EFFECT OF DIFFERENT PLANT PROPAGULES AND MULCHING MATERIALS ON PERFORMANCE OF WATERLEAF (*TALINUMTRIANGULARE)* IN DELTA STATE

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Abstract

Experiment was conducted at Agbor Delta State, to investigate the effect of different propagules and mulching materials on the performance of waterleaf in Delta State. The mulching materials used were Annona muricataLin, Tridaxprocumbensand elusinindica. The propagules used for propagation were the stump, main shoot and lateral shoot. The experimental design was 3 x 3 factorial layout and was replicated 3 times. The variable measured were number of sprout, length of sprouts, number of branches, length of branches, number of leaves and flowers. The data were subjected to analysis of variance (ANOVA) and the significant means obtained were separated using Duncan multiple Range Test (DMRT). The result showed that the plants propagated with main shoot was significantly different from others in number of sprout, branch leaves and flowers waterleaf. The leaves of Annona muricataLin exhibited superiority over other mulching materials in all the perimeters measured except in length of sprout and branches. Therefore, Annona muricataLin is recommended for mulching material and main shoot as cutting for propagation of waterleaf.

Keywords: waterleaf, mulching propagule, *Annona muricata*Lin, *Tridaxprocumbens, elusinindica.*

Introduction

Waterleaf is a small glabrous perennial herb with stems that are succulent, sometimes with purple colour, round flattened or triangular in cross section when they bear an inflorescence. The plant can grow up to 60 cm in height. It

originated from tropical region of central Africa from which it spread to South America are widely grown in Tropical West African, South America and Asia (Dominic and Bassey (2016).

The leaves and shoots are used as vegetable in soups, sauces and stews. It is used for the preparation of ethno – medicines based on the high content of phytochemicals. Traditionally, it is used for the management of various ailments including measles, arthritics and stomach upsets.

The plant grows rapidly in moist and humid conditions. It thrives well on well drained fertile soil high in organic matter although, reasonable growth can be obtained from relatively poorer soils if fertilized (Ibeawuchi and Onweremadu, 2006). In some part of the country, *T. triangulare*can be cultivated using the monocropping system. Propagation is by stem cuttings, although seeds have been used in large farms when stem cuttings is insufficient. The stem cuttings are usually 10 to 15 cm in length, which is pinned in a well pulverized soil, one cutting per stand at spacing of 15 to 20 cm apart and 8 to 15 cm within row. The crop thrives better in an organic soil (Uko*el al.* 2013). Application of organic material as soil amendment materials can enhance the production of waterleaf. This could also be achieved if organic such as green manure is incorporated into the soil during land preparation. Light shade promotes weed production.

Total covering of the soil with vegetative materials is one of the agronomic practices that can enrich the soil and also control the growth of weeds, but this depends on the materials. The use of synthetic materials as mulching materials have fewer advantage than those of vegetative materials. The vegetative materials when use as mulching materials not only check erosion, evaporation, weeds and regulate soil temperature like the synthetic materials, but decay to add nutrients into the soil as well as increase the activities of microorganisms in the soil (Osabohien and Ogunbiyi, 2019). There are some plants which add more plant nutrients to than enhance production more than others, this could be as a result of chemical constituents in them. This research is to investigate effect of different propagules and mulching materials on the performance of waterleaf in Delta State.

Materials and methods

The experiment was conducted in the research and experimental site of the Agbor, Delta State. Agbor is tropical rainforest zone, which has between latitude 5^{o} 15^{1}S and 8^{o} $20^{1(??)}$N and longitude 5^{0} 13^{1}W and 7^{o} 15^{1}E of the equator. It is characterized by a dry period between November and March, rainy season between April and October. There is usually about 2 – 3 weeks dry spell in

August usually refer to as August break. The average annual rainfall of the location ranges from 1905 – 2665 mm, the temperature ranges from 23^{o}C to 36^{o}C with an average 30^{o} C (Nmosi 2000).

The experimental site was cleared with cutlass, the debris gathered and bundled out and the site measured marked and divided into three portions as replicates. The marked out plots were elevated with soil to form beds using hoe. The major objective of the tillage was for easy penetration of roots of seedlings after transplanting. Two weeks cured poultry manure was incorporated into the soil of various plots at basal rate a week before transplanting of the seedlings. This is to allow for adequate incubation, transformations and detoxification of the poultry manure.

