Impact of physical factors on growth and sporulation of saprophytic pathogenic fungi

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Abstract:

The physical factors like temperature and pH having impact on growth and sporulation of saprophytic pathogenic fungi. It is well known that groups of fungi have pH optimum, minimum and maximum for fungal growth. Depletion of physical factors directly impact on growth and sporulation of fungi lowering and high temperature fungal growth will be retarded but at optimum temperature stimulating fungal growth and sporulation. Temperatures from 25^0C to 30^0C were most favorable for the growth of pathogen. The highest growth of *Alternaria porri, Aspergillus niger, Aspergillus flavus, Fusarium oxysporum, Colletotrichum circinans,*and *Penicillium corymbiferum* was recorded at 30^0C. Optimum pH 6.5 to 7.5 sporulation was good seen in *Alternaria porri, Aspergillus niger, Aspergillus flavus, Fusarium oxysporum, Colletotrichum circinans,*and *Penicillium corymbiferum.* The pH ranges 5 to 8 were found suitable to the growth of all the pathogenic fungi.

Key words: physical factors temperature and pH, pathogenic fungal spores, PDA media.

Introduction:

The physical factors having impact on growth and sporulation of pathogenic fungi. Reduction of physical factors directly impact on growth and sporulation of fungi lowering and high temperature fungal growth will be retarded but at optimum temperature stimulating fungal growth and sporulation. Similar results have been reported by several workers Rangaswami and Sambandam (1961) suggested the temperature for incubation of fungus *Alternaria alternata* at 29^0C. Saad and Hagedorn (1969) observed that the growth of the pathogen in pure culture occurred over a temperature range of 4 to 36^0C and each isolate of *Alternaria alternata* had the same optimum temperature of 28^0C. No isolate was grown well at 4 or 36^0C. Patil and Rao (1975) showed that *Alternaria tenuis* grew well in a wider range of temperature i.e. 15 to 35^0C, however temperature range of 20 to 30^0C was found favorable for good growth and sporulation. The optimum temperature was found to be 25 to 30^0C. Growth of fungus ceased at 10 and 37^0C. Dennis (1983) Low temperature storage is the most effective and practical method for delaying

the development of fungal decay. Strew, J.R., 1975, Effect of humidity on losses of bulb onion (Allium cepa L) stored at high temperature. Shinde (1995) noticed that *Alternaria alternata* was able to grow at temperature from 5 to 35^{0}C. Maximum growth and sporulation was reported between the temperature ranges of 28 to 30^{0}C. The fungus failed to grow at 0^{0}C and above 40^{0}C. Pingale (1996) studied the pathogen *Alternaria alternata* and reported that the fungus would grow from 5 to 35^{0}C temperature. Maximum growth and sporulation was observed at 28 ± 1^{0}C, while growth was not observed below 5^{0}C and beyond 40^{0}C. Optimum pH 6.0 to 7.5 sporulation was good seen in *Alternaria porri, Aspergillus niger, Aspergillus flavus, Fusarium oxysporum, Colletotrichum circinans,*and *Penicillium corymbiferum.* In general pathogens do not grow or grow very slowly, at pH levels below 4.6; but there are exceptions. Many pathogens can survive in food at pH levels their growth minima. It has been reported that *C. botulinum* was able to produce toxin as low as pH 4.2 (Smelt and others 1982). The influence of pH and temperature on initiation of growth of *Salmonella* spp. (Ferreira MASS, Lund BM.1987). The pH ranges 5 to 8 were found suitable to the growth of all the pathogenic fungi.

Material and methodology:

To study the effect of various physiological factors like temperature and pH on growth of *Alternaria porri, Aspergillus niger, Aspergillus flavus, Fusarium oxysporum, Colletotrichum circinans,*and *Penicillium corymbiferum* was observed on the Potato Dextrose agar medium. The samples were incubated at +- 5^{0}C to 40^{0}C for week and the results were observed. The samples were culture on 4- 10 pH PDA medium range for week

