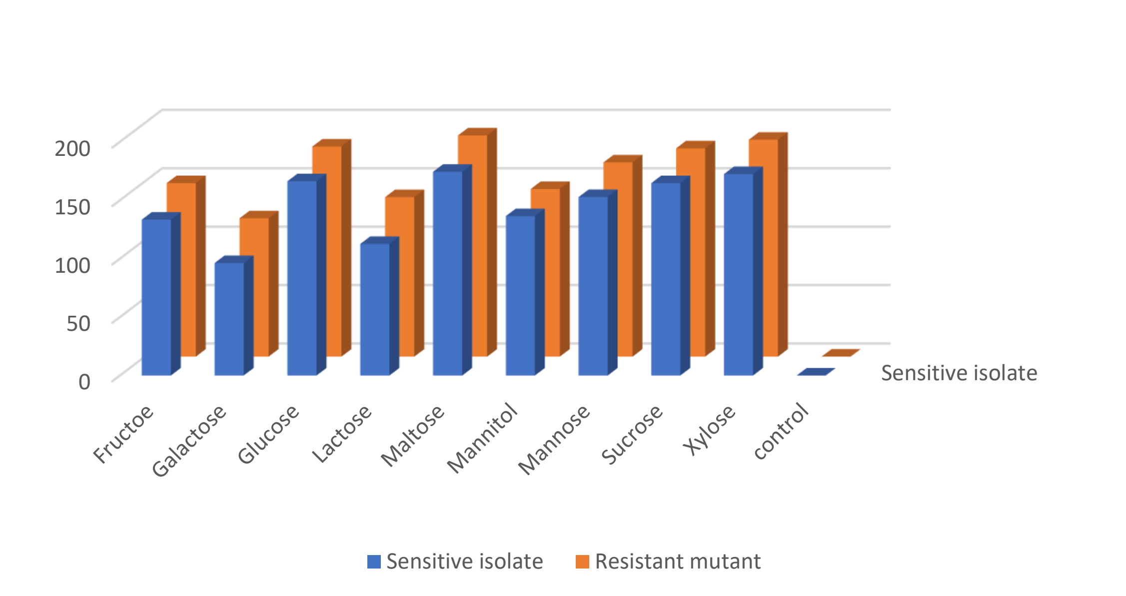
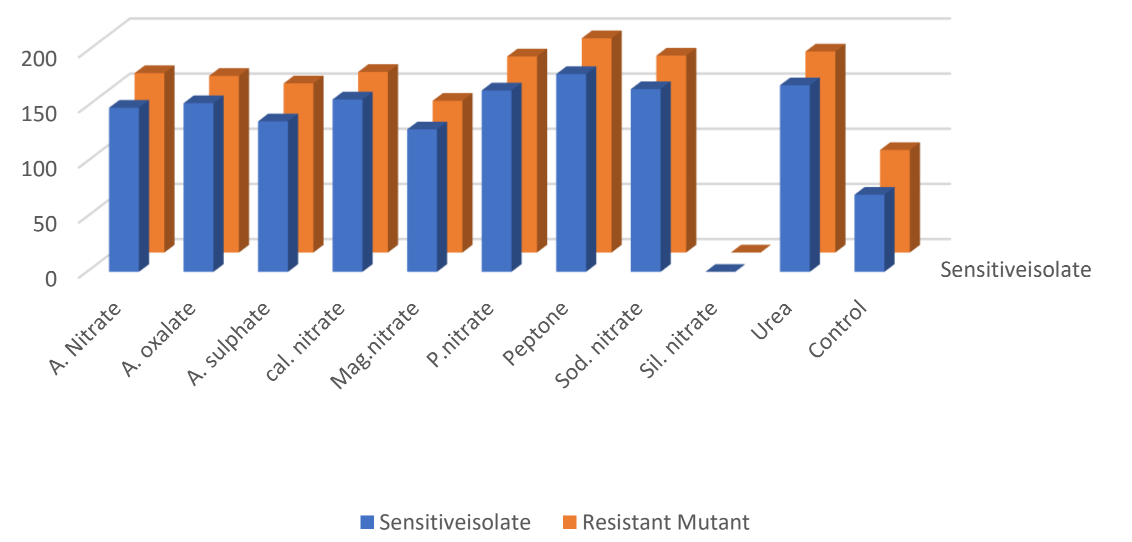


