



## EFFECT OF VARIETY AND POULTRY MANURE LEVELS ON MOISTURE STRESS OF PAPAYA (*Carica papaya*) SEEDLINGS

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### ABSTRACT

A field experiment to determine the effect of variety, moisture stress and poultry manure levels on the growth of papaya seedlings was conducted during the 2023 and 2024 dry seasons at Tafawa Balewa Road, Federal Low-cost Housing Estate Bauchi, Bauchi State, Nigeria. The treatments consisted of five Poultry manure levels (0.0kg, 0.2kg, 0.4kg, 0.6kg and 0.8kg) and two varieties of papaya seedlings (Calina IPB9 True Dwarf and Sun Grads). These were factorially combined and arranged in a randomized complete block design (RCBD) with three replications. The results revealed that, the treatment significantly ( $P \leq 0.05$ ) affected plant height with poultry manure level (0.8kg) having a taller plants in 2023. However, in 2024 poultry manure level of 0.8kg/pot gave taller plants only at 8 and 10 weeks respectively. There was a significant ( $P \leq 0.05$ ) effect on the number of leaves where poultry manure rate of 0.2kg gave a higher number in 2023, 0 and 0.2kg at 8 weeks and 0.8kg at 12 weeks in 2024. A significant ( $P \leq 0.05$ ) effect of the treatments was recorded on stem girth at 8 and 10 weeks with poultry manure level of 0.8kg having bigger stem girth at 2023. Poultry manure levels of 0.2kg at 12 weeks in 2023 and 0.6kg/pot at 4 weeks recorded statistically ( $P \leq 0.05$ ) higher node numbers. Furthermore, there was a significant ( $P \leq 0.05$ ) effect in moisture stress where poultry manure level of 0.2kg showed higher remaining leaves (RML), taller plants (0.6kg), bigger stem girth (0.6kg and 0.8kg), and higher dry matter weight (0.2kg) in 2023. In 2024, 0.6kg poultry manure level records higher nodes ( $P \leq 0.05$ ) with no significant difference in the remaining measured parameters. The application of cured poultry manure at 0.2kg, 0.6kg and 0.8kg levels enhanced growth performance and resistance to moisture stress of the papaya seedlings. Trials with other organic manure as a source of nutrients are therefore recommended.

**Keywords:** Variety, Moisture, Stress, Poultry, Manure

### INTRODUCTION

Papaya (*Carica papaya* L.) is a tropical fruit, said to be a native to Central and South America and cultivated around the world (FAO, 2019). Papaya has spread to different areas of the planet, due to its ease of cultivation and production all year round. In 2019, the world production of papaya reached 13 million tons, with India, Brazil, Mexico, Indonesia, Dominican Republic and Nigeria being the largest producers (FAO, 2019). Brazil is the third largest world producer with 1 million tons in 2019, second only to India having 5.7 million tons in the same year (FAO, 2019). Moisture stress in vegetative stage less important than in reproductive stage of stress and the impact on yield and its yield attributes. However, since the stress at this stage of growth and development of plant, photosynthesis and the accumulation of most importance is the effect in plant (Kabiri, 2014). Water shortages condition, with the disappearance of cells, disrupted physiological processes of plants, plant growth, photosynthesis, stomatal closure, changes in metabolism of plants and dying plants (Yadav, *et al.*, 2011). Seedling production is one of the most important stages in papaya growing. The substrate and the volume of containers influence seedling formation, providing appropriate conditions for germination and root system growth (Mesquita *et al.*, 2012). In this sense, the choice of a substrate that meets the nutritional and physical requirements of seedlings, as well as is accessible to the producer, is directly linked to the success of the crop (Siqueira, *et al.*, 2012). Thus, low-cost alternative materials that can be used in the constitution of new substrates have been sought, e.g., agricultural and industrial wastes. With the use of these materials, costs can be reduced and seedling quality enhanced.



