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Effect of Temperature, pH and Photoperiod on the Growth of *Alternaria petroselini* (FCLW#23) for the Mycoherbicidal Management of Weeds of Leguminous Crop

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ABSTRACT

Pulses are the most important food crops after cereals, constitute the major source of dietary protein. India is the world's largest producer and the largest consumer of leguminous crop. The plant pathogen causes the some effect on weeds as the phytotoxin it produces it would be possible to use either the pathogen or the phytotoxin as a Bio-herbicide. However have limitations that often make their use impractical with current technology. *Alternaria petroselini* (FCLW#23) was isolated from weeds of leguminous crop. The effect of various parameters like temperature, pH and photoperiod were investigated for the growth of *Alternaria petroselini* (FCLW#23) used as a mycoherbicidal agents. Results of experiment indicated that the maximum phytotoxic effect in temperature 28°C and pH range of 5.0. The *Alternaria petroselini* (FCLW#23) was grown under different photoperiod. Good mycelium growth was recorded with 24 hours continuous darkness.

Keywords : *Alternaria petroselini* (FCLW#23), pH, Temperature, Photo period.

I. INTRODUCTION

Legume crops are the second most important group of food plants and the major source of protein in the predominately vegetarian diet of the people of India. The intensity and distribution of weed species in the gram and pea crop are functions of a complex interaction among soil properties, rainfall patterns, temperature and cultural practices. Gram and pea yield losses resulting from weed interference and the cost of weed control constitute some of the highest costs involved in the production of the crop.

The quality of the harvested crop is directly influenced by weeds. Increase in moisture content, foreign matter, and splits have been documented when high levels of weeds were present at harvest. The potential value of bio-products as a source of compounds for development is widely, under-appreciated. Types of species of *Alternaria petroselini* (FCLW#23) are known to produce many phytotoxins,

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but only some have been proven to play roles in pathogenesis

Mass production of secondary metabolites are known to be influenced by physicochemical factors viz., nutrients, temperature, pH, static or rotary conditions (Saxena *et al.*, 2001; Singh and Pandey, 2010). To improve the efficacy or modify virulence, viability, host specificity or environmental requirement, formulations are required.

Then, host-specific from *Alternaria petroselini* (FCLW#23) fungi will be discussed with a review of the available literature as well as recent findings from our laboratory. Finally, the development of Bio-herbicides from phytotoxins of *Alternaria petroselini* (FCLW#23).

In the present study to investigate the effect of various environmental condition like nutritional media's temperature, pH and photo period for growth and large scale toxic production of *Alternaria petroselini* (FCLW#23).

II. MATERIAL & METHODS

Fungal culture: - *Alternaria petroselini* (FCLW#23) were isolated from different diseases samples collected from weeds of leguminous crop viz. (*Echinochloa crusgalli, Euphorbia heterophylla, Cyperus rotundus* and *Commelina benghalensis*) Jabalpur, Madhya Pradesh India. *Alternaria petroselini* (FCLW#23) were isolated on PDA media by serial dilution and pour plate, technique the *Alternaria petroselini* (FCLW#23) were identified using Research literature the culture was stored at 4°C for further study.

Fugal Culture growth at different temperature: - To study the effect of different temperature mycelial growth and their phytotoxin production of *Alternaria petroselini* (FCLW#23) was observed on eight different levels of temparuture ranging from low mesophilic to therophilic (viz. 5, 10, 15, 20, 28, 30, 40 and 50°C) these temperatures were maintained on solid and liquid media. Mycelia biomass was recorded after 14 days incubation (Sohni *et al.*, 2018 and Roli *et al.*, 2017).

Fungal Culture growth at different pH: - Hydrogen ion concentration of the growth medium is a significant factor that affected the rate of growth and sporulation of fungi establishing the optimum pH for phytotoxin production by the *Alternaria petroselini* (FCLW#23) it was grown at various pH level. The pH required for optimum growth was taken as standard for subsequent experiment.

Effect of photoperiod: - To study the effect of light incubation of fungal pathogen *Alternaria petroselini* (FCLW#23) culture inoculated in petriplates were exposed to 3 light conditions viz. 12 hours of continuous light and 12 hours of continuous darkness. Next 24 hours of continuous darkness and last is 24 hours of continuous light (Sinclair and Bhingra 1995).

III. RESULTS

The *Alternaria petroselini* (FCLW#23) isolated from weeds of leguminous crop fungus were identified and used for further optimization investigation.

