

## INFLUENCE OF PHYSICAL FACTORS ON ANTAGONISTIC POTENTIAL OF TRICHODERMA VIRIDE AGAINST PYTHIUM APHANIDERMATUM

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### ABSTRACT

Influence of physical factors, such as temperature, pH and light, on antagonistic potential of *Trichoderma viride* was evaluated against *Pythium aphanidermatum* causing rhizome rot in turmeric. The physical factors greatly influenced antagonistic potential of *Trichoderma viride*. The optimum temperature range for antagonistic activity of *Trichoderma viride* was found to be 25 to 30°C, whereas the highest inhibition percentage was observed at 30°C. Optimum pH was 6.5, which showed maximum inhibition. Quality (color) of light did not influence inhibition percentage.

**Key words:** Turmeric, *Trichoderma viride*, Antagonistic potential, *Pythium aphanidermatum*, Physical factors etc.

### Introduction:

Turmeric (*Curcuma longa* L.) rhizome rot disease is caused by *Pythium aphanidermatum*. As the fungus *Trichoderma* is gaining importance due to its capability to antagonize plant pathogens, it was employed during present investigation for controlling the pathogen. Attempts were made to investigate the effect of physical factors such as temperature, pH and light on sporulation and antagonistic potential of different *Trichoderma* species. During present investigation different physical factors such as temperature, pH and light spectra were evaluated to investigate their influence on antagonistic potential of *Trichoderma viride* against *Pythium aphanidermatum* causing rhizome rot of turmeric.

### Material and Methods:

*Trichoderma viride* was isolated from soil samples collected from turmeric rhizospheres from different districts of Maharashtra state. Those were screened

for isolation of *Trichoderma* species by 'Soil plate method' as described by Warcup (1947). Isolated *Trichoderma* species were identified following Bissette (1991).

*Pythium aphanidermatum* was isolated from infected rhizomes of turmeric, the samples of which were collected from different districts of Maharashtra state. Collected turmeric rhizomes were washed by using tap water, blotted by using sterile blotting paper. Then surface sterilized with 70 % alcohol. After sterilization washed with sterile distilled water and cut into small pieces and inoculated on Czapek Dox Agar medium. *Pythium aphanidermatum* was identified following Van der Plaats-Niterink (1981).

For this experiment Czapek Dox Agar culture medium having pH 7.5 was used to evaluate antagonistic potential of *Trichoderma viride* against *Pythium aphanidermatum* under the influence of three physical factors viz- temperature, pH and light spectra, by dual culture method. (Maria, 2017).

Various temperatures ranging from 5 to 40 °C were used, where in petri-plates inoculated with pathogen *Pythium*

*aphanidermatum* and bioagent *Trichoderma viride* were kept for incubation for seven days. The petri plates kept at room temperature ( $27 \pm 2^\circ\text{C}$ ) were considered as control. To investigate in influence of different pH values (3.5–9.5), those were adjusted in the medium by adding weak acid / alkali, wherein the pH 6.5 was considered as Control. For evaluation of the influence of light spectra the plates were exposed to Violet, Indigo, Blue, Green, Yellow, Orange and Red lights, while the petri-plate exposed to normal light was considered as control.

Antagonistic potential of *Trichoderma viride* against *Pythium aphanidermatum* was evaluated by using dual culture technique. Both bioagent and pathogen were inoculated on Czapek Dox agar culture medium at opposite side to each other. Inoculated petri plates were incubated for seven days in BOD incubator at  $27 \pm 2^\circ\text{C}$ . Linear growth of *Pythium aphanidermatum* was measured on 7<sup>th</sup> day of incubation and Per cent inhibition was calculated by using the equation given by Vincet (1947).