Table 2. Effect of nitrogen sources on the Aureofungin sensitive isolate (Aa-1) and resistant mutant (EMS-Aa-3) of *Alternaria alternata.*

Sr. no.	Nitrogen sources (0.3 %)	Sensitive		Resistant	
		Dry mycelial weight (mg/25ml)	Sporulation	Dry mycelial weight (mg/25ml)	Sporulation
1	Ammonium nitrate	145.8	+	162.7	+
2	Ammonium oxalate	153.0	+ +	160.2	+ +
3	Ammonium sulphate	136.5	+	153.4	+
4	Calcium nitrate	156.4	+	163.8	+
5	Magnesium nitrate	129.2	+ +	137.6	+ +
6	Potassium nitrate	164.5	+ + +	177.8	+ + +
7	Peptone	179.4	+ + +	194.3	+ + +
8	Sodium nitrate	165.7	+ + +	178.6	+ + +
9	Silver nitrate	00.0	-	00.0	-
10	Urea	169.2	-	182.3	-
11	Control	70.0	-	93.0	-
	S.E.	15.31		15.94	
	C.D. at 0.05	159.0		171.94	
	0.01	169.4		182.77	

+ + + = Good sporulation, + + = Moderate sporulation, + = Few sporulation, - = Nil

Fig 2 Effect of nitrogen sources on the Aureofungin sensitive isolate (Aa-1) and resistant mutant (EMS-Aa-3) of *Alternaria alternata.*



RESULTS AND DISCUSSION

Effect of carbon sources

The mycelial growth and sporulation of sensitive isolate and resistant mutant of *Alternaria alternata* were studied *in vitro* using nine carbon sources were substituted to glucose. The results in table 1 and fig. 1 indicated that the growth of resistant mutant was always higher when compared with the sensitive isolate in all carbon sources. The highest growth of sensitive isolate was seen in maltose followed by D-xylose, glucose, sucrose, mannose, mannitol, fructose, and galactose in decreasing manner while the highest growth of resistant mutant was also seen in maltose followed by D- xylose, glucose, sucrose, mannose, mannitol, lactose, galactose and fructose in decreasing manner. Sporulation was higher in fructose, glucose, maltose and sucrose in both the sensitive and resistant mutant.

Thus, the similar results of the present study on the effect of sources of Carbon *viz*., Maltose, Glucose, Sucrose, Lactose and Manitol to supported maximum growth and sporulation in *Alternaria carthami* and several *Alternaria* spp. were reported earlier by several workers (Ranjan, *et al*., 1998; Jash, *et al*., 2003; Kumar, *et al*., 2006; Ramjegatesh and Ebenezar, 2012; Taware *et al.*, 2014; Gholve *et al.*, 2015).

Effect of Nitrogen source

The mycelial growth and sporulation of sensitive isolate and resistant mutant of *Alternaria alternata* were studied *in vitro* using ten nitrogen sources. The results showed that Urea, peptone, potassium nitrate, sodium nitrate and ammonium oxalate were most favorable for the growth of sensitive isolate while silver nitrate was inhibitory. The growth of the resistant mutant was higher in all the nitrogen sources compared with the sensitive isolate. The maximum growth was seen in peptone. Sporulation was stimulated due to potassium nitrate, peptone and sodium nitrate. In other sources sporulation was less (Table 2 & Fig. 2)

Thus the similar results of the present study on the effect of sources of nitrogen *viz*., Potassium nitrate, Peptone and Sodium nitrate to support maximum growth and sporulation in *Alternaria carthami* and several *Alternaria* spp. were reported earlier by several workers (Kumari, 1998; Ramjegathesh and Ebenezar, 2012, Taware et al, 2014; Gholve et al, 2015).

