Asian Jr. of Microbiol. Biotech. Env. Sc. Vol. 7, No. (2) : 2005 : 289-292

EFFECT OF GLUCOSE ON GROWTH, SPORULATION, FOLIN-POSITIVE AND PROTEIN PRODUCTION BY BLIGHT PATHOGENS

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Abstract – The growth, sporulation, folin-positive and protein production by blight pathogens i.e. *Alternaria solani* (VIRULENT PATHOGEN) and *Alternaria triticina* (AVIRULENT PATHOGEN) on modified Richard's liquid culture medium with tomato fruit extract of Pusa Ruby (RESISTANT VARIETY) and Prince Long (SUSCEPTIBLE VARIETY) were studied with different concentration (0.10 and 1.0%) of glucose. The maximum stimulation of growth, sporulation, folin-positive and protein production was recorded with the fruit extract of Pusa Ruby followed with Prince long variety by the pathogen *A. solani* and inhibition was recorded in the case of *A. triticina* under similar conditions. The stimulation and inhibition depend not only upon the carbon source but also on the host-pathogen relation.

Key words: Glucose, Tomato, Wheat, *A. solani* and *A. triticina*.

INTRODUCTION

Lycopersicum esculentum (Tomato) an economically important vegetable crop is often infected by the blight pathogens in the urban and rural areas of the Ranchi District of Jharkhand State.

The blight pathogens *Alternaria solani* (Jones and Grout) and *Alternaria triticina* (Prabhu and Prasad) produce leaf blight disease on tomato and wheat. Olutiola (1978) reported that growth, sporulation and production of pectic and cellulolytic enzymes in *Fusarium oxysporium* and the fungus release pectic and cellulolytic enzymes during growth in liquid media containing pectic or cellulosic carbon source. A wide variety of carbon sources helps to grow cellulolytic fungi and cellulolytic enzyme is produced only in the presence of cellulose (Mandels and Reese 1957, 1960). The pectolytic and cellulolytic enzymes are responsible for both maceration and killing effects during the disease development and are secreted in a routine manner as a feature of host-parasite interaction (Sadasivan and Subramanian, 1963; Bateman and Miller, 1966; Horsfall and Diamond, 1957).

The present investigation is an attempt to study the growth, sporulation, folin-positive and protein production by blight pathogens i.e. *A. solani* and *A. triticina* on the extract of tomato fruit of the resistant and susceptible variety with the different concentrations (0.10 and 1.0%) of glucose, a manosaccharide.

MATERIALS AND METHODS

The blight pathogens *A. solani* and *A. triticina* were isolated from the leaf blight of tomato and wheat for investigation. The pathogens were grown on modified Richard's liquid culture medium with phosphate buffer (0. 1M) pH and was adjusted at 6.00.

Extract of tomato fruit was obtained from each 125 g of healthy tomato fruits of Pusa Ruby and Prince long variety and thereafter squeezed through centrifuge. 180 – 185 mL supernatant was obtained from each variety and then 70-65 mL phosphate buffer (0.1M) was mixed in each supernatant to prepare 250 mL of extract solution of each variety. After this 250 mL of double strength medium was added with each extract solution to protect the strength of nutrients and finally mixture was made to 500 mL. Each was divided into 5 beakers measuring 100 mL and to each 100 mg, 250 mg, 500 mg, 750 mg and 1.0g glucose was added to get 0.10%; 0.25%, 0.50%; 0.75% and 1.0% concentration. Thereafter 25 ml of different concentrations of glucose was dispensed into each 250 ml Erlenmeyer flask to get 4 vials, 2 vials for *A. solani* and 2 vials for *A. triticina* of each variety. The medium without glucose served as

control. The flasks were autoclaved at Ca 1.06 kg/sq. cm for 15 minutes.

The experiment with a minimum of 20 cultures of both varieties were repeated thrice. The culture was maintained in dark at 24±1°C for a fortnight following the culture methods Gupta (1973), Singh *et al.* (2001, 2003).