Effect of Temperature

The test fungi *Alternaria Petroselini* (FCLW#23) could grow within a wide range of temperature i.e., 15°C to 40°C. Maximum growth was recorded at 28°C in liquid and solid media. Beyond this the growth gradually decreased with increase or decrease in temperature. The extremes of temperature (0, 5, 10 and 50°C) failed to support any growth. (Results show in graph no 1 and 2) A similar observation has been reported by Sohni *et al.*, 2018 for *Alternaria alternata.*

Effect of pH (Hydrogen ion concentration)

Hydrogen ion concentration exerts indirect effects upon cellular metabolism through changes in chemical environment. Hydrogen ion concentration has important effect in the enzymatic control system of fungi. There is a great ambiguity still prevailing in relation to the mechanism of action of pH on growth, and toxin production.

Alternaria petroselini (FCLW#23) could grow well within a pH range of 3.5 - 6.0. The initiation of mycelial growth was immediately observed within 24 hours of inoculation at pH 4.5 and 5 followed by pH 4, 3.5, 6 and 7. At pH 8 and 9 initiation of mycelial growth appeared only after 48 and 72 hours of incubation respectively. (Data show in graph no - 3)

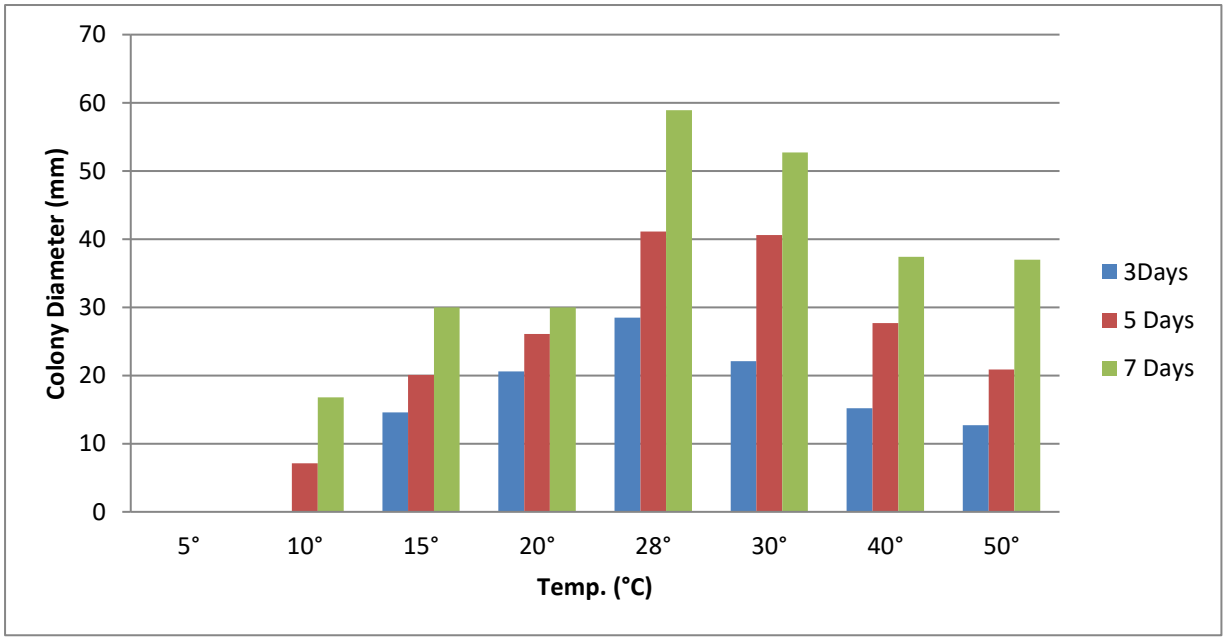
Similar results were recorded by Ramakrishnan (1941) with *C. fallatum*. Drastic changes in final pH were also recorded by number of other workers (Tandon and Verma, 1962; Armstrong, 1921 and Agarwal and Shikhende, 1959).

Effect of photoperiod (Light)