Representative soil (0 – 15 cm) were collected with sampling augur, the samples were dried at room temperature (25^{o}C) for five days and pulverized to pass through a 2 mm mesh sieve. The samples were analyzed to determine the physical and chemical properties of the soil.

The experimental design was a completely randomized design with three replicates in a 3 x 3 simple factorial layout. Fresh healthy stemsand stumps of waterleaf were harvested. The stems were main stem and lateral shoots, these were used as propagules and were measured at a length of 12 cm.These (stumps, main shoot and lateral shoots) were pinned to the ground in various plots measured. The vegetative materials used as mulching materials include *Annona muricata* leaves, *Tridaxprocumbens*and *Elusinindica*.This were used to cover the plots immediately after planting.The variables measured were number of sprouts, leaves branches and flowers, this was done through direct counting, plant height, length of branches and were taken at fourth week after planting. Plant height and length of branches were measured using metal rule. The data were subjected to analysis of variance (ANOVA) and the significant means obtained were separated using Duncan multiple Range Test (DMRT).

Result and discussion

The chemical and physical properties of the soil used for the field experiment is presented in table 1. The soil P^{H} is neutral (PH 7.5). the total nitrogen, available phosphorus, and exchangeable potassium values were 0.4g/kg, 4.50mg/kg and 0.31 Omokkg respectively. These values are below the critical values of 2.2 g.kg, 8 mg/kg and 0.70 Omol/kg respectively for crop production (Nmosi 2000).

Effect of different propagules and mulching materials on of number of sprouts of waterleaf revealed that plants grown with main shoot had more number

of sprout followed by lateral shoot while stump didn't sprout. This is in corroboration with Hope (2023) who stated that sixteen elements were detected and quantified in the leaves of *Annona muricata*, these elements include Na, Mg, Al, Si, P, S, C, K, Ca, Mn, Fe, Cu, Zn, Rb, Sr and Ba. These elements enrich the soil hence plant growth, development and reproduction. The result of mulching materials showed that plots covered with *Annona muricata*leaves was significantly different from others ($P<0.05$) followed by plots covered with *Tridaxprocumbens*(table 2). This could be as a result of present of chemical constituents that are found in *Annona muricata* leaves which enhances soil fertility. This is in line with Iren*et al (*2015) who reported that the incorporation of fresh or dry *Annona muricata* leaves into the soil increases the soil organic matter, nitrogen and phosphorus contents and reduced exchangeable aluminium and hydrogen ions. That the nutrients released was higher in dry leaves than fresh leaves.

The result of length of sprout of waterleaf grown with different propagules and mulching materials showed that plants grown with lateral shoot were the tallest compare to main shoot and stump. The plants grown on soil covered with*Tridaxprocumbens*were was significantly different from those grown on soils covered with *Annona muricata* and *Elusinindica*(table 3).

Table 4 revealed the result of number of leaves of waterleaf plants grown from different plant propagules and mulching materials. It showed that plants grown with main stems exhibited superiority over others ($P<0.05$) followed by plants grown with lateral shoot. The plants grown on soil covered with soursop was significantly different from those of *Tridaxprocumbens*and *Elusinindica* in leaves production. The number of branches of waterleaf grown with different propagules and mulches followed the same trend as that of number of sprout and leaves(table 5). This could be in accordance of the findings of Ayo (2023) who reported that different parts of *Annona muricata* plant have numerous functions which they perform, that the extract of the plant can be used to improve growth and yield of crops when applied as foliar fertilizers or green manure.

The length of branches of waterleaf grown with different propagule and mulches followed the same trend as that of the length of sprout (table 6). The result of number of flowers of waterleaf grown with different propagules and mulching materials revealed that the same trend was followed like that of number of sprouts, leaves and branches (table 7).Uche (2023) affirmed that when *Annona muricata* plant when used as bio fertilizers has proven to improve the yield of crops.

