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INFLUENCE OF PLANTING METHODS AND PINCHING ON GROWTH AND VEGETATIVE YIELD OF DRUMSTICK (*Moringa oleifera*Lam)

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ABSTRACT

Field trials were conducted during the 2010 and 2011 cropping seasons at Federal College of Forestry Mechanization farm, Afaka located (10° 37¹N and 74° 7¹E) in the Northern Guinea savannah ecological zone of Nigeria to study the influence of planting method and pinching on growth and vegetative yield of drumstick (Moringa oleifera Lam). The experiment consisted of six treatments, viz direct sowing+ pinching at 2 weeks after sowing (WAS); direct sowing + pinching at 2 and 4 WAS; direct sowing+ no pinching; transplanting at 2 WAS +pinching at 2 weeks after transplanting (WAT); transplanting at 2 WAS + pinching at 2 and 4 WAT; transplanting at 2 WAS + pinching at 2WAT; transplanting at 4 WAS + pinching at 2 and 4 WA T. The treatments were laid out in Randomized Complete Block Design replicated three times. The plant had significantly vigorous plant with stem diameter at 3 and 9 WAS. However, numbers of leaves, canopy spread and number of branches were not significantly affected by planting methods. Fresh vegetative yield were obtained with direct sowing + pinching at 2 and 4 WAS and transplanting at 2 WAT and pinching at 2 WAT respectively.

INTRODUCTION

Drumstick (*Moringa oleifera* Lam) also known as Zogale (Hausa), Okwe Oyibe (Igbo) and Ewe Igbale (Yoruba) belongs to the family of *Moringaceae*, order *Brassicales* genus *Moringa*. There are twelve species of *Moringa* but the commonest in use is *Moringa oleifera* Lam. The plant is believed to originate from the sub Himalayan tracts of southern foothillsbut is now found Worldwide in the tropics and sub tropics. Drumstick is also grown in the Savannah region of Africa.

Moringa is planted either by direct seeding, transplanting or using hard stem cuttings. Direct seeding is the practice of broadcast, drilling or dibbling seeds in the field with pre-germinated seed or dry seeds. It requires less labour and less water. Direct seeding is preferred in drumstick cultivation when plenty of seed is available (Palada and Chang, 2003). Uprooting of seedling from the nursery into the prepared field at recommended spacing is known as transplanting. The benefits of transplanting include intensive care provided to the seed to ensure germinating seeding of the crop long before favourable planting condition, availability of viable healthy seedlings and maximum seedling establishment (Olorukooba, 2011). Transplanting allows flexibility in field planting but requires extra labour.

Pinching is a process which involves the removal of the terminal tips of the plants, at a predetermined height depending on the plant. This is done using sharp knife or blade since the terminal growth is tender. Secondly branches usually begin appearing on the main stem below the internodes a week when they reach a length of 20cm. Palada and Chang (2003) recommended that *Moringa* should be trimmed to promote branches, increase yield and facilitate harvesting.

The yield of drumstick has been reported to be influenced by planting methods (Palada and Chang, 2003). Pinching also plays a vital role in branching and subsequent leaflet production of plants. The succulent leaves of drumstick are harvested daily for soup and salad to provide vitamins A and C where diet is lacking in these essential nutrients. However, research reports on cultural practices in drumstick production are scanty especially in the Savannah areas of Nigeria. Yields of Moringa leafy yield is known to be low despite its importance as a food and for medicinal purposes In view of these, the work was conceived to determine the influence of planting methods for optimum growth and vegetative yield of *Moringa oleifera*. It was also done to determine the effect of pinching on growth and leafy yield of *Moringa oleifera*.

MATERIALS AND METHODS

The field trials were conducted during the wet seasons of 2010 and 2011 at the Federal College of Forestry Mechanization, Afaka Igabi Local Government of Kaduna State. The experimental farm is located at latitude 10^0 37^1 N and longitude 7^0 47^1 E, and situated in the Northern guinea savannah ecological zone of Nigeria.