Organic manure represents a strategy for improving plant growth conditions, as its properties increase water and nutrient retention in the soil and improve plant productivity, in addition to bringing benefits to the environment. Calina Papaya is a native Indonesian fruit. This variety is the result of the breeding of IPB University researchers. This papaya is widely planted by farmers in various regions throughout Indonesia because of its multiple advantages and high market demand. Small papaya with an average weight of 1.3 kilograms per fruit sold in supermarkets, labelled as "California papaya". This papaya has been exported to foreign countries including Malaysia and Singapore (IPBU, 2018). The thing that makes Calina papaya favored by consumers and dominates the fruit market is its sweet taste, thick and soft meat, unprocessed, red in color, and not emitting a distinctive papaya aroma. In addition, the fruit is not too large and can be spent in a single meal, so there is no need to bother storing the cut papaya in the refrigerator (IPBU, 2018). The study aimed to examine the Effect of Variety, Moisture Stress and Poultry Manure on Growth of Papaya (*Carica Papaya*) Seedlings.

## **MATERIAL AND METHODS**

### **Experimental Site**

A field experiment was conducted during 2023 and 2024 at Tafawa Balewa Road, Federal Low-cost housing Estate Bauchi, located at approximately  $10^{\circ} 26^1$  latitude and longitude of  $9^{\circ} 48^1 42E$  and about 586meters above sea level, in the Northern Guinea Savanna Agro-ecological zone of Nigeria.

### **Treatments and Experimental Design**

The treatments consisted of five poultry manure levels (0.0kg, 0.2kg, 0.4kg, 0.6kg and 0.8kg) and two varieties of papaya seedlings, factorially combined and laid out in a randomized complete block design (RCBD) with three replications. The effect of moisture stress was measured at the end of the experiment by subjecting the seedlings to a drought period of one month which was uprooted and root parameters were measured. Throughout the experiment irrigation interval of two days was maintained.

### **Experiment Materials and their Sources**

The polythene bags used for the experiments were obtained from Wunti market in Bauchi. Variety Calina IPB9 True Dwarf and Sun Grads papaya were purchased from Jos, Plateau State. The poultry manure used was purchased from BSADP, Bauchi State.

### **Data on Moisture Stress**

The effect of moisture stress was measured at the end of the experiment by subjecting the seedlings to a drought period of one month which was uprooted and root parameters were measured.

### **Data Analysis**

All data collected were subjected to statistical analysis of variance (ANOVA) using IBM statistically package for social science (SPSS) software to test the treatment effect for their significance (Snedecor and Cochran, 1967). DMRT (Duncan Multiple Range Test) was used to separate the significantly different means and their interactions.

## **RESULT AND DISCUSSION**

### **Effects of Moisture Stress on Remaining Leaves, Seedling Height, Stem Girth and Number of Nodes**

Table 1 shows the effect of variety, moisture stress and poultry manure levels on papaya seedlings during the 2023 and 2024 dry seasons. The result shows that, the two varieties in terms of remaining leaves, seedling height, Stem girth and Number of node of papaya seedlings during the two dry seasons were significantly same in response to moisture stress. The result of this findings is not in conformity with the report of Lim and Hawa (2007), who stated that this might be due to the sharing of genetic character. The application of poultry manure levels significantly ( $P \leq 0.05$ ) increased papaya remaining leaves, seedling height, stem girth and number of node. Remaining leaves were affected by poultry manure level of 0.4kg while seedling height and stem girth were affected at poultry manure level of 0.6kg in 2023 dry season. However, in 2024 season there was no significant ( $P \leq 0.05$ ) effect of poultry manure except on number of node where poultry manure level of 0.6kg/pot gave higher



number of node. The significant difference observed in terms of survival to moisture stress could be due to addition of organic matter which increase moisture holding capacity of the soil. The results of this study is in agreement with the findings of Pastors *et al.* (2010) who affirmed that, application of poultry manure significantly increased organic matter content of soil.