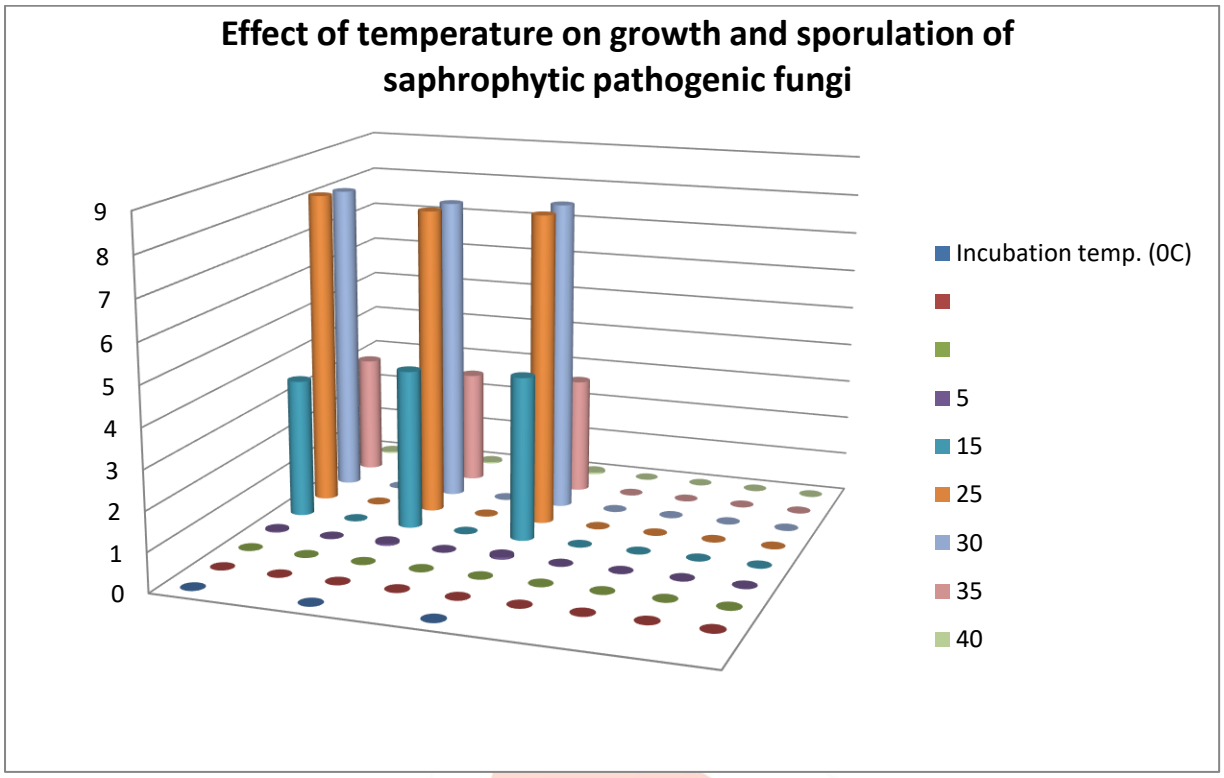
Table No. 1: Effect of temperature on growth and sporulation of saprophytic pathogenic fungi

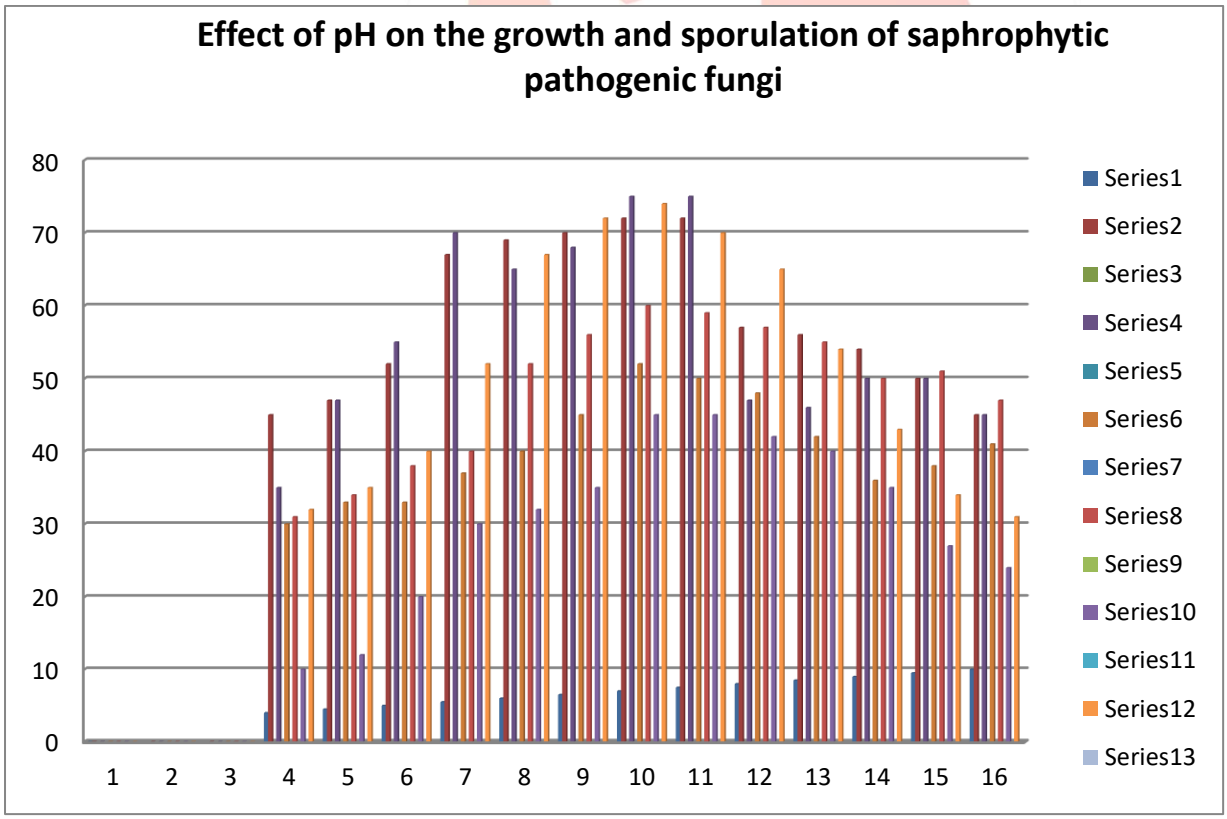
Incubation temp. (^{0}C)	*Alternaria porri*		*Aspergillus niger*		*Aspergillus flavus*		*Colletotrichum circinance*		*Penicillium corymbiferum*		*Fusarium oxysporum*	
	Growth (mm)*	Sporu-lation	Growth (mm)*	Sporu-lation	Growth (mm)*	Sporu-lation	Growth (mm)*	Sporu-lation	Growth (mm)*	Sporu-lation	Growth (mm)*	Sporu-lation
05	0.03	-	0.05	-	0.06	-	0.07	-	0.08	-	0.04	-
15	3.57	++	4.09	+	4.20	+	3.90	++	3.75	+	3.65	-
25	8.12	++	7.90	++	7.98	++	8.25	+++	8.55	++	8.75	++
30	8.00	+++	7.85	++	7.99	+++	8.00	+++	8.20	++	8.45	+++
35	3.05	++	2.90	+	2.99	++	2.80	+	2.70	+	3.10	+
40	0.04	-	0.04	-	0.05	-	0.07	-	0.08	-	0.039	-