The experimental treatments are direct sowing + pinching at 2 weeks after sowing (WAS), direct sowing + pinching at 2 and 4 WAS, direct sowing + no pinching, transplanting at 2 WAS + pinching 2 weeks after transplanting (WAT), transplanting at 2 WAS + pinching at 2 and 4 WAT, transplanting at 4 WAS + pinching at 2 WAT and transplanting at 4 WAS + pinching at 2 and 4 WAT. The seed was purchased from vegetable seed supplier at the Kawo seed market and was subjected to pre-germination treatment by soaking in cold water for 24 hours to remove the seed coat and enhance germination. The experimental sites were cleared, harrowed and ridged at 75cm spacing. The design was Randomized Complete Block (RCBD) and replicated thrice. The plot sizes were 3m × 3m. Pre-germinated seeds were sown in dug holes of 3cm depth and spacing of 50×50cm. The polythene bags with dimension of 18 × 12cm were filled with potting mixture. The pre-germinated seeds were sown in the bags and uniform healthy seedlings were transplanted accordingly to the treatment specification.

Pinching was done at 2 and 4 WAT. Successive harvesting of vegetative yield was carried out at 3 weeks interval till the end of the wet season. Observations were carried out on plant vigour, plant height, stem girth, number of leaves, number of branches and fresh vegetative leafy yield.

STATISTICAL ANALYSIS

The data collected were subjected to statistical analysis of variance (ANOVA) as described by Snedecor and Cochran (1994). Mean separation was done at 5% level of probabilities using Duncan Multiple Range Test (DMRT) as suggested by Duncan (1955).

RESULTS AND DISCUSSION

Table 1 presents vigour and stem girth of drumstick plant as influenced by direct sowing and transplanting at 3 and 9 weeks after sowing and transplanting (WAS/T) The most vigorous plant at 3 and 9 WAS/T were obtained from transplanting carried out at 4 WAT+ pinching at 2WAS/T. Stem girth was significant when observed at 3WAS/T though only direct seeding +pinching at 2WAS; transplanting at 2 WAS + pinching at 2WAT resulted in reduced growth.

TABLE I: Influence of planting methods and pinching on mean plant vigour score and stem girth of drumstick during the 2010 and 2011 wet season at Afaka of Nigeria.

Treatments	Plant vigour[1] at		Stem girth(cm) at	
	3	9(WAS/T)[2]	3	9(WAS/T)
Direct Sowing + Pinching 2WAS	1.36	7.0b[3]	0.1c	1.60
Direct Sowing + Pinching 2 and 4WAS	1.76	7.0b	0.47b	1.7a
Direct Sowing + no Pinching	3.0a	8.0b	0.5a	1.3a
Transplanting at 2WAS + Pinching 2WAT	1.4b	7.0b	0.1c	1.6a
Transplanting at 2WAS + Pinching 2+4WAT	3.0a	7.7ab	0.5b	1.5ab
Transplanting at 4WAS pinching 2WAT	2.9a	8.7a	0.6a	1.4ab
Transplanting at 4WAS + Pinching 2+4WAT	1.0b	5.3c	0.45b	1.8a
Se±	1.25	0.24	0.02	0.09

[1]A scale of 1-10 was used to assess plant vigour, where I indicated least vigorous and 10 most vigorous: [2] week after sowing and transplanting 3mean followed by the same letters are significantly different using Duncan Multiple Range Test (DMRT) at 5% level of probability.

The intensive care carried out on transplanted plant must have enhanced early growth and vigour of the plant thus resulting in improved growth thereafter.

The influence of planting methods and pinching on mean number of leaves petiole and canopy cover was not significant throughout the periods of study (Table 2). However the trend of growth from 6 and 9 WAS/T showed consistent increase in number of leaves petiole thereby increasing the canopy spread. The plant being a fast growing perennial, early pinching could increase the number of leaves and simultaneously increase canopy cover.

Transplanting at 4WAS + pinching at 2WAT produced taller plant than other methods (Table 3). The number of branches was not significantly affected during the investigation However, Fuglie (1999), recommended pinching in Moringa, in order to avoid shoot growing vertically with sparse flowers and few fruits. Pinching and pruning allowed early production of new leaves in abundance.

Table 2: Influence of planting methods and pinching on mean number of leaves and canopy spread of drumstick during the 2010 and 2011 wet season at Afaka of Nigeria.

