SEEDLING MANAGEMENT TECHNIQUES TO IMPROVE FIELD ESTABLISHMENT OF *TETRAPLUERA TETRAPTERA*.

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ABSTRACT

Delayed transplanting results in overgrown seedlings, discards and economic lost to the farmer (nurseryman). An experiment was conducted to assess various seedling management techniques of 2 years old overgrown seedling of *T. tetraptera* for field establishment. *T. tetraptera* is an endangered forest tree and aromatic spice. The field experiment was carried out in Plant Genetic Resource Centre of the School of Agriculture and Agricultural Technology, Owerri. Seedlings of *T. tetraptera* were subjected to the following management practices: Control (whole plant), prune all leaves and retain all roots, prune half-leaf lamina, prune all roots and retain all leaves, prune all leaves and roots, apical decapitation and apical and axial decapitation. The seedlings were planted in 60.0 × 60.0cm holes manure with poultry droppings of about 500g. The experiment was laid in randomized complete block design and replicated three (3) times. Establishment and growth of seedling in the field were monitored. All the management practices used were successful with 77.9-100% establishment except intact plants and prune half-leaf lamina seedlings which had poor field establishment of 66.67 %, respectively. For overgrown seedlings of *T. tetraptera*, prune all leaves and retain roots, prune all roots and retain all leaves, prune all leaves and roots, apical decapitation and apical and axial decapitation are recommended for seedling management techniques for the establishment of overgrown *T. tetraptera* in the rainforest agroecology of Southeastern Nigeria.

Keywords: Seedling management techniques, *Tetrapluera tetraptera*, field establishment, spice, Rainforest agroecology.

Introduction

Aidon tree, *Tetrapleura tetraptera* (Oshokirisho Igbo), Edeminang (Effik), Aridan (Yoruba), Apapa (Ijaw), Uyayak (Ibibio). *Tetrapleura tetraptera* is a deciduous forest tree spice, 15-25 cm long by about 5cm across the wing like ribs, dark purple brown, glabrous and glossy, usually slightly curved. Two of the wings are hard and woody and the other two filled with a soft sugary pulp; seeds are hard, black, flat, oval, about 8mm long, embedded in the body of the fruit, whose fruits are aromatic for seasoning of food and pharmaceutical use; stem and branches for timber and fruit- pulp for industrial uses.

The term spice includes all culinary herbs seasonings and condiments of vegetable origin (Sigmund and Gustar, 1991). Spices are plant products used in flavouring foods and beverages (Govindarajan, 1985). It has nutritional value and often referred to as food accessories or adjuncts because of their ability to stimulate appetite and increase the flow of gastric juice (Dziezak, 1989). Each spice has a unique aroma and flavor which derive from phytochemicals (Walker, 1994).

By the late 19th Century, Nigeria had about 65 million hectares of rich tropical primary forests, with abundant flora and fauna and presently, this hectareage has been reduced to about 4 million hectares, as Nigeria lost 5 percent of its forest annually (NEST, 2003). Available reports also indicate that Nigeria still loses an annual average of 350,000 hectares of forest cover (Ogbonaya, 2003; Some of the valued forest tree spices are facing the threat of extinction caused by high rates of urbanization, deforestation, increasing mobility, and development of new housing schemes which resulted in the large-scale destruction of the natural forests that are rich sources of plants used as spices locally (Adelaja and Fasidi, 2008).There is an urgent need for preservation of endangered spice (*Tetrapleura tetraptera)* species as some of the valued forest tree spices are facing the threat imminent of extinction. The study investigated the seedling management techniques to improve field establishment of *Tetrapluera tetraptera.*

Materials and methods

The field experiment was carried out in Plant Genetic Resource Centre of the School of Agriculture and Agricultural Technology, Federal University of Technology Owerri located between Latitudes 40 40 and 80 15 N, and Longitude 6 40 and 8 15 E (FDALR, 1985). It is of the humid tropics with bimodally-distributed annual rainfall of about 2500mm. The soil is a sandy loam, and earlier classified as an ultisol (Orajaka, 1975). Overgrown seedlings of *T. tetraptera* were subjected to the following seedling transplanting management techniques: ((1) Control (intact plant), (2) prune all leaves and retain all roots, (3) prune half-leaf lamina, (4) prune all roots and retain all leaves, (5) prune all leaves and roots, (6) apical decapitation and (7) apical and axial decapitation. The seedlings were planted in 60.0 × 60.0Cm holes manure with poultry droppings of about 500g. The experiment was laid in randomized complete block design and replicated three (3) times. Data were collected on plant height, number of leaves, leaf area, number of established

plants and size of girth at the initial stage, 6 and 12 months, respectively. Percentage field establishment was taken at 12 months after transplanting. These parameters were subjected to descriptive statistics and analysis of variance using general ANOVA at 5% significance level Genstat (2007) discovery model. The means were separated for significance using Least Significance Difference.