Table No. 2: Effect of pH on the growth and sporulation of saprophytic pathogenic fungi

pH	*Alternaria porri*		*Aspergillus niger*		*Aspergillus flavus*		*Colletotrichum circinance*		*Penicillium corymbiferum*		*Fusarium oxysporum*	
	Growth (mm)*	Sporu-Lation	Growth (mm)*	Sporu-lation	Growth (mm)*	Sporu-lation	Growth (mm)*	Sporu-lation	Growth (mm)*	Sporu-Lation	Growth (mm)*	Sporu-Lation
4.0	45	-	35	-	30	-	31	-	10	-	32	-
4.5	47	+	47	+	33	-	34	-	12	+	35	+
5.0	52	++	55	+	33	-	38	+	20	++	40	++
5.5	67	+++	70	++	37	-	40	++	30	++	52	++
6.0	69	++	65	++	40	++	52	++	32	+++	67	+++
6.5	70	+++	68	+++	45	+	56	+++	35	+++	72	+++
7.0	72	++	75	+++	52	+++	60	+++	45	+++	74	+++
7.5	72	+	75	++	50	++	59	+++	45	+++	70	++
8.0	57	+	47	+	48	+++	57	+	42	+	65	+
8.5	56	-	46	+	42	++	55	+	40	+	54	+
9.0	54	-	50	-	36	-	50	-	35	-	43	-
9.5	50	-	50	-	38	-	51	-	27	-	34	-
10	45	-	45	-	41	-	47	-	24	-	31	-

* = Average of the three replication, - = No sporulation, + = Poor sporulation, ++ = Moderate sporulation, +++ = Good sporulation


Effect of temperature on growth and sporulation of saphrophytic pathogenic fungi
9
8
7
6
5
4
3
2
1
0
Incubation temp. (0C)
5
15
25
30
35
40


Effect of pH on the growth and sporulation of saphrophytic pathogenic fungi
80
70
60
50
40
30
20
10
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
Series1
Series2
Series3
Series4
Series5
Series6
Series7
Series8
Series9
Series10
Series11
Series12
Series13

Result and Discussion:

Temperatures from 25^0C to 30^0C were most favorable for the growth of these saprophytic pathogenic fungi. The highest growth of *Alternaria porri, Aspergillus niger, Aspergillus flavus, Fusarium oxysporum, Colletotrichum circinans* and *Penicillium corymbiferum* was recorded at 30^0C. Optimum pH 6.0 to 7.5 sporulation was good recorded in *Alternaria porri, Aspergillus niger, Aspergillus flavus, Fusarium oxysporum, Colletotrichum circinans* and *Penicillium corymbiferum.* The influence of pH and temperature on initiation growth of these pathogenic fungi. The influence of pH and temperature on initiation of growth of *Salmonella* spp. (Ferreira MASS, Lund BM.1987).The pH ranges 5 to 8 were found suitable to the growth of all the pathogenic fungi.

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