### Results and Discussion:

Maximum inhibition of *Pythium aphanidermatum* by *Trichoderma viride* was

observed at  $30^\circ\text{C}$  (61.70%), Optimum temperature range for antagonistic activity was found to be at 25 to  $30^\circ\text{C}$ . Complete inhibition of *Trichoderma viride* and *Pythium aphanidermatum* was observed at 5, 10 and  $40^\circ\text{C}$ . temperature (Table. 1). Optimum pH range for antagonistic activity was 5.5 to 7.5. Highest inhibition (61.70%), of *P. aphanidermatum* by *Trichoderma viride* was observed at pH6.5 (Control). whereas lowest at pH 3.5. (Table. 2). Light spectra showed minimum or nil effect on the antagonistic activity, however, highest inhibition percentage (61.70%) was observed in normal light, which served as control (Table 3).

Maurya et al., (2017) reported maximum growth of *T. viride* at  $25 - 30^\circ\text{C}$ . Domingues et al., (2016) revealed that  $27^\circ\text{C}$  was optimum temperature for the growth of *Trichoderma asperellum* and *T. asperelloides*. Marie et al., (2018) observed that 4.5 and 5.5 pH was optimum for antagonistic activity of *Trichoderma* species. Similar results were recorded by Zehra et al., (2017); Kredics et al., (2003). Petrisor et al., (2016) recorded that  $30^\circ\text{C}$  temperature and pH 4.5 were more suitable for highest antagonistic activity of *Trichoderma* species

**Table 1:Effect of Temperature on antagonistic potential of *Trichoderma viride* against *Pythium aphanidermatum***

Sr. No.	<i>Pythium aphanidermatum</i> Isolate	Inhibition Percentage (%)								
		5°c	10°c	15°c	20°c	25°c	27°c	30°c	35°c	40°c
1.	Pa- 1	00	00	00	00	50.0	58.8	60.0	00	00
2.	Pa-2	00	00	00	00	52.2	57.7	58.8	00	00
3.	Pa-3	00	00	00	00	51.1	57.7	62.2	00	00
4.	Pa-4	00	00	00	00	50.0	61.1	55.5	00	00
5.	Pa-5	00	00	00	00	54.4	58.8	58.8	00	00
6.	Pa-6	00	00	00	00	50.0	58.5	60.0	00	00
7.	Pa-7	00	00	00	00	56.6	57.7	58.8	00	00
8.	Pa-8	00	00	00	00	50.0	56.6	57.7	00	00
9.	Pa-9	00	00	00	00	50.0	57.7	56.6	00	00
10.	Pa-10	00	00	00	00	51.1	56.6	57.7	00	00
11.	Pa-11	00	00	00	00	50.0	58.8	55.5	00	00
12.	Pa-12	00	00	00	00	52.2	57.7	54.4	00	00
13.	Pa-13	00	00	00	00	55.5	57.7	60.0	00	00
14.	Pa-14	00	00	00	00	50.0	56.6	61.1	00	00
15.	Pa-15	00	00	00	00	54.4	58.8	60.0	00	00
16.	Pa-16	00	00	00	00	52.2	60.0	58.0	00	00
17.	Pa-17	00	00	00	00	51.1	58.8	60.0	00	00
18.	Pa-18	00	00	00	00	51.1	61.1	61.1	00	00
<b>Mean of Inhibition Percentage (%)</b>		00	00	00	00	<b>51.77</b>	<b>58.37</b>	<b>61.70</b>	00	00

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**Table 2: Effect of pH on antagonistic potential of *Trichoderma viride* against *Pythium aphanidermatum***

