Comparative Efficacy of Aqueous Extract of Moringa (*Moringa Oleifera* Lam.) and Coconut (*Cocos Nucifera* L.) Milk on the Performance of Pawpaw (*Carica Papaya* L.) Seedlings

M. A. Muhamman, and B. Kwada

Abstract- To minimize time, energy and money spent in raising pawpaw (Carica papaya L.) seedlings, experiment was conducted in 2013 dry season at FAO/TCP Farm, Faculty of Agriculture, Adamawa State University, Mubi, to compare the efficacy of aqueous extract of moringa (*Moringa oleifera* Lam.) and coconut milk (*Cocos nucifera* L.) on the performance of pawpaw seedlings. Moringa shoots about 40 days were crushed with water and filtered out. Liquid extract were diluted with water to 5% concentration. Coconut milk was also diluted to 5% concentration. The treatments with a control (tap water) were tested on pawpaw seedlings raised in polythene bags, and arranged in a Randomized Complete Block Design with four replications. Foliar spray of treatments started at 3 weeks after sowing (WAS) and continued fortnightly until 12 WAS. Data were collected on plant height, plant diameter, number of leaves per plant, leaf area per plant, plant vigour and shoot dry weight. Data obtained were subjected to analysis of variance. Results showed significant effects of treatments on parameters, except on plant diameter and shoot dry weight. Moringa extract had the highest effect and should be adopted in raising pawpaw seedlings.

Keywords– Aqueous extract of moringa, Coconut milk, Performance of papaya seedlings.

I. Introduction

The time spent in raising papaya (*Carica papaya* L.) seedling in the nursery is the major constraint faced by farmers in Mubi, Nigeria. This result in dedicating extra farm input, labour and time. Measures that can facilitate rapid growth and development of seedlings become pertinent. Papaya is an important fruit crop in Nigeria. Nigeria is ranked second in the world top 10 papaya producers [1]. It is considered for it rich sources of vitamins and minerals when consumed in salad or as a fresh fruit. Moringa (*Moringa oleifera* Lam.) is gaining significance as plant growth hormone (PGH), promoting rapid seed germination, growth, development and yield of crops [2], [3], [4]. Some of the characters reported to be significantly affected were plant height, number of leaves, leaf area per plant and shoot dry weight [5].

Department of Crop Science, Adamawa State University, Mubi, Nigeria. *Email:* mmuhamman@gmail.com.

Similarly, coconut milk (CM) was reported to contain growth hormone which is active in promoting cell divisions [6]. In their study to determine the response of cowpea to foliar application of growth regulators and coconut water [6] a positive performance of the crop with coconut milk was recorded. Thus, both moringa extract and coconut milk are natural plant products locally available. If they can facilitate the performance of papaya seedlings in the nursery it will be a welcome development.

This research therefore, was design to compare the efficacy of moringa extract and coconut milk on the performance of papaya seedlings in the nursery, with the view of determining the most efficient for use, to reduce cost of input, labor and time spent.

II. Materials and Methods

Research was conducted at the FAO/TCP Farm, Faculty of Agriculture, Adamawa State University, Mubi, Adamawa State, Nigeria (Latitude 10^0 11' N and Longitude 13^0 19' E at an altitude of 696 m above sea level), to compare the efficacy of aqueous extract of moringa (AEM) and CM on the performance of pawpaw seedlings in the nursery. Treatments include; tap water as control, Moringa extract at 5% concentration and coconut milk at 5% concentration. Moringa shoots of about 40 days old were crushed with small amount of water (10 kg of fresh material in 1 liter of water). The extract was diluted in water (1 part of moringa extract in 20 parts of water) to obtained the concentration. Similarly, coconut milk was also prepared using the same method. These treatments was tested on papaya seedlings that was grown in a polythene bags of 8 cm diameter and 25 cm in height, in an experimental laid out in a Randomize Complete Block Design with four replications. Soils used in filling the polythen bags were prepared at the ratio of 2:1:1 of river sand, topsoil and cow dung, respectively. Two seeds of papaya (Congo dwarf variety) was sown per bag, thereafter thinned to one plant per bag at two weeks after sowing (WAS). Weeds were controlled manually using hand pulling. Data were collected on; Plant height at 3,6,9 and 12 WAS: heights of the six plants per treatment were measured using meter rule graduated in cm from the soil level to the terminal bud and their average taken and recorded. Number of leaves per plant: leaves of the six plants per treatment were counted at 3, 6, 9 and 12 WAS and average taken and recorded. Stem diameter: diameter of six

plants per treatment was measured at 3, 6, 9 and 12 WAS and their average determined and recorded. Leaf area per plant: leaf area at 3, 6, 9 and 12 WAS was measured, result taken and recorded. Shoot dry weight at 9 and 12 WAS: a plant from each treatment was subjected to oven drying at constant temperature (85^oC) until a constant weight was obtained; result was then taken and recorded. Data generated were subjected to Analysis of Variance using SAS System for Windows [7]. Means showing significant F-test were separated using Least Significant Difference (LSD).

