

Study on the Control of Red Rot Pathogen through Moist Hot Air Therapy *in Vitro*

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Received on 16.2.94

ABSTRACT

Moist hot air treatment (MHAT) at 54°C for 4 hours with 97% relative humidity completely controlled red rot pathogen in three sugarcane varieties such as Isd 2-54, Isd-16 and Co 1158. The external and internal tissues drawn from infected and apparently uninfected setts after MHAT did not yield red rot pathogen, *Colletotrichum falcatum* on wet blotter *in vitro* while untreated setts showed 80 to 100% and 10 to 30% infection in infected and apparently uninfected setts respectively.

INTRODUCTION

Red rot caused by *Colletotrichum-falcatum* Went is one of the most serious seed piece transmissible diseases of sugarcane in Bangladesh. The annual occurrence of the disease is primarily through diseased setts. Control of seed-borne infection of red rot has not been successful through chemotherapy. However, heat therapy, offers some hope in eliminating the pathogen. At present hot water treatment (50°C for 3 h) is being employed for the control of some seed-piece transmissible diseases in the country. But Srinivasan (1971) reported that hot water treatment is ineffective in eliminating dormant infection of red rot in the nodal region of seed piece. However, Singh (1972) found hot air treatment of canes at 54°C for 8 h was effective in controlling red rot. But both hot water and hot air systems have some limitations. In hot water plant, its complicated design, manual operation, high initial cost, non uniformity of temperature, unsuitability to immature seedcane are the limiting factors (Sharma *et al.* 1986). In case of hot air treatment, 8 h treatment duration and dry-age of seedcane during treatments affecting germination are main limiting factors. To overcome these limitations, moist hot air treatment plant was designed at IISR, Lucknow (Srivastava *et al.* 1977). Singh *et al.* (1980) reported that moist hot air treatment have been found effective in eradicating red rot inoculum from seed material. Recently, MHAT plant has been introduced in Bangladesh, and the present study was undertaken to test the efficacy of MHAT in eliminating red rot pathogen from seedcane.

MATERIALS AND METHODS

In this study, red rot inoculated setts of three varieties such as Isd 2-54, Isd-16 and Co 1158 representing resistant, moderately resistant and susceptible reaction group were used. The cane stalks of these varieties were inoculated with one virulent

isolates of red rot collected from the variety Isd 18 at SRTI farm. Three to four feet long canes from inoculated stalks including the inoculated internodes of three varieties were collected after 2 months of inoculation. The inoculated cane were divided into two lots. One lot was kept without any treatment, and rest lot was treated with MHAT at 54°C for 4 h excluding initial heating time to raise 54°C temperature and relative humidity upto 97%.

After treatment of stalks, single-bud-setts were prepared and grouped into two categories such as infected and apparently uninfected setts. The infected setts were prepared from the inoculated internodes and apparently uninfected setts were prepared from the portion nearest to the inoculated internode showing no visible symptoms of red rot. Ten setts for each categories and varieties including control were made from the treated and untreated setts with the help of a sterilized cutting knife. For studying the presence of *Colletotrichum falcatum* on the setts, isolations were made from treated and untreated setts. For isolations, surface (rind region) and inner tissues (approx. 1.5X5 cm) of the setts were prepared with the help of a sharp sterilized knife and kept in trays having two sterilized filter paper sheet and covered with glass sheet (little modification of blotter method, ISTA, 1976). The trays were incubated at 28-30°C for 10 d and the presence of red rot pathogen were recorded after being confirmed with microscopic examination.

RESULTS AND DISCUSSION

As evident from the data presented in the Table 1, the surface (rind region) and internal tissues taken from the setts after MHAT at 54°C for 4 h did not yield red rot pathogen *Colletotrichum falcatum*.

Table 1. Colonization of surface and internal tissues by *Colletotrichum falcatum* collected from MHAT treated and untreated setts.

Variety	Categories of setts	Treatment	Setts colonized (%)		Disease control over check (%)	
			Surface	Internal	Surface	Internal
Co 1158	Infected	MHAT	—	—	100	100
		untreated	80	100	—	—
	Apparently uninfected	MHAT	—	—	100	100
		untreated	30	20	—	—
Isd 2-54	Infected	MHAT	—	—	100	100
		untreated	70	90	—	—
	Apparently uninfected	MHAT	—	—	100	100
		untreated	30	20	—	—
Isd 16	Infected	MHAT	—	—	100	100
		untreated	90	80	—	—
	Apparently uninfected	MHAT	—	—	100	100
		untreated	30	10	—	—

But in untreated (Control) setts, the surface tissue yielded *Colletotrichum falcatum* from 70-90% in infected setts while 10-30% in apparently uninfected categories. Infected setts of the varieties Co. 1158, Isd-2/54 and Isd-16 showed 80, 70 and 90% surface colonization of setts by red rot organism respectively while 30% in apparently uninfected setts of all varieties. It is also revealed from the Table 1, that 80-100% setts were colonized by *C. falcatum* in the infected setts while 10-20% in apparently uninfected setts. The data presented in Table 1 shows 100% control of red rot organism after MHAT at 54°C for 4 h. Complete control of red rot was reported in the variety BO 17 and BO 54 after MHAT at 54°C for 2 h while 100% and 87.5% infection was recorded in untreated setts (Singh *et al.* 1980). Successful control of seed borne infections of red rot was reported by hot air treatment (HAT) for 8 h at 54°C (Singh, 1967; 1973). In MHAT, the treatment duration is almost half of that of HAT as it takes about 3.5 to 4 h including the initial period of heating. Furthermore, high humidity in treatment chamber does not allow any desiccation of seed cane during the course of MHAT (Srivastava *et al.* 1977). Yang (1979) showed that aerated steam treatment (AST) at 52°C for 4 to 5 h killed *Colletotrichum falcatum* in naturally infected buds, leaf sheaths, midribs, borer tunnel and inoculated internodes. The principle of MHAT and AST is identical as the medium of heat transfer is humidified air in both the cases (Singh *et al.* 1980). From the result of this study, it can be concluded that MHAT at 54°C for 4 h excluding initial heating time to raise the temperature and relative humidity upto 97% is effective in controlling red rot.

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