**Table 1:** Effect of Variety, Moisture Stress and Poultry Manure Levels on Papaya Seedlings during the 2023 and 2024 dry Seasons

Treatments	2023				2024			
	RML	SH	SG	NN	RML	SH	SG	NN
<b>Variety</b>								
Calina IPB9 (True Dwarf)	3.87	59.33	6.53	32.00	6.40	55.53	8.47	31.73
Sun Grads	4.60	61.07	6.64	33.33	6.73	62.87	9.07	34.73
LS	NS	NS	NS	NS	NS	NS	NS	NS
SE± (P≤0.05)	0.243	1.592	0.179	0.692	0.624	2.396	1.331	0.927
<b>Poultry Manure Level (kg)</b>								
0.0kg	4.17 <sup>ab</sup>	60.67 <sup>ab</sup>	6.15 <sup>b</sup>	33.33	5.83	53.33	8.17	30.67 <sup>b</sup>
0.2kg	4.17 <sup>ab</sup>	55.83 <sup>b</sup>	6.40 <sup>ab</sup>	32.33	7.83	55.83	11.00	32.50 <sup>ab</sup>
0.4kg	4.83 <sup>a</sup>	57.50 <sup>b</sup>	6.33 <sup>ab</sup>	31.50	6.17	61.17	7.17	32.67 <sup>ab</sup>
0.6kg	4.50 <sup>ab</sup>	65.83 <sup>a</sup>	7.03 <sup>a</sup>	33.33	5.33	63.00	7.33	36.33 <sup>a</sup>
0.8kg	3.50 <sup>b</sup>	61.17 <sup>ab</sup>	7.00 <sup>a</sup>	33.00	7.67	62.67	10.17	34.00 <sup>ab</sup>
LS	*	*	*	NS	NS	NS	NS	*
SE± (P≤0.05)	0.384	2.518	0.283	1.094	0.986	3.788	2.104	1.465
<b>Interaction</b>								
V×PM	NS	NS	NS	NS	NS	NS	NS	NS

SE = Standard Error, \* = Significant at (P≤0.05), NS = Not Significant, RML = Remaining Leaves, SH = Seedling Height, SG = Stem Girth, NN = Number of Node, LS = Level of Significance.

### Effects of Moisture Stress on Root Length, Lateral Root, Root Diameter and Root Dry Weight

Table 2 shows result of the effect of variety, moisture stress and poultry manure levels on papaya seedlings during the 2023 and 2024 dry seasons. The results indicated that, root length, lateral root, root diameter and root dry weight were not significantly (P≤0.05) affected by variety of papaya. The result of this study disagree with the findings of Perez *et al.* (2014) who reported that response to moisture stress is a function of gene and environmental interaction. The result further revealed that, application of poultry manure significantly (P≤0.05) increased papaya root dry weight with poultry manure level of 0.2kg given higher value than the rest in 2023 season. However, in 2024 dry season there was no significant effect of poultry manure on seedling root dry weight. The variation in terms of response to moisture stress with different rate of poultry manure indicated the importance of poultry manure in increasing soil moisture retention capacity. The result of this study lend its support from the findings of Maryani *et al.* (2021) who reported that, soil moisture retention capacity increased with increasing rate of organic matter content of soil.



**Table 2:** Effect of Variety, Moisture Stress and Poultry Manure Levels on Papaya Seedlings during the 2023 and 2024 dry Seasons

Treatments	2023				2024			
	RL	LR	RDM	DMW	RL	LR	RDM	DMW
<b>Variety</b>								
Calina IPB9 (True Dwarf)	21.87	32.33	3.80	26.08	20.60	25.93	6.87	36.48
Sun Grads	21.00	34.40	4.07	31.27	19.40	25.67	7.60	29.93
LS	NS	NS	NS	NS	NS	NS	NS	NS
SE± (P≤0.05)	1.279	1.293	0.235	1.944	1.554	1.280	0.998	3.789
<b>Poultry Manure Level (kg)</b>								
0.0kg	21.83	30.50	3.50	21.75 <sup>b</sup>	19.67	25.00	5.33	29.20
0.2kg	18.83	35.83	4.00	33.37 <sup>a</sup>	19.83	29.17	9.17	32.42
0.4kg	22.17	33.83	3.33	28.18 <sup>ab</sup>	18.50	23.83	8.00	36.47
0.6kg	22.50	32.83	4.00	28.48 <sup>ab</sup>	18.50	23.50	5.83	30.47
0.8kg	21.83	33.83	4.50	31.58 <sup>ab</sup>	23.50	27.50	7.83	37.48
LS	NS	NS	NS	*	NS	NS	NS	NS
SE± (P≤0.05)	0.022	2.045	0.372	3.074	2.457	2.023	1.578	5.991
<b>Interaction</b>								
V×PM	NS	NS	NS	NS	NS	NS	NS	NS

