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Production of IAA by earthworm-borne fungi

B. Vijayapal Reddy, K. Narsihma Rao*, Darcusjoy and S. M. Reddy

Department of Botany, Kakatiya University, Warangal

ABSTRACT

Production of Indole acetic acid (IAA) by earthworm borne fungi were studied in two different media (Asthana Hawker's medium A and Asthana Hawker's medium A with Tryptophan in place of potassium nitrate). B. terricola, C. cucurbitarum, G. roseum, S. tessarthra, U. botrytis, and V. chlamydosporum were produced IAA in the absence of precursor. No correlation could be observed between the IAA production and vegetative growth.

Key words : Indole acetic acid (IAA), earthworm-born fungi, Asthana Hawkar's medium.

INTRODUCTION

Auxins are reported to increase the fermentative capacities of micro organisms. IAA was recognised as metablic product of bacteria by salkowiski when cultured on the peptone medium. This was subsequently confirmed by biochemists. Herter [1] suggested the presence of auxin in *celtis reticclora*.

Nielson [2] reported that the growth of *Absidia* remosa and *Rhizopus suinus* contained a substance which promoted the growth of *Avena coleoptiles*. This substance was thought to be IAA, although no chemical evidence was thought to be IAA, Until Thimann [3] was first to isolate to and crystallize IAA from the cultures of *R.Suinis*. Since then a wide variety of microorganisms such as bacteria and fungi one reported to synthesize IAA in different ecological niches such as pathogenesis [4]. Mycorrhizae [5], rhizosphere [6] and phyllosphere; [7]. Strains of microorganisms are reported to differ in their capacity to produce IAA. Tryptophan as a precursor of IAA in fungi was first reported by Thimann [3], and Farah Ahmad et.al. The production of IAA by large number of fungi [8-10]. However, no such information is available on production of IAA by earthworm – borne fungi. Hence it was considered worthwhile to study the production of IAA by some earthworm-borne fungi.

MATERIALS AND METHODS

IAA synthesizing capacity of different earth worm-borne fungi table-1 (*A, phaeospernum, B. ferricola, C.culurgitum, G.nurorum, G.nurorum Var. Pdychrona, G.Macrocladum, H.qurantiacum, N.crassa pithomyces maydicus, P.terrestris, S. terrsrtha, T.roseum, U.botrytis, V.chalmydosporuous and V.dahliae)* was studied by growing them in Asthana and Howker's medium A with and without DL-tryptophan. Twenty five ml of medium was taken in 250 ml Ehrlenmyerflask and incubated the fungus after sterilization at 15 lbs pressure for 30 min and incubated at 27±2ºc for 15 days.

At the end of 3, 6, 9 and 12 days of incubation the cultures were harvested. The pH of the medium was recorded, biomass and IAA produced was determined. To 2 ml of culture filtrate, 8 ml of Salkowskii's reagent was added and incubated in dark for 30 minutes. The intensity of colour thus developed was read at 540nm. The amount of IAA in broth was calculated from the standard curve. Rest of the details were similar to those described earlier drawn for IAA.

RESULTS AND DISCUSSION

Table 1 reveals that *A.phaeospermum* failed to produce IAA in Medium A but the addition of tryptophan resulted in the production of IAA which increased with the progress of incubation period. *B.terricola* synthesized IAA in Medium A which decreased after 6th day but again increased by 12th day of incubation period. But addition of tryptophan resulted in increased IAA production till the end of incubation period tried. *Choanephora cucurbitarum* elaborated IAA in increasing quantity with the progress of incubation period in Medium A which, further increased in the presence of tryptophan. *G.roseum* also produced significant amount of IAA in medium A. Addition of tryptophan resulted further increase of IAA production. *G.murorum* var. *polychrome, G.macrocladum, H.aurantiacum, N.crassa, P.maydicus, P.terrestris and V.dahliae* failed to produce IAA even in the presence of tryptophan. *S.tessarthra* could elaborate IAA in medium A in increasing amount with the advancement of incubation period. *U.botrytis* also produced almost same amount of IAA in both the media suggesting constitutive production of IAA by this organism. *V.chlamydosporum* also produced increasing amount of IAA with the advancement of incubation period. However, on 6th day no IAA could be detected in medium A. All the fungi under investigation accomplished good mycelial growth which increased with the advancement of incubation period. With a few exceptions either 9 or 12 days of incubation was optimum for the vegative growth of fungi under investigation. The pH shift was towards alkaline side and the final pH was around 7.0 to 7.5. When *G.macrocladum* and *H.aurantiacum* opted Medium A for IAA production, while *P.terrestris, B.terricola, A.Phaeospermum, V.dahliae, C.cucurbitarum, S.tessarthra, U.botrytis* and *V.chlamydosporum* opted Medium B for vegetative growth.

