Research Paper E-ISSN NO : 2455-295X | VOLUME : 10 | ISSUE : 5 | MAY 2024

EFFECT OF DIFFERENT WATER-SOLUBLE VITAMINS ON GROWTH OF *FUSARIUM OXYSPORUM* F. SP. *LENTIS* (VASUDEVA AND SRINIVASAN) THE CAUSAL ORGANISM OF WILT DISEASE OF LENTIL (*LENS ESCULENTA* MOENCH.)

DR. HIMANSHU BHUSHAN JARUHAR [1]

[1] DEPARTMENT OF BOTANY, SURAT PANDEY DEGREE COLLEGE, GARHWA, 822114.

ABSTRACT:

Vitamins are growth supporting organic compounds. It influences vital activities of the life such as growth and reproduction of plant and animals. Fusarium wilt is one of the serious diseases of the crops and trees all over the world. Ten water soluble vitamins were taken individually to observe their effect on mycelial growth of the Fusarium oxysporum f. sp. lentis the causal organism of wilt disease in lens esculenta Moench in two and four weeks of incubation in vitro. Pyridoxin hydrochloride was found best vitamins for mycelial growth in older incubated culture in Casein hydrolysate broth media. Riboflavin was found second best vitamin for growth accelerator. D- biotin and thiamine hydrochloride was found no significant effect on growth. Nicotinic acid was found greatest depressant followed by folic acid and P- aminobenzoic acid respectively. As the culture become older the effect become more evident.

KEYWORDS:

FUSARIUM WILT, FUSARIUM OXYSPORUM F. SP. LENTIS.

PAPER ACCEPTED DATE:	PAPER PUBLISHED DATE:
15th May 2024	18th May 2024

INTRODUCTION

The fungal kingdom constitutes highly versatile group of eucaryotic heterotrophic organism that has successfully occupied most of the natural habitat (Knogge, 1996). Most known saprophytic fungi with less than 10 percent of the known 10x105 known fungal species are able to colonize into the plants. Even a little fraction of these is capable of causing diseases.

Fungal wilt disease occurred in wide variety of economically important crops (Scheffer, 1991) and it is a major limiting factor in production of many agricultural and horticultural crops including lentil (*Les esculenta* Moench.), Erking and Bayaa, 1996.

Wilt of lentil is one of the major constraints in production of lentil in countries of Asia, Europe, Africa and middle east. In India, study of fusarium wilt was carried out by Vasudeva and Srinivasan in 1950 and the species isolated from diseased lentil wilt crop was named *Fusarium oxysporum lentis* (Padwick, 1947).

Management of fusarium wilt is achieved mainly through chemical soil fumigation and resistant cultivars. Unfortunately, resistant breeding is very difficult for this pathogen because there is lack of dominant gene isolation for this disease resistance. On the other hand, in vitro study of nutrients alteration during growth period of pathogen was found very encouraging results. The vitamins are growth supporting organic components of the essential nutrients for all the life forms. It regulates growth and physiological activities in all organism. The vitamins are required in very small quantities. Some of them are coenzymes or co factors o the metabolic reactions. As a rule, fungus have no requirements for fat soluble vitamins such as Vit. A, D, E and K (Fries, 1965, Doby, 1965).

Ten water soluble vitamins namely: Thiamine Hydrochloride, d-biotin, inositol, nicotinic acid, Ca-pantothenic acid, folic acid, pyridoxine hydrochloride, p aminobenzoic acid, l- ascorbic acid and riboflavin were taken individually to observe their effect on the growth and sporulation of the pathogen.

MATERIALS AND METHODS

The diseased samples of root and stem of the plant was used for the isolation of the organism. All standard procedure of sterilization up to seeding stage were essentially the same as described by Riker and Riker(1936). Culture medium was used for this experiment was casein hydrolysate medium 110. Some of the thermos stable vitamins such as Thiamine Hydrochloride, riboflavin, inositol and nicotinic acid were added to the basal medium and sterilization took place. Special care was taken by wrapping with black paper the flasks containing the medium and riboflavin to prevent them from being adversely affected by exposure of light. 110 The ten vitamins were added separately each to on litre of the basal medium in the following amount: Thiamine Hydrochloride (100µg), d-biotin (5 µg), inositol (5 µg), nicotinic acid (500 µg), Ca- pantothenic acid (200 µg), folic acid (500 µg), pyridoxine hydrochloride

(100 µg) and riboflavin (100 µg), p- aminobenzoic acid (5 µg), l- ascorbic acid(500 µg). all the noted quantities of vitamins were used according to Chaudhary (1971). Two sets of observation were made at the interval of two and four weeks of incubation periods and results was recoded in table 1.

