

RESEARCH ARTICLE

Effect of some physiological parameters on the growth of *Fusarium oxysporium* f. sp. *carthami*

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SUMMARY

The growth of pathogen *i.e.* *Fusarium oxysporium* f.sp.*carthami* causing wilt disease of safflower. *In vitro*, studies were carried out of the nutritional requirements of the pathogen for different carbon and nitrogen sources and different levels of pH and temperatures on the growth and sporulation of pathogen. The maltose was found to be the best source of carbon for the growth of pathogen and maximum macro-conidial production was noted in starch and manitol. Among nitrogen sources the urea was best organic source for the growth of pathogen. Whereas MgNO₃ was the best inorganic source of nitrogen followed by KNO₃. Conidial production was totally absent in (NH₄)₂SO₄. The most suitable pH level for the growth of fungus was 5.0 to 7.0. The growth of *Fusarium oxysporium* was maximum at 25°C and 30°C temperature after 5 days of inoculation.

Key Words : *Fusarium oxysporium*, Safflower, Carbon, Nitrogen, pH, Temperature

How to cite this article : Shinde, Anjali B. and Hallale, B.V. (2016). Effect of some physiological parameters on the growth of *Fusarium oxysporium* f. sp.*carthami*. *Internat. J. Plant Sci.*, **11** (1): 33-36.

Article chronicle : Received : 21.07.2015; Revised : 06.11.2015; Accepted : 20.11.2015

C*arthamus tinctorius* L. commonly known as safflower or Kardi an important oilseed crop belonging to family Asteraceae of dicotyledonous plants, It is important edible oilseed crop in India. It contains about 40 per cent edible oil which has high percentage of essentials poly-saturated fatty acid and lonelic acid which helps in reducing cholesterol

level in human blood. The potential yield of this crop is affected by a number of diseases as well as seed borne pathogen. Among them wilt caused by *Fusarium oxysporium* causes heavy losses to crop (Klisiwicz, 1963; Shastry and Jayraman, 1993). Disease manifests in the form of unilateral infection on branches and golden yellow discolorations of leaves followed by wilting, vascular browning appearing on side of root and stem. Disease severity and disease incidence depend on the nutritional factor provided to the host. Therefore, studies were undertaken.

MEMBERS OF THE RESEARCH FORUM

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MATERIAL AND METHODS

Richard's medium was used as a medium for studying effect of carbon. The six carbon sources *viz.*,

glucose, fructose, maltose, sucrose, starch and manitol were used individually as a constituents of carbon sources in Richard's medium. The medium without carbon source acted as a control.

Richard's medium was used as a medium for studying the effect of nitrogen sources. Various organic sources *i.e.* leucine, cystine and urea and in inorganic sources *i.e.* KNO_3 , $(\text{NH}_4)_2\text{SO}_4$, MgNO_3 were used, 10ml media with different nitrogen sources were poured separately in sterilized Petri plates aseptically. The medium without nitrogen was used as a control. The disc of *Fusarium oxysporium* was inoculated at the center of plates. The inoculated Petri-plates were incubated at room temperature (25-30°C). The growth of fungal pathogen was recorded after five days of incubation.

The test fungus was inoculated on Richard's medium for the study of pH on the growth and sporulation of fungus. The pH was adjusted to 5.0, 6.0, 7.0, 8.0, 9.0 and 10.0. The plates were kept at room temperature (25 -30°C). The growth of fungal pathogen was recorded after five days of incubation.

The 5mm disc of fungus *Fusarium.f.sp.carthami*

was inoculated on Richard's medium and Petri-plates were kept at 5, 10,15,20,25,30 and 35°C temperatures.

