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Effects of cutting heights and interval of cutting on the yield of *Moringa Oleifera* (horse raddish)

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Abstract

The study examined the effects of three cutting heights (Ground level, 0.20m and 1.00m) and harvesting interval on the yield of *Moringa oleifera*. Field investigation was employed to generate data. The data obtained was analysed using simple descriptive statistics. The result showed there was significant difference among the cutting heights in dry yield. The highest 369.26g/tree (10.416t/ha) biomass was obtained from cutting at 0.20m, followed by the ground level cutting with 282.83g/tree (4.843t/ha), the lowest yield 241g/tree (3.128t/ha) was recorded from cutting at 1.00m height. The finding further indicated that yield also differed significantly with harvesting interval, with progressive increase from 2 to 12 weeks there was corresponding increase in yield (305-319.53g) respectively. On the basis of which the study recommends that cutting at 0.02m height and a progressive increase of 2 weeks interval of cutting will significantly improve the yield of *Moringa oleifera.*

Keywords: Cutting height; Harvesting interval; Moringa oleifera; Yield

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1. Introduction

Moringa oleifera, horse radish or *zogala* is considered one of the world's most useful trees as every part of the tree can be used either for food (salad) or has other beneficial properties. In the tropics, it is used as fodder for livestock; it is an exceptionally nutritious vegetable tree with a variety of potential uses:

- The *Moringa* tree is one of the most useful and multi-purpose plants that exist because of its wealth of vitamins, minerals and proteins
- Most communities in arid and semi arid areas of Niger Republic are known to depend on indigenous tree species such as *Adansonia digitata*, *Tamarindus indicia, Parkia biglobosa*, and introduced species such as *Acacia holocericea*, *Moringa oleifera* as food, fodder, fuelwood, medicinal and raw material for small-scale industries, without giving attention to improving their regeneration. *Moringa oleifera* is certainly considered one of the world's most useful trees, but it is underutilized at present
- Little is known on how the tree could be managed. Silvicultural treatments and /or practices such as pruning, cutting and fertilization etc have not been practiced and applied scientifically. Farmers in Niger have established *Moringa oleifera* plantations as cash crop. Its production is well suited to small farms, but traditional and cultural practices of the people have not been studied so as to improve upon them
- *Moringa oleifera* is a tropical tree with numerous economic importance hence methods of efficient propagation becomes of growing international interest.

The study of management practices is indispensable in determining the best levels of cutting methods, which will provide baseline information for further research. This study therefore is necessary in promoting and realizing the full potential of this crop. Thus, the objective of this research was to determine whether different cutting heights affect yield as well as to determine the effects of interval of harvesting on the yield of *Moringa oleifera.*

2. Materials and methods

2.1. The study area

The study was conducted in Rafawa, Soura, and Djiratawa districts of Maradi Region of Niger Republic. Located in the extreme Southern part of the country between latitude 13°N and 15°26'N and longitude 6°16'E and 8°36'E.

2.2. Sampling procedure and data collection

2.2.1. Yield

To obtain yield of dried leaves, three major cutting heights (close to farmers' traditional cutting heights) of harvesting (Ground level, 0.20m and 1.00m) were applied on even aged trees (2 years) in the farmers' field. Each method of harvesting was carried out systematically on 5 trees in each site given a total of 45 trees. The

yield of leaves per tree was weighed using appropriate electronic balance (KERN.440.45) for a period of 12 weeks.

2.3. Data analysis

Data gathered were analysed by descriptive statistics using percentages, frequencies and tables. Analysis of variance (ANOVA) was carried out to test the identified heights of harvesting on yield of *Moringa* leaves. SPSS 15.0 was used for all analyses of data gathered. Duncan Multiple Range was used to separate significant means.

3. Results and discussions

3.1. Harvesting techniques

The results (TABLE 1) indicated that 50, 42 and 40% of the farmers at Rafawa, Soura and Djiratawa respectively cut trees at the height of 0.20m above the ground, and this was the most prepared cutting height across the villages. It is important to note that certain farmers apply 2 or 3 methods like 0.20m and at ground level and cutting at 0.20m and 1.00m in the same field.