TABLE 1: EFFECT OF DIFFERENT VITAMINS ON MYCELIAL GROWTH OF *FUSARIUM OXYSPORUM* F SP *LENTIS*. INCUBATION PERIODS TWO AND FOUR WEEKS

S. No.	Name of the vitamins	Incubation periods	pH of the medium	Mycelial dry weight (mg)
1	Basal medium (control)	Two weeks	6.0	2.31.36
		Four weeks	6.1	328.54
2	Thiamine Hydrochloride	Two weeks	6	241.18
		Four weeks	6.1	351.6
3	D- biotin	Two weeks	6	251.76
		Four weeks	5.9	354.23
4	Inositol	Two weeks	6	239.21
		Four weeks	5.8	337.36
5	Nicotinic Acid	Two weeks	5.5	168.40
		Four weeks	6.2	196.50
6	Ca- pantothenic acid	Two weeks	6.2	207.50
		Four weeks	6	319.11
7	l- ascorbic acid	Two weeks	6	218.10
		Four weeks	5.8	321.44
8	P- aminobenzoic acid	Two weeks	6	238.20
		Four weeks	5.9	333.08
9	Folic acid	Two weeks	6	165.21
		Four weeks	5.6	176.34
10	Pyridxine hydrochlride	Two weeks	6.1	278.45
		Four weeks	5.8	471.89
11	Riboflavin	Two weeks	6.1	266.00
		Four weeks	5.8	363.87

TABLE 2: ANALYSIS OF VARIANCE: EFFECT OF DIFFERENT VITAMINS ON DRY WEIGHT OF MYCELIUM OF *FUSARIUM OYSPORUM* F SP *LENTIS*. INCUBATION PERIODS TWO AND FOUR WEEKS.

S. No.	Source of variance	DF	Dry weight of mycelium		
			SS	MSS	F
1	BETWEEN TREATMENTS	10	2434535.00	243453.50	24.85***
2	BETWEEN PERIODS	1	106466.20	106466.20	56.83***
3	ERROR	10	42837.30	4283.73	
Cd (5% = 17.54					

*** significant at p =1%

RESULTS AND DISCUSSION

Mycelial growth was favoured best in pyridoxine hydrochloride followed by riboflavin, d -biotin, thiamine hydrochloride, inositol but p- aminobenzoic acid, l- ascorbic acid, ca- pantothenic acid, nicotinic acid and folic acid pulls down the dry weight in comparison to control. In four weeks, old incubation, pyridoxine hydrochloride was remained as the best vitamin for mycelial growth. Riboflavin slightly loosed its potency but remain as the

second best vitamin for the growth of mycelium. D-biotin and thiamine hydrochloride retained their capacities as growth promoter. P- benzoic acid, inositol and l- ascorbic acid kept mycelial growth the same as in control. Nicotinic acid and folic acid however remain inhibitor o mycelial growth. The statistical analysis of variance (table2) of the different vitamins and incubation periods was observed highly significant. For the riboflavin pyridoxine hydrochloride, folic acid, and nicotinic acid with comparison to control, treatments were highly significant. Among nicotinic acid and folic acid there was no significant difference observed. Effect of d- biotin, thiamine hydrochloride, inositol and p- aminobenzoic acid was found not significant within themselves. Significant difference was recorded within incubation period.

Reports on the study of vitamins nutrition in fungi are as numerous as they are varied. The variations are so much distinct that it leads to their classification as auxoautotrophs or auxoheterotrophs. A general review on vitamin requirement of fungi has been presented by Fries(1965). An overall picture of growth in *Fusarium oxysporum* f sp *lentis* taken as dry weight accumulated fungal mycelium at two and four wees interval was suggestive of growth promoter action of pyrimidine hydrochloride, riboflavin, thymine hydrochloride, d - biotin, inositol and p- aminobenzoic acid were moderately stimulative towards mycelial growth. Ca pantothenic acid and l- ascorbic acid were slightly inhibitory which lost its depressant effect towards the end of the four weeks old culture. Folic acid and nicotinic acid appeared to e acted as inhibitor of greatest magnitude for mycelial growth throughout the culture. Thiamine hydrochloride as an accelerator has been reported for *Fusarium oxysporum* Schlech and *Fusarium moniliforme v subglutinans* Wr and Rg.(Prasad,1972).