III. Result and Discussion

TABLE I shows the effect of AEM and CM on plant height of pawpaw. Highly significant effects of treatments were recorded at 6, 9 and 12 WAS. There was no significant effect of treatments on plant height at 3 WAS. Aqueous extract of moringa had the highest effect in all the weeks with plant heights of 11.28 cm, 18.13 cm and 29.16 cm, at 6, 9 and 12 WAS, respectively. This was followed by CM, with plant heights of 7.55 cm, 12.78 cm and 23.77 cm, at 6, 9 and 12 WAS, respectively. Least effect was recorded with the control (tap water). The significant effect of treatments on plant height of pawpaw might be due to the role of PGH in promoting cell division and elongation in plant. Moringa extract manifested highest effect probably because the concentration of PGH in it was higher than that of CM. The result of this study is in line with the earlier report [8] that plant height of kalmegh was highest with moringa extract at 2% concentration as compared to other sources of PGH. Also shown in TABLE 1 the effect of AEM and CM on number of leaves per plant of pawpaw, in the TABLE no significant differences between treatments at 3, 6 and 9 WAS. Significant differences between treatments was recorded at 12 WAS with AEM having the highest number of leaves (14.45) followed by CM (13.60) and least with the control (12.80). The non-significant effects of treatments on number of leaves at their early stage might be due to low physiological responses of PGH on leaf tissues. Significant effect was observed at 12 WAS as the plant increase in size. This study agreed with the earlier report [8] that number of leaves per plant of Kalmegh was highest with moringa extract. TABLE II shows the effect of AEM and CM on plant diameter of pawpaw, no significant effect of treatments was recorded in the weeks. The non-significant effect of treatments on plant diameter might be due to the translocation of treatments to the elongation point at the expense of diameter. The result disagrees with the earlier report [2] that plant diameter increased with foliar application of moringa. Similarly, in TABLE II the effect of AEM and CM on leaf area per plant of pawpaw at 3, 6, 9 and 12 WAS was recorded. Highly significant effect of treatments was observed. The trend followed the same pattern with that of plant height. Aqueous extract of moringa had the highest effect with leaf areas of 14.54 cm^2, 27.29 cm^2, 63.02 cm^2, and 270.56 cm^2, at 3, 6, 9 and 12

WAS, respectively. This was followed by CM, while lower leaf areas were recorded with the control. The significant effect of treatments on leaf area may be due to the niche of PGH, stimulating light and increasing chlorophyll content of a leaf there by, increased leaf area. This result is in agreement with the report [4] that leaf area of cowpea increased with moringa extract. TABLE III shows the effect of AEM and CM on plant vigour of pawpaw. Like the previous parameters AEM had the highest vigour score. Vigour scores of 6.58, 8.92 and 9.05 were recorded at 3, 9 and 12 WAS, respectively. However, there was no significant effect recorded at 6 WAS. Least vigour was recorded with the control. The significant effects of treatments on plant vigour score might be due to the role of treatments on the other parameters measured. As it manifest effects on plant height and leaf area, the effect may be glaring for physical observation. Also in TABLE III there were no significant effects of AEM and CM on shoot dry weight. The non-significant effect might be due to low physiological responses of PGH on stem tissues.

IV. Conclusion and Recommendations

Aqueous extract of moringa and coconut milk were found to significantly affect pawpaw seedlings in the nursery, with AEM manifesting highest effect. Thus, its role in raising pawpaw seedlings in the nursery are enormous, it can reduced time, energy and money spent. Consequently, AEM at 5 % should be adopted by farmers to facilitate rapid growth and development of pawpaw seedling.

References

[1] FAOSTAT: The Statistics Division, Food and Agriculture Organization of the United Nations. http://faostat.fao.org. Retrieve: 17/03/2014

[2] N. Foidl, H. P. S. Makkar and K. Becker. *The Potential of Moringa oleifera for Agriculture and industries Uses.* In L. J. Fuglie (editor) The Miracle Tree: The Multiples attribute of Moringa.CTA and CWS, Dakar, Senegal. 2001, Pp.168.

[3] Edward and J. Jenny. ECHO, N.Ft. Meyers, FL33917, USA. 2009.

[4] C. Phiri and D. N. Mbewe. Influence of *Moringa oleifera* leaf extracts on the germination and seedlings survivals of three common legumes. *International Journal of Agriculture and Biology*. 2010, 12:315- 317.

