

JP-Microbiology

Cultural Physiology: Effect of Plant Growth Hormones on the Growth and Sporulation of *Aspergillus umbrosus*

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Article Info	Summary
Article History Received : 18-03-2011 Revised : 30-03-2011 Accepted : 03-04-2011	On the growth and sporulation of <i>Aspergillus umbrosus</i> (Bainier and Sartory) the effect of different plant growth hormones taken for studies, those were; indole-3-acetic acid (IAA), indole-3-butyric acid (IBA), naphthyl acetic acid (NAA), gibberlic acid (GA), 6-benzyl adenine (BA) and kinetin. In each case the hormones were sterilized and filtration and added in the medium in 10, 15, 20 and 25 ppm concentrations after autoclaving. Results after experiments indicated that the plant growth hormones were adverse for the growth and sporulation of the fungus.
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Introduction

Kulshreshta and Ali (1986) have reported that *Aspergillus umbrosus* possessed a good antifungal activity and could be exploited as a biofungicide. They also observed that the fungus was a difficult organism for exploitation because of a very slow rate of growth and scanty to minimal sporulation, due mainly to the prevalence of degeneration polymorphism of the conidial heads. All of this information about *A. umbrosus* evoked much interest to plan studies for understanding the physiology of its behaviour, and also to overcome constraints by suitably manipulating environment factors under cultural conditions. Plant growth hormones have been reported to exert stimulatory effect on fungal growth & activities. Brian (1960) found that most of the 25 soil fungi studied, were able to produce indole-3-acetic acid. Production of auxins and gibberellic to an appreciable extent by *A. awamori* (F18) was reported by Sattar and Gaur (1987). Effect of different concentrations of cytokinin on growth of 4 species of soil fungi viz., *Aspergillus oryzae*, *A. terreus*, *A. niger* and *Alternaria alternata* was studied, the hormone was applied singly in various concentrations, increased growth rate and biomass production revealed significant values when treated with dilute solutions of cytokinin at 15, 30 and 45 mgL⁻¹ by Nasim & Rahman (2009).

Material and Methods

Modified Richard's media was taken for experiment with pH 5, incubation period of 12 days, temperature 30°C, dry mycelium weight was taken as biomass. The different plant growth hormones taken were; indole-3-acetic acid (IAA), indole-3-butyric acid (IBA), naphthyl acetic acid (NAA), gibberlic acid (GA), 6-benzyl adenine (BA) and kinetin. In each case the hormones were sterilized and filtration and added in the medium in 10, 15, 20 and 25 ppm concentrations after autoclaving. After the addition of plant growth hormones, medium was sterilized by filtration through Millipore bacteriological filters (Pore size 0.45µm, Sartorius, SM. 11306).

Results

Studies on *A. umbrosus* has shown that the plant growth hormones IAA, NAA, IBA, GA, BA and K were found to be inhibitory in all cases, for growth and sporulation as compared with control taken (modified Richard's medium – without plant growth hormones), they also effected the fungus in morphological features of its colony and exudation of secondary metabolites. Secretion of secondary metabolites also mentioned in the form of exudates which were experimented to show as reverse coloration in the broth medium. Results also indicated that IAA had the most inhibitory than in comparison with kinetin out of six plant hormones experimented. (Table and fig.)

Table: - Effect of plant growth hormones on growth and sporulation of *Aspergillus umbrosus*