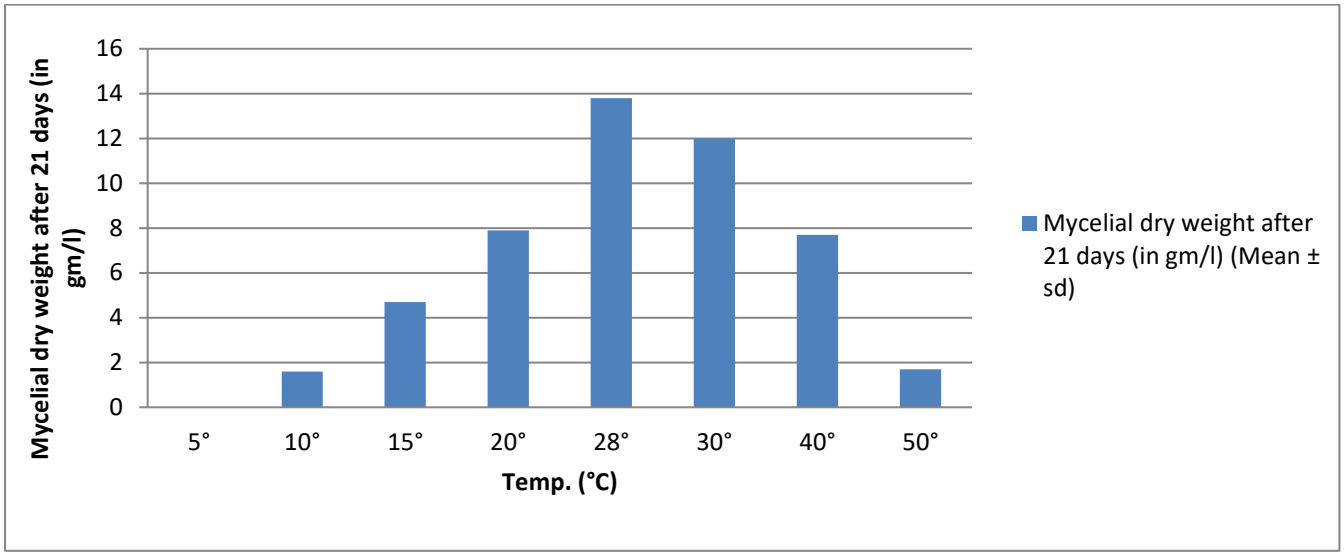
Light is having significant impact upon cellular metabolites production through changes in chemical environment.

Good mycelial growth of *Alternaria petroselini* (FCLW#23) was recorded when 24 hours of continuous darkness. It was followed by culture plates provided with alternate light and darkness of 12 hours. Radial bands of dark and light shade could be seen after 3 days of incubation in plates that were provided with light and darkness of 12 hours. Sharma *et al.* (2005) reported that mycelial growth of *Fusarium oxysprium* sp. was maximum when alternate light and darkness of 12 hours was provided. Lowest growth was seen in plates kept in 24 hours of light.

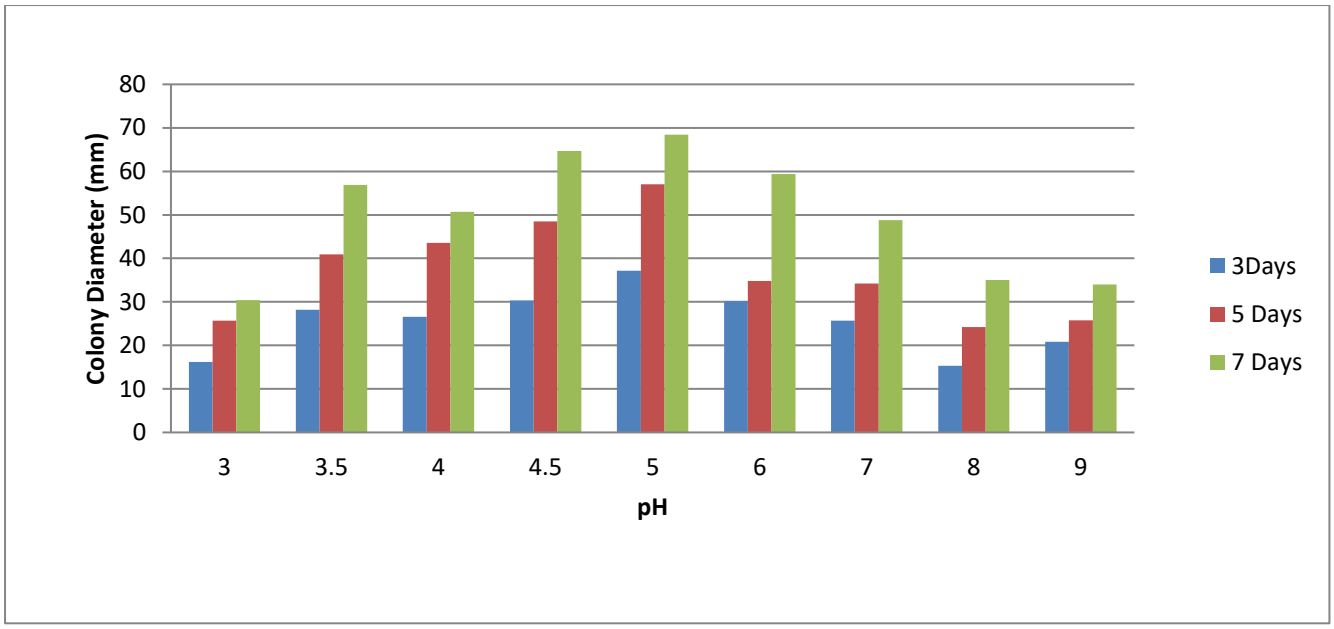
Graph (i) : Effect of temperature on growth and sporulation of *Alternaria petroselini* (FCLW#23) in solid media