Critical perusal of table reveals that *B.terricola, C.cucurbitarum, G.roseaum, S.tessarthra, U.botrytis* and *V.chlamydosporum* produced IAA even in the absence of precursor, suggesting constitutive nature. Narania and Reddy [10] and Reddy and Reddy [8] have also reported the production of IAA even in the absence of precursor, while Charya and Reddy [7] have reported production of IAA only in the presence of tryptophan by the fungi studied by them. No correlation could be observed between the IAA production, vegetative growth and pH changes.

Table-1: Growth (mg/ml) pH changes and Indole acetic acid (IAA) productions by some earthworm-borne gungi.

Name of the fungus	3						6						9						12					
	*MA			**MB			MA			MB			MB			MB			MB			MB		
	Dry wt. (mg/ml)	pH	IAA (µg/ml)	Dry wt. (mg/ml)	pH	IAA (µg/ml)	Dry wt. (mg/ml)	pH	IAA (µg/ml)	Dry wt. (mg/ml)	pH	IAA (µg/ml)	Dry wt. (mg/ml)	pH	IAA (µg/ml)	Dry wt. (mg/ml)	pH	IAA (µg/ml)	Dry wt. (mg/ml)	pH	IAA (µg/ml)	Dry wt. (mg/ml)	pH	IAA (µg/ml)
Athrinium phaeospermum	0.4	6.8	-	0.5	6.8	40.0	0.7	7.0	-	0.7	7.0	65.0	1.3	7.5	-	2.0	7.0	105.0	1.6	7.5	-	3.2	7.5	210.0
B.terricola	0.6	6.8	45.0	0.7	6.8	35.0	0.9	7.0	45.0	0.7	7.1	55.0	1.3	7.5	30.0	1.3	7.1	30.0	1.1	7.0	50.0	1.7	7.2	130.0
Choanephora cucurbitarum	0.4	6.0	30.0	1.3	7.0	45.0	0.4	7.1	45.0	1.6	7.1	60.0	2.1	7.5	45.0	2.0	6.8	80.0	1.2	7.0	140.0	2.0	7.1	185.0
Gliocladium roseum	0.4	6.8	45.0	0.9	7.0	50.0	0.4	6.8	50.0	0.7	7.2	75.0	1.6	7.2	90.0	1.4	7.1	115.0	1.3	7.2	165.0	1.7	7.5	210.0
G.murorum var.plychroma	0.4	6.8	-	0.4	6.8	35.0	0.9	7.1	-	1.0	7.0	70.0	1.0	7.0	-	1.2	7.1	100.0	1.3	7.1	-	2.6	7.5	235.0
G.macrocladum	0.7	6.5	-	1.3	6.8	-	1.0	7.1	-	1.4	6.8	30.0	1.3	7.0	-	1.7	6.8	75.0	2.3	7.2	-	1.5	7.5	150.0
Heterocephalum aurantiacum	0.5	6.8	-	1.2	7.1	-	0.9	7.5	-	1.0	7.0	-	2.0	7.5	-	2.1	7.1	10.0	2.8	7.0	-	2.3	7.5	10.0
Neurospora crossa	0.4	6.8	-	1.0	6.8	30.0	1.3	7.2	-	1.2	7.0	70.0	1.7	7.0	-	1.6	7.2	90.0	2.0	7.1	-	1.7	7.5	195.0
Neurospora maydicus	0.4	6.8	-	0.4	7.1	35.0	1.0	7.1	-	1.0	7.2	60.0	1.7	7.5	-	1.2	7.2	80.0	1.2	7.0	-	1.3	7.0	145.0
Pencillum terrestris	0.6	6.5	-	1.3	6.8	-	1.0	7.0	-	1.7	7.1	75.0	2.0	7.5	-	1.7	7.2	75.0	1.3	7.2	-	2.6	7.1	170.0
Spearazzinia tessarthra	0.5	6.5	35.0	1.3	7.0	45.0	0.9	7.0	45.0	1.7	7.2	60.0	1.4	7.5	60.0	2.3	7.5	75.0	1.0	7.1	125.0	3.3	7.5	120.0
Trichothecium roseum	0.5	6.8	-	1.2	7.1	40.0	1.2	7.2	30.0	0.9	7.0	75.0	1.6	7.5	-	1.3	7.2	95.0	1.6	7.0	-	1.7	7.5	205.0
Vulocladium spp.	0.4	6.8	15.0	1.0	7.1	30.0	0.9	6.8	50.0	1.1	7.2	35.0	2.1	7.5	60.0	2.1	7.2	65.0	2.1	7.1	110.0	2.6	7.5	115.0
Verticillium chlamydosporum	0.7	6.5	30.0	1.3	7.0	30.0	1.1	7.5	-	1.6	7.1	60.0	1.3	7.5	60.0	2.0	7.5	65.0	2.3	7.2	160.0	3.1	7.5	190.0
Verticillium dahliae	0.4	6.8	-	0.6	7.1	40.0	1.0	6.8	-	1.0	7.0	65.0	1.2	7.4	-	0.7	7.5	75.0	2.1	7.1	-	2.9	7.5	170.0

**MA = Asthana Hawker's medium A.*

***MB = Asthana Hawker's medium A. with Tryptophan in place of Potassium nitrate.*

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