RESULT AND DISCUSSION

The present investigation reveals the effect of glucose on the growth, sporulation, folin-positive and protein production by blight pathogens *A. solani* and *A. triticina* grown on Richard's liquid culture medium containing tomato fruit extract of both varieties (Pusa Ruby and Prince Long) in different concentrations (0.10 - 1.0%). The increase of growth from 1.3 – 10.0%, spore production from 0.0 to 22.0%, folin positive from 3.0-11.0% and protein production from 0.0 to 8.6% were recorded when the concentration of glucose was enhanced from 0.10 to 1.0% in the culture medium complexed with fruit extract of Pusa Ruby variety by *A. solani* (Fig. 1). *A. solani* also enhanced the growth (from 1.85 – 9.5%), folin-positive (1.3 to 9.6%), protein production (2.8 to 14.0%) in case of fruit extract of Prince Long Variety (Fig. 2). There was no change in spore production at lower concentration (0.10%) of glucose while at higher concentration (1.0%) it an increase by 15% with the fruit extract of Prince Long variety was observed (Fig. 2). When *A. triticina* was grown on culture medium containing tomato fruit extract of both varieties in different concentrations (0.10 - 1.0%) of glucose, an increase in growth by 2.3 to 9.0%, in spore production by 0.0 to 8.0%, in folin-positive by 2.0 to 10.0% and in protein production by 0.0 to 9.5% was found with fruit extract of Pusa Ruby variety (Fig. 3). When the pathogen was grown on fruit extract of Prince Long variety the growth was increased from 1.1 to 9.2% sporulation from 0.0 to 12.5%, folin-positive from 1.8 to 8.9% and protein production from 4.8 to 38.0% (Fig 4).

The growth and sporulation by *A. solani* in a culture of yeast extract and circinic acid was studied by Rajderkar (1966). Olutiola (1978) reported that the fungus release pectic and cellulytic enzymes during growth in liquid media containing pectic or cellulosic carbon source in *Fusarium oxysporium*. The present investigation supports the findings of Olutiola (1978). Rotem and Bashi (1969) studied the induction of sporulation in *A. porri* and *A. solani* by inhibition of its vegetative development under the interruption of dark, light and moisture. Bhowmic (1969) in his detailed study on wheat seed infection by *A. triticina* and *A. alternata*, he observed that both species formed dense mycelial mat between the epidermal surface and cross layer cells by the embryo

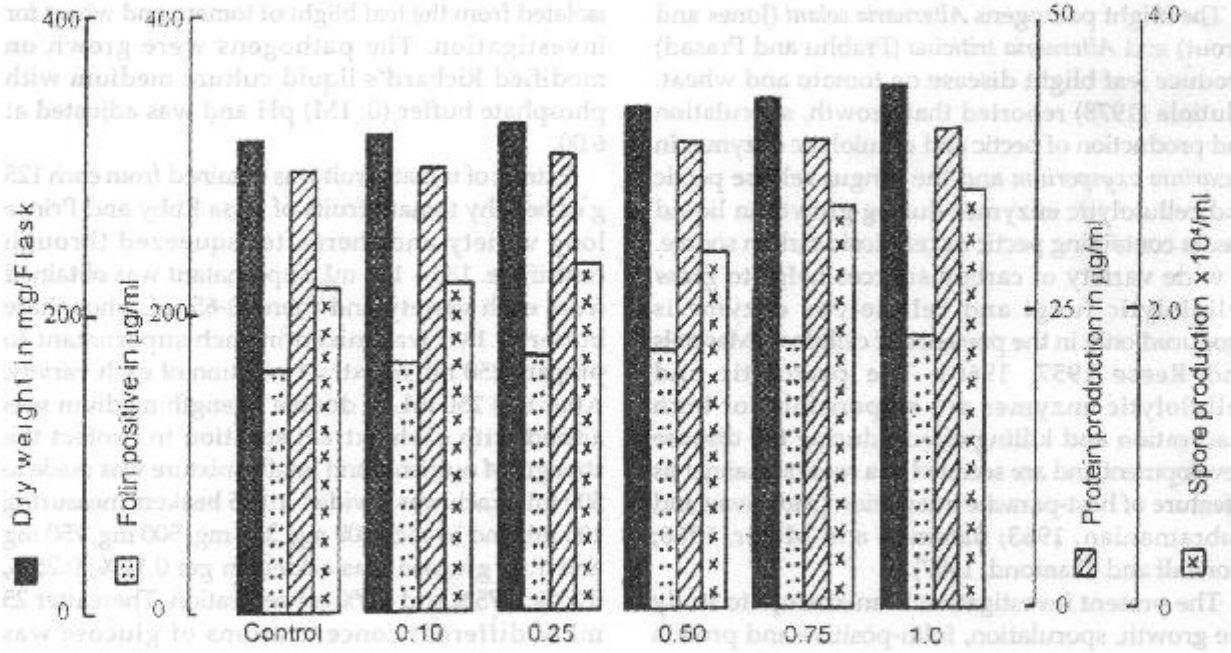

Fig. 1. *A. solani* grown on culture media containing extract of pusa ruby cultivar.