Results and Discussion

Table 1 reported that the seedling management techniques significantly (P<0.05) affected plant height. Prune all leaves and retain all roots and apical and axial decapitation were significantly taller than those plants in other treatments. At the initial stage, all the seedlings in the various treatments had leaves while prune all leaves and retain all roots had no leaves at transplanting. Number of branches did not record any significant (P<0.05) differences among the treatments. Stem girth recorded significant (P<0.05) differences. Stem girth of seedlings of apical decapitation were smaller in size compared to those of intact plant, prune half-leaf lamina, and apical & axial decapitation, respectively.

Table 1: Initial measurements of growth parameters before transplanting

Treatment	Plant height (cm)	No. of leaves	No.of branches	Stem girth(cm)
1	136.00	19.30	0.33	4.80
2	143.70	0.00	1.00	3.77
3	125.00	17.70	0.67	4.37
4	105.80	11.70	.33	3. 33
5	128.30	15.00	0.00	3.33
6	70.00	11.70	000	2.10
7	148.30	9.70	0.33	4.80
$LSD_{(0.05)}$	67.70	10.96	NS	2.18

NS=Not significant, LSD=Least significant difference

Treatments, 1=Intact plant (control), 2= Prune all leaves and retain all roots, 3=Prune half leaf lamina, 4=Prune all roots and retain all leaves, 5=Prune all leaves and roots
6=Apical decapitation, 7=Apical and axial decapitation

All the treatments had significant (P<0.05) differences in the parameter (Table 2). Plant height of seedlings in prune all leaves and retain all roots were taller than those in intact plant, prune all roots and retain all leaves, prune all leaves and roots, and apical decapitation respectively. Number of leaves was significantly (P<0.05) higher in apical and axial decapitation (12.67cm) than in prune all leaves and retain all roots, and prune all leaves and roots. Number of branches was significantly higher in apical and axial decapitation than those in intact plant, prune half leaf-lamina, prune all roots and retain all leaves, and prune all leaves and roots, respectively.

Table 2: Seedling growth performances at six months after field establishment

Treatments	Plant height (cm)	No. of leaves	No.of branches	Stem girth (cm)
1	99.00	7.00	1.00	6.37
2	166.70	5.67	3.00	5.23
3	150.70	8.00	0.00	5.37
4	95.00	7.33	0.67	3.00
5	90.00	6.00	1.33	4.17
6	96.70	8.33	2.00	2.17
7	126.70	12.67	3.33	5.10
$LSD_{(0.05)}$	60.79	5.75	1.93	4.01

LSD=Least significant difference

Treatments, 1=Intact plant (control), 2= Prune all leaves and retain all roots, 3=Prune half leaf lamina, 4=Prune all roots and retain all leaves, 5=Prune all leaves and roots
6=Apical decapitation, 7=Apical and axial decapitation

At 12 months after field establishment, plant height was significantly (P<0.05) taller in prune all leaves and retain all roots than those in intact plants, apical decapitation, and apical and axial decapitation respectively. Number of leaves did not record any significant (P<0.05) differences. Prune half leaf-lamina did not record any branch development compared to other treatments where branches developed. Stem girth of seedlings of intact plants were significantly (P<0.05) bigger than those in prune all leaves and roots, and apical and axial decapitation respectively. Prune half leaf-lamina was significantly (P<0.05) bigger in stem girth than those in prune all leaves and roots (Table 3)