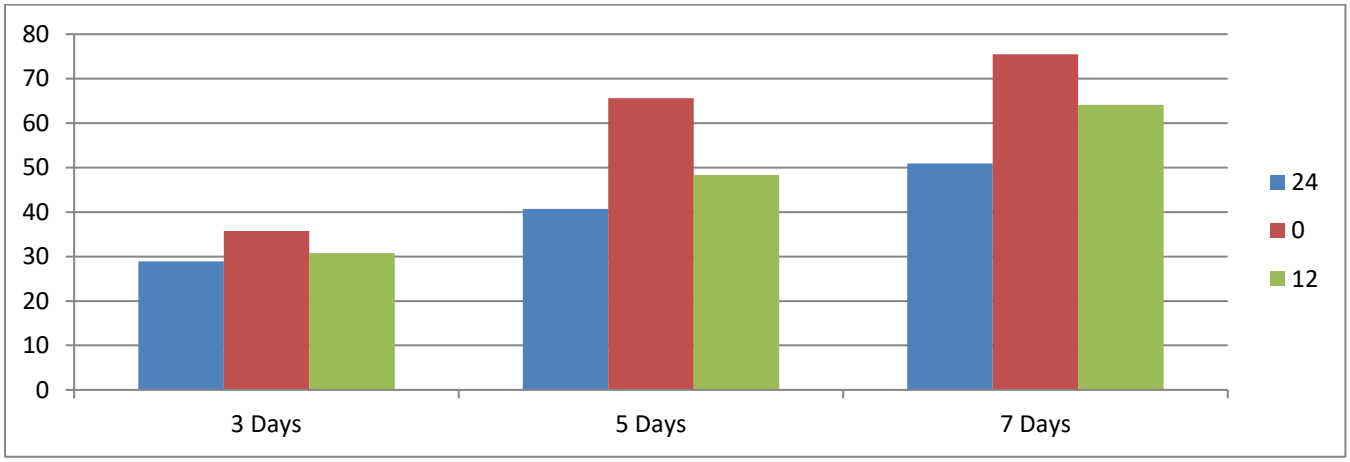
Graph (ii) : Effect of temperature on biomass production of *Alternaria petroselini* (FCLW#23) in liquid media



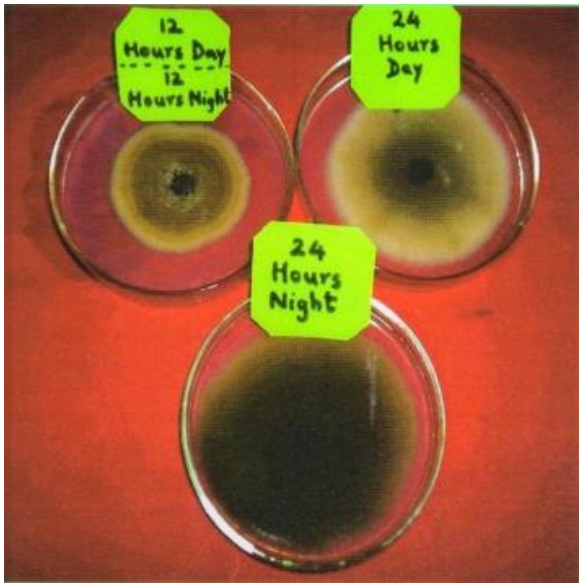
Graph (iii) : Effect of different hydrogen ion concentration on growth of *Alternaria petroselini* (FCLW#23)



Graph (iv) : Effect of photoperiods on growth of *Alternaria petroselini* (FCLW#23)



Effect of pH on biomass production of *Alternaria petroselini* (FCLW#23)



Effect of Photoperiod on growth of *Alternaria petroselini* (FCLW#23)

Effect of different liquid media on growth and sporulation of *Alternaria petroselini* (FCLW#23)

IV.CONCLUSION

On the basis of all observation, it is concluded that the effect of different factors like pH, temperature and photoperiod of the medium was played a important role for the growth of Alternaria petroselini (FCLW#23) and the physiological factors are essential for large scale production of biomass of the Alternaria petroselini (FCLW#23) for the biological management of weeds of leguminous crop.

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