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An *In vitro* Test for Evaluating the Efficacy of *Fusarium solani* (Mart.) Sacc. on the Uredospore Germination of Rust (*Puccinia arachidis*) of Peanut

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ABSTRACT

***In vitro* germination and germ tube growth of *Puccinia arachidis* uredospores were reduced significantly with conidia and culture filtrates of *Fusarium solani*. The antagonistic capabilities of *F. solani* indicates its potential for use in biological control of peanut rust (*P.arachidis*).**

KEY WORDS : *Puccinia arachidis*, *Fusarium solani*, hyper paraiste

Rust of peanut (*Arachis hypogaea* L.) caused by *Puccinia arachidis* Speg. is one of the economically important foliar diseases of peanut plants in India and other countries of the world. Chemical control of groundnut rust resulted in varying degrees of success, but their use presented some problems for small scale groundnut farmers of semi-arid tropics. The antagonistic effect of *Fusarium solani* a hyperparasite (Jayapal Gowdu and Balasubramanian, 1991) on the germination of uredospores of groundnut rust was tested *in vitro* to know its biocontrol capability.

MATERIALS AND METHODS

F. solani was isolated from peanut rust uredosori (Jayapal Gowdu, 1986). Concentration of uredospores collected from pustules in distilled water containing 0.01% Tween-80 were adjusted to the required level. *F. solani* conidial suspensions were prepared from 10-day-old cultures according to the method of Balasubramanian and Kalyanasundaram (1979) and the concentration was adjusted to the desired level.

Antagonistic activity of *F. solani* conidia to *P. arachidis* uredospore germination was studied at different concentrations (10^5, 10^6 and 10^7 conidia ml^{-1}) of *F. solani* by incubating with *P. arachidis* uredospores (10^5 ml^{-1}). In a second experiment, the effect of addition of *F. solani* 24 and 48 h before as well as 2 h after inoculation of *P. arachidis* was studied. Uredospores alone in distilled water served as control.

Culture filtrates of 15-day *F. solani* cultures in Czapek Dox medium were prepared by filtering through filter paper. Different concentrations of the culture filtrate were tested on *P. arachidis* uredospore germination. *In vitro* uredospore germination was carried out in cavity slides by incubating in humid conditions under total darkness at 25 ± 2°C. Rate of germination and growth of germtubes were recorded 4 h after incubation in five different microscopic fields.

Table 1. Effect of *F. solani* conidia on germination and germtube growth of uredospores of *P. arachidis*.

Concentration of *F.solani* conidia ml^{-1}	*P.arachidis* germination (%)	Germtube length (μ m)
1×10^5	88.6	92.0 [a]
1×10^6	75.3 [b]	84.0 [b]
5×10^6	56.8 [b]	68.0 [b]
1×10^7	0.0	0.0
Control	89.5	98.0

a, b, Significantly different (p:a = 0.01; b = 0.001) from control

Table 2. Effect of *F. solani* conidia on germination and growth of *P. arachidis uredospores*

Treatments	*P.arachidis* (%) germination	Germtube length (μ m)
Uredospores alone	86.5	94
FS added 2 h after U	65.4 [b]	91
FS added 24 h before U	56.5 [b]	87 [a]
FS added 48 h before U	48.7 [b]	71 [b]

FS - *Fusarium solani;* U - Uredospores
a,b; Significantly different from control (P : a = 0.01 ; b = 0.001)

RESULTS AND DISCUSSION

Data presented in Table 1 shows that the conidia of *F. solani* inhibited the germination and germtube growth. Complete inhibition of *P. arachidis* uredospores was observed with high concentration of conidia (10^7 conidia ml^{-1}). Supression of germination of uredospores and growth of germtubes were significantly higher when *F. solani* were inoculated before *P. arachidis*. *F. solani* added 48 h before *P. arachidis* resulted in maximum suppression of uredospore germination as well as germ tube growth (Table 2). Cell-free filtrates of *F. solani* completely inhibited uredospore germination (Table 3). There was a reduction in inhibitory effect after dilution.

Roy (1973) reported *F. solani* hyperparasites on teliosori of *Puccinia thawitesii*. Prasada and Sharma (1964) reported that the germination of uredospores of *P. graminis* var. *tritici* was completely inhibited when incubated with *Fusarium roseum* conidia. Chester (1946) found *Fusarium nivale* on uredospores of *Puccinia recondita* and mentioned its antagonism to wheat leaf rust. Sundaram (1962) reported that rusts of coffee leaves *Hemileia wrightiae* and *H. vastatrix* were parasitized by *Fusarium* sp. and this hyperparasite caused distintegration of uredospores and teliospores. Kapooria and Sinha (1969) reported that *Fusarium oxysporum* was antagonistic to uredospores germination of *Puccinia penniseti*. Inhibition of uredospores germination of *Uromyces cicerisarieteni* was observed with *Fusarium orthoceras* and *F. oxysporum* (Sinha and Bahadur, 1974). Uredospore germination of sunhemp rust (*Uromyces decoratus*) was reduced by supernatants of spore suspension and metabolites of *Fusarium oxysporum in vitro* (Sharma, 1985). Results of present study indicates that *Puccinia arachidis* uredospore germination was less in post treatment than in pre and mixed treatment with *F.solani* conidial suspensions. Substances released during hydration as well as early stages of germination of spores (spores germ leachets) could have inactivated enzymes or stimulators which are responsible for mobilization of reserve substrates during germination. Searles and French (1964) found that bacteria convert aldehyde stimulators into acids and bacteria themselves may produce volatile inhibitors which reduce uredospore germination of wheat stem rust. Whether such conversions occur or not in interaction of peanut rust and *F. solani* is not known and needs further study.

Results of tests with culture filtrates clearly indicated their antagonistic nature.

Table 3. Effect of culture filtrates of *F.solani* on germination of *P.arachidis* uredospores

Treatments	Germination (%)
Control	83.0
Dialysed filtrate	8.3 [a]
Undialysed filtrate	0.0
Undialysed filtrate 100^0 C	57.5 [a]
1%	84.5
10%	45.6[a]
20%	26.7[a]
30%	18.0[a]
40%	0.0

a Significantly different from control (P = 0.001)

These toxic substances which are responsible for inhibition of uredospore germination are thermolabile and mostly undialysable. These results clearly indicate the antagonistic potential of *F. solani.*

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