Treatments	Number of leaves at		Canopy spread(cm) at	
	3	9(WAS/T)[6]	3	9(WAS/T)
Direct Sowing + Pinching 2WAS[1]	7.3	9.3	45.2	82.0
Direct Sowing + Pinching 2 and 4WAS	7.3	9.7	50.3	71.0
Direct Sowing + no Pinching	6.7	9.7	48.0	60.0
Transplanting at 2WAS + Pinching 2WAT[2]	7.7	9.0	60.0	90.0
Transplanting at 2WAS + Pinching2+4WAT	8.0	9.3	71.5	80.0
Transplanting at 4WAS +pinching 2WAT	7.7	10.0	66.7	77.0
Transplanting at 4WAS+Pinching 2+4WAT	8.7	11.0	52.2	60.0
Se±	0.53	0.37	5.10	11.4

[1] Weeks after sowing [2] Weeks after transplanting

Table 3: Influence of planting methods and pinching on mean plant height and number of branches of drumstick during the 2010 and 2011 wet season at Afaka of Nigeria.

Treatments	Plant height at		Number of [3]branches At	
	3	9(WAS/T)	3	9(WAS/T)
Direct Sowing + Pinching 2WAS[1]	10.7b	28.7	0.3	1.0
Direct Sowing + Pinching 2 and 4WAS	10.3a	39.8	0.1	1.7
Direct Sowing + no Pinching	10.8a	77.1	0.3	1.0
Transplanting at 2WAS + Pinching 2WAT[2]	10.2a	37.2	1.0	1.0
Transplanting at 2WAS + Pinching 2+ 4WAT	11.3ab	41.5	0.7	2.0
Transplanting at 4WAS pinching 2WAT	13.3a	51.6	1.0	2.3
Transplanting at 4WAS + Pinching 2 + 4WAT	12.2ab	62.5	0.6	2.3
Se±	0.08	3.3	0.32	0.62

[1] Weeks after sowing/transplanting, [2] Mean followed by the same letter(s) are not significantly different using Duncan Multiple Range Test (DMRT) at 5% level of probability, [3] Branches

Table 4: Influence of planting methods and pinching on the cumulative fresh vegetative yield of drumstick at harvest during the study period of wet season at Afaka of Nigeria.

Treatments	Fresh vegetative yield per plant (kg)	Fresh vegetative yield per ha (t)
Direct Sowing + Pinching 2WAS[1]	3.17c[3]	30.9c
Direct Sowing + Pinching 2 and 4WAS	4.10a	34.68a
Direct Sowing + no Pinching	3.73b	33.0ab
Transplanting at 2WAS + Pinching 2WAT[2]	3.10c	34.5a
Transplanting at 2WAS + Pinching 2+ 4WAT	3.67b	31.7b
Transplanting at 4WAS pinching 2WAT	4.07a	29.0c
Transplanting at 4WAS + Pinching 2 +4WAT	2.59d	25.9d
Se±	0.03	7.40

[1]Weeks after sowing [2]weeks after transplanting [3] means in a column of a set of treatment followed by same letters are not significantly different (p>o.o5) using DMRT.

The cumulative fresh vegetative yield was significantly affected by methods of planting (Table 4). The highest fresh vegetative yield was obtained with direct sowing and pinching at 2 and 4WAS, transplanting at 2WAS and pinching at 2WAS/T. The result could be due to partitioning of the photosynthates at the early period of growth due to pinching which enhanced the vegetative growth and partitioning to the branches thereby resulting in non-significant number of leaves and canopy. Similarly, pinching of tomato plant at 50 cm height was recommended to increase fruit yield in a research conducted in Niger state of Nigeria (Tswanya *et. al*., 2011). The result conforms to Loomis and Williams (1969), who reported that translocation on partitioning, determines the correlation between primary productivity and economic yield.

CONCLUSION

The result obtained could be an indication that the best management practices would be necessary for abundant leafy vegetative yield of drumstick. Therefore direct sowing + pinching at 2 and 4WAS and transplanting at 2WAS + pinching at 2WAS/T could be recommended for farmers' adoption in the savanna zones.

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