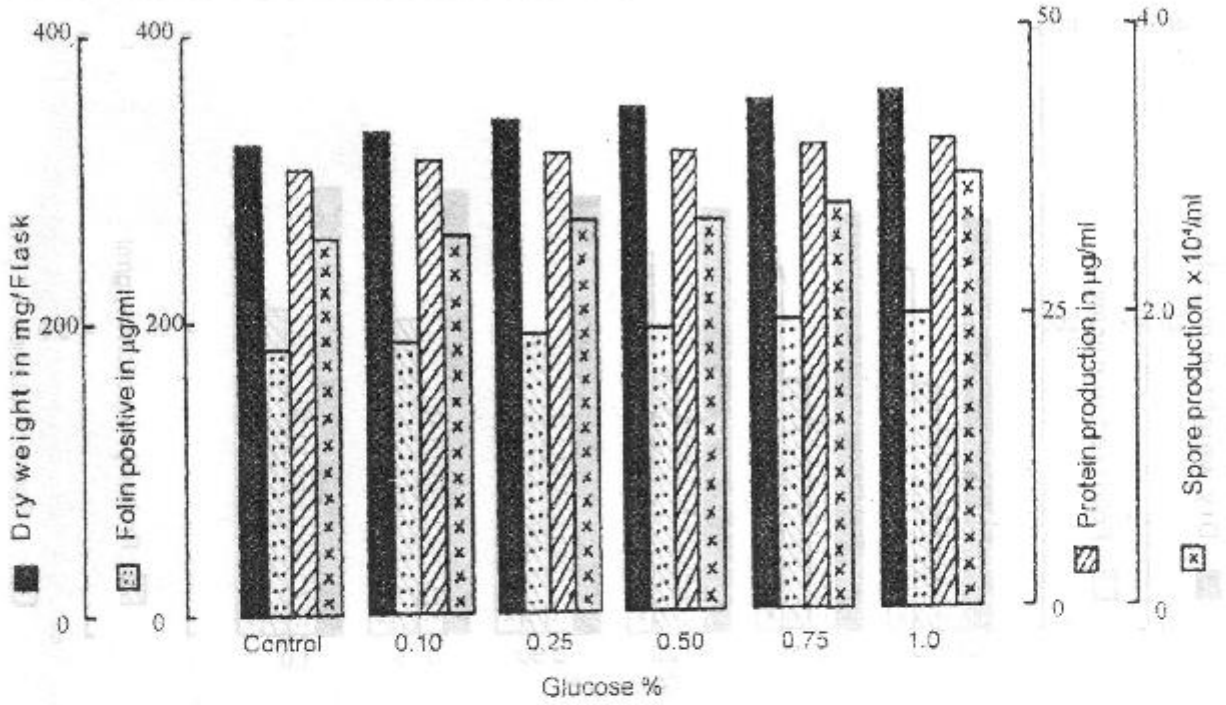

Fig. 2. *A. solani* grown on culture media containing extract of prince long cultivar.