Sr. No.	<i>Pythium aphanidermatum</i> Isolate	Inhibition Percentage (%)						
		pH Levels						
		3.5	4.5	5.5	6.5	7.5	8.5	9.5
1.	Pa- 1	51.1	60.0	56.6	60.0	58.8	54.4	46.6
2.	Pa-2	57.7	58.8	56.6	58.8	57.7	55.0	54.4
3.	Pa-3	58.8	57.7	57.5	62.2	57.7	52.0	58.8
4.	Pa-4	55.2	55.1	57.4	55.5	61.1	55.8	50.0
5.	Pa-5	55.1	56.0	60.0	58.8	58.8	57.7	54.4
6.	Pa-6	54.3	61.1	60.4	60.0	58.8	55.1	55.5
7.	Pa-7	56.0	57.1	57.7	58.8	57.7	53.8	47.7
8.	Pa-8	60.0	56.1	58.8	57.7	56.6	55.1	58.8
9.	Pa-9	58.5	55.1	60.0	56.6	57.7	56.6	54.4
10.	Pa-10	58.4	57.3	60.0	57.7	56.6	55.1	54.4
11.	Pa-11	56.4	60.8	61.1	55.5	58.8	55.1	53.3
12.	Pa-12	54.3	60.7	61.1	54.4	57.7	55.0	53.3
13.	Pa-13	54.3	56.6	58.8	60.0	57.7	56.1	57.7
14.	Pa-14	58.1	565.6	60.0	61.1	56.6	54.2	51.0
15.	Pa-15	58.8	60.3	57.4	60.0	58.8	54.1	48.8
16.	Pa-16	57.7	59.3	57.5	58.0	60.0	54.2	55.5
17.	Pa-17	56.1	60.3	57.7	60.0	58.8	55.0	56.6
18.	Pa-18	60.3	59.1	57.7	61.1	61.1	57.1	55.5
<b>Mean of Inhibition Percentage (%)</b>		<b>53.45</b>	<b>55.16</b>	<b>58.69</b>	<b>61.70</b>	<b>58.38</b>	<b>55.30</b>	<b>53.60</b>

**Table 3: Effect of Light Spectra on antagonistic potential of *Trichoderma viride* against *Pythium aphanidermatum***

Sr. No.	<i>Pythium aphanidermatum</i> Isolate	Inhibition Percentage (%)						
		Light Spectra						
		Red	Green	Yellow	Blue	Orange	Indigo	Control
1.	Pa- 1	55.5	61.1	58.8	55.5	60.0	58.8	60.0
2.	Pa-2	57.7	60.0	61.1	58.8	61.1	60.0	58.8
3.	Pa-3	55.5	61.1	57.7	57.7	57.7	61.1	62.2
4.	Pa-4	54.4	60.0	58.8	57.7	60.0	60.0	55.5
5.	Pa-5	54.4	62.2	60.0	61.1	61.1	61.1	58.8
6.	Pa-6	55.5	58.8	58.8	56.6	66.6	60.0	60.0
7.	Pa-7	56.6	60.0	58.8	58.8	60.0	58.8	58.8
8.	Pa-8	55.5	58.8	60.0	55.5	57.7	57.7	57.7
9.	Pa-9	56.6	57.7	58.8	57.7	61.1	55.5	56.6
10.	Pa-10	57.7	63.3	62.2	56.6	60.0	57.7	57.7
11.	Pa-11	56.6	60.0	61.1	56.6	57.7	58.8	55.5
12.	Pa-12	56.6	58.8	62.2	55.5	62.2	58.8	54.4
13.	Pa-13	55.5	55.5	57.7	57.7	61.1	57.7	60.0
14.	Pa-14	57.7	55.5	58.8	55.5	58.8	60.0	61.1
15.	Pa-15	55.5	55.5	60.0	57.7	57.7	57.7	60.0
16.	Pa-16	58.8	55.5	58.8	58.8	55.5	56.6	58.0
17.	Pa-17	57.7	56.6	62.2	54.4	56.6	57.7	60.0
18.	Pa-18	57.7	58.8	60.0	57.7	57.7	60.0	61.1
<b>Mean of Inhibition Percentage (%)</b>		<b>56.41</b>	<b>58.84</b>	<b>59.76</b>	<b>50.92</b>	<b>59.58</b>	<b>58.7</b>	<b>61.70</b>