[5] M. A. Muhamman, B. M. Auwalu and S. G. Mohammed. Response of ize (*Zea mays* L.) to Aqueous Extract of Moringa (*Moringa oleifera* Lam.) and Nitrogen rates. Part II. *Scientific Papers. Series A .Agronomy*, Vol. LVII, ISSN 2285-5785; ISSN CD-ROM 2285- 5793; ISSN Online 2285- 5807; ISSN -L 2285-5785. 2014, Pp 264 – 271.

[6] S. U. Remison, S.U. and G. Mbeze. Response of cowpea plants to foliar application of growth regulators and coconut water. *The Nigerian Journal of Agriculture and Forestry*. 2004. Volume 1 (2): 1-12.

[7] SAS system for windows V8. Institude Inc. Cary. NC 27613 USA, 2000.

[8] M. A. Prabhu, A. Ramesh Kumar and K. Rajamani Influence of bio – stimulants on growth, yield and economics of Kalmegh (*Andrographis paniculata*). *Madras Agricultural Journal*. 2009. 96 (1 – 6): 150 – 155.

TABLE I
EFFECT OF AQUEOUS EXTRACT OF MORINGA (*MORINGA OLEIFERA* LAM.) AND COCONUT MILK (*COCOS NUCIFERA* L.*)* ON PLANT HEIGHT (CM) AND NUMBER OF LEAVES OF PAWPAW (*CARICA PAPAYA* L) IN 2013 DRY SEASON.

Treatments	Plant height				Number of leaves			
	3WAS	6WAS	9WAS	12WAS	3WAS	6WAS	9WAS	12WAS
Tap water	5.46	7.07[b]	10.65[b]	21.66[b]	7.37	8.58	12.25	12.80[b]
Aqueous extract of moringa (5% concentration)	5.99	11.28[a]	18.13[a]	29.16[a]	8.17	10.58	13.00	14.45[a]
Coconut milk (5% concentration)	5.70	7.55[b]	12.78[b]	23.77[b]	6.71	8.29	12.41	13.60[ab]
Level of significance	ns	**	**	**	ns	ns	ns	**
SE(±)	0.39	0.41	0.72	0.88	0.54	0.69	0.54	0.25

Means in the same column followed by the same letter (s) are not significantly different at 5% level of probability using LSD.
WAS = weeks after sowing. ns = not significant. ** = highly significant at 1% level of probability using LSD.

TABLE II
EFFECT OF AQUEOUS EXTRACT OF MORINGA (MORINGA OLEIFERA LAM.) AND COCONUT MILK (*COCOS NUCIFERA* L.) ON PLANT DIAMETER (MM) AND LEAF AREA PER PLANT (CM^2) OF PAWPAW (*CARICA PAPAYA* L.) IN 2013 DRY SEASON.

Treatments	Plant diameter				Leaf area per plant			
	3WAS	6WAS	9WAS	12WAS	3WAS	6WAS	9WAS	12WAS
Tap water	0.02	0.03	0.04	0.06	4.87[c]	9.68[c]	26.02[b]	67.55[b]
Aqueous extract of moringa (5% concentration)	0.02	0.03	0.04	0.07	14.54[a]	27.29[a]	63.02[a]	127.56[a]
Coconut milk (5% concentration)	0.02	0.03	0.04	0.07	9.08[b]	7.88[b]	30.79[b]	99.27[b]
Level of significance	ns	Ns	Ns	ns	**	**	**	**
SE(±)	3.33	3.44	3.82	1.86	0.95	1.45	3.43	9.76

WAS = weeks after sowing. ns = not significant. ** = highly significant at 1% level of probability using LSD.

TABLE III
EFFECT OF AQUEOUS EXTRACT OF MORINGA (MORINGA OLEIFERA LAM.) AND COCONUT (*COCOS NUCIFERA* L.) MILK ON PLANT VIGOUR SCORE AND SHOOT DRY WEIGHT (G) OF PAWPAW (*CARICA PAPAYA* L.) IN 2013 DRY SEASON.

Treatments	Vigour score				Shoot dry weight	
	3WAS	6WAS	9WAS	12WAS	9WAS	12WAS
Tap water	4.87[b]	5.75	5.88[b]	7.70[b]	0.25	1.21
Aqueous extract of moringa (5% concentration)	6.58[a]	7.20	8.92[a]	9.05[a]	0.49	1.77
Coconut milk (5% concentration)	5.37[b]	6.09	6.88[b]	8.25[ab]	0.36	1.10
Level of significance	*	Ns	**	**	ns	Ns
SE(±)	0.32	0.66	0.46	0.29	0.07	0.23

Means in the same column with the same letters (s) are not significantly different at 5% level of probability using LSD. WAS = weeks after sowing. ns = not significant. ** = highly significant at 1% level of probability using LSD.
* = significant at 5% level of probability using LSD.