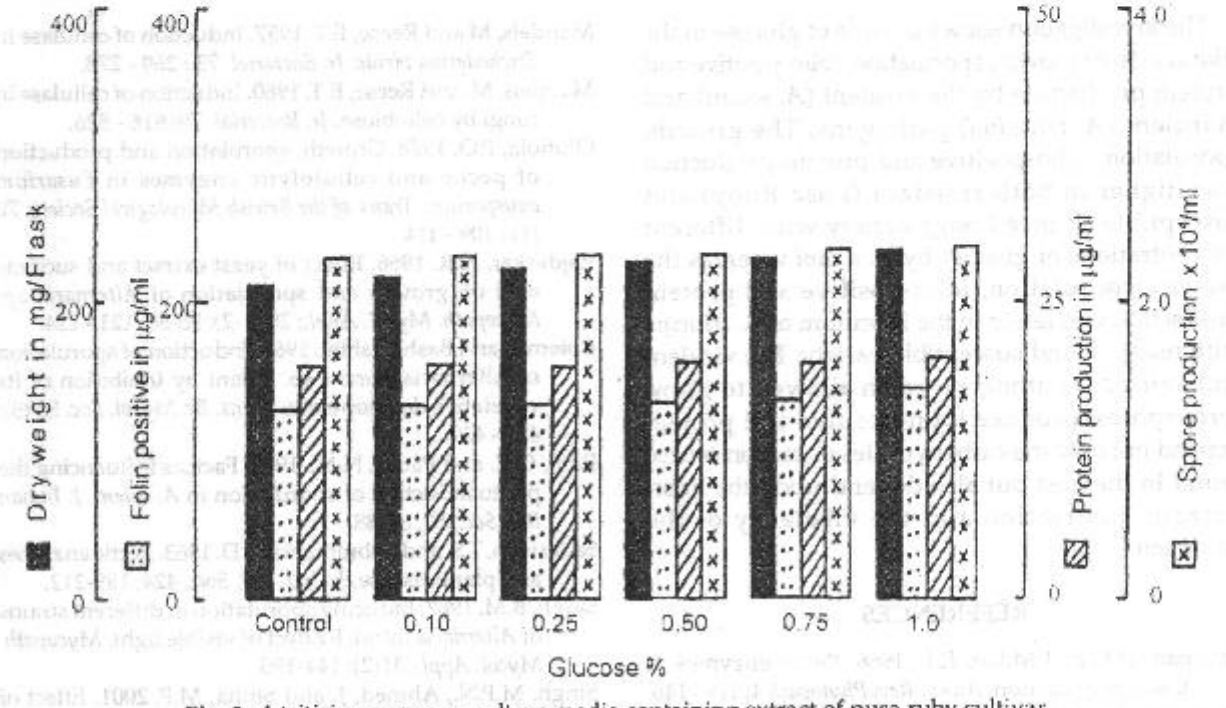

Fig. 3. *A triticina* grown on culture media containing extract of pusa ruby cultivar.

and stratchy endosperm region. Rath and Padhi (1973) observed that direct sunlight exposure to three days old culture of *A. solani* for 10 minutes increased sporulation whereas high temperature reduced it. The present cultures were however, maintained in dark and an increase in sporulation was found. Singh (1967) reported that the three strains of *A. solani* from tomato, potato and other plant leaves produced a large number of spores under green region of visible spectrum.

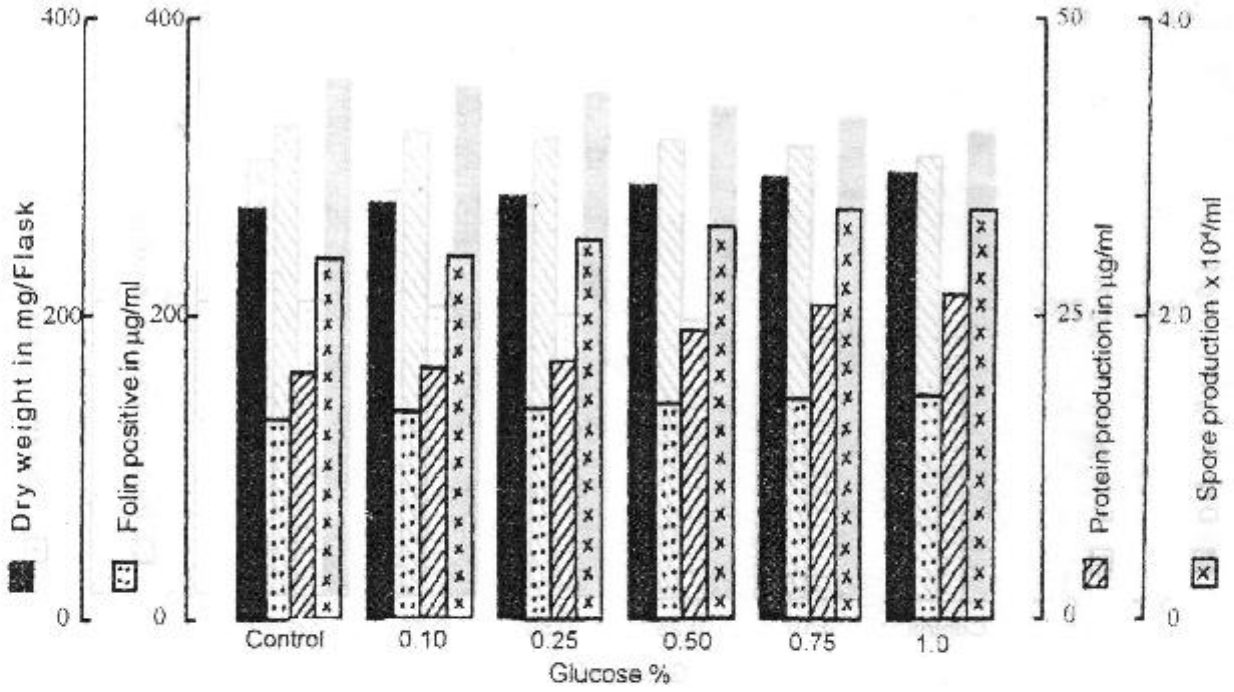

Fig. 4. *A. triticina* grown on culture media containing extract of prince long cultivar

The investigation shows the role of glucose in the stimulation of growth, sporulation, folin-positive and protein production by the virulent (*A. solani*) and avirulent (*A. triticina*) pathogens. The growth, sporulation, folin-positive and protein production was higher in both resistant (Pusa Ruby) and susceptible (Prince Long) variety with different concentrations of glucose by *A. solani* whereas the growth, sporulation, folin-positive and protein production was lesser in the inoculum of *A. triticina* with resistant and susceptible variety. The virulent and avirulent pathogens when allowed to grow, form spores, produce folin-positive and protein depend not only the carbohydrates or carbon source found in the host but also depend upon the host-parasite interaction and the virulency of the pathogen.

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