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PHYTOHORMONE PRODUCTION BY DIA/OTROPHS ASSOCIATED WITH PLANTATION AND ORCHARD CROPS

Nitrogen fixing bacteria such as *AzospiriHum* and *Azotobacter* are known to produce different types of phytohormones like indole acetic acid (IAA), gibberellins and cytokinins (Brown and Burlingham, 1968; Abbas and Okon, 1993). In the present investigation, the ability of 18 isolates of *Azospirillum* and *Azotobacter* to produce IAA was studied under *in vitro* conditions. These diazotrophs were initially isolated from the rhizosphere of seven different plantation and orchard crops such as pepper *(Piper nigrum* L.), clove *(Eugenia caryophyllus* [Spregall Bullock et Hassison), nutmeg (*Myristicafragrans* Hout), mango (*Mangiferaindica* Scarrone), jack (*Artocarpus heterophyllus* Raub), cashew (*Anacardium occidentale* Scarrone) and cocoa (*Theobroma cacao* L.) grown at the Instructional Farm of the College of Agriculture, Vellayani, Trivandrum.

The *AzospiriHum* and *Azotobacter* cultures were grown respectively in modified malate and Jensen's nitrogen free broth supplemented with 100 ppm L-tryptophan. The quantitative estimation of IAA was done by the method of Gorden and Paleg (1957) on 7th, 14th and 21st day of culture growth by using a colorimeter at 535 nm. An isolate of *AzospiriHum brasilense* from the Tamil Nadu Agricultural University, Coimbatore and *Azotobacter chroococcum* from Indian Agricultural Research Institute, New Delhi were used as standard reference cultures.

The production of JAA by most of the isolates of *AzospiriHum* attained a peak level during the second week of culture growth. The quantity of IAA produced, 67.5 µg / ml of medium on 14th day was maximum for an isolate of *A. lipoferum* (No.34) from the rhizosphere of Karimunda variety of pepper (Table 1). This was followed by other cultures such as Isolate 30 from mango variety Mundappa (50.5 µg / ml). Isolate 18 from pepper variety Kuthiravaly (48.6 µg / ml) and the standard culture of*A. brasilense* (45.4 µg / ml). However, in the case of certain isolates like No.6 from *Piper colubrinum* and 31 and 32 from mango varieties Pairi and Malgao (S-2), the production of IAA was more on 21st day of culture growth. A similar trend was also observed with different isolates of *Azotobacter.* But the net quantity of IAA produced was less as compared to that of isolate 34 from Karimunda. It varied from 6 to 28 µg *I* ml of culture broth. This type of natural variations in the production of phytohomiones by bacteria have been reported earlier also by

Table 1. Production of IAA (µg ml^{-1})* by *Azospirillum and Azotobacter* spp.

Crop	Isolate No.	Incubation period		
		7D	14 D	21 D
I. *AzospiriHum*				
A. Pepper				
Karimunda	34	45.1	67.5	37.6
Kuthiravaly	18	28.1	48.6	41.9
Panniyur 1	9	31.1	38.4	17.6
Panniyur 3	7	0.0	10.3	10.0
Panniyur 4	23	0.0	4.6	0.0
Piper colubrinum	6	0.0	6.5	10.3
B. Mango				
Malgoa S1	2	7.8	12.2	3.2
Malgoa S2	32	0.0	6.8	7.6
Mundappa	30	36.5	50.5	35.1
Pairi	31	1.6	16.2	22.9
Suvarnareka	33	0.0	11.6	2.7
C. Jack	39	0.0	1.1	0.0
D. Clove	43	0.0	12.2	10.3
E. Nutmeg	36	2.7	19.2	14.1
F. Cashew	25	0.0	4.6	0.0
G. Cocoa	17	0.0	5.4	11.4
H. *A. brasilense*	TN	33.3	45.4	30.8
II. *Azotobacter*				
A. Panniyur 3	40	4.0	4.0	6.0
B. Jack	39	22.0	22.0	28.0
C. *A.chroococcum*	IARI	13.0	15.0	17.0

* Mean of three **replications**

Lee *et al.* (1970) and Crozier *et al.* (1988). This appears to be an inherent genetic characteristic of a particular strain of bacterium and is not much influenced by external factors such as soil, crop and weather conditions.

One of the significant effects of phytohormone production by *Azospirillum* and *Azotobacter* is that it will induce higher root biomass production in inoculated plants. This has been observed in many crops like tomato and lettuce (Barea and Brown, 1974), rice (Dewan and Rao, 1979), peal miller (Venkateswarlu and Rao, 1983), pepper (Govindan and Chandy, 1985) and wheat (Kapulnik *et al*, 1985). Therefore, it is essential to take into consideration the phytohormone producing ability of diazotrophs also as an important criterion for the selection of efficient cultures of *Azospirillum* and *Azotobacter* for mass production of biofertilizers. The use of such cultures will ensure better establishment and growth of inoculated plants.

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