REFERENCES

Chahal DC and Malhi CS, 1969. Fungi associated with rotting of stored grape in the northern western India. *Indian Jr. Hort.*, **26**(1&2): 186-192.

Dekker J, 1982. Counter measures for avoiding fungicide resistance. In: Fungicide resistance in crop Protection (Eds.J. Dekker and Georgopoulos S.G.). CAPD, Wageningen, Netherlands, pp 177-186

Gholve VM, Taware MR and Wagh SS, 2015. Effect of Carbon and Nitrogen Sources on Mycelial Growth and Sporulation of *Alternaria carthami, Trends in Biosciences* 8(1): 54-56.

Ghosh SK and Gemawath PD, 1976. Evaluation of fungicides against *Alternaria solani* in vitro. *Proc. Indian Acad. Sci.*, **84** (5):15-158.

Jash S, Dudda S and Bandopadhyay S, 2003. Effect of different culture media on growth and sporulation of *A. zinnia*, causing leaf blight of marigold. *Envi.* and *Ecol*., **21** (2): 321-325.

Krishna K, Akbar M and Kalpana sastry R, 1998. In vitro evaluation of fungicides against Alternaria carthami Choudury incitant of leaf spot of safflower. *Indian Journal of Plant Protection*, **26** (2):181-182.

Krishnaih, Satyaprakash, Giridharsing, Shankarlingan and Thirupathak, 1983. Control of Alternaria rot of grapes by using wax. *Sci. and Cult.* **49**(12): 391-393.

Kumar S, Sangwan, MS, Mehtan N and Kumar R, 2006. Pathogenic diversity of isolates of *Alternaria brassicae* infecting rapeseed and mustard. *J. Mycol. Pl. Pathol*., **33** (1): 59-64.

Kumari A, Jha AK, Sinha SK and Ojha KL, 1998. Effect of different sources of carbon nitrogen and vitamins on growth and sporulation of *Alternaria brassicae*. *J. Appl. Biotech.*, **8**(1):100-103.

Molnar AL, Hornok and Pesti M, 1989. The high level of benomyl tolerance in Fusarium oxysporum is determined by synergistic interaction of two genes. *Experimental Mycology*, **9**: 326-333.

Nene YL,Thapliyal RN, 1993. Evaluation of fungicides in Fungicides for Plant Disaease Control (3rd ed.). Oxford, IHB Pub. Co. New Delhi, P. 331.

Ramjegathesh R and Ebenezar EG, 2012. Morphological and physiological characters of *Alternaria alternata* causing leaf blight disease of onion. *Intern. J. Pl. Pathol*., **3**: 34-44.

Ranjan S, Jha AK and Lal HC, 1998. Effect of temperature, carbon source on leaf blight on sunflower caused by *Alternaria helianthi*. Jr. *Applied Biotechnology*, **8** (2): 54-56.

Rao VG, 1994. Alternaria disease of grape, *Drakshvritta Souvenir*. **6:** 137

Taware MR, Gholve VM, Wagh SS, Kuldhar DP, Pawar DV and Chavan AA, 2014. Effect of different culture media, temperature, pH, carbon and nitrogen sourceson mycelial growth and sporulation of *Alternaria carthami* causing Alternaria blight of safflower. *International Jr. of Plant Prot.*, **7**(2):349-353.

How to cite this article

Kadam K. S, 2020. Effect of Carbon and Nitrogen sources on the growth and sporulation of *Alternaria alternata* causes fruit rot of Grapes. *Bioscience Discovery*, **11**(3):111-120.

Google Scholar citation: https://scholar.google.co.in/citations?user=vPzEyC8AAAAJ&hl=en