Thiamine hydrochloride as effective exogenous growth source was found by Sankhala *et al*,.(1967) for *Rhizoctonia bataticola*, Singh(1963b) for *Macrophomina phaseoli*. The inhibitory effect of thiamine hydrochloride was reported by Mathur *et al*.,(1949). In contrast with the findings of Sankhala *et al*., (1967) and Mathur *et al*., (1949) the mycelial growth of *Fusarium oxysporum* f sp *lentis* was enhanced by the addition of thiamine hydrochloride in the medium. A depressant effect of inositol on growth of *Verticullium alboatrum* and *Colletotrichum gloeosporiodes* has been reported by Roth and Brandt(1964). And Singh and prasad(1967a) respectively. The depressant effect of nicotinic acid was reported by Kating and Drephal (1966) on *Torulopsis utilis*. The growth was inhibited by amide of nicotinic acid in many species of Phytophthora as reported byCameron132. Thus, the nutritional study on this fungus came to the conclusion that this pathogen behaves differently with different vitamins. I required some vitamins for growth but dislikes other vitamins. Vitamins like thiamine hydrochloride, d- biotin, inositol, riboflavin and pyridoxine hydrochloride were needed for mycelial growth and on the other hand nicotinic acid, folic acid, and to some extent ca- pantothenic acid did not require for growth rather it caused inhibition. P - aminobenzoic acid and l- ascorbic acid had neither auxoautotrophic nor auxoheterotrophic role in action for mycelial growth. The inhibitory role of vitamins may further be exploited by the agricultural scientist for biotic control of the disease.

ACKNOWLEDGEMENT

The Author is very much thankful to Dr. S. K . Chadhary and Dr. Ajay prasad for prolonged cooperation during the research work on this topic and provided literature for data reviews.

REFERENCES

1. **Cameron, H.R. 1966**. Variability in the genus Phytophthora II. Effect of vitamins on growth. Phytopath. **56**:812-815.

2. **Chaudhary, S. K. 1971.** Studies of the physiology of *Fusarium oxysporum* f odum (butler) Snyder and Hansen (Causal organism of wilt of *Cajanas caja*n Millps.) Ph.D thesis, Department of Botany, Ranchi university, Ranchi pp 297

3. **Doby, G. 1965**. Plant biochemistry, interscience publishers, London, new York, Sydney. 768 pp.

4. **Erking, W ad Bayaa B. 1996.** Yield loss, incidene and inoculum density associated with vascular wilt of lentil. Phytopathol. Mediterr. **36**: 24-32.

5. **Fries, N. 1965.** The chemical environment for fungal groth. The fungi an advanced treatie Vol -I (Editors- G.C. Aninsworth and A.S. Sussman) Acad. Press, new York and London, 491-523.

6. **Kating, H. and drephal, G. 1966**. Zur wirkng von Nicotinaureamide auf das wachstum dis stickstaff-nutzung und fattsynthese bei *Endomycopis vernalis* and *Torulopsis utilis*. Arch f. milkobiol. **53**: 163-167.

7. **Leonian, L.H. and Lilly, V.G. 1938.** Studies on the nutrition of fungi. L thymine, its constituents and the source of nitrogen. Phytopathol. **28**: 531-548

8. **Mathur, R.S., Lilly, V.G. and Barnett, H.L. 1949.** Partial vitamins deficiencies of *Choletotrichum gleosporioides* in culture. Phytopath. **40**: 104-114.

9. **Padwick, G. W. 1947.** Report of the empirical mycologist. Science reporter Agric. Inst. New Delhi. 1931-**40**: 94-110.

10. **Prasad, M. 1972.** Comparative studies on the effect of vitamins on the sporulation in *Fusarium oxysporum* Schlecht. Ex fr. And *Fusaium moniliforme* var subglutinans. Mycopathol. Et. Mycol. Applicata. **46**: 367-372.

11. **Riker, A. J. and Riker, R. S. 1936** Introduction to research on plant disease. John, S. Suilft Co. N.Y. USA.

12. **Roth, J. and Brandt, W. H. 1964**. Soe effect of vtamins on growth and differentiation in vrtcillium plant Dis.Rotr. **48**: 649-652.

13. **Sankhala. M. C., Mathur, B. L. and Mathur, R.L. 1967.** Response of *Rizoctonia bataticola* to growth regulators, trace elements, and vitamins. Ind. Phytpath. **20**:142-145.

14. **Singh R. D. and Prasad N. 1967a** The influence of vitamins on growth and sporulation of few isolates of *Choletotrichum gleosporioides* Labdev. Jour. Sci. Tech. 5: 315-317.

15. **Singh, R.R. 1963b**. Effect of vitamins on growth of *Macrophomina phaseoli* (Maubl.) Asby Ind. Phytopath. **16**: 387-389.

16. **Scheffer, R. P. 1991.** Role of toxins in evolution and ecology of plant pathogenic fungi. Experimentia. **47**: 804-811.