Conclusion

The conclusion of this research is based on the findings. It is therefore, concluded that waterleaf should be grown with main shoot instead of lateral shoot. The use of stumps for propagation should avoided. Also the plant thrives better when grown of *Annona muricata* leaves mulch soil than *elusinindica* and *Tridaxprocumbens*.

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Table 1:Result of analysis of physio – chemical Properties of experimental site

Parameters	**soils**
PH	7.10
Sandy (%)	86.70
Clay (%)	3.30
Silt (%)	10.00
Organic carbon (%)	0.4
Total Nitrogen (g/kg)	0.70
Available P (mg/kg)	4.5
Exchangeable K (Cmol/kg)	0.31
Exchangeable Na (Cmol/kg)	0.32
Exchangeable acidity	0.40
ECEC	0.02
Mn (mg/kg)	5.4
Cu (mg/kg)	1.45

Table 2. Effect of different propagules and mulching materials on number of sprouts of waterleaf at fourth week after planting

Propagules/mulching materials	***Annona muricata***	***Tridaxprocumbens***	***Elusinindica***	**Mean***
Stump	0	0	0	0^{c}
Main shoot	13	6	5	8^{a}
Lateral shoot	8	5	2	5^{b}
Mean *	7^{a}	3.6^{b}	$2/3^{b}$	

Means within the same column or row followed by the same letter are not significantly different at P<0.05 level according to DMRT

Table 3. Effect of different propagules and mulching materials on length of sprout of waterleaf at fourth week after planting

Propagules/mulching materials	*Annona muricata*	*Tridaxprocumbens*	*Elusinindica*	Mean*
Stump	0	0	0	0^{c}
Main shoot	35	44	24	34.3^{b}
Lateral shoot	34	78	45	52.3^{a}
Mean*	23^{b}	40.7^{a}	23^{b}	

Means within the same column or row followed by the same letter are not significantly different at P<0.05 level according to DMRT

Table 4. Effect of different propagules and mulching materials on number of leaves of waterleaf at fourth week after planting

Propagules/mulching materials	*Annona muricata*	*Tridaxprocumbens*	*Elusinindica*	Mean*
Stump	**0**	**0**	**0**	$\mathbf{0^{c}}$
Main shoot	**126**	**79**	**31**	$\mathbf{78.7^{a}}$
Lateral shoot	**87**	**67**	**25**	$\mathbf{59.7^{b}}$
Mean*	$\mathbf{71^{a}}$	$\mathbf{48.7^{b}}$	$\mathbf{18.7^{c}}$	

Means within the same column or row followed by the same letter are not significantly different at P<0.05 level according to DMRT

Table 5. Effect of different propagules and mulching materials on number of branches of waterleaf at fourth week after planting

Propagules/mulching materials	*Annona muricata*	*Tridaxprocumbens*	*Elusinindica*	Mean*
Stump	0	0	0	0^{c}
Main shoot	35	14	12	20.3^{a}
Lateral shoot	21	12	12	15^{b}
Mean*	18.7^{a}	8.7^{b}	8^{b}	

Means within the same column or row followed by the same letter are not significantly different at P<0.05 level according to DMRT

Table 6. Effect of different propagules and mulching materials on length of branches of waterleaf at fourth week after planting

Propagules/mulching materials	*Annona muricata*	*Tridaxprocumbens*	*Elusinindica*	Mean*
Stump	0	0	0	0^{c}
Main shoot	18	10	7	11.7^{b}
Lateral shoot	27	12	10	16.3^{a}
Mean*	15^{a}	7.3^{b}	5.7^{bc}	

Means within the same column or row followed by the same letter are not significantly different at P<0.05 level according to DMRT

Table 7. Effect of different propagules and mulching materials on number of flowers of waterleaf at fourth week after planting

Propagules/mulching materials	***Annona muricata***	***Tridaxprocumbens***	*Elusinindica*	Mean*
Stump	**0**	**0**	**0**	**0^{c}**
Main shoot	**34**	**23**	**15**	**24^{a}**
Lateral shoot	**17**	**14**	**13**	**14.7^{b}**
Mean*	**17^{a}**	**12.3^{b}**	**9.3^{bc}**	

Means within the same column or row followed by the same letter are not significantly different at P<0.05 level according to DMRT