Table 3: Seedling performance at 12 months after field establishment

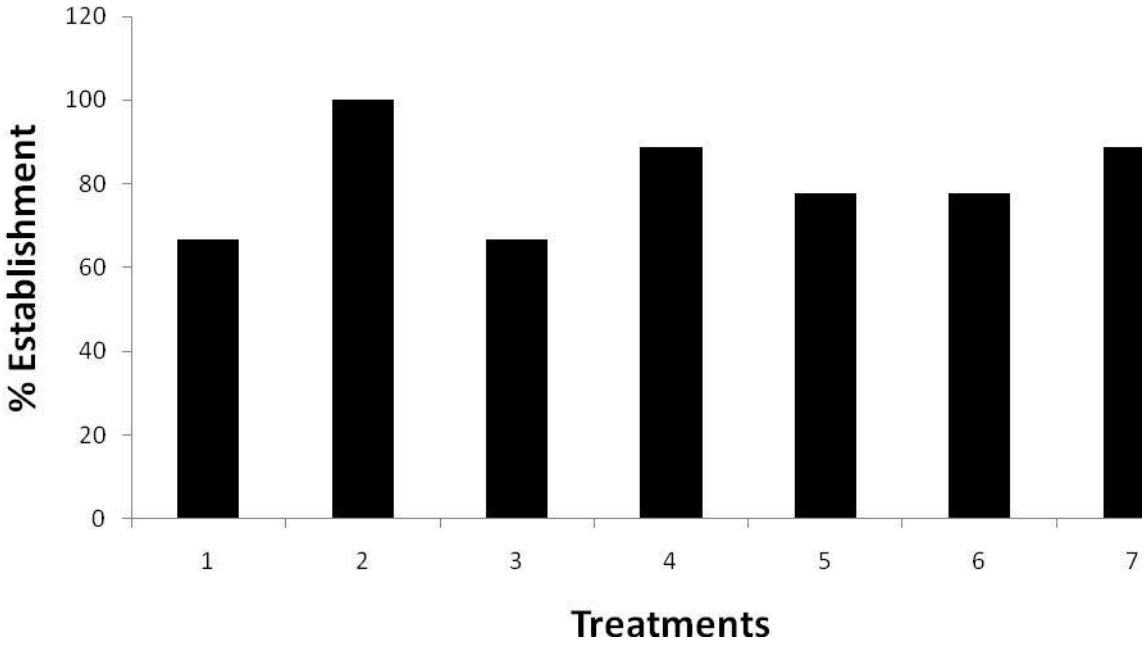
Treatment	Plant height (cm)	No. of leaves	No.of branches	Stem girth (cm)
1	86.00	12.00	2.33	5.10
2	170.00	11.70	2.67	3.93
3	139.30	10.00	0.00	5.03
4	106.3	12.3	1.67	1.87
5	134.30	15.70	2.33	1.83
6	74.30	20.70	2.33	3.47
7	91.70	18.00	3.33	2.23
$LSD_{(0.05)}$	74.90	NS	2.71	2.91

LSD=Least significant difference

NS=Not significant, Treatments 1=Intact plant (control), 2= Prune all leaves and retain all roots,

3=Prune half leaf lamina, 4=Prune all roots and retain all leaves,
5=Prune all leaves and roots,
6=Apical decapitation, 7=Apical and axial decapitation

All the seedling management techniques used to improve field establishment of *Tetrapluera tetraptera* was successful (77.90-100%) except intact plant (control) and prune half-leaf lamina that recorded 66.67%, respectively (Fig.1)



Key

Treatments 1=Intact plant (control), 2= Prune all leaves and retain all roots, 3=Prune half leaf lamina 4=Prune all roots and retain all leaves, 5=Prune all leaves and roots, 6=Apical decapitation 7=Apical and axial decapitation.

Fig. 1: Percentage field establishment of *Tetrapluera tetraptera*

Discussion

Seedlings are young trees generated from seeds. They are raised under controlled conditions to assure high survival and growth rate. Hence, seedlings must be transplanted with great care to increase their chances of survival (Williams, 1985). Apical and axial decapitation recorded higher number of branches (3.33), followed by prune all leaves

and retain all roots (2.67). The density of branches is increased by cutting back the apical and axial shoots of the seedlings (Yaacob and Subhadrabandhu, 1995). Quality in Christmas trees is measured by colour of the needles, density of the branches, and fullness of the foliage (Simons, 1997). These characteristics can all be controlled by using silviculture practices. Field establishment of *Tetrapluera tetraptera* seedling after 24 months in the nursery was achieved by the use of prune all leaves and retain all roots (100%), prune all roots and retain all leaves (88.9%), apical and axial decapitation (88.9%), prune all roots and leaves (77.8%), and apical decapitation (77.8%). This is in line with the findings of Tchoundjeu, *et al* (2006) who reported that seedling survival rates of 75-80% are considered to be normal for seedlings properly transplanted

Conclusion and Recommendation

The principles of tree domestication are similar to those used in agriculture. No single characteristic determines seedling quality. Seedling quality is a combination of height, diameter, plant nutrition, health, root size and shape. Together, these characteristics determine how well the plant will establish itself in the field, and they affect the rate of survival. Height alone is often not a good predictor of how a plant will grow in the field. Prune all leaves and retain all roots, prune all roots and retain all leaves, prune all leaves and roots, apical decapitation and apical and axial decapitation are recommended for seedling management techniques to improve field establishment of *Tetrapluera tetraptera.*

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