S.No.	Name of the plant growth hormone	Concentration of the plant growth hormone (in ppm)	Growth (biomass in mg/25 ml)	Degree of sporulation	Reverse coloration
1.	Indole 3-Acetic Acid (IAA)	10	71	2 ⁺	Greenish
		15	79	2 ⁺	Greenish
		20	68	2 ⁺	Greenish
		25	65	2 ⁺	Greenish
2.	Naphthyl Acetic Acid (NAA)	10	44	1 ⁺	Greenish
		15	97	2 ⁺	Greenish
		20	84	2 ⁺	Light yellow
		25	50	2 ⁺	Light yellow
3.	Indole 3-Butyric Acid (IBA)	10	104	2 ⁺	Greenish
		15	106	2 ⁺	Greenish
		20	76	2 ⁺	Greenish
		25	108	2 ⁺	Greenish
4.	Gibberellic Acid (GA)	10	154	2 ⁺	Light brown
		15	138	2 ⁺	Light brown
		20	132	2 ⁺	Light brown
		25	159	2 ⁺	Light brown
5.	6-Benzyl Adenine	10	145	2 ⁺	Light brown
		15	141	2 ⁺	Light brown
		20	170	2 ⁺	Light brown
		25	113	2 ⁺	Light brown
6.	Kinetin	10	141	2 ⁺	Light brown
		15	170	2 ⁺	Light brown
		20	207	2 ⁺	Greenish brown
		25	152	2 ⁺	Light brown
7.	Control (Modified Richard's Medium, without plant growth hormone)	-	338	4 ⁺	Dark brown

Degree of Sporulation: 1⁺ = V. poor. 2⁺ = Poor. 3⁺ = Moderate. 4⁺ = Good.
Incubation period = 12 days. Temperature = 30° C. pH = 5.

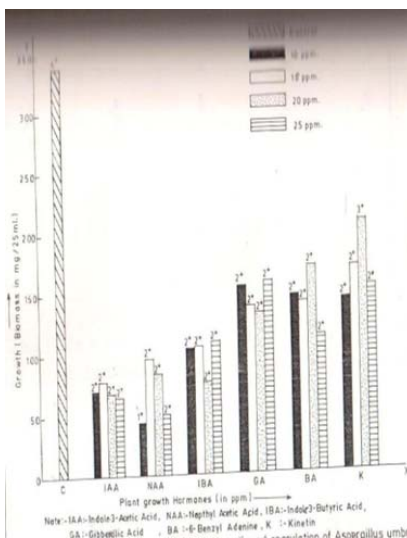


Fig.: Effect of plant growth hormones on growth and sporulation of *Aspergillus umbrosus*. Superscript on bar is degree of sporulation

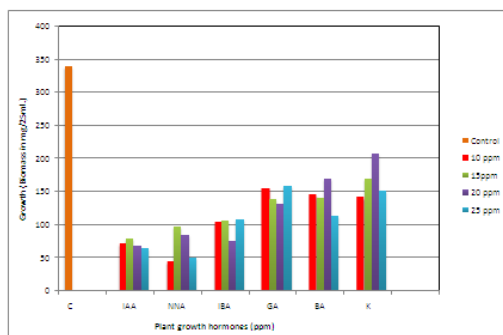


Fig. - Effect of plant growth hormones on growth and sporulation of *A. umbrosus*.
Note: - IAA: - Indole-3-Acetic Acid, NAA: - Naphthyl Acetic Acid, IBA: - Indole-3-Butyric Acid, GA: - Gibberellic Acid, BA: - 6-Benzyl Adenine, K: - Kinetin, C: - Control (without plant growth hormone)

Discussion and Conclusions

Farag *et. al.* (1987) reported the growth and aflatoxin production by *A. parasiticus* in synthetic medium containing plant hormones, herbicides or insecticides. They observed that addition of indole-acetic acid to the medium increased aflatoxin production more than gibberellic acid. Bucio-Villalobos, *et. al.* (2005) evaluated the effect of plant growth hormones, Gibberellic and Jasmonic acids, invitro to determine their effect on growth, differentiation and mycotoxins synthesis in *A. nidulans* and *A. parasiticus*, resulted that jasmonic acid 1mM had no effect on both fungal species. Gibberellic acid had a stimulatory effect on mycotoxin synthesis in the fungi, they also resulted that the growth factor 2,4-dichlorophenoxyacetic acid had no effect in any of the evaluated parameter in *A. nidulans*, however high concentration of this compound decreased all the parameters in *A. parasiticus* & *A. nidulans*. Experiments concluded with the present studies indicated that the effect of plant growth hormones was found to be adverse for the growth and sporulation of *A. umbrosus*, formation of secondary metabolites as exudated in the medium were also adversely affected in all cases.

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