SE = Standard Error, \* = Significant at (P≤0.05), NS = Not Significant, RL = Root Length, LR = Lateral Root, RDM = Root Diameter, DMW= Dry Matter Weight, LS = Level of Significance.

## CONCLUSION AND RECOMMENDATIONS

The study concluded that the application of cured poultry manure reduced moisture stress of papaya seedlings. Application of 0.2kg, 0.6kg and 0.8kg poultry manure levels are suggested to enhance growth performance and resistance to moisture stress of the considered papaya seedlings. Trials with other organic manure as a source of nutrients is also recommended.

## REFERENCES

- Food and Agriculture Organization – FAO. (2019). Papaya production. Retrieved from <http://www.fao.org/faostat/en/#data/QC/visualize>
- IPBU prepare to launch Seed Center" (<http://www.antaranews.com/en/news/73107/ipb-to-laun-ch-seed-center>) ANTARA News. Retrieved 25 September (2018).
- Kabiri R, Ali Hatami and Mehdi Naghizadeh (2014) Effect of Drought Stress and its Interaction with Salicylic Acid on Fennel (*Foeniculum vulgare* Mill.) Germination and Early Seedling Growth: Received: 04 March 2014/Accepted in revised form: 21 July 2014 © 2013 Iranian Society of Medicinal Plants. All rights reserve
- Lima RCA, Souza Jr. MT, Pio-Ribeiro G, Lima JAA (2016) Sequences of the coat protein gene from Brazilian isolates of Papaya ringspot virus. *Fitopatologia Brasileira* **27**, 174-180.4
- Lim RCA, Hawa, G.A., Souza Jr. MT, Pio-Ribeiro G, Lima JAA (2007) Sequences of the coat protein gene from Brazilian isolates of Papaya ringspot virus. *Fitopatologia Brasileira* **27**, 174-180.
- Maryani, A.T., Mirna, N and Bahar, F.F. 2021. International Conference on Environmental and Sustainability Context IOP Conf. Series: Earth and Environmental Science **10**:894- 012030
- Mesquita, M. S., Gonçalves, C. A. A., Cruz, V. A., Masson, G. A., Alvarez, M. C., & Costa, L. L. (2012). Avaliação centesimal e sensorial da geleia de morango com adição de semente de mamão (C. Papaya). *Anais do Seminário de Pesquisa e Inovação Tecnológica*, **1**(1), 1-9.
- Pastor, M. C. R., Rodrigo, M. G. L. and Sanchez, M. L. S., 2010. Behavior of papaya cultivars Sunset, Sunrise and genotypes of „Baixinho De Santa Amalia” and BH - 65 in the South of Tenerife Island. *Rev. Bras. Frutic, Jaboticabal – SP.*, **32** (4): 1105-1115.
- Perez, A., Reyes, M. N. and Cuevas, J. (2014). Germination of two papaya varieties: effect of seed aeration, K-treatment, remoal and sarcotesta, high temperature, soaking in distilled water, and age of the seed. *Journal of the Agricultural University of Puerto Rico*, **64**:173-180.



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Siqueira D.L. de, Botrel, N., Clima (2012) e Solo para a cultura do mamoeiro, Informe Agropecuario **134** (1986) 8–9.

Yadav, P. K., Yadav, A. L., Yadav, A. S. and Yadav, H. C. (2011). Effect of integrated nutrient nourishment on vegetative growth and physico-chemical attributes of papaya (*Carica papaya* L.) fruit cv. Pusa Dwarf. *Plant Archives*, **11**(1): 327- 329.