

FACTORS IMPELLING PLANT GROWTH: A PROSPECTIVE MODEL PRACTICAL IN MANGO (*Mangifera indica* L.) SAPLING

Debojyoty Ghosh

Research Assistant, Sundarban Tiger Reserve

E-Mail: debojyotyghosh@gmail.com

Abstract

Detection of some possible controlling factors of growth and development of mango seedlings collected from the West Bengal State University campus was the prime objective of the study. Total weight (TW), Cotyledon weight (CW), stem with leaf weight (SWL), Stem height (SH), number of photosynthetic leaves (PHOL) were measured/counted. Different pH levels viz. shoot apex pH (SA pH), root apex Ph (RA pH), and the cotyledon pH (CL pH) were measured. SA pH and SH also gives a positive correlation between them, it means Stem height is dependent on Shoot apex pH. RT pH and SH also give a positive correlation, indicating that auxin is an important factor which controls plant growth.

Keywords: growth factors, auxin, plant growth parameters, pH, seedling growth

Introduction

Various factors are responsible for growth and development in plants, viz. hormones, cotyledon weight, photosynthetic leaf area etc. Detection of some possible controlling factors for mango seedling development was the prime objective of the study.

Material and Methods

Small mango seedlings (*Mangifera indica* L.) are collected from the West Bengal State University campus (22.73⁰N, 88.43⁰E) and Ramakrishnapur region (22.72⁰N, 88.49⁰E) of North 24 Pgs district in a random manner. All the saplings were attached with green cotyledons. Total weight (TW), Cotyledon weight (CW), stem with leaf weight (SWL), stem without leaf weight (SOL) etc are measured by using Sartorius weight machine (model: BSA2245-CW). Stem height (SH) is measured by using plastic scales. Number of photosynthetic leaves (PHOL) were also counted.

Plant hormones, especially auxin has an important role in seedling development [1, 2]. Auxin is mainly found in meristematic tissues for plant growth. Different pH levels viz. shoot apex pH (SA pH), root apex Ph (RA pH), and the cotyledon pH (CL pH) are measured by using the pH papers (MARK) and digital pH meter. Statistical works and the graphs are made by using MS-

Excel 2007. Previous works were based on *Arabidopsis* spp. and some model plants, but the present study is focused on the growth and development of mango saplings according to the availability inside the university premises and associated areas.

Results and Discussion

The study showed that the mean values of SA pH, CL pH and RT pH are 5.23, 4.57 and 5.03 respectively (Figure 1). But the overall study on mango seedlings depicts the mean pH value of acidic hormone (auxin in meristematic tissues) is 4.94. The reported pKa value of Indole Acetic Acid (auxin) ranges between 4.60 and 4.75 [3].

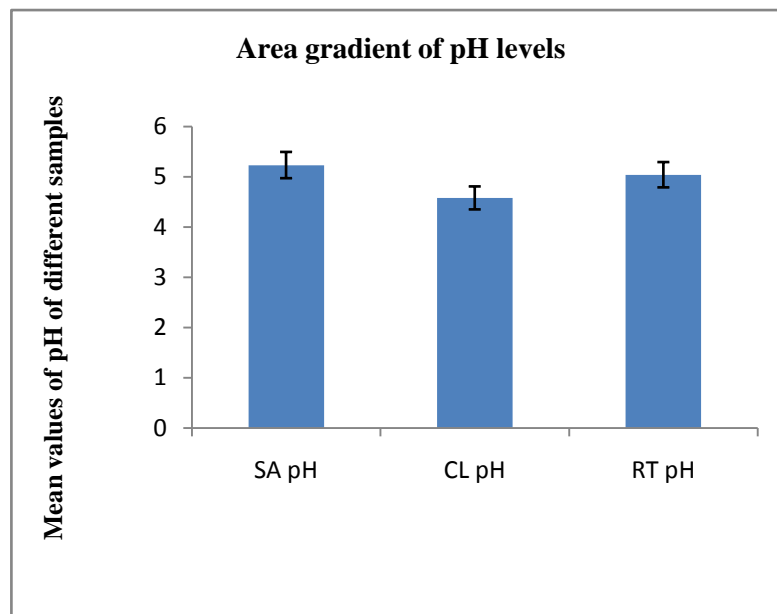


Figure 1. Area gradient pH level with standard deviation

A Pearson correlation is executed (Figure 2), between CW and leaf area of the sample seedlings. SA pH and SH also gives a positive correlation between them, it means Stem height is dependent on Shoot apex pH. RT pH and SH also gives a positive correlation, indicating that auxin is an important factor which controls the plant growth. A partial positive correlation is observed between CW and SH [4]. There is a positive correlation existing between CW and SH in the study of the growth of the mango seedlings.

There is also a positive correlation observed between stem height (SH) and leaf area in the seedlings, means if the stem height is increasing, the photosynthetic area (i.e. leaf area) is also increasing [5,6].

	TW (g)	CW (g)	SWL (g)	SOL (g)	SH (cm)	Leaf Area (cm ²)	SA pH	CL pH	RT pH	PHOL
TW (g)	1									
CW (g)	0.843952676	1								
SWL (g)	0.571128338	0.115492485	1							
SOL (g)	0.432366591	0.035436392	0.837067	1						
SH (cm)	0.574804845	0.302036	0.705052	0.672255	1					
Leaf Area (cm ²)	0.008872166	-0.014432659	0.102742	-0.11353	0.312281874	1				
SA pH	0.124237901	0.256665045	0.133215	0.1407	0.227382585	-0.032395923	1			
CL pH	0.173231173	0.255453644	0.262481	0.210253	0.271370571	-0.017704402	0.939715943	1		
RT pH	0.079528779	0.168264037	0.174489	0.220837	0.310573956	0.004705852	0.927125378	0.9308906	1	
PHOL	0.169653119	0.02920333	0.314356	0.467333	0.265535467	-0.37914011	0.369870498	0.30525704	0.418335	1

Figure 2: Pearson correlation matrix of the total data, showing the positive and negative correlation between the studied parameters

References

1. Matilla, AJ. Auxin: Hormonal Signal Required for Seed Development and Dormancy. *Plants (Basel)*. 9(6):705 (2020).
Published 2020 Jun 1. doi:10.3390/plants9060705
2. Figueiredo DD, Köhler C. Auxin: a molecular trigger of seed development. *Genes Dev*. 32(7-8):479-490 (2018).
doi:10.1101/gad.312546.118
3. Raven, J. A. Transport of indoleacetic acid in plant cells in relation to pH and electrical potential gradients, and its significance for polar IAA transport. *New Phytol*. 74:163-172 (1975).
4. Zar, J.H. *Biostatistical Analysis*, Pearson Education, Chap 17 (2010).
5. Sen, S. and Mukherji, S. Seasonal changes in growth characteristics in *Abelmoschus esculentus* (L.) Moench and *Lycopersicon esculentum* Mill. *Indian Biol*. 30(2) : 60-66 (1998).
6. Sen, S. and Mukherji, S. Changes in photosynthetic parameters in *Abelmoschus esculentus* (L.) Moench as affected by seasonal environmental conditions. *Asian J. Microbiol. Biotech. Env. Sc*. 1(3-4) : 157-161 (1999).