Cutting at 0.20m above the ground produced more shoots (6 to 10) which increase significantly more leafy production and farmers reported that the decay of stumps is avoided and the agricultural crops have more space to develop. Studies have shown that highest total biomass was obtained in the long harvest intervals (Adejumo, 1992), while Lazer, (1981) reported that the maximum yield of the shrubs occurred at short cutting (20cm and 40cm above the ground), but according to Crosbyand Craker (2001) similar harvesting heights were conducted on trees with mean height of 19.7cm and 150cm which had inadequate regrowth for a second harvest. Cutting at 0.20m, ground level (0m) and 1.00m levels were all used by the majority of farmers in the study area, while the cutting heights at 0.5m and 1.5m were practiced in few cases because after cutting, the trees are exposed to the veracity of wind and competition with the agricultural crops for light as observed by(Saint Sauveur,1992).

Table 1. Distribution of farmers based on cutting height

Location	**cutting height (m)**		
	Gl (0)	0.20	0.5
Djiratawa	30	40	5
Soura	35	42	9.3
Rafawa	20	50	10.6

3.1.1. Yield

The yield recorded after 12 weeks from the 3 cutting heights applied is shown in TABLE 2; at ground level (0m), 0.20m and 1.00m levels. Mean dry yield across harvesting methods was 297.70g per tree. There were significant differences in dry yield between cutting heights with 0.20m>0m>1m ($P<0.05$) with corresponding values of 369.27, 282.53 and 241grams. Dry yield differed significantly between harvest time with 6,8,10 and 12 weeks after cutting yielding 305.33, 313.00, 318.00 and 319.53grams which were statistically not different ($P>0.05$) but higher ($P<0.05$) than 287grams produced after 4 weeks of cutting.

The result showed that cutting at 0.20m above the ground remains the best management technique on *Moringa* tree regeneration because it gave the highest dry matter (DM) yields of leaves of 369.27g/plant(10.416t/ha/yr). This technique gave 6 to 10 shoots after operation which contributes enormously to the final yield (Ramachandra and Sharey, 1980). This was also observed by Crosbyand Craker (2001) on the same species where the yield approximates 405g/plant or 11.42t/ha/year. Cutting at the ground level (0m) where the harvest gave 282.83g DM yield/plant approximately 4.612t/ha/yr. It gave dry matter less than the former because few shoots (3-6) were observed this could be attributable to water logging for a long time or when the cutting is conducted in the rainy season. Cutting at 1.00m encouraged the release of more lateral buds but harvesting yielded 241g DM yield/plant or approximately 3.128t/ha/yr. It produced more branches with few leaves. Some researchers have found that higher cutting yielded higher DM yield Hairiah *et.al, (*1992); However, this study was in disagreement with Blair, and Edger (1990) who reported that in some cases, cutting height did not affect yield, so also(Stür *et. al*. 1994), but Ella, and Curet, (1989)] considered that the effect of cutting height on the growth pattern of trees and shrubs is still not clear and requires more studies as well as the number of shoots per plant. Cutting frequency of 2 weeks resulted in the highest yield and progressively from 2 weeks to 12 weeks. The total yield increased as the cutting interval was prolonged because trees release more buds after harvesting, stimulate the fast regrowth, and develops high leafy retention and coppicing capacity after cutting during the dry season as agreed by (Lazer, 1981).

Table 2. Effect of cutting height and time interval on the yield of *Moringa oleifera*

Factor	**Yield(g/tree)**
Overall	297.70
Harvesting height(m)	
1	241^{c}
0.20	369.27^{a}
G level 0	282.83^{b}
SE	5.76
Time of harvesting(week)	
2	243.33^{c}
4	287.00^{b}
6	305.33^{a}
8	313.00^{a}
10	318.00^{a}
12	319.53^{a}
SE	8.14

abc: means bearing different superscripts along column within a subclass differ (P<0.05) Significantly

4. Conclusions

This paper observed that despite the dietary, socio-economic and health benefits of *Moringa,* there was no conscientious effort made to improve the production and management of this plant. One way of achieving this is by harvesting the plant at a distance of 0.20m height and at an interval of 2weeks so as to improve the yield. The study further reveals that the higher the cutting height at frequent interval the greater the yield.

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