RESULTS AND DISCUSSION

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads :

Effect of different carbon sources on the growth of *Fusarium oxysporium f.sp.carthami* :

The result indicates that maltose and starch showed significantly highest growth of *Fusarium oxysporium f.sp.carthami* over rest of the sources tested followed by glucose, fructose, sucrose and manitol. Similar result were noted by Raina *et al.* (1970). According to Thimmegowada *et al.* (2008) sucrose gave significantly highest growth followed by glucose. According to Sajid Farook *et al.* (2005) glucose was most favourable. The maximum macroconidial production was noted on starch. Mannitol allowed selective production of microconidia only. In the rest of the carbon sources macro and microconidia were

Table 1 : Effect of different carbon sources on the growth and sporulation of *Fusarium oxysporium f.sp.carthami*

Sr. No.	Sources of carbon	Mean colony diameter in mm	Sporulation	
			Macro	Micro
1.	Glucose	48.20	++	++
2.	Fructose	48.12	++	++
3.	Maltose	53.50	++	++
4.	Sucrose	44.30	+++	++
5.	Starch	51.04	+++	++
6.	Mannitol	42.20	+++	+++
7.	Control	55.00	++++	+++

Table 2 : Effect of different nitrogen sources on the growth and sporulation of *Fusarium oxysporium f.sp.carthami*

Sr. No.	Sources of nitrogen	Mean colony diameter in mm	Sporulation	
			Macro	Micro
Organic sources				
1.	Leucine	33.10	++	+
2.	Cystine	32.40	++++	+++
3.	Urea	40.30	++	-
Inorganic sources				
4.	KNO_3	42.36	+++	-
5.	$(\text{NH}_4)_2\text{SO}_4$	12.10	-	-
6.	MgNO_3	41.30	++++	++++
7.	control	45.60	++++	++++

in equal proportion. The differential sporulation ability in different carbon sources was also recorded by Smith *et al.* (1994).

Effect of different nitrogen sources on the growth of *Fusarium oxysporium f.sp.carthami* :

Different scientist used different nitrogen sources for their studies. Utility requirement a of different sources of nitrogen has been studied by different workers. Organic sources of nitrogen, peptone was frequently used as nitrogen sources in media (Lilly and Barnett, 1951). All amino acids were not equal in nutritional value for a fungus Sajid Farooq *et al.* (2005) reported the effect of nitrogen source on the growth of *Fusarium ciceri*. They reported peptone was found to be best of nitrogen source followed by KNO_3 . Similar observation was made by Hussain *et al.* (2003) for mycelia growth of *Scrotium rolfsii*. Sacc. Tariq *et al.* (1993) obtained maximum growth of *Botrytis glaiolorum* with KNO_3 used as nitrogen source.

In the present investigation, among the organic nitrogen sources urea was the best source of nitrogen

for the growth and sporulation followed by cystine and leucine. Among inorganic sources in KNO_3 recorded significantly highest growth of *Fusarium oxysporium f.sp. carthami*.

Effect of different pH on the growth of *Fusarium oxysporium f.sp.carthami* :

The growth of fungus was decreased by decreasing pH level from neutral level (Hayes,1978). The growth of *Fusarium oxysporium f.sp.carthami* occurred at pH7. Maximum conidial production was noted in pH 5. This fungus can tolerate a wide range of pH *i.e.* 5.0-6.5 (Shaik, 1974).

Effect of different temperature on the growth of *Fusarium oxysporium f.sp.carthami* :

It is observed that temperature 25°C and 30°C showed maximum growth and sporulation of the fungus. Similar results were noted by Werner (1990). The minimum growth was recorded at 5°C temperature. Similar result was observed by Gupta *et al.* (1986).

Table 3 : Effect of different pH on the growth and sporulation of *Fusarium oxysporium f.sp.carthami*

Sr. No.	pH	Mean colony diameter in mm	Sporulation	
			Macro	Micro
1.	5.0	41.38	++++	++++
2.	6.0	42.60	+++	+++
3.	7.0	44.80	+++	+++
4.	8.0	39.50	++	++
5.	9.0	35.30	+++	+++
6.	10.0	32.45	+++	++
7.	Control	45.83	-	-

Table 4 : Effect of different temperature on the growth and sporulation of *Fusarium oxysporium f.sp.carthami*

Sr.No.	Temperature	Mean colony diameter in mm	Sporulation	
			Macro	Micro
1.	5°C	3.00	-	-
2.	10°C	18.21	+	+
3.	15°C	30.10	++	++
4.	20°C	45.25	+++	+++
5.	25°C	52.83	+++	+++
6.	30°C	56.13	++++	++++
7.	35°C	44.25	-	-

Sporulation : +++++ -- Excellent, Sporulation:- +++ -- Good, ++ -- Fair, + -- Poor, -- -- Absent

